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27,671	1028	29,278	1138	2037	767	3728	939	6491	812	9609	781	14,388	1169
27,672	1021	29,283	1126	2056	813	3869	1176	6497	900	9638	908	14,473	896
27,673	1021	29,297	650	2124	691	3923	1023	6500	578	9745	972	14,644	949
27,674	1021	29,355	576	2137	864	3938	1054	6583	780	9749	820	14,656	1071
27,696	1020			2155	1032	3948	604	6597	1130	9833	1035	14,702	975
27,720	1122			2161	1201	4053	1053	6672	763	9843	638	15,035	1071
27,778	1197			2173	707	4065	980	6756	447	9877	1133	15,103	883
27,802	1087	**1912.**		2187	1143	4066	1119	6795	998	9940	766	15,140	1025
27,823	860			2191	546	4125	780	6798	1026	10,017	722	15,451	1054
27,829	824	7	804	2222	328	4127	591	6817	985	10,117	1187	15,452	951
27,834	677	56	821	2306	595	4155	1078	6888	686	10,122	657	15,480	1083
27,835	770	72	443	2311	900	4188	933	6903	547	10,349	1082	15,628	1185
27,858	985	95	1082	2312	651	4273	1032	6907	676	10,373	890	15,658	1147
27,864	1033	126	676	2313	547	4318	972	6908	676	10,442	922	15,684	953
27,879	930	142	776	2346	1025	4386	761	6993	635	10,446	1117	15,689	994
27,900	292	227	933	2351	972	4406	837	7060	837	10,478	653	15,753	809
27,902	441	251	605	2357	1137	4409	1135	7095	1185	10,479	1032	15,783	1089
27,930	524	252	1054	2371	1193	4410	1135	7151	947	10,538	702	15,787	1204
27,931	289	262	1069	2389	983	4496	860	7152	948	10,560	917	15,860	1089
27,951	1136	356	637	2420	1168	4510	767	7232	708	10,718	1032	15,919	1126
27,952	843	663	831	2425	529	4520	1116	7235	780	10,750	844	16,225	1071
27,969	597	673	1173	2458	1023	4610	1075	7245	681	10,751	900	16,226	864
27,978	1115	712	978	2498	504	4700	910	7253	996	10,824	972	16,296	1083
28,075	658	717	1070	2503	761	4758	813	7292	1176	10,835	766	16,471	913
28,085	792	725	782	2547	770	4775	784	7389	786	10,887	1122	16,499	1074
28,139	631	749	545	2550	918	4799	844	7558	729	10,958	1190	16,928	1023
28,140	453	771	1083	2617	864	4843	933	7634	812	10,971	694	17,222	1096
28,141	724	781	594	2669	931	4855	762	7698	652	11,028	1169	17,225	984
28,145	1172	784	817	2741	699	4860	774	7699	809	11,209	805	17,259	1116
28,153	1071	799	1055	2749	910	4895	632	7865	900	11,354	945	17,616	1021
28,166	764	804	825	2806	604	4986	844	7946	787	11,452	1167	18,436	1193
28,172	1072	807	1086	2812	792	5005	641	8199	608	11,558	1033	18,648	1073
28,173	765	822	637	2813	708	5082	776	8217	806	11,613	1120	19,172	1134
28,185	782	919	592	2857	763	5089	1135	8347	816	11,750	1124	19,334	1176
28,187	860	978	1117	2867	900	5106	1033	8348	875	11,758	1147	19,515	975
28,235	729	1073	1121	2881	661	5117	1194	8349	875	11,915	1117	19,601	1125
28,269	729	1105	458	2882	1007	5125	795	8400	1135	11,932	885	20,262	1144
28,306	1140	1154	1147	2883	900	5214	940	8402	735	12,053	702	21,728	1147
28,335	1069	1170	900	2919	643	5235	780	8421	635	12,117	1079	23,115	1168
28,402	954	1198	1136	2941	1172	5323	680	8422	766	12,188	1176		
28,404	641	1215	658	2948	1025	5413	1049	8495	662	12,233	694		
28,479	1073	1219	558	2949	867	5545	1136	8503	702	12,324	1079		

LIST OF JOURNALS ABSTRACTED, WITH ABBREVIATIONS USED, AND ADDRESSES OF PUBLISHERS.

Journal.	Abbreviation.	Address of Publisher.
Agricultural Ledger	Agric. Ledger	Reporter on Economic Products to the Government of India, Calcutta.
Allgemeine Zeitschrift für Bierbrauerei und Malzfabrikation	Allgem. Z. Bierbrau. u. Malzfabr.	Michaelerstrasse 25, Vienna XVIII/$_1$.
American Chemical Journal	Amer. Chem. J.	The Johns Hopkins Press, Baltimore, Md., U.S.A.
American Journal of Pharmacy	Amer. J. Pharm.	145, North Tenth Street, Philadelphia, Pa., U.S.A.
American Journal of Science	Amer. J. Sci.	New Haven, Conn., U.S.A.
Analyst	Analyst	Simpkin, Marshall, Hamilton, Kent, and Co., Ltd., 2, 4, 6, 8, Orange Street, London, S.W.
Annalen der Chemie	Annalen	C. F. Winter'sche Verlagshandlung, Leipzig, Germany.
Annales de Chimie Analytique	Ann. Chim. Analyt.	M. Crinon, 45, Rue Turenne, Paris, 3*e*.
Annales des Falsifications	Ann. Falsific.	56, Rue Madame, Paris, 6*e*.
Annali della R. Stazione Chimico Agraria Sperimentale di Roma	Ann. R. Staz. Chim. Agrar. Sperim. Roma	R. Stazione Chimico-Agraria Sperimentale di Roma, Rome.
Apotheker-Zeitung	Apoth.-Zeit.	Lovetzowstrasse 16b, Berlin, N.W., 87.
Archiv der Pharmazie	Arch. Pharm.	Selbstverlag des Deutschen Apotheker-Vereins, Berlin, Germany.
Atti della Reale Accademia dei Lincei, Roma	Atti R. Accad. dei Lincei, Roma	Tipografia della R. Accademia dei Lincei, Rome.
Berichte der Deutschen Chemischen Gesellschaft	Ber.	R. Friedländer und Sohn, Karlstrasse 11, Berlin, N.W., 6, Germany.
Berichte der Deutschen Pharmazeutischen Gesellschaft	Ber. deuts. Pharm. Ges.	Verlag von Gebr. Bornträger, Berlin, W. 35, Schöneberger Ufer 12A, Germany.
Biedermann's Zentralblatt für Agricultur Chemie	Biedermann's Zentr.	O. Leiner, Königstrasse 26B, Leipzig, Germany.
Bio-chemical Journal	Bio-chem. J.	Bio-chemical Dept., The University, Liverpool.
Biochemische Zeitschrift	Biochem. Zeits.	Verlag von J. Springer, Berlin, W. 9, Linkstrasse 23/24.
Board of Trade Journal	Bd. of Trade J.	Messrs. Wyman and Sons, Fetter Lane, London, E.C.
Brewers' Journal	Brewers' J.	F. W. Lyon, Eastcheap Buildings, Eastcheap, London, E.C.
British and Colonial Druggist	Brit. and Col. Drug.	194-200, Bishopgate, London, E.C.
Bulletin de l'Association Chimique de Sucre et de Distillerie	Bull. Assoc. Chim. Sucr.	M. le Trésorier, 156, Boulevard Magenta, Paris, 10*e*, France.
Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases.	Bull. Bureau Agric. Intell.	International Institute of Agriculture, Rome.
Bulletin de la Société Chimique de Belgique	Bull. Soc. Chim. Belg.	M. J. Wauters, Palais du Midi (Galerie du Travail, 7), Brussels.
Bulletin de la Société Chimique de France	Bull Soc. Chim.	Masson et Cie., 120, Boulevard Saint-Germain (6*e*), Paris.
Bulletin de la Société Française de Photographie	Bull. Soc. Franç. Phot.	51, Rue de Clichy, Paris, 9*e*.
Bulletin de la Société Industrielle du Nord de la France	Bull. Soc. Ind. Nord	Rue de l'Hôpital Militaire 116, Lille, France.
Bulletin de la Socié Industrielle de Mulhouse	Bull. Soc. Ind. Mulhouse	Berger-Levrault et Cie., 5, Rue des Beaux-Arts, Paris.
Bulletin de la Société d'Encouragement pour l'Industrie Nationale	Bull. Soc. d'Encour.	Secrétariat, Rue de Rennes 44, Paris, France.
Le Caoutchouc et le Gutta-Percha	Caoutchouc et Gutta-Percha	A. D. Gillard fils, 49, Rue des Vinaigriers, Paris, X.
Chamber of Commerce Journal	Ch. of Comm. J.	Oxford Court, Cannon Street, London, E.C.
Chemical News	Chem. News	E. J. Davey, 16, Newcastle Street, Farringdon Street, London, E.C.
Chemical Trade Journal	Chem. Trade J.	Davis Bros., Danes Inn House, 265, Strand, London. W.C.
Chemiker-Zeitung	Chem.-Zeit.	Dr. v. Vietinghoff-Scheel, Cöthen, Anhalt, Germany.
Chemische Industrie	Chem. Ind.	Weidmann'sche Buchhandlung, Zimmerstrasse 94, Berlin, S.W., Germany.
Chemische Revue über die Fett- und Harz-Industrie	Chem. Rev. Fett-Ind.	Dr. L. Allen, Grosse Reichenstrasse 17, Hamburg, Germany.
Chemisches Zentralblatt	Chem. Zentr.	R. Friedländer und Sohn, Karlstrasse 11, Berlin, N.W., 6, Germany.
Chemist and Druggist	Chem. and Drug.	42, Cannon Street, London, E.C.
Collegium	Collegium	K. Schorlemmer, Sebastian-Munster-Strasse 28, Worms am Rhein, Germany.
Comptes-Rendus hebdomadaires des Séances de l'Académie des Sciences	Comptes rend.	Imprimerie Gauthier-Villars, Quai des Grands Augustins 55, Paris.

JOURNAL.	ABBREVIATION.	ADDRESS OF PUBLISHER.
Comptes-Rendus des Travaux de Laboratoire de Carlsberg	Comptes-rend. Trav. Lab. Carlsberg	H. Hagerup, Copenhagen.
Deutsche Zuckerindustrie ..	Deuts. Zuckerind. ..	Verlag der Gesellschaft, Die Deuts. Zuckerindustrie, Berlin.
Electrician	Electrician	G. Tucker, Salisbury Court, Fleet Street, London, E.C.
Elektrochemische Zeitschrift ..	Elektrochem. Zeits. ..	F. Siemenroth, Hafenplatz 9. Berlin, S.W. 11.
Engineer	Engineer	S. White, 33, Norfolk Street, London, W.C.
Engineering	Engineering	C. R. Johnson, 35 and 36, Bedford Street, Strand, London, W.C.
Engineering and Mining Journal	Eng. and Min. J. ..	505, Pearl Street, New York City.
Färber-Zeitung	Färber-Zeit.	Julius Springer, Linkstrasse 23/24, Berlin W. 9. Germany.
Ferrum	Ferrum	W. Knapp. Mühlweg 19. Halle on Saale, Germany.
Foreign Office Annual Series (Cons. Reports)	F. O. Ann. Series ..	Wyman and Sons, Fetter Lane, London, E.C.
Gazzetta Chimica Italiana ..	Gazz. chim. ital. ..	La Direzione della "Gazzetta Chimica," Via Panisperna, 89, Rome.
Gerber	Gerber	VI/$_2$ Gumpendorferstrasse 89, Wien, Austria.
Gummi-Zeitung	Gummi-Zeit.	Geschäftsstelle der "Gummi-Zeitung," Blücherstrasse 31, Berlin, S. 61, Germany.
Hopper-Seyler's Zeitschrift für Physiologische Chemie	Z. physiol. Chem. ..	Verlag von K. J. Trübner, Strassburg, Germany.
Imperial Institute Bulletin ..	Bull. Imp. Inst. ..	John Murray, Albemarle Street, London, W.
India-Rubber Journal	India-rubber J. ..	Maclaren and Sons, 37 and 38, Shoe Lane, London, E.C.
International Sugar Journal ..	Int. Sugar J... ..	N. Rodger, Office of "The Sugar Cane," Mossburn Buildings, Altrincham, Manchester.
Internationale Zeitschrift für Metallographie	Internat. Z. Metallog.	Gebr. Bornträger, Schöneberger Ufer 12a, Berlin, W. 35.
Journal of Agricultural Science..	J. Agric. Sci... ..	University Press, Cambridge.
Journal of the American Chemical Society	J. Amer. Chem. Soc.	C. L. Parsons, Box 505, Washington, D.C., U.S.A.
Journal of the American Leather Chemists' Association	J. Amer. Leather Chem. Assoc.	American Leather Chemists' Assoc., Easton, Pa., U.S.A.
Journal of Biological Chemistry ..	J. Biol. Chem. ..	2419-21, York Road, Baltimore, Md., U.S.A.
Journal of the Canadian Mining Institute	J. Canad. Min. Inst.	3 & 4, Windsor Hotel, Montreal, Canada.
Journal of the Chemical Society of London, Transactions and Proceedings	Chem. Soc. Trans. *or* Chem. Soc. Proc.	Gurney and Jackson, 33, Paternoster Row, London, E.C.
Journal of the Chemical, Metallurgical, and Mining Society of South Africa	J. Chem. Met. Soc., S. Africa	F. Rowland, 9, South African School of Mines Building, Eloff Street, Johannesburg.
Journal de Chimie Physique ..	J. Chim. Phys. ..	Gauthier-Villars, 55, Quai des Grands Augustins, Paris.
Journal of the College of Agriculture, Tokyo Imperial University, Japan	J. Coll. Agric., Tokyo	Director of the College of Agriculture, Tokyo Imperial University, Japan.
Journal of the College of Engineering, University of Tokyo	J. Coll. Eng. Univ. Tokyo	The University, Tokyo.
Journal of the College of Science, Imperial University of Tokyo.	J. Coll. Science, Tokyo	Director of the College of Science, Tokyo Imperial University, Japan.
Journal of the Franklin Institute	J. Franklin Inst. ..	The Actuary, The Franklin Institute, Philadelphia, Pa., U.S.A.
Journal für Gasbeleuchtung und Wasserversorgung	J. Gasbeleucht. ..	R. Oldenbourg, Glückstrasse 8, München, Germany.
Journal of Gas Lighting.. ..	J. Gas Lighting ..	W. King, 11, Bolt Court, Fleet Street, London, E.C.
Journal of Industrial and Engineering Chemistry	J. Ind. Eng. Chem...	C. L. Parsons, New Hampshire College, Durham, N.H., U.S.A.
Journal of the Institute of Brewing	J. Inst. Brewing ..	Harrison and Sons, 45, Pall Mall, London, W.
Journal of the Institution of Mechanical Engineers	J. Inst. Mech. Eng. ..	Storey's Gate, Westminster, S.W.
Journal of the Russian Physical-chemical Society	J. Russ. phys.-chem. Soc.	Laboratoire de Chimie, Université Imperiale, St. Petersbourg, Russia.
Journal of Physical Chemistry ..	J. Phys. Chem. ..	W. D. Bancroft, Ithaca, N.Y., U.S.A.
Journal de Pharmacie et de Chimie	J. Pharm. Chim. ..	O. Doin et fils, Place de l'Odéon, Paris, 8.
Journal für praktische Chemie ..	J. prakt. Chem. ..	J. A. Barth, Dörrienstr. 16, Leipzig, Germany.
Journal of the Royal Society of Arts	J. Soc. Arts	G. Bell and Sons, York House, Portugal Street, London, W.C.
Journal of the Society of Dyers and Colourists	J. Soc. Dyers and Col.	E. T. Holdsworth, 10, Merton Road, Bradford, Yorks.
Journal of the Washington Academy of Sciences	J. Wash. Acad. Sci. ..	The Waverley Press, Baltimore, Md., U.S.A.
Leather World	Leather World ..	Leather Trades Publishing Co., The Hop Exchange, Southwark Street, London, S.E.

JOURNAL.	ABBREVIATION.	ADDRESS OF PUBLISHER.
L'Industria Chimica	L'Ind. Chimica ..	Associazione Chimica Industriale, Via Roma 28 (Galleria Nazionale Scale A), Turin, Italy.
Memoirs of the College of Science and Engineering, Kyoto Imperial University	Mem. Coll. Sci and Eng. Kyoto Imp. Univ.	The University, Kyoto, Japan.
Memoirs and Proceedings of the Manchester Literary and Philosophical Society	Mem. & Proc. Manchester Lit. & Phil. Soc.	36, George Street, Manchester.
Mémoriale des Poudres et Salpêtres	Mém. Poudres et Salpêtres	Gauthier-Villars, 55, Quai des Grands Augustins, Paris.
Metall und Erz	Metall u. Erz.. ..	W. Knapp, Mühlweg 19, Halle on Saale, Germany.
Metallurgical and Chemical Engineering	Metall. and Chem. Eng.	McGraw Publishing Co., 239, West 39th Street, New York City, U.S.A.
Mining Magazine	Mining Mag.	819, Salisbury House, London, E.C.
Mining and Engineering World ..	Min. and Eng. World	Monadnock Building, Chicago, Ill., U.S.A.
Mittheilungen aus dem königlichen Materialprüfungsamt zu Gross-Lichterfelde West	Mitt. k. Materialprüf.	Julius Springer, Linkstrasse 23/24, Berlin, W. 9, Germany.
Mittheilungen aus der Centralstelle für wissenschaftlich-technische Untersuchungen	Mitt. Centralst. Wiss.-techn. Unters.	Prof. Dr. W. Will, Neu-Babelsberg, bei Berlin, Germany.
Mittheilungen des k.k. Technischen Versuchsamtes	Mitt. k.k. Techn. Versuchsamtes	Verlag der k.k. Hof- und Staatsdruckerei, Wien, Austria.
Monatshefte für Chemie der kaiserlichen Akademie der Wissenschaften, Wien	Monatsh. Chem. ..	A. Hölder, Rothenthurmstrasse 13, Wien, I, Austria.
Moniteur Scientifique	Monit. Scient. ..	Dr. G. Quesneville, 12, rue de Buci, Faubourg St. Germain, Paris.
Oesterreichische Chemiker-Zeitung	Oesterr. Chem.-Zeit. ..	Pestalozzigasse 6, Wien I, Austria.
Oesterreichische Zeitschrift für Berg- und Hüttenwesen	Oesterr. Z. Berg- u. Hüttenw.	Kohlmarkt 20, Wien I, Austria.
Oil, Paint, and Drug Reporter..	Oil, Paint, and Drug Rep.	100, William Street, New York City, U.S.A.
Paper Making	Paper Making ..	5, Ludgate Circus Buildings, London, E.C.
Papier-Fabrikant	Papierfabr.	Otto Elsner, Oranienstr. 140-142, Berlin, S., 42.
Perfumery and Essential Oil Record	Perfumery and Essent. Oil Rec.	6, Serle Street, London, W.C.
Petroleum	Petroleum	Verlag für Fachtliteratur, Motzstrasse 8, Berlin, W. 30.
Pharmaceutical Journal	Pharm. J.	Pharmaceutical Soc. of Great Britain, 72, Great Russell Street, London, W.C.
Philippine Journal of Science ..	Philippine J. Sci. ..	Bureau of Science, Manila, Philippine Islands.
Philosophical Magazine and Journal of Science	Phil. Mag.	Taylor and Francis, Red Lion Court, Fleet Street, London, E.C.
Photographic Journal	Phot. J.	Harrison and Sons, 45, Pall Mall, London, S.W.
Proceedings of the American Institute of Mining Engineers, *and also* Bulletin	Proc. Amer. Inst. Min. Eng.; Bull. Amer. Inst. Min. Eng.	124-128, North Seventh Street, Philadelphia, Pa., U.S.A.
Proceedings of the American Society of Civil Engineers	Proc. Amer. Soc. Civ. Eng.	220, West 57th Street, New York City, U.S.A.
Proceedings of the Engineers' Society of Western Pennsylvania	Proc. Eng. Soc. W. Pa.	2511, Oliver Building, Pittsburg, Pa., U.S.A.
Proceedings of the Faraday Society	Proc. Faraday Soc. ..	The Secretary, 82, Victoria Street, London, S.W.
Proceedings of the Institution of Civil Engineers	Proc. Inst. Civ. Eng...	The Secretary, Great George Street, London, S.W.
Proceedings of the Institution of Mining and Metallurgy	Proc. Inst. Min. and Met.	Salisbury House, London, E.C.
Proceedings of the Royal Society	Roy. Soc. Proc. ..	Harrison and Sons, 45, St. Martin's Lane, London, W.C.
Recueil des Travaux Chimiques de Pays-Bas	Rec. Trav. Chim. Pays-Bas	A. W. Sijthoff, Leiden, Holland.
Revue Générale des Matières Colorantes	Rev. Gen. Mat. Col. ..	L. Lefèvre, 4, rue de Stockholm, Gare St. Lazare, Paris, France.
Revue de Métallurgie	Rev. Mét.	H. Dunot and E. Pinat, 49, Quai des Grands-Augustins, Paris.
School of Mines Quarterly ..	Sch. Mines Quart. ..	T. H. Harrington, Columbia University, New York.
Science Abstracts	Science Abst... ..	E. and F. N. Spon, Ltd., 57, Haymarket, London, S.W.
Science Reports of Tohoku Imperial University	Sci. Reports, Tohoku Imp. Univ.	The Maruzen-Kabushiki-Kaisha, Sendai, Japan.
Scientific American	Scient. Amer. ..	361, Broadway, New York City, U.S.A.
Scientific Proceedings of the Royal Dublin Society	Scient. Proc. Roy. Dublin Soc.	Leinster House, Dublin.
Sitzungsberichte der Königlich Preussischen Akademie der Wissenschaften	Sitzungsber. Kgl. Preuss. Akad. Wiss.	Verlag der Königlichen Akademie der Wissenschaften, Berlin.
Sprechsaal	Sprechsaal	Verlag von Müller und Schmidt, Coburg, Germany.

JOURNAL.	ABBREVIATION.	ADDRESS OF PUBLISHER.
Stahl und Eisen	Stahl. u. Eisen ..	A. Bagel, Breitestr. 27, Düsseldorf 74, Germany.
Tonindustrie-Zeitung	Tonind.-Zeit.	Dreysestrasse 4, Berlin, N.W. 21, Germany.
Transactions of the American Ceramic Society	Trans. Amer. Ceram. Soc.	The Secretary, Columbus, Ohio, U.S.A.
Transactions of the American Electrochemical Society	Trans. Amer. Electrochem. Soc.	Lehigh University, South Bethlehem, Pa., U.S.A.
Transactions of the American Foundrymen's Association	Trans. Amer. Foundrymen's Assoc.	R. Moldenke, Watchung, N.J., U.S.A.
Transactions of the American Institute of Metals	Trans. Amer. Inst. Metals	Buffalo, N.Y, U.S.A.
Transactions of the American Institute of Chemical Engineers	Tr. Amer. Inst. Chem. Eng.	D. Van Nostrand Co., New York, and F. & N. Spon, Ltd., London.
Transactions of the Australian Institute of Mining Engineers	Tr. Austral. Inst. Min. Eng.	57–59, Swanston Street, Melbourne, Victoria, Australia.
Transactions of the English Ceramic Society	Trans. Engl. Ceram. Soc.	Victoria Institute, Tunstall, Staffordshire.
Transactions of the Institute of Metals	Trans. Inst. Metals ..	Institute of Metals, Caxton House, Westminster, London, S.W.
Transactions of the Iron and Steel Institute	Trans. Iron and Steel Inst.	28, Victoria Street, London, S.W.
Transactions of the Mining Institute of Scotland	Tr. Min. Inst. Scot. ..	Albany Buildings, 39, Victoria Street, London, S.W.
Transactions of the North of England Institute of Mining and Metallurgy	Tr. N. Eng. Inst. Min. and Met.	Newcastle-on-Tyne.
Tropenpflanzer	Tropenpflanzer ..	Unter den Linden 43, Berlin N.W., Germany.
Wasser und Gas	Wasser u. Gas ..	G. Stalling, Oldenburg i. Gr., Germany.
West Indian Bulletin	West Ind. Bull. ..	Imperial Dept. of Agriculture, Barbados, W.I.
Wochenblatt für Papierfabrikation	Wochenbl. Papierfabr.	Güntter-Staib in Bieberach a. d. Riss, Württemburg, Germany.
Wochenschrift für Brauerei ..	Woch. f. Brau. ..	P. Parey, Hedemannstrasse 10, Berlin, S.W., Germany.
Zeitschrift der allgemeine Oesterreichische Apotheker-Verein	Z. Allgem. Oesterr. Apoth.-Ver.	Spitalgasse 31, Vienna IX/₂, Austria.
Zeitschrift der analytischen Chemie	Z. anal. Chem. ..	C. W. Kreidel's Verlag, Wiesbaden, Germany.
Zeitschrift für angewandte Chemie	Z. angew. Chem. ..	Verlag von Otto Spamer, Leipzig-R, Germany.
Zeitschrift der anorganischen Chemie	Z. anorg. Chem. ..	Verlag von L. Voss, Leipzig, Germany.
Zeitschrift für Chemie und Industrie der Kolloide	Z. Chem. Ind. Kolloide	Verlag von T. Steinkopff, Dresden A. 14, Bismarckplatz 16 I, Germany.
Zeitschrift des Vereins der deutschen Zucker-Industrie	Z. Ver. deut. Zuckerind.	Vereins-Direktorium, Kleiststrasse 32, Berlin, W. 62, Germany.
Zeitschrift für das gesammte Brauwesen	Z. ges. Brauw. ..	R. Oldenbourg, Glückstrasse 8, München, Germany.
Zeitschrift für das gesammte Schiess- und Sprengstoffwesen	Z. ges. Schiess- u. Sprengstoffw.	J. F. Lehmann, Paul Heysestrasse 26, München, Germany.
Zeitschrift für Elektrochemie und angewandte physikalische Chemie	Z. Elektrochem. ..	W. Knapp, Mühlweg 19, Halle a.S., Germany.
Zeitschrift für Farben-Industrie	Z. Farben-Ind. ..	Verlag für Textil-Industrie, Kottbuser Ufer 39/40, Berlin, S.O. 26, Germany.
Zeitschrift für öffentliche Chemie	Z. öffentl. Chem. ..	M. & H. Schaper, Hannover, Germany.
Zeitschrift für physikalische Chemie	Z. physik. Chem. ..	W. Engelmann, Mittelstrasse 2, Leipzig, Germany.
Zeitschrift für physiologische Chemie	Z. physiol. Chem. ..	Verlag von K. J. Trübner, Strassburg, Germany.
Zeitschrift für Spiritusindustrie..	Z. Spiritusind. ..	P. Parey, Hedemannstrasse 10, Berlin, S.W., Germany.
Zeitschrift für Untersuchung der Nahrungs- und Genussmittel	Z. Unters. Nahr. u. Genussm.	Julius Springer, Linkstrasse 23/24, Berlin, W. 9, Germany.
Zeitschrift für Zuckerindustrie in Böhmen	Z. Zuckerind. Böhm...	Die Administration, Vodickova No. 704 (Palais Lucerna), Prag II, Bohemia.

LIST OF ERRATA, 1912.

Issue.	Page.	Column.	Line from Top.	Line from Bottom.	Errata.
No. 2—Jan. 31	51	1	..	46	*For* " neither " *read* " either."
,, ,,	51	2	13	..	*For* " olemargarine " *read* " oleomargarine "
,, ,,	54	2	25	..	*For* " layer " *read* " larger."
,, ,,	55	1	22 and 23	..	*Delete* " as shown."
,, ,,	56	2	6	..	*For* " electrode " *read* " electrolyte."
,, ,,	57	2	22	..	*For* " tons " *read* " kilos."
,, ,,	57	2	..	11	*For* " 1910 " *read* " 1011."
,, ,,	60	2	19	..	*For* " Duncan's " *read* " Duggan's."
,, ,,	90	2	..	10	*For* " Birsten " *read* " Birstein."
No. 4—Feb. 20	191	1	21	..	*Insert authors' names*, " S. J. Johnstone and T. Crook."
No. 8—Apr. 30	379	2	29	17	*For* " Kaufmann " *read* " Kauffmann."
No. 18—May 31	466	2	Last line but one		*For* " approximate " *read* " proximate."
,, ,,	481	2	..	11	*For* " 254,050 " *read* " 245,059."
No. 10—June 15	545	2	16	..	*For* " Egerton " *read* " Edgerton."
,, ,,	546	1	8	..	*For* " Klopper " *read* " Klopfer."
No. 12—June 29	600	2	20	..	*For* " sodium nitrite " *read* " nitrite nitrogen."
No. 13—July 15	620	1	30	..	*For* " $CH_2 : C(CH_3).C : CH_2$ " *read* " $CH_2 : C(CH_3).CH : CH_2$."
,, ,,	635	2	..	30	*For* " Ger. Pat." *read* " Eng. Pat."
,, ,,	636	2	18	..	*After* " 13,340 " *insert* " of 1910, date of Appl."
No. 14—July 31	688	1	..	16, 17, 21, 22	*For* " sulphate " *read* " persulphate."
No. 15—Aug. 15	707	2	Title of 2nd abstract		*For* " July 3, 1912 " *read* " July 3, 1911."
,, ,,	728	1	Second Title		*For* " Paissakowitsch " *read* " Peissakowitsch."
No. 16—Aug. 31	765	2	17	..	*For* " Eng. Pat." *read* " Eng. Pats."
,, ,,	765	2	18	..	*Before* " Nov. 24, 1911 " *insert* " 26,343."
No. 20—Oct. 31	975	2	..	13	*After* " 19,515 " *insert* " of 1912."
,, ,,	994	1	First Title		*Before* " Roitzheim " *insert* " A."
,, ,,	1008	1	26	..	*For* " monoallylbarbituric " *read* " monoalkylbarbituric."
,, ,,	1008	1	27	..	*For* " monoalkyl- " *read* " monoallyl."
No. 21—Nov. 15	1053	1	31	..	*For* " Fritsche " *read* " Fritzsche."
No. 22—Nov. 30	1076	2	Title of 2nd patent		*For* " Tagliarue " *read* " Tagliabue."
No. 23—Dec. 16	1138	1	Bottom line		*For* " 1 " *read* " 0."
,, ,,	1148	..	Table at foot		*Under* " Temperature " (*for* " Napthalene ") *read* " 217·96 " *instead of* " 271.06."
No. 24—Dec. 31	1167	1	..	11	*Delete* first 8 words to comma, and substitute the following :— " In a known form of gas-washing apparatus the contact between liquid and gas or vapour is obtained by leading the liquid by fixed inverted, truncated cones, etc., towards and upon the centre of central rotating discs, whence the liquid is thrown outwards and broken up. In the present method for securing a more perfect atomising action—"

Journal of the Society of Chemical Industry.

No. 1, Vol. XXXI. JANUARY 15, 1912. No. 1, Vol. XXXI.

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ANNUAL GENERAL MEETING, 1912.

In accordance with the provisions of By-law 64, notice is hereby given that the Annual General Meeting will be held in the Rumford Hall of the Chemists' Club, 50, East 41st Street, New York City, at 10 a.m. on Tuesday, September 3rd, 1912. A programme of the proceedings will be issued later.

Under Regulation 5, all elections to the Committees and all elections of officers of local sections, with the exception of those to fill up unforeseen vacancies, must take place so that they can be reported to the Council in time to be considered at the meeting held under By-law 24 not less than two months prior to the Annual General Meeting.

Charles G. Cresswell,
Secretary.

Manchester Section.

Meeting held at the Grand Hotel, on Friday, November 3rd, 1911.

DR. G. J. FOWLER IN THE CHAIR.

PRESENTATION TO MR. JULIUS HÜBNER.

On behalf of the Section Mr. R. H. Clayton, the late Chairman, made a presentation to Mr. Julius Hübner, the retiring Hon. Secretary, as a mark of the Section's esteem and appreciation of his services during the past eight years. The testimonial took the form of a silver tray with silver tea and coffee service and an illuminated address and album, containing the signatures of the subscribers.

Meeting held at the Grand Hotel on Friday, December 1st, 1911.

DR. G. J. FOWLER IN THE CHAIR.

NOTES ON SEWAGE SLUDGE AND ITS DISPOSAL.

BY DR. J. GROSSMANN.

From an economic point of view, the present mode of sewage disposal by water carriage is wasteful. In the course of sewage purification, the solids are separated by settling or precipitation processes at sewage works, to be further dealt with on the spot or elsewhere, whilst the liquid part ultimately finds its way into the streams and the sea. This part of the sewage, which contains valuable manurial constituents, is at present entirely wasted. If it could be advantageously used, it would represent a value of about £40,000,000 per annum in this country. This, however, is distributed over a quantity of 3,000,000,000 tons, and even if it were possible to recover the total amount of valuable constituents without any expense, each ton would only produce 3d. With a liquid of such complex nature as sewage, the recovery of its chemical constituents by chemical methods would be a hopeless task.

When the system of water carriage was adopted in this country, it was pointed out by Liebig that the system was economically wrong; but it was recognised that from a hygienic point of view it should be superior to any other system, if properly carried out. So far as the liquid part of sewage is concerned, all anticipations can now be realised, but as regards the solid part of it, which has to be separately dealt with, the system has proved most disappointing from a hygienic point of view. A great point has been made of the fact that although those solids which constitute the sludge may not be all that can be desired from an aesthetic point of view, yet pathogenic germs are but rarely found in it, and it has been argued that this proved that sewage sludge was not dangerous to health. This seems to me one of the fallacies which have crept into the consideration of the sludge disposal question. It is well known that the sampling of a substance for the purpose of analysis is even more important than the analysis itself. For chemical purposes, an average sample is sufficient; but in the case of a bacteriological examination of sludge, an average sample taken in the ordinary way is of no use. In a town of 100,000 inhabitants, in which one person is afflicted with a zymotic disease, the infection from that person will be contained probably in the accumulation of a couple of months sludge, say in from 5,000 to 10,000 tons, and then only present in a very limited area, and in taking samples of the sludge, it is highly improbable that one would find pathogenic germs in the sample used for testing. In our present state of knowledge, it is impossible to separate a small bacterium bed from its surroundings. The fact that pathogenic germs have ever been found appears to me a proof that they must be far more prevalent than is at present accepted, and the same reasoning appears to me to apply to pathogenic germs which may find their way into the atmosphere from septic tanks, or from wet or dry sewage or sewage sludge.

In choosing a problem for research, especially one in connection with working up of by-products, the technical chemist has to consider the intrinsic value of the ingredients of the waste products, and whether their value as commercial products would be likely to leave a profit on the working expenses. When, however, it becomes a question of public health that a by-product should be rendered innocuous, expense should become a secondary consideration, and even if a method for the hygienic disposal of sewage sludge were to add to the expenses of sewage treatment, it would still leave a valuable asset in the improved health of the population.

The cheapest and simplest way of getting over the difficulty of sludge disposal is that of carrying the sludge, which may contain from 87 per cent. to 92 per cent. of water, out to sea in specially constructed boats and dumping it there. There appears to be always a danger that the tide may bring the sludge back to the nearest coasts; as is shown by the fact that it has occurred at Southend and other places on the estuary of the Thames, Llandudno, and other places; it has certainly been established that fish, including shellfish, may become contaminated and carry disease through coming in contact with sewage and sludge. In fact, it has become necessary to issue special Government regulations controlling the working of oyster beds. This method of disposal can therefore not be recommended. The cost of dumping into the sea, calculated on the dry substance contained in the sludge, is given in the Royal Commission's Report as follows:—

	Per cent. dry substance.		Tons dry substance per annum.	Calculated on dry substance or sludge.
Glasgow ...	(13·2%)	..	40,000 tons at	40·9d. per ton.
Salford	(21%)	..	28,600 ,, ,,	45·1d. ,, ,,
Dublin	(10%)	..	11,500 ,, ,,	50·2d. ,, ,,
London	(8%)	..	200,000 ,, ,,	56·9d. ,, ,,
Manchester .	(14%)	..	23,600 ,, ,,	68·9d. ,, ,,
Southampton	(10%)	..	1,395 ,, ,,	169·0d. ,, ,,

It thus appears that Salford, which is smaller than Manchester, is sending out more sludge, containing, moreover, 21 per cent. of solids, a very large percentage: possibly Salford is not only disposing of the sludge it makes, but is also removing quantities of old sludge which in years past has been dumped on land and become concentrated through exposure to the air, but there is nothing in the Commissioners' Report to show whether such be the case. It is to be regretted that the Report does not state the amount of sludge which may be obtained per 1,000 or per 100,000 inhabitants, and which at present is not known.

Probably in the majority of towns the process used consists in filter-pressing the settled sludge, and it is here where I found the greatest difficulties in ascertaining the actual cost of that process. If it is desired to dispose of the sludge by filter-pressing, it would be necessary to know the costs of producing and disposing of a quantity of pressed cake equivalent to one ton of actual sludge. However, it is customary to state the results in quite a different manner, and in such a way as to render them useless for comparison. From my point of view, the quantity of water contained in a sludge cake is not the only thing to be considered, and going into the question on these lines we find discrepancies which have not appeared before, and which have in many cases led to the adoption of fallacious views. To give an instance of this, I may refer to the paper on "Sewage Sludge and its Disposal," read by Mr. A. B. Ogden in 1910 before the Association of Managers of Sewage Disposal Works. Starting with sludge containing 10 per cent. of solid matter and 90 per cent. of water, he states that in his work the average proportion of liquid sludge to one ton of cake is 2·73 to 1, and that the resulting cake contains 50 per cent. of water. On the figures given, however, it appears impossible to obtain a cake of 50 per cent.; the proportion of 2·73 to 1 corresponds to a cake containing 27·3 per cent. of sludge, and even allowing 4 per cent. for lime added before pressing, we can only account for 31·3 per cent. of solid matter in the cake, which brings the percentage of water to 68·7, instead of 50 per cent. To obtain such a cake, he calculates that it costs about 2s. per ton. This, in the 50 per cent. cake which he assumes is obtained, would work out at 4s. and with a 31 per cent. cake at 6s. 5d. per ton of dry matter, including the added lime. To compare the cost with other processes the calculations must be based on the 27·3 per cent. of actual sludge, which corresponds to 7s. 4d. per ton of actual sludge. In this is not included the cost of the power used for filter-pressing, and instead of 4s. per ton on the dry material, it would therefore cost more than 7s. 4d. to remove one ton of actual sludge by filter-pressing, whereas the actual cost of removal by steamer is stated to be 5s. 9d. per ton.

The above instance is not an isolated one, and should prove how important it is to reduce the calculations to dry sludge as a basis. Pressed sludge cake nearly always contains lime and, in many cases, other ingredients which have been added in the settling tanks, and which by increasing the bulk of the solid matters and apparently decreasing the amount of water are liable to lead to erroneous conclusions. The Royal Commissioners have also overlooked the importance of reducing facts to a common basis. The costs for pressing given in their Report vary from 1s. 11d. to 6s. 4d. per ton of sludge cake in different localities; some of the sludge has been obtained from sedimentation tanks without the addition of chemicals, some with the addition of chemicals, some from septic tanks; the proportion of lime added for pressing varies from 1·3 per cent. on the sludge to 20 per cent. In no case is the amount of water in the original sludge or the amount of water and added chemicals and lime in the finished pressed cake given. The primary object for which filter-pressing was introduced seems to have been lost sight of. That object was to lessen the cost of removal by reducing the bulk and weight of sludge which would be obtained from the settling tanks, and which on an average contained nine tons of water to every ton of dry substance. It is, however, quite feasible to obtain a sludge containing four tons of water to every ton of dry substance by settling and draining, and if a sludge cake after addition of chemicals does not show a very decided increase over 20 per cent. in the percentage of actual sludge there appears to be no advantage in going to the expenses involved in the processes connected with filter-pressing. The same principle will apply in the examination of other processes which aim at the reduction of the bulk of the original settled sludge. In one of these, the water is separated from the solids by centrifuging in a highly ingenious machine constructed by Schäfer ter Meer. A report of the results obtained is to be found in the "Communications from the Royal Testing Institution of Berlin for the Supply of Water and for the Removal of Sewage and Waste Liquors in Berlin."[*] At the request of that Institution, one of their Building Inspectors, Mr. Reichle, and Professor Dr. Thiesing, carried on a series of experiments, in which the cost of filter-pressing is given as 2s. 4d. per ton and that of centrifuging 3s. 5d. per ton, but as they do not state the amount of water in finished products nor the amount of foreign substances added (in the case of filter-pressing, it appears that fine coal was added) it is impossible to determine the relative costs of the two processes calculated on the dry sludge. It appears clear that after centrifuging the mass only contains from 26 per cent. to 30 per cent. of dry substance. Assuming that the pressed cake contained the same amount of actual sludge, say 28 per cent., then the relative costs, calculated on dry sludge, would come to 8s. 4d. by filter-pressing, and 12s. 2d. by centrifuging. Apart from the increased expense, a drawback to the centrifugal method is that only about 60 per cent. of the sludge passing through the machine is effectively dealt with, and the rest has to be settled again, and to be passed through the machine a second time, and so on. It has been contended that the sludge leaving the centrifugal machine can be stored for any length of time without causing a nuisance, or put on the land without further manipulation, but I am informed that in Frankfort, where several of those machines are working, it has been found necessary to put down a drying machine, which will add still more considerably to the expense of centrifuging. In any case, the local circumstances in this country are such as would render it unlikely that this centrifugal machine would be generally adopted.

In the course of these investigations, it occurred to me to calculate what would be the cost of producing the same result as in a filterpress or centrifugal machine by means of heat. There is no difficulty in obtaining a sludge of 20 per cent. solid actual sludge and 80 per cent. of water by settling. Taking the sludge obtained by centrifuging or filterpressing to contain 33⅓ per cent. of solids and 66⅔ per cent. of water, I calculated how much water would have to be removed from the 20 per cent. settled sludge in order to convert it into a sludge with 33⅓ per cent. of solids and 66⅔ per cent. of water. In order to obtain three tons of 33⅓ per cent. sludge one would have to evaporate two tons of water from every five tons of the 20 per cent. sludge. I had previously found that in a drying machine for sludge, which I constructed for the purpose and a description of which is to be found in Eng. Patent No. 28,516 of 1909, I could evaporate nearly six pounds of water per pound of low grade coke or coke breeze, and as the price of this material varies from 5s. to 7s. 6d. per ton, a reduction in bulk of sewage sludge which had been previously settled down to 20 per cent. to the consistency of the cake obtained by filterpressing can be obtained at a cost in fuel of from 1s. 8d. to 2s. 6d. per ton, calculated on the dry material; to obtain the same result by filterpressing or centrifuging costs more than from 8s. 4d. and 12s. 2d. per ton, so that so far as the reduction in bulk goes, the method of evaporation by heat is cheaper than any other. Of course, other expenses have to be added to this for labour, capital charges, etc., but even then, the partial desiccation by heat is cheaper than filterpressing or centrifuging in Schäfer ter Meer's machine.

The disposal of sludge by shallow burial in the ground can only be resorted to in cases where large tracts of land are available close to the sewage works, and even then there is a residue left which, sooner or later, may have to be dealt with if the land is not to remain worthless, and also there is a possible danger to health from pathogenic germs.

As regards lagooning, the same considerations apply, and there is probably no case in which lagooning does not produce a nuisance and possible danger to the neighbourhood. I will, therefore, for the present, confine myself to the processes which are most in vogue for the further manipulation of the sewage sludge after it has been pressed. The course generally adopted is that of dumping the pressed sludge on land which has been bought for the purpose. But in many towns land suitable for that purpose is nearly filled up, and it is becoming a serious question what will have to be done when there is no more land available for dumping. In some cases, farmers will cart the stuff away for nothing; in some they will even pay a small sum for it, but even there it will only be removed during winter and spring, and left at the sewage works in summer, when it is most desirable that it should be shifted. Experiments on the value of sludge as a manure have been made at the instigation of the Royal Commissioners, and published in a special Report, in which it is distinctly stated that no sludge is worth 10s. per ton on the dry matter in it. This shows that sewage sludge can never become a marketable article which will pay the producer. Small works situated in the centre of a large farming district may be able to dispose of their sludge to farmers who may find that the sparing use of sludge on their land pays for the cost of cartage, but in the majority of cases, it would be necessary to distribute the sludge at a considerable distance from the works, and in that case, the cost of cartage, commission to salesmen, and other items would, on an average, far exceed the value of the sludge. The evidence given by sewage engineers before the Royal Commission shows that they recognise the fact that sludge is worthless as a commercial product for agricultural purposes, and the general opinion appears to be that practically the only constituent in the sludge which is valuable to farmers is the lime which is added to the sludge before pressing, and which often amounts to a considerable percentage of the sludge.

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[*] Mittheilungen aus der Königlichen Prüfungsanstalt für Wasserversorgung und Abwässerbeseitigung zu Berlin. Heft 10.

In Appendix VIII. which treats with the manurial value of sewage sludge, these points are clearly set out, and one would have expected that the Commissioners would endeavour to find some reason why the results obtained with sewage sludge on land should be out of proportion to the amounts of nitrogen, potash, and phosphates which it contains, but I cannot find that they have done so, and what appears to be the most natural reason for it has been overlooked altogether. It is well known that every sludge contains fatty matter, arising from soapsuds, and other domestic refuse. Notwithstanding this, the amount of grease contained in the sludges used for the experiments on land was not determined. Had this been done, it would have been found that it is the grease which interferes with the action of the manurial constituents of the sludge. Fatty substances mixed with mineral and organic matter will produce a kind of magma impervious to rain and air, and the deleterious effect of the presence of grease in manures has been recognised before. In the article on artificial manures, in "Thorpe's Dictionary of Applied Chemistry," Warington says, on p. 504, vol. 2, 1891 edition, with regard to fish manure: "The practical value of the manure depends to some extent on the quantity of oil present; the smaller the quantity of oil the more readily does the manure decompose in the soil." Now fish manure contains more than five times the nitrogen, and nearly twenty times the amount of phosphates, which sewage sludge contains, so that if its proportion of grease were to render inoperative such an amount of nitrogen and phosphates as is contained in sewage sludge, there would still be a large amount of these constituents available to act on the plants, and though of less value than a similar manure which contained no grease, fish manure would still produce good results; in sewage sludge, however, the grease predominates to such an extent as to render the manurial constituents practically inoperative.

In the experiments carried out by the Royal Commission, it was found that nothing was gained by drying sludge before applying it on land; in fact, it is stated that dried sludge produces worse results than wet sludge. Mr. Ogden, however, in the paper referred to above, evidently does not accept these facts and values the dried sludge manufactured at the Manchester Sewage Works at £1 per ton, or double the amount which has been found to be its utmost value by the Royal Commission. The cake which is obtained from the filterpresses is compressed into blocks 9 in. cube, and these blocks are dried on iron plates heated from waste steam from the engine. Even if it were possible to establish a market value of 20s. for the dried sludge, which, in the face of the Royal Commission's Report, is not probable, it would not pay to produce dry sludge in the manner which he has adopted. There is comparatively little steam required in a sewage works for the purposes of power, and the quantity of sludge which could be dried with waste steam would only be a small fraction of the total production. Sludge is a bad conductor of heat, and in his mode of drying, which is one of the least economical, it would be impossible to get the heat to penetrate into the centre of the cubes, so that neither a sufficiently dried cake would be obtained nor would any germs contained in the sludge be sterilized. If the coal had to be paid for in the drying it would add at least 3s. 6d. per ton for fuel, and the several items which he enumerates will stand as follows:—

	s.	d.
Pressing	6	5
Cutting cakes, etc.	3	6
Drying	3	6
Bags	4	0
Total	17	5

The total cost would come to 17s. 5d., leaving 2s. 7d. to pay for carriage, cartage, commission to salesmen, and general charges and bad debts. Thus there is the certainty of a substantial loss on each ton of dry sludge sold. Mr. Ogden mentions in his paper that the dried sludge which he obtains is pyrophoric and thus liable to spontaneous combustion, and for that reason it is ground shortly before dispatch; that fact may lead to difficulties with the insurance and railway companies.

It appears from Mr. Ogden's paper, and from the Annual Report for the year ending March 29th, 1911, of the Rivers Department of the City of Manchester, that experiments have been made with the Manchester pressed sludge cake with a view to gasifying it in a generator. Four tons of sludge cake containing 50 per cent of water were mixed with one ton of coal and gasified in a producer, and the report which Messrs. Crossley Bros. have given (Rivers Department Report, p. 20) is as follows:—

"We are pleased to inform you that we have succeeded in gasifying this material up to a moisture content of 50 per cent. to 55 per cent. Our yield shows 80,000 cubic feet of gas of a calorific value of 112 B.T.U.'s net at N.T.P., and the equivalent of 61 lb. of ammonium sulphate per dried ton gasified, when dealing with material of nitrogen content 1·46 per cent. Our only difficulty consisted in thoroughly cleaning the fire with such a material containing 40 per cent. of ash, for dealing with which our small experimental plant is indifferently equipped."

Practically the same figures are given in Mr. Ogden's paper with the following further particulars:—One ton of coal equals 160,000 cubic feet of gas, 28½ tons of gasified coal equals one ton sulphate of ammonia. Calorific value 154·6 B.T.U.'s per cubic foot, combustible gas 40·3 per cent.

On the strength of these data, the following comments are made in the Annual Report of the Manchester Rivers Department (p. 20):—"With specially designed plant and a larger proportion of coal, the above results indicate that where use exists for power, the pressing of the sludge with small coal and subsequent gasification may afford a satisfactory means of its disposal."

I have calculated the actual facts from the figures given, and I find that the actual amount of gas due to the sludge comes to 26,000 cubic feet of a calorific value of 28·5 B.T.U.'s, and the sulphate of ammonia per dried ton of sludge would only amount to a little over 20 lb., which is less than that of coal by the ordinary process of dry distillation, and one-fourth that which would be obtained in the production of Mond gas from coal.

The calorific value of the gas obtained being absurdly low shows that more than five tons of sludge cake would be required to give the equivalent of the available thermal value produced by one ton of coal, and including the removal of the clinkers more than six tons of material would have to be handled to obtain the same results as could be obtained from one ton of coal. The generator part of the plant also would have to be proportionately larger and more expensive. Reducing the whole to money values it means this, that one would have to pay probably five times the amount that an ordinary gas producing plant would cost, and that one would have to pay about £2 for fuel in the shape of sludge against 8s. 6d. per ton for which coal can be bought at the Manchester Sewage Works. There is nothing said about the commercial side of this question in Messrs. Crossley's Report, which quite properly only states that there appears to be a likelihood that the purely engineering difficulties of the problem might be overcome, and I fail to see what useful purpose can be served by stating, as is done in the Manchester Report, that this method may yield satisfactory results. A calculation based on the thermal value of sludge would have shown that it is hopeless to gain a satisfactory yield in power or heat from sludge cake with 50 per cent. water in a generator, and the results obtained by Messrs. Crossley Bros. fully confirm this.

Quite recently, the plan of gasifying sludge in gas retorts, which I advocated more than thirteen years ago in a paper read before this Society, has been resuscitated in Germany. I stated then that if the engineering difficulties could be overcome, there was a prospect of that method being practicable. I have since come to the conclusion that though from a purely technical point of view my statement was correct; it would be out of the question that a process of that kind could be worked in this country, in which the gas works are in nearly every case owned by Corporations, and in which the profit from the gas works helps to relieve the rates. The plant for the dry distillation of sewage sludge would be far more expensive than that used in the case of coal. The quality and quantity of the gas would be varied and uncertain, and its distribution would entail additional expense and inconvenience, as sewage works are generally at a considerable distance from the towns. Again, it might cost nearly £2 to obtain a quantity of sludge equivalent to one ton of coal. I have finally, after serious thought, abandoned the idea on which I first started in connection with the disposal of sewage sludge, and devoted my endeavours to my process of distillation with superheated steam, and which, I have found, has none of the objections either from an economic, engineering, commercial, or hygienic point of view, which the other method has.

The hygienic disposal of sewage sludge is the keystone of sewage purification, and the most rational mode of sludge disposal is that of putting it back on the land. But to use it in the shape of sludge, wet, pressed or dried, for farming purposes is, nearly always impracticable and always open to serious objections on hygienic grounds. There will always be a suspicion that it may disseminate disease amongst cattle and human beings; it should never be used where cattle is grazing, and not where the plant shoots have appeared above ground; its use in the latter case is, I understand, forbidden by law in France. Ordinary drying of sludge is no guarantee of sterilization. To make the sludge available for farming purposes it must be deprived of its grease, and the residue exposed to such a temperature as will be a guarantee that it is thoroughly sterilized. It is these considerations which I have borne in mind in working out my process for the disposal of sludge by means of distillation with superheated steam in such manner as will comply with the severest requirements of hygiene.

Discussion.

Mr. W. **Thomson** said that the cost of the author's process of drying sludge could be very easily verified. According to Dr. Grossmann, the cost of coal for direct drying by heat would be from 1s. 8d. to 2s. 6d., as compared with 8s. 4d. to 12s. 2d. by filtration, and 5s. 9d. for removing it in the wet condition by boat which was the present practice in Manchester and Salford. That involved the hygienic question that in such deposits there was a chance of inoculating the fish and rendering seaside resorts objectionable. The disposal of large quantities of refuse solid material near large towns constituted a most difficult problem, as the available land soon got filled up. Besides drying the sludge, Dr. Grossmann's process recovered most of the grease which was a valuable product, and left a dry, sterilised material which possessed manurial value much greater than the wet greasy and slimy stuff produced from the partially dried sludge. Both from its physical constitution and from some of its constituent parts, it seemed to constitute a valuable manure. One of the medical officers of health spoke to him most enthusiastically of its value as a manure from the results obtained by him from comparative experiments made in flower pots and on the soil in his own garden.

Mr. R. H **Clayton** inquired with respect to the figure of 40,000,000 pounds what percentage was solid and what liquid. It seemed a great pity that all the constituents were lost. In a book dealing with the natural resources of America, it was stated the crust of the earth only contained 0·1 per cent. of phosphorus, and there was no chemical method known at the present time of manufacturing phosphates. Phosphorus had a very great bearing upon agriculture. In Wisconsin, farming the land according to the American method, they had reduced the phosphoric acid contents from 2800 lb. per acre down to 1800 lb. in the 8 inches of virgin soil. That difference had to be replaced by fertilisers. As a consequence of the American methods of farming, the "corn belt" had gone right back nearly to the West.

Mr. S. S. **Platt** agreed with much that Dr. Grossmann had said, but until they had had the process outlined in his previous paper worked out on a sufficiently large scale so that they could really determine what the cost was and what were the commercial benefits, he did not think they could make much progress. It was all a question of expense. The process was to be worked on a large scale at Oldham where there was no grease beyond what came from the slopstones. If the process proved satisfactory there, then the result should augur well for those towns which had a considerably larger quantity of grease in their sewage than Oldham.

Mr. G. **Gunn** believed the system of multiple evaporation could be tried very cheaply. The Yorkshire woolcombers had had a system of recovering grease, in which they also recovered the free ammonia in the distilled water from the evaporator which was returned to the works for washing purposes. That might not be a commercial proposition at present, but he thought it was worth considering.

Mr. W. H. **Coleman** observed that in France there were several large installations where the separation of the domestic portion of the sewage was undertaken, and where ammonia was recovered in fairly large quantities. The two chief towns were Angers and Bordeaux.

The **Chairman** mainly agreed with Dr. Grossmann's statements, but differed in one or two matters of fact. The question of pathogenic germs was one upon which very little was known. It would be a very good thing if they could adopt some better method of dealing with sludge than dumping it down among the fish. He had seen centrifuges in Frankfort, and his impression was precisely that of Dr. Grossmann. They did not reduce the moisture to a very great extent, and there was a very considerable proportion of unpurified liquid. In his opinion, the one advantage was that the sludge was delivered in a granular condition, so that it could be readily passed along a travelling band into a dryer, and, being loose, dried more readily than pressed cake. At Ostend they had sludge presses at work side by side with centrifuge presses which rather indicated that the sludge press was the simpler. He was afraid a good deal of Dr. Grossmann's argument was built up on a wrong figure, because he took 33 per cent. as being the solid content of pressed sludge. Though he (the speaker) would not pin himself to more than 50 per cent, as being a round figure, it was certainly more than 33 per cent., one might certainly say 45 per cent. with Manchester pressed cake, which was the only one he could speak of, as an average. Sludge calculations were extremely difficult to follow, and he quite agreed they ought to be made on a basis of dried solids, and he thought they ought to thank Dr. Grossmann for the hint. In reference to the relative solids between Manchester and Salford, it was quite true that for many years Salford dumped its sludge into an old dry sludge pit, which raised the solid content considerably; but in making comparisons it was necessary to have the facts right. Lagooning was not altogether satisfactory, but he did not agree that digging into the soil would necessarily come to an end, for the simple reason that the sludge, after a period of shallow burial, not of deep burial, was completely disintegrated, and the land was actually benefited and loosened thereby. He was entirely in agreement with Dr. Grossmann with regard to the question of grease, and had always wondered why the Royal Commission should have overlooked the matter. Perhaps Dr. Grossmann had not sufficiently considered the point of Mr. Ogden's paper, and it was to be regretted that that gentleman was not present to answer the criticism that the sludge dealt with by him did not contain any grease, and was not sewage sludge properly speaking, but was humus material washed out of the filter beds. They would readily admit that to dry the whole of the Manchester sewage sludge with the waste steam available at the sewage works was a very big proposition. With regard to the matter of power production, the point was simply that many sewage works had destructors attached to them, by means of which the sludge was finally and hygienically got rid of, though at a price.

Dr. Grossmann, in reply, said he had had to go somewhat against the ordinary groove in which things were accepted in sewage works. He had calculated the relative values of solid and liquid matter in sewage in different ways, but it was extremely difficult to determine them. In the middle of the last century Liebig was asked by the London Metropolitan Authority to present a report on the water carriage system, and in consequence made a series of calculations in which he apparently made allowances for everything, and the proportion between solid and liquid appeared to be as between 1 to 20 and 1 to 40; to get nearer to the relative values in the present condition of things was not possible. He hoped to be able to convince Mr. Platt that the process which had been adopted in Oldham was not only effective, but also satisfactory as regards cost. He felt, from the tone of the discussion, he had done right in bringing the matter forward, and that the points he had raised required clearing up. The evaporation of the liquid part of sewage was a very large order, and he did not see how it could be done. Mr. Coleman mentioned it was done in France, and, though that was correct, still it was not done under the water carriage system, in which about 30 gallons of water per person was added and would have to be evaporated. In the places in France referred to by Mr. Coleman, the sewage was not mixed with water. In Manchester, before the general adoption of the water carriage system, as much as 10,000 tons of manure was made from middens by evaporation; that had a high reputation among farmers; but the old system had been condemned on hygienic grounds, and there was no doubt it was now dead. They were committed to the water carriage system, which was, in his opinion, from a hygienic point of view, by far the best system, and they stood to get back in health what they lost in money. He was of opinion that even if it were only doubtful whether a product might carry infection, the best plan to adopt where it was a question of public health would be to do away with it altogether. He was also pleased that Dr. Fowler agreed with his remarks on Schäfer ter Meer's centrifugal machine. He could not agree with Dr. Fowler upon the question of percentage of sludge in pressed cake. The average percentage of total solid matter in cake was under 40 per cent.; this contained on an average from 4 to 6 per cent. of lime which had been added to it. There was an impression that but little lime was in the cake, as its quantity was calculated on the original sludge. It sounded very little to add one per cent. of lime to sludge, but that sludge contained only 5 or 10 per cent. of solid matter, and thus on the dry material the lime amounted to 10 or 20 per cent. in the end; not many cakes, therefore, contained more than 33 per cent. of sludge. It was not quite clear from Dr. Fowler's remarks whether he had read Mr. Ogden's paper, which stated distinctly that that gentleman worked with sewage sludge from the settling tanks, of which he used 2·73 parts at 10 per cent. solids to obtain one part of pressed cake. It was evident on these figures, that the Manchester pressed cake as produced by Mr. Ogden could not possibly have had more than 27·3 per cent. of actual sludge in his pressed cake; all the statements made by him (Dr. Grossmann) could be verified by reference to that paper: his arguments were not built on wrong figures or assumptions. With regard to Dr. Fowler's remarks on gasifying and dry distillation it must be borne in mind that the calorific value of the sludge was low, and in any scheme of gasifying in producers or of producing illuminating gas by dry distillation one would have to reckon with the fact that one had to compete with coal at from 7s. to 15s. per ton, whilst a quantity of sludge capable of producing the same results would cost nearly 40s., and require much larger plant, and handling of five or six times the weight of an equivalent quantity of coal, and he could therefore not agree with Dr. Fowler's views on the practicability of these methods.

Newcastle Section.

Meeting held at Newcastle on Wednesday, November 15th, 1911.

MR. E. F. HOOPER IN THE CHAIR.

SOME ASPECTS OF CHEMICAL TRADE.

BY E. F. HOOPER.

Only since the passing of the Census of Production Act, 1906, has it been possible to obtain, even approximately, figures as to the production of chemicals in the United Kingdom. It should be noted, however, that the line of demarcation between chemicals and non-chemicals is a most difficult one to define for comparative purposes. It is open, naturally, to reasonable debate as to whether such bodies as mineral oils, motor spirit, etc., should be classified as chemicals or not. As far as possible, I have included as chemicals those products mentioned by H.M. Customs and Excise Departments in their Blue Books for 1910. The metals, as such, have been omitted as chemicals, as also has soap, prepared food-stuffs, culinary preparations, purple iron ore, burnt pyrites, rubber and gutta-percha products, artificial gems, paints and varnishes, matches, gums, and sealing-waxes. Important products not included in chemical imports and exports are as under:—Asbestos, metallic ores, methylated spirit, explosives, plumbago, artificial silk, talc and mica, and gas mantles.

Further, as investigations proceed, one notices different materials and products defined as chemical products in each separate country, therefore all comparisons are necessarily approximate.

The United Kingdom.

Table I.

Production of chemicals, 1906.

(All products under £20,000 in value are omitted, and all figures stated are calculated to the nearest thousand pounds in each case.)

Article.	Value.
Acids: Acetic, hydrochloric, and nitric	£425,000
Sulphuric acid	855,000
Aluminous sulphates	213,000
Ammoniacal liquor	31,000
Ammonium sulphate	300,000
Arsenic and its oxides	55,000
Bleaching materials	520,000
Boiler compositions	55,000
Borax	205,000
Brewers' finings	69,000
Coal tar products, except Dyes	1,987,000
Coal tar dyes	373,000
Compressed gases	106,000
Disinfectants, insecticides, sheep dips	136,000
Druggists' sundries	128,000
Copper sulphate	598,000
Drugs and galenical preparations	2,461,000
Dyewoods and tanning materials	98,000
Essential oils	91,000
Extracts for tanners, printers, dyers	316,000
Fine chemicals	1,613,000
Finishing materials for textile trades	323,000
Manures, other than sulphate of ammonia (made in chemical works only as apart from manure works solely)	205,000
Mineral residues	62,000
Mordants	34,000
Soluble oils, for textile and other trades	33,000
Patent medicines	1,285,000
Perfumed spirits and toilet preparations	804,000
Photographic chemicals	581,000
Soda compounds (excepting chromates, cyanides, borax and sodium chloride)	3,315,000
Sulphur	148,000
Wood distillation products	46,000
Chemicals not enumerated	2,770,000
Other chemicals	674,000
Sulphate of ammonia	2,823,000
Total	£23,738,000

It may be noted here that amongst the most important of the products prepared, *i.e.*, the gross value exceeding £500,000 annually, are sulphuric acid, bleaching materials, coal tar products, copper sulphate, drugs, fine chemicals, patent medicines, perfumes and toilet preparations, photographic preparations (chemicals), soda compounds, and sulphate of ammonia.

The cost of materials used shown in relation to the value of output :—

Value of output	£23,447,000
Total cost of materials used	13,983,000
Value of output, less cost of materials used and amount paid to other firms for work given out to them	£9,464,000

Note.—The figures above do not exactly accord with the statement shown in the earlier table owing to slight differences in definitions of chemical products.

Employment in purely chemical trade.—The employees in the chemical trade are estimated at 51,088 persons, comprised of 44,555 males and 6,533 females ; this figure includes 5,981 salaried persons.

The figures in Table II. show a singularly steady ratio of imports from foreign countries.

Taking into consideration the rapid growth of our import trade, which increased from 1908 to 1910 by no less then £85,000,000, the equivalent ratio of chemical imports is a remarkable and wholesome factor, as far as chemical industry is concerned, if, as a late eminent statesman propounded, the trade in chemicals indexed the commercial welfare of the country.

The total exports from the United Kingdom to foreign countries and British Possessions are now compared with the chemical exports of the United Kingdom in the same manner as imports.

TABLE II.

External Trade of the United Kingdom.

IMPORTS.—Imports from foreign countries and British Possessions:—

	1906	1907	1908	1909	1910
Total imports	£607,886,000	£645,800,000	£592,593,000	£624,705,000	£678,257,000
Chemical imports from :—					
(1) Foreign countries	8,900,000	10,082,000	8,800,000	9,364,000	10,036,000
(2) British Possessions	1,204,000	1,547,000	1,385,000	1,233,000	1,224,000
Ratio percentage of chemical imports from foreign countries compared with total imports	1·4	1·56	1·48	1·49	1·48

TABLE III.

EXPORTS.

	1906	1907	1908	1909	1910
Total exports	£375,575,000	£426,035,000	£377,104,000	£378,180,000	£430,385,000
Chemical exports to :—					
(1) Foreign countries	11,055,000	12,352,000	11,863,000	12,039,000	13,309,000
(2) British Possessions	4,466,000	4,700,000	4,409,000	4,744,000	5,259,000
Ratio percentage of total chemical exports to foreign countries compared with total exports	4·1	4·0	4·0	4·4	4·3

TABLE IV.

	1906	1907	1908	1909	1910
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Total trade imports per head of population from foreign countries	13 18 6	14 12 11	13 6 3	13 17 6	14 18 0
Chemical import per head of population from foreign countries	4s. 1d.	4s. 7d.	3s. 11d.	4s. 2d.	4s. 5d.
Chemical import per head of population from British Possessions.	6d.	8·4d.	7·5d.	6d.	6d.
Total chemical import value per head of population	4s. 7d.	5s. 1d.	4s. 5d.	4s. 8d.	4s. 11d.

Note.—To arrive at the above figures, the population of the United Kingdom was taken as 45,500,000 in 1910 and 41,609,000 in 1901, and the proportionate average increase figure of 389,000 per annum has been added.

TABLE V.

	1906	1907	1908	1909	1910
Export of chemicals per head of population to foreign countries	5s. 1d.	5s. 7d.	5s. 4d.	5s. 4d.	5s. 11d.
Export of chemicals per head of population to British Possessions	2s. 0½d.	2s. 2d.	2s. 0d.	2s. 1d.	2s. 4d.
Total chemical export per head of population to foreign countries and British Possessions	7s. 1½d.	7s. 9d.	7s. 4d.	7s. 5d.	8s. 3d.

The figures in Table III. show a slight but steady improvement in the export of chemicals over the period indicated.

It may here be noted that the balances in export value over imports to foreign countries and British Possessions amount to:—

1906	1907	1908	1909	1910
£6,620,500	£6,970,000	£7,471,000	£7,419,000	£8,532,000

We may note with satisfaction that the exports appear to indicate a material improvement during the year 1910.

If we now take the personal factor, *i.e.*, trade per head of population, into consideration, the results will be as shown in Table IV.

In 1908, 420,000 tons of artificial manure were exported, presumably not under the head chemicals, to a value of over £2,000,000. If soap and candles be classed as "chemicals," 17 per cent. of the former and 31 per cent. of the latter are exported from this country, the total weight of these materials amounting to 350,000 tons.

It is of special interest to note that in organic chemicals the Continent has been able to produce a very considerable quantity of the organic raw products which used to be mainly supplied from this country. The Board of Trade note that the exports of bleaching powder amounted to nearly one half, and those of soda compounds (except chromates, cyanides, borax, and salt) to about 42 per cent. of the quantities produced in the United Kingdom.

It may be of further interest to analyse to some extent the destination of the production of the United Kingdom, as well as to ascertain from what countries we derive our principal requirements.

TABLE VI.

Imports and exports from the German Empire to the United Kingdom.

(Only exports and imports exceeding £20,000 in value are dealt with, the values stated being calculated to the nearest thousand pounds).

Products imported to U.K.	1909	1910
Bleaching powder	£21,600	£21,900
Coal tar products (not dyes)	77,400	98,200
Cream of tartar	60,800	85,500
Potassium nitrate (saltpetre)	112,000	132,500
Soda salts	50,000	62,800
Tartaric acid	85,800	81,400
Unenumerated	820,000	917,000
Drugs	237,000	227,800
Dyes: Anthracene, alizarin	238,000	279,000
Dyes: Aniline and naphthalene	1,184,000	1,300,000
Synthetic indigo	117,000	101,200
Tanning extracts	21,300	30,500
Dye extracts	29,000	33,000
Total	£3,053,900	£3,370,800

Notes.—Coal-tar products show a steady increase since 1906.
Cream of tartar shows a steady increase since 1906.
Saltpetre shows a steady increase since 1906.
Unenumerated, highest in 1907.
Dyes: Anthracene and alizarin, steady increase since 1906.
Aniline, etc., steady increase since 1906.
Synthetic indigo, general decrease since 1906.

Products exported from U.K.	1909	1910
Carbonate of ammonia	£24,000	£28,200
Carbolic acid	24,000	31,300
Copper sulphate	36,000	24,000
Potassium and sodium chloride	24,000	34,000
Unenumerated	164,000	161,000
Sodium and potassium chromates	23,815	33,700
Total	£295,815	£312,200

Carbonate of ammonia shows steady increase since 1906. Carbolic acid, in other published statistics by the Board of Trade, shows a decline to £12,000 in 1910. Unenumerated £177,000 in 1906 to £161,000 in 1910.

Germany appears to have developed its soda industry so as to require small import from any other country.

TABLE VII.

The United States of America.

Products imported to U.K.	1909	1910
Acetone	£36,000	£16,000
Unenumerated	555,000	369,000
Total	£591,000	£385,000

The total chemical imports of the U.S.A. amounted to:—

$74,400,000	in	1906
$83,000,000	,,	1907
$73,200,000	,,	1908
$78,300,000	,,	1909

Products exported from U.K.	1909	1910
Bleaching powder	£116,000	£123,000
Aniline and toluidine	34,000	31,000
Carbolic acid	32,000	39,000
Tar oils	281,000	351,000
Coal products (not dyes)	38,600	31,000
Dyes (products of coal tar)	60,200	50,200
Crude glycerin	143,300	263,400
Ammonium chloride	91,000	87,000
Caustic soda	—	26,000
Sulphate of soda	—	21,600
Other soda salts	24,700	10,600
Unenumerated	185,600	195,400
Total	£1,006,400	£1,229,800

The exportation of tar oils to U.S.A. is a largely increasing factor; as to glycerin the increase is largely due to the rise in price.

The cyanide imports of U.S.A. have dropped very heavily since 1906.

TABLE VIII.

Belgium.

Products imported to U.K.	1909	1910
Acetic acid	£21,600	£27,000
Glycerin	—	26,000
Potassium nitrate	—	24,300
Unenumerated	101,000	102,000
Total	£122,600	£179,300

Products exported from U.K.	1909	1910
Pitch	£219,900	£230,600
Copper sulphate	20,600	—
Unenumerated	58,400	58,100
Total	£298,900	£288,700

TABLE IX.

France.

Products imported to U.K.	1909	1910
Drugs	£79,400	£81,500
Dyestuffs	63,000	58,700
Unenumerated	184,500	209,200
Tanning extracts	377,500	382,400
Borax	18,000	23,200
Cream of tartar	183,200	201,800
Crude glycerin	39,800	61,800
Total	£945,400	£1,018,600

Products exported from U.K.	1909	1910
Benzols	£50,000	£65,400
Naphthas	23,500	25,600
Pitch	219,500	263,700
Copper sulphate	237,400	219,000
Sodium potassium chromates	29,200	35,500
Unenumerated	147,800	158,100
Total	£707,400	£767,300

TABLE X.

Netherlands.

Products imported to U. K.	1909	1910
Quinines	£48,500	£48,100
Glycerin	—	24,000
Total	£48,500	£72,100

Products exported from U.K.	1909	1910
Carbonate of ammonia	£23,700	£31,300
Copper sulphate	70,700	36,000
Potassium and sodium chromates	28,500	29,300
Unenumerated	72,200	69,700
Carbolic acid	23,700	31,300
Total	£218,800	£197,600

Having dealt in some detail with our home, foreign, and colonial trade, taking some note of the personal equation, it may be of value to compare our chemical trade with that of our near neighbour, Germany. The German position may fairly be judged by taking the results of the last three years, of which statistics are now available, viz., 1907, 1908, and 1909.

TABLE XI.

The German Empire.

(Note.—The value of a mark is taken as equal to one shilling).

	1907	1908	1909
Total IMPORTS	£437,200,000	£383,200,000	£426,000,000
Total import of chemicals	19,022,500	17,710,150	18,880,600
Percentage ratio of chemical imports to total imports	4·3	4·6	4·4
Total exports	£342,260,000	£319,930,000	£329,110,000
Total export of chemicals	27,922,500	27,702,850	31,336,300
Percentage ratio of chemical exports to total exports	8·1	8·6	9·4
Population of the German Empire	62,083,000	62,980,000	63,879,000
Value per head of chemical imports	6s. 1½d.	5s. 7d.	5s. 10d.
Value per head of chemical exports	9s. 0d.	8s. 9d.	9s. 9d.

The imports and exports of the German Empire, and their values, may be classified as under :—

TABLE XII.

Imports.

Products.	1907	1908	1909
Saltpetre	£6,401,400	£5,881,400	£6,051,000
Tanning materials	1,706,700	1,442,700	1,617,300
Elements, salts, and bases	2,496,000	2,590,700	2,811,400
Drugs and perfumes	2,176,000	1,999,600	2,204,600
Resins and gums	2,281,000	2,226,000	2,006,000
Turpentine and allied bodies	1,412,600	1,050,000	1,237,900
Colours and dyes	967,000	842,000	823,200
Unenumerated	1,581,500	1,630,900	2,078,600

TABLE XIII.

Exports.

Products.	1907	1908	1909
Crude chemicals	£1,589,300	£1,535,050	£1,709,400
Potassium chloride	1,258,850	1,264,000	1,568,000
Bases, salts, acid	6,976,900	7,153,200	7,996,100
Drugs, ethers, perfumery	3,766,300	3,871,100	4,182,200
Indigo	2,129,100	1,932,700	1,973,600
Aniline dyes	5,623,800	4,954,300	5,883,800
Unenumerated	8,079,700	6,992,300	7,913,100

The total production of chemicals in the German Empire for the year 1908 appears to be about £62,500,000, or rather over £1 per head of the population.

Such figures as those presented above are of vital interest to manufacturers as a whole, and, so far as I am aware, similar statistics are not generally easy to obtain except by a considerable amount of time and research. The figures have been re-checked, and I have reason to believe are accurate in so far as any statistics of this character are publicly available. Should any inaccuracies be found, it will be my immediate desire to have them rectified without delay.

Meeting held at Newcastle on Wednesday, December 13th, 1911.

MR. E. F. HOOPER IN THE CHAIR.

THE ESTIMATION AND ELIMINATION OF SULPHUR COMPOUNDS IN COMMERCIAL BENZOL.

BY J. G. ELLERTON.

Although many compounds of sulphur occur in benzol, the principal are :—(1) carbon bisulphide, (2) thiophen, and (3) mercaptans. Of these three forms, the first and second predominate, and the third may be neglected.

Carbon bisulphide seems to have been noticed in the first instance in benzol by Vincent and Delachanal. It is met with mostly in the commercial 90 per cent. benzol, but even in the "pure benzene" (so-called) Liebermann and Seyewetz found from 0·2 per cent. to 0·3 per cent, of this body. The peculiarly offensive smell of impure carbon bisulphide is quite indistinguishable when that substance is present in benzol even to the extent of 20 per cent.

Thiophen was discovered in commercial benzol by Victor Meyer. It is the cause of some colour reactions formerly ascribed to benzol itself by Baeyer, Classen, and Laubenheimer. Thiophen and its homologues are a source of trouble in the manufacture of products from benzol. They cause in nitrobenzol and in nitrotoluol a yellow colour which develops by contact with air, and shows in aniline and toluidine made from them. Hence the importance to aniline-colour makers of procuring a benzol reasonably free from thiophen. Couple with this the fact that benzol is used to some extent as a motor spirit, and for gas-enrichment and the necessity that its sulphur content should be a minimum can be appreciated.

A series of experiments has been made, with the object of finding the best commercial method of removing these sulphur compounds, and at the same time of testing the accuracy of the several existing methods for their estimation. The results obtained in regard to the latter will be described first.

The Carius method of determining sulphur in organic compounds is not applicable in the case of benzol owing to its low content of sulphur. Two methods were tried. The first is the "*Two-crucible method*" of Garrett and

Lomax (this Journal, 1905, 1212), which was proposed by its authors for the determination of sulphur in petroleum. From the excellent results it gave in that particular case, it was hoped that it would prove equally applicable to benzol. However, the results obtained, though of value, were generally low. For example, one result showed 750 grains of sulphur per gallon, whereas the correct figure was 864 grains. The low results may be accounted for by the readiness with which the benzol vapourises, and thus to a large extent passes from the sphere of action, before the lime becomes sufficiently hot to bring about the complete decomposition of the sulphur compounds.

Attempts made to decompose the sulphur compounds by aspirating the benzol vapour over lime heated to redness in glass tubes, likewise gave very low results.

The second method is Irwin's, which is that generally accepted for sulphur in benzol, and is an adaptation of the familiar "Gas Referee's test." It consists in burning the benzol, diluted with methylated spirit, in an ordinary spirit lamp the top of which is surrounded with ammonium carbonate. Ammonium sulphate and sulphite are formed as a result of the combustion and subsequent combination of the oxides of sulphur with ammonia, and are retained in the condensed liquor, which is washed out, and filtered. The filtrate is oxidised with bromine water and the sulphur estimated in the usual manner as barium sulphate. Repeated experiments with this method gave results considerably below the true value as determined separately from the percentage of carbon bisulphide and thiophen. Here it should be added, in justice to the originator, that he points out this fact in his original communication. It is noteworthy, however, that the results obtained agree closely with one another, and it was found from experiments conducted with known quantities of freshly distilled carbon bisulphide dissolved in the spirit that the correct value might be deduced by multiplying by a factor approximating to 1·8. Table 1 shows some of the results obtained.

TABLE 1.

Sulphur present. Grs. per gall.	Sulphur found. Grs. per gall.	Factor.
486	277	1·75
486	283	1·72
486	270	1·80
564	307	1·83

Passing from the estimation of total sulphur to that of carbon bisulphide alone, the method of Nickels was finally adopted for the latter. It consists in agitating the benzol to be examined with alcoholic potash and converting the potassium xanthate so formed into cuprous xanthate. When a series of experiments was being made it was found that much time could be saved by titrating the acetic acid solution of potassium xanthate with a deci-normal solution of copper sulphate, using potassium ferrocyanide as an indicator. This modification, devised by Macagno, is more rapid and more accurate than the gravimetric method. An approximate value may be got from the specific gravity by subtracting from it the value 0·885 and dividing by 0·00346. For example—benzol which has a specific gravity 0·900 would contain 4·3 per cent. of carbon bisulphide. Advantage was taken of this rough method to estimate the percentage of carbon bisulphide during various stages of a distillation of crude benzol. The results for a still containing 1200 gallons are given in Table No. 2.

TABLE 2.

Gallons distilled.	Spec. grav. at end of fraction.	Carbon. bisulphide.
60	0·914	7·54 per cent.
80	0·904	3·00 ,,
100	0·898	3·4 ,,
120	0·898	3·4 ,,
140	0·895	2·6 ,,
160	0·889	1·7 ,,
250	0·888	0·76 ,,
270	0·887	0·63 ,,
350	0·884	0·12 ,,

Thiophen is estimated by a method due to Denigès. A concentrated solution of mercuric sulphate is added to the benzol dissolved in methyl alcohol, and the precipitate so formed is dried at 115° C. and weighed.

It seemed probable that the low values in Irwin's test for total sulphur, previously referred to, might be due to the presence of carbon bisulphide masking the thiophen reaction. However, the discrepancy could not be explained on this assumption, for although it was found that carbon bisulphide did to a slight extent interfere with the reaction between the thiophen and the mercury salt, it was noticed that a gelatinous precipitate—presumably a molecular compound of mercuric sulphate and carbon bisulphide—was formed. A sample of the first runnings from a benzol distillation contained 1·3 per cent. of thiophen; on removing the carbon bisulphide by means of alcoholic potash the percentage was 1·35—practically the same. But as 12 per cent. by volume of bisulphide had been removed, the thiophen should have increased to 1·48 per cent., which proves that the first result was false, and that the determination had been affected by the presence of the bisulphide. As the amount of carbon bisulphide in ordinary 90 per cent. benzol is less than 1 per cent., this will not alter the value of the Denigès test.

The next point is the practical means of eliminating these sulphur compounds. Carbon bisulphide, in virtue of its different boiling point, is easily removed by fractional distillation; the removal of thiophen, however, is a matter of greater difficulty, because it has a boiling point near to that of benzol. The general method for its removal is by treatment with strong sulphuric acid, but the proportion removed depends entirely on the strength of the acid and, in general, only the strongest acid has any appreciable action. Table 3 gives some of the results obtained with different percentages and strengths of acids.

TABLE 3.

Acid strength.	Quantity used.	Thiophen before.	Thiophen after.
		per cent.	per cent.
169°Tw.	8% in 3 washes	1·22	0·23
169° ,,	8% in 8 ,,	1·22	0·59
169° ,,	8% in 1 ,,	1·22	0·47
Fuming acid Sp. gr. 1·87	6% in 3 ,,	1·22	0·22
Fuming acid Sp. gr. 1·87	5% in 1 ,,	1·22	0·27

This acid treatment for the removal of thiophen involves a loss of crude benzol which may vary between 8 per cent. to 12 per cent., and in cases exceed the latter figure. With a view to finding if possible a method for eliminating thiophen, which would not involve any considerable loss of benzol, experiments were made with such oxidising agents as ozone, hydrogen peroxide, and lead oxide.

A sample of benzol was subjected to the action of ozone; as results, there was a slight black deposit due to oxidation of impurities; the loss was small, well under 3 per cent., the odour of the benzol was much improved, the effect on the fractionation was very small indeed, whilst the duration of the treatment was from 15 to 20 minutes and no long period of settling was necessary.

The acid washing involves a loss of three times that of the ozone process, the time required for its completion is several hours, whilst the cost of treatment amounts to about £2 per 1000 gallons, against 10s. per 1000 gallons in the case of ozone treatment. But the ozone treatment fails to remove the thiophen sufficiently to admit of it ever becoming a serious rival of the "old" acid process. To give an example: a crude benzol contained 0·88 per cent. of thiophen; after treatment with ozone it contained 0·80 per cent., as compared with 0·45 per cent. after washing with concentrated sulphuric acid.

Further experiments with ozone and small quantities of lead oxide, and also with hydrogen peroxide, likewise gave very unsatisfactory results, as will be seen from a glance at Table 4.

TABLE 4.

Crude benzol.	After-treatment with ozone plus ½ per cent. lead oxide.	Ozone plus 1 per cent. lead oxide.	10 per cent. hydrogen peroxide.
1·24 per cent.	1·05 per cent.	0·89 per cent.	1·14 per cent.

Thiophen.

With hydrogen peroxide the loss in volume of the benzol was only 1 per cent., whilst the thiophen content was practically unaltered.

Ozone has a slight action, too slight however to be of any practical value, and hydrogen peroxide none at all; all of which goes to prove that in the purification of crude benzol of its thiophen and complex tarry bodies, oxidising agents play a subsidiary part, and that the real process of refining is one of polymerization and condensation.

In conclusion, it might be of interest to give the percentage of total sulphur in some typical benzols.

TABLE 5.

Material.	Sulphur in grains per gallon.
90 per cent. benzol from Durham tar	250
90 ,, ,, ,, Yorkshire tar.......	240
90 ,, ,, ,, Lancashire tar	49
90 ,, ,, ,, Staffordshire tar	504
Crude benzol (coke oven)	64·4

Yorkshire Section.

Meeting held at Leeds on Monday, November 13th, 1911.

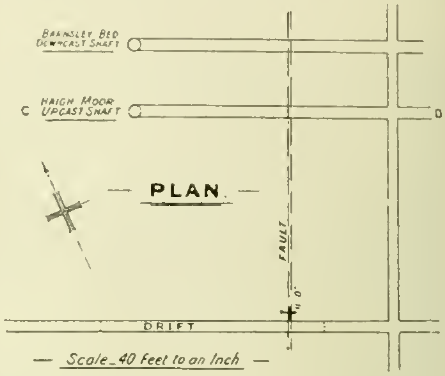
MR. G. WARD IN THE CHAIR.

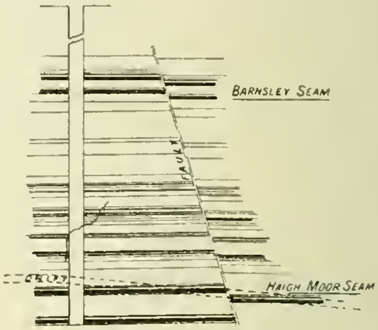
PARAFFINS FROM A YORKSHIRE COAL SEAM.

BY J. B. COHEN, PH.D., B.SC., F.R.S., AND C. P. FINN, B.SC.

About three years ago the attention of one of us was drawn to a curious oil which dripped from the roof of the Haigh Moor seam of the Hemsworth Collieries. This oil, it was stated, had been running for about seven years, and at one time there was such a quantity that workmen had been in the habit of using it as a lubricant. It was further stated by those officials connected with the colliery before its acquirement by its present owners, that when a road was driven through the place mentioned, what they expressively described as "balls of vaseline" were found. As the flow at this time (1908) was very slow, arrangements were made to collect a supply of the oil, but a fall of roof caused the breakage of the collecting vessels, and as the place had to be timbered up, the opportunity was lost.

A description of the position where the oil was found will be of interest. The two shafts of the Hemsworth Collieries pass through several seams of coal, the principal ones being the Shafton, Barnsley Bed, and Haigh Moor. At present only the two last mentioned are worked at depths of 613 yards and 686 yards respectively. At distances of 32 yards from the Haigh Moor shaft in the Barnsley seam and 53 yards in the Haigh Moor seam in a direction south, 24° east, a downward displacement or dip fault occurs in the strata. This fault is observed in all the seams, and to an extent of 11 feet (maximum). The position of the fault and the strata lying between the Barnsley and the Haigh Moor seams are shown in the accompanying diagram. The oil was found in the Haigh Moor seam at a point where the road from the pit bottom crossed the fissure of the fault. This was at a depth of about 690 yards from the surface, and in a bed of blue stone bind, some of which contained ironstone bands and was intersected by a white, soft, and permeable sandstone rock. At first sight, then, it seemed that the oil had an origin in some stratum above the Haigh Moor seam, and to have come down the fissure of the fault. As it was not found in the Barnsley seam, it possibly came from a stratum below that seam.





— SECTION ON C. D. —
SHOWING POSITION ON DRIFT

Early in 1911 it was decided to drive a drift which would cross this fault in another place, and whilst this was being done, a careful watch was kept for any possible flow of oil. Expectations were fulfilled, and where the drift crossed the line of fault, the surrounding strata were found to be saturated with oil and the sample was obtained, the results of the examination of which are now presented. The oil as it ran was of a yellow colour, which turned to dark brown on exposure to air. There was no evidence of any natural gas at this point.

Previously recorded instances of oil occurring in the coal seams of Great Britain are few, and except in one or two instances, the chemical composition of such bodies has not been determined to any extent. The historic find by Young near Alfreton in Derbyshire is, perhaps, the most familiar. D. R. Steuart (this Journal, 1887, 128) describes an oil found at Broxburn in a borehole at depths of 200 and 310 yards. This was found below the famous Broxburn shale and was accompanied by brine and natural gas. It was of specific gravity 0·830, solidified at 61° F., was brown in colour, but green by reflected light. Steuart refined the oil in an empirical manner, and found that the bromine absorption of what he termed the "burning oil" portion was 40 per cent. as compared with *nil*, and 11 per cent. for Baku and American oils respectively. He states the percentage of "paraffin scale," m.pt. 103° F. to be 12·5. Watson Smith (this Journal, 1891, 975) refers to oils occurring near to or under peat mosses, and mentions that Angus Smith found in them indications of paraffins but no solid paraffin, which results were confirmed by Schorlemmer. Hall (this Journal, 1907, 1226) describes the examination of an oil from the roof of the Cockshead seam of North Staffordshire. In colour this sample was dark brown, but dirty green by reflected light; it was solid at 15° C., and crystals separated at 18° C. Hall separated two bodies of the formulæ, $C_{11}H_{24}$ and $C_{13}H_{28}$, and concluded that the oil was a mixture of paraffins of high molecular weight and possibly some naphthenes and phenolic bodies. Bedson (in the same issue) gives the results of a very complete examination of paraffins found in 1905 in the Ladysmith Pit of the Whitehaven Collieries. The oil was found in a drift through the Yoredale rocks at a depth of 355 yards, the shaft having passed through the Permian strata, Whitehaven sandstone and the coal measures. No whin dykes or intrusions of basaltic rock were found. The oil as in the case of that at Hemsworth became viscid and the flow slackened. It was of a dark brown colour and smelled of petroleum, and by fractional distillation was separated into the following fractions: (1) Colourless liquid, b.p. 90°—180° C. at 70 mm., 37·5 per cent. (2) Slightly coloured liquid, b.p. 180°—240° C., 17·5 per cent. (3) Pale yellow solid, b.p. 240°—300° C., 25·0 per cent. (4) Residue—dark fusible solid, 20·0 per cent. From the solid (3) Bedson obtained a solid paraffin, possibly $C_{34}H_{56}$, and concluded from the physical properties that the lowest member present in the liquids was $C_{10}H_{32}$. By further fractionation and determinations of the refractive indices and the iodine absorptions of the fractions, he arrived at the approximate formulæ of the bodies. Bedson concludes that the substance consisted mainly of paraffins, $C_{13}H_{28}$—$C_{19}H_{38}$, with a considerable amount of solid members of that group, but that it also contained olefines.

A short time ago oil was discovered in the No. 3 Sovereign Arley pit of the Wigan Coal and Iron Co., and to Mr. W. H. Hewlett of that firm we are indebted for particulars concerning it. The oil came from a fault at about 550 yards from the surface. It came up from the floor, had a treacly consistency, with bubblings of gas. There was also an outburst of gas in the vicinity. The strata consisted of ordinary blue metal, and there were no whin dykes. The oil flowed for about eight weeks and made about fifty barrels. According to Mr. Byrom, the firm's chemist, the oil on distillation yielded 5 per cent. up to 150° C., and 28 per cent. up to 400° C. The remainder was solid, melting at 38° C.

About 150 grams of a dark brown semi-solid material from the Haigh Moor seam of the Hemsworth Colliery was available for analysis. The constituents of this material resemble those of the higher boiling petroleum fractions (Mabery, Amer. Chem. J., 1902, **28**, 165) and appear to point to a common origin. With so small a quantity of material it was impossible to effect a complete separation of the very numerous constituents; but the results are contained in the following brief summary.

The substance was melted, and 100 grams were decanted from fine gravel and dirt into a distilling flask and distilled at about 20 mm. pressure. It distilled without any decomposition, and the following fractions were collected:—

1.	70—150° C.	8	per cent.	pale yellow	mobile liquid.
2.	150—200° C.	8·5	,,	,,	,,
3.	200—250° C.	10	,,	nearly colourless	liquid which partly solidified.
4.	250—260° C.	6	,,	pale yellow	,, ,,
5.	260—300° C.	13	,,	dark yellow	,, ,,
6.	300—350° C.	18	,,	,,	,, ,,

Fraction 1. The density at 20°/4° was 0·7755. When redistilled at the ordinary pressure it boiled at 160—266°. As it did not decolorise bromine immediately it may be assumed to consist of paraffins, which from the boiling points given by Mabery (*loc. cit.*) would include members of the series from $C_{10}H_{22}$ up to $C_{16}H_{34}$; but the quantity was too small to effect any further separation.

Fraction 2. The density was 0·7969, and when redistilled at 30 mm. boiled at 140—240°. It did not decolorise a chloroform solution of bromine at once but slowly, and hydrogen bromide was evolved.

Fraction 3. The fraction was drained at the pump and the filtrate distilled. It boiled at 170—220° at 25 mm., and had a density of 0·8071. The solid portion which weighed 2·5 grms. was repeatedly crystallised from ethyl acetate and separated in colourless foliated crystals which finally melted at 43—45·5°, when further crystallisation produced no change in the melting-point.

According to Mabery (*loc. cit.*) the substance should correspond to a mixture of docosane, $C_{22}H_{46}$, m.p. 44°, and tricosane $C_{23}H_{48}$ m.p. 45°. As the percentage of carbon and hydrogen between the different homologues from $C_{20}H_{42}$ to $C_{30}H_{62}$ lies within the error of experiment, molecular weight determinations have been employed to differentiate the hydrocarbons. Analytical data are, however, given for the middle and largest fraction 5 (see below).

The molecular weight was determined by the cryoscopic method in benzene. 0·1608 grm. in 8·64 grms. of benzene gave a depression of 0·298° C., indicating a mol. wt. of 316. The calculated value for $C_{22}H_{46}$ is 310, and for $C_{23}H_{48}$, 324.

The mother liquors from the crystals deposited a small quantity of foliated crystals m.p. 38—39°, the molecular weight of which (287) corresponded to $C_{20}H_{42}$ (mol. wt. 282). This substance was not isolated by Mabery from petroleum.

Fraction 4. The fraction was drained on a porous plate, which was then extracted with ether, and the oil remaining after removing the ether boiled at 210—280° at about 20 mm., and had a density of 0·8352. It slowly decolorised bromine with evolution of HBr. The crude solid weighed 3·5 grams, and after repeated crystallisation from ethyl acetate finally melted at 43—48°, when further crystallisation produced scarcely any change. The molecular weight (343) corresponded to that of pentacosane $C_{25}H_{52}$ (352). There is no doubt that some tetracosane $C_{24}H_{56}$, m.p. 48° was also present, which explains the low melting-point and low molecular weight. The mother liquors deposited crystals of the previous fraction, m.p. 42—45°.

Fraction 5. The fraction was treated as above and deposited 4·5 grams of solid which after 5 crystallisations softened at 50° and melted at 56°. It then remained unchanged by further crystallisation. The molecular weight obtained by the cryoscopic method was 366. The same result was obtained by the ebullioscopic method, 0·1645 grm. in 8·685 grms. of benzene giving a rise of 0·135° C. (mol. wt.=366). The calculated mol. wt. for $C_{26}H_{54}$ is 366.

Three elementary analyses gave the following figures:—

	I.	II.	III.	Calculated for $C_{26}H_{54}$
Carbon	85·23	85·33	85·37	85·24
Hydrogen	15·10	14·86	15·08	14·76

The mother liquors deposited crystals m.pt. 46—47·5° corresponding, according to Mabery, to tetracosane $C_{24}H_{50}$, m.p. 48°.

Fraction 6. The fraction was drained as in the previous case and the porous plate extracted. The oil gave a dark yellow distillate boiling at 270—350° at 25 mm., and had a density of 0·8606. It gave off HBr immediately on adding bromine. The solid portion weighing 3 grams was crystallised six times, when it softened at 57° and melted completely at 60°. As the substance is only slightly soluble in cold benzene the molecular weight was determined by the ebullioscopic method in benzene solution and gave (I.) 446, (II.) 435. Calculated for $C_{32}H_{66}$=450.

With regard to the nature of the liquid portions separated from the solid fractions, they do not immediately decolourise bromine solution, but slowly evolve hydrogen bromide. They are consequently saturated compounds, and do not correspond to the liquid unsaturated hydrocarbons which, according to Mabery (*loc. cit.*), accompany the solid paraffins in petroleum.

On account of the small quantity of material it was impossible to study more fully the nature of these liquid fractions; the results, however, afford definite evidence of the following solid paraffins in the deposit.

$C_{20}H_{42}$: $C_{22}H_{46}$: $C_{23}H_{48}$: $C_{24}H_{50}$: $C_{25}H_{52}$: $C_{26}H_{54}$; $C_{32}H_{66}$.

The origin of this body of oil and how it came to be found in the strata of the coal measures is a somewhat perplexing question, and one which it is difficult to answer completely. There is nothing in the character of the coal near to it to indicate that the oil has originated from the coal itself. Further, there is no indication of any intrusion of igneous rock, which in a heated condition might have caused a destructive distillation of the coal. The only indication of anything abnormal is the "fault" referred to, and between the presence of the oil and the fault, there is no doubt some connection. A possible explanation is that the oil has been formed in a lower stratum, and finding an outlet along the fissure of the fault has distilled upwards and condensed in the cooler strata above. As to the manner of formation of the body, whether by inorganic or organic processes, any theory that may be advanced in the light of the meagre facts known is a pure speculation.

In conclusion, we desire to express our thanks to Mr. W. W. Finn for his assistance in preparing the diagram which illustrates this paper, and to Mr. Thos. Beach, of Hemsworth Collieries, who very kindly supplied the data for it.

Note. The following interesting statement has been received from Mr. J. R. R. Wilson, H. M. Inspector of Mines, since the above paper was written, and we have received his permission to publish it, for which we desire to express our thanks.

In 1900 while sinking was in progress above the Parkgate seam of the Manvers Main Colliery, Wath on Dearne, and the shaft had reached a depth of 461 yards from the surface or 85 yards above the Parkgate and 185 yards below the Barnsley seam, a piece of solid crude petroleum (Hatcheline ?) was found. The piece measured 15 inches in circumference.

In 1902 when headings were being driven, a feeder of petroleum water and gas broke in from the roof at the coal face and brought down about 1 ton of coal (forced off). For 7 days the quantity was about 7,200 gallons per day, and afterwards 2880 gallons per day, 50 per cent. of the total quantity being petroleum. The same feeder was tapped 3 days later in an adjoining heading, and the quantity given off was 4320 gallons per day, 80 per cent. being oil. The oil consisted of highly volatile matter (spirit) 3—5 per cent., hydrocarbon oil, 97—95 per cent., and resembled very closely the American green oil. The feeder lasted for about 5 weeks, gradually reducing in quantity.

In 1903 in the same district of the mine a quantity of water broke in, bringing with it a little oil. The quantity at first was 780 gallons per hour, but fell to 260 gallons per day two days later.

In 1905 there was an outburst of oil mixed with some 10 per cent. of water in a part of the mine half a mile away from the previous outbursts. It was impossible to estimate the quantity of this feeder, as it was in the gob where the coal had been extracted, and the bulk of the oil was lost.

The oil generally was dark green in colour and, although liquid in the mine, it set quite hard upon the main road or when sent to the surface.

There is no record of any cannel being in the neighbourhood or any faults near the outflow. The oil came in above the Parkgate seam from fissure in the rock roof, so that it is difficult to say from what strata it actually came.

The ball of grease referred to, which was found below the Barnsley and above the Parkgate seam was about the horizon of the Flockton seam, which in S. Yorkshire is very variable; sometimes there is a thin coal and sometimes none. On the same horizon, however, in W. Yorkshire, probably at Flockton, this coal is cannel or at least the upper part, so that it is quite possible that the Manvers sinking passed through something of the kind. For over 90 feet above the Parkgate seam there is nothing but very hard stone binds (shales and sandstones).

DISCUSSION.

Mr. G. WARD thought that this was almost the first time that deposits of the nature discussed in the paper had been noticed in connection with coal seams. He asked if Prof. Cohen had compared his analysis with similar investigations on Pennsylvanian petroleums. The method of formation of such deposits had been debated for over fifty years. The exact composition of the constituents of these deposits was difficult to ascertain. They often consisted of closely related members of the same homologous series, which were usually soluble in one another, and had melting points very close together, and were not separated by recrystallisation or obtained pure without much trouble.

Mr. F. W. RICHARDSON asked why the refractive indices had not been observed. These might give valuable information and help to explain the high specific gravities.

Mr. STANLEY NETTLETON said that he had made investigations on this subject both from geological and chemical standpoints. Compounds of paraffin character were frequently associated with cannel and shales of the cannel type. By distillation at low temperatures he had obtained oils and paraffin wax from Yorkshire cannel and coal measure shales. Although the fault to which Mr. Finn referred had a bearing on the occurrence of oil at Hemsworth, it was a subsidiary feature of the question, and it was desirable to trace out the original source of the oil. It was possible that the oil had been distilled from some cannel or shale by the heat and pressure developed by the movement of the fault. The lighter products of distillation would escape and the oil flow along the line of faulting. By filtration through sandy material it was possible to separate oils of different specific gravities, and in America experiments had been made with a view to the fractionation of paraffin compounds on these lines. No commercially successful methods had yet been discovered. He had not heard of any occurrence of petroleum where there was an entire absence of fish remains. Aquatic remains were found in cannel and shale, but never in true bituminous coal seams. He asked if Mr. Finn could give any information as to existence of cannel in the rocks in the vicinity of the oil outburst at Hemsworth.

Mr. T. FAIRLEY asked if any observations of the temperature had been taken at various depths. Certain formulæ were published showing the rate at which the temperature increased with increasing depths. By their use it might be possible to calculate roughly the temperature at lower depths from observations made at the higher levels. This would give an idea at what depth the heat would be sufficient to cause distillation.

Dr. M. G. CHRISTIE asked Mr. Nettleton how he explained the formation of paraffins in the brown coal deposits of Germany if their origin and that of petroleum was always associated with the existence of fish remains. Microscopic examination of those coals showed no traces of marine deposits.

Mr. J. W. COBB said that it had been assumed that the true melting point of a crystal was the point at which its limiting surfaces began to become indistinct. The constitution of a solid was, however, peculiar. Its bounding surface was different from its interior, and might become indistinct on heating, from surface tension forces coming into play before the interior was liquid and rounding the corners before the real melting point was reached. In high temperature work, with silicates, considerable error could arise from that cause. Had the same phenomena to be taken into account by the organic chemist ?

Prof. J. B. COHEN, in reply, said that Mr. Cobb's remarks might account for the apparent impurity of the substances dealt with in the paper. They might be in reality pure. The phenomenon would probably be the same at low and high temperatures, but he had never heard it mentioned before. The characters of different kinds of petroleum could be reproduced and imitated by preparation according to the method of Sabatier and Senderens. The theory about the connection of fish remains with the existence of petroleum in mineral deposits raised a difficulty. One would expect, if this were the case, to find organic bases such as pyridine and similar bodies, but little or no nitrogen was found. Sulphur was present, and it might be that nitrogen had escaped in the form of ammonia. The determination of the refractive indices might be useful in the examination of hydrocarbons of this kind. He had carefully compared his results with those of Mabery obtained by the examination of Pennsylvanian petroleum in 1902. The densities of his paraffins did not correspond either with Mabery's or with those obtained by Crafts from synthetic paraffins.

Mr. C. P. Finn said there was some cannel near to the coal seam, but the oil was found only in the neighbourhood of the fault. He had thought that the cannel might have something to do with the formation of the oil, and had commenced experiments to test this theory, but they had been postponed owing to accident.

Mr. S. Nettleton said he should not expect to find oil in cannel itself. He knew of one case where a dark wax-like deposit found near a fault hardened rapidly on exposure to air. His experience of the distillation of oil shales was that a fair amount of ammonia could be obtained, in fact more than from gas coal. He had little knowledge of the brown coal of Germany, but he knew that there were fish residues in the deposits of shale in the South of France. Enormous quantities of oil could be obtained from these shales relatively to their bulk and weight.

Obituary.

HEINRICH VON BRUNCK.

Heinrich von Brunck was born at Winterborn (Bavarian Palatinate) in 1847. He was educated at Kaiserslautern. His chemical studies commenced at the Zürich Polytechnikum, then under the direction of P. Bolley, the well-known technologist. He next worked under Kekulé at Ghent, and completed his curriculum under A. Strecker at Tübingen, where, with his dissertation, "On some derivatives of phenol," he obtained his doctor's degree in 1867. Soon after this he entered the chemical factory of E. de Haen at List, a position which at the suggestion of his friend, Karl Glaser, he exchanged in 1869, for one at the Badische Anilin und Soda Fabrik at Ludwigshafen. Here, up to the outbreak of the Franco-German war, he was in charge of the production of magenta and chloral hydrate and problems connected therewith, and after his return, of the study of inorganic products (chromates, acids, etc.) at the Duisburg branch of the B.A.S.F. In 1875, v. Brunck gave special attention to the manufacture of artificial alizarin, and one of the first fruits of his investigations was the process for the manufacture of soluble Alizarin Blue in the discovery of its bisulphite compound (this J., 1882, 399). This discovery led to the important conclusion, that Alizarin Blue evidently owes its property of combining with bisulphites to form soluble compounds, to its quinoline structure and character, and not to its being an anthracene derivative, since quinoline itself similarly unites with the bisulphites, whereas alizarin and purpurin do not. Brunck also early recognised the great importance of the alizarin dyestuffs in wool dyeing. His chief merit consists however in the unstinted support he gave to his co-workers and subordinates whilst engaged in the development of the production of sulphuric acid by the catalytic process and of that of synthetic Indigo, notwithstanding many and costly failures. ; indeed the success finally achieved in the works was mainly due to the energy and far-sightedness of Brunck. The work in connection with the former has been fully dealt with by R. Knietsch (this J., 1902, 172 and 343), and the latter by v. Brunck himself (this J., 1901, 239). He was once more concentrating all his energies upon the important problem of the utilisation of the nitrogen of the air, when sudden illness seized him, and death brought his labours to a close, Dec. 4, 1911.

Journal and Patent Literature.

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I.—GENERAL PLANT ; MACHINERY.

Patents.

Evaporating apparatus. S. M. Lillie, Philadelphia, Pa. Eng. Pat. 24,473, Oct. 21, 1910.

The evaporator consists of a series of closed evaporating chambers each of which is divided into three parts, viz., a central battery of evaporating tubes over which the liquor to be evaporated flows, a steam heating chamber at one end containing tubes in which the liquor is preheated, and an evaporating chamber at the other end from which the generated steam or vapour is withdrawn by an exhaust device. The steam heating chambers are connected in series, so that the steam from the steam boiler passes from end to end of the apparatus, while each evaporating chamber is connected with the heating coil of the adjacent steam heating chamber, so that the liquor after being partially cooled in one chamber is again heated before it passes into the evaporating chamber of the next member of the series. The pipes, valves, and circulating pumps are arranged to enable the flow of liquor to be reversed when desired.—H. H.

Vacuum evaporating apparatus. C. Ordway, New York. U.S. Pat. 1,009,782, Nov. 28, 1911.

A rectangular casing is divided into separate chambers by partition plates so that several "effects" are combined in one vessel and loss by radiation is reduced. Each chamber or "effect" has tube-plates and tubes, the steam spaces of the various "effects" being substantially opposite each other.—W. H. C.

Evaporation of liquids. F. Heckmann and Soc. des Salines Suisses du Rhin Réunies. Fr. Pat. 432,213, July 13, 1911.

The principal evaporator is a closed vessel heated by fire and the mixture of air and steam given off is withdrawn by a fan and delivered into the heating chamber of a preliminary vacuum evaporator. The air is separated from the condensed water and returned to the principal evaporator.—W. H. C.

Evaporator for concentrating liquids: Rapid tubular ——. U. Rossi. Fr. Pat. 432,231, June 8, 1911. Under Int. Conv., June 10, 1910.

Each unit of the system is formed of an inclined tubular evaporator having the lower ends of the tubes curved so that they dip vertically into the supply chamber. The upper ends of the tubes terminate in a cyclone separator and the lower ends are provided with helical guides to give a movement of rotation to the liquid so as to cause it to pass over the walls of the tubes in a thin film. The first unit is heated by steam and the second and succeeding units by the vapours from the preceding separators. The lower ends of the tubes may be provided with nozzles through which gases can be injected into the tubes.—W. H. C.

Valves for controlling the flow of thick pulpy material and the like. E. H. Nutter and Minerals Separation Ltd., London. Eng. Pat. 28,376, Dec. 6, 1910.

The apparatus, which effects a separation of the pulpy material from the liquid, consists of an inverted conical vessel into which the liquid to be treated flows; at the lower end of this vessel is a vertical tube leading to the valve casing in which is a diaphragm valve of rubber, the extent to which this valve is allowed to open being capable of adjustment. By means of an external tube leading to the conical vessel, the pressure of the head of liquid is applied to both sides of the valve, and further the area of the orifice through which the flow is to be controlled is less than the effective area or pressure on the other side of the diaphragm, whereby when both sides of the diaphragm are under the same liquid head, the valve will be normally closed. As the collection of heavy pulpy material in the vertical tube proceeds, the pressure on the upper side of the valve increases till, at a predetermined pressure the valve opens and discharges the heavy material, closing when the pressure again falls. The periodic opening of the valve may also be effected by pulsations of pressure conveyed from an external source to the lower side of the valve.—B. G. McL.

Separating liquids from vapours or gases; Separating members for use in apparatus for ——. W. Mackie, Govan, N.B. Eng. Pat. 462, Jan. 7, 1911.

The vapours are passed over a series of gutter-like members in which the liquid becomes entrapped, each member comprising a channel partly closed at the top by an inclined web fixed to or forming part of that side of the channel against which the moving vapour first impinges, the inlet opening being on the opposite side.—H. H.

Filters; Manufactures for use in ——. F. Candy, London. Eng. Pat. 1336, Jan. 18, 1911.

A lining for pressure sand filters and the like, which is capable of resisting corrosion, is formed of slabs of vitreous material, glazed earthenware, or the like, cemented into the filter casing with bituminous cement (asphaltum). The outer faces and the edges of the slabs have striations of dove-tail section or other form to permit of firm contact with the cement, the edge striations being radial when the slabs are in position: for a circular filter vessel the slabs are caused to key together. The inner faces of the slabs are provided with horizontal groovings, which may be V-shaped, dove-tail or semicircular, and of such a size as to admit of the entry of the filtering material.
—B. G. McL.

Filter-press; Treating semi-solid matter in the chambers of a —— *and removing it therefrom.* C. W. Merrill. Fr. Pat. 431,106, June 15, 1911.

The chambers of the press are partially filled so that a space is left in the centre of each cake between two vertical parallel layers of semi-solid matter. The supply of material is then stopped and compressed air is introduced behind the cloths to break away the cake, after which the solid matter is washed out of the chambers by a jet of liquid introduced through a perforated pipe which passes through a channel formed in the bottom of the frames. This pipe is rotated so that the jets of liquid reach every part of the chambers. When it is desired to open the press, several plates may be moved at once by attaching a cable to ears formed on the exterior of the frames. The press is provided with a hydraulic closing ram.—W. H. C.

Gas furnaces; Introduction of gas and secondary air into ——. A. Folliet-Mieusset, Liège, Belgium. Eng. Pat. 1645, Jan. 21, 1911.

In order to obtain widely-spread flames the outlet openings of the air and gas ducts into the combustion chamber are formed as narrow parallel slots, so that on emerging, the gas and air layers meet along the wide faces of these layers; usually the gas duct is placed between two air ducts which latter may be inclined to cause the air to converge on the gas; the size of the flame is determined by the distance separating the openings. The "combustion group" may be inserted either in the roof or in the sole of the furnace.
—B. G. McL.

Furnace; Rotary ——. E. S. Davis, Jersey City, N.J., Assignor to Rockwell Furnace Co., New York. U.S. Pat. 1,010,728, Dec. 5, 1911.

A tubular furnace lined with refractory material is mounted on a frame provided with gearing for rotating the furnace. The frame is supported on a stage so that it can be inclined, and the upper end of the furnace is provided with a feed hopper which substantially closes the upper opening. The lower end of the furnace is provided with a stationary chamber, lined with refractory material, through which the material being treated is discharged. The stationary chamber has a burner opening through which a burner connected with a supply of fuel projects.
—W. H. C.

Kilns. E. R. Sutcliffe, Leigh, Lancs. Eng. Pat. 11,309, May 10, 1911.

The patent involves the introduction of gas producer units into kilns for the burning of clay bricks, ore briquettes and the like. In a double row multiple chamber kiln in which the working proceeds continuously round the succession of chambers, each chamber is provided at one end, adjoining the dividing wall, with a transverse grate set in the floor; fuel is fed on to this grate through openings in the roof of the kiln, and air and steam are forced upwards through the fuel from a flue placed beneath, the air being either cold air or hot air from the hot air flue. The secondary air for combustion of the gas is introduced over the fire through a series of ports in the dividing wall, the fire being retained by a flash wall, behind which is a conduit for the introduction or removal of hot air for pre-drying. Ports are also provided in the dividing walls which permit of the utilisation in other chambers of the heat in the products of combustion for preliminary drying of the goods. With this mode of operation it is claimed that the goods are fired in a neutral atmosphere (neither oxidising nor reducing) out of actual contact with the solid fuel and with a greater efficiency in time and material than can be achieved with a kiln fired with gas from an external producer.—B. G. McL.

Kilns for revivifying animal charcoal. F. Lafeuille. Fr. Pat. 432,044, Sept. 26, 1910.

The draught on the retorts is suppressed by turning the end of the vapour escape pipes downward and constricting them. Air is supplied to the furnaces by steam jets or fans, so that practically a plus pressure system is obtained. In this way an equilibrium is established and the products of combustion and air are not drawn into the retorts.
—W. H. C.

Heat interchangers. M. Hildebrand, Berlin. Eng. Pat. 9368, Apr. 15, 1911.

The apparatus consists of a number of superposed tiers of tubes, every unit of which comprises a central tube with open ends, surrounded by an outer tube, closed at the ends but communicating through short passages with similar tubes above and below. The highest and lowest of the outer tubes are connected by cross tubes with the highest and lowest members of parallel tiers of tubes. The whole arrangement is immersed in one of the heat interchanging media, which is free to circulate through the inner tubes, while the other medium is circulated through the large outer tubes.—H. H.

Dryer W. M. Schwartz and A. M. Schreuder, Assignors to The Philadelphia Textile Machinery Co., Philadelphia, Pa. U.S. Pat. 1,010,322, Nov. 28, 1911.

A rectangular casing is divided by a longitudinal vertical partition into an air heating section, provided with heating coils, on one side, and a drying section, provided with three endless band conveyors, on the other, placed one above the other. A fan operating in an opening in the partition, withdraws air from the drying section and causes it, after passing over the heating coils, to return to the drying section through openings in the top and bottom of the partition. The return run of the upper conveyer is in close proximity to the carrying run of the intermediate conveyer, and the return run of the intermediate conveyer is in close proximity to the carrying run of the lower conveyor, so that the air, passing down through the upper conveyer and up through the lower conveyer, will travel on each side of the intermediate conveyer, the return runs preventing the displacement of the material carried on the two lower conveyers.—W. H. C.

Still; Self-cleaning ——. W. H. McCune, Vandergrift, Pa. U.S. Pat. 1,010,508, Dec. 5, 1911

The retort is provided with a valve-controlled outlet at the bottom, actuated intermittently by mechanical means which may be so regulated as to vary the duration of the periods during which the valve is closed.—W. H. C.

Refrigerating machines with three or more evaporators for low temperatures: Process of regulating ——. Ges. f. Linde's Eismaschinen A.G. Fr. Pat. 431,893, July 4, 1911.

The whole of the liquid necessary to be evaporated to produce the required diminution of temperature in the whole series of evaporators is sent through the evaporators in succession. In the first evaporator partial evaporation takes place; the gas is withdrawn by a compressor and after compression delivered to the cooler, but the liquid remaining passes to the next evaporator and so on. When once the valves between the evaporators are set, the working of the whole series can be controlled by the inlet valve to the first evaporator.—W. H. C.

Raising or forcing liquids; Methods of —— *and apparatus therefor.* H. A. Humphrey, Westminster. Eng. Pat. 21,849, Sept. 20, 1910.

See Fr. Pat. 428,296 of 1911; this J., 1911, 1148.—T. F. B.

Drying-machines having steam heated cylinders. T. F. Dexter, Providence, U.S.A. Eng. Pat. 3600, Feb. 13, 1911. Under Int. Conv., Feb. 17, 1910.

See Fr. Pat. 425,985 of 1911; this J., 1911, 950.—T. F. B.

Extinguishing fires; Compound for and process of ——. E. M. Davidson, New York, Assignor to Pyrene Manufacturing Co., Delaware. U.S. Pats. 1,010,869 and 1,010,870, Dec. 5, 1911.

See Eng. Pat. 12,233 of 1910; this J., 1911, 272.—T. F. B.

Still for use with a high vacuum. P. Porges, Königsfeld, Germany. U.S. Pat. 1,011,079, Dec. 5, 1911.

See Eng. Pat. 29,145 of 1910; this J., 1911, 941.—T. F. B.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal; Determination of volatile matter in ——. S. W. Parr. J. Ind. Eng. Chem., 1911, **3**, 900—902.

In order to avoid the mechanical loss which takes place in the determination of volatile matter in coals, especially in lignites and Illinois coals, the author recommends saturating the sample of coal (1 grm.) with kerosene (10—15 drops).—A. S.

Methane equilibrium; The ——. J. N. Pring and D. M. Fairlie. Chem. Soc. Proc. 1911, **27**, 305.

Carbon was heated electrically in hydrogen at definite known temperatures between 1100° and 2000° C., and under pressures between 10 and 200 atmospheres. The velocity of the formation of methane was found to increase rapidly with the pressure, and to proceed to a final equilibrium stage. As would follow from the law of mass action for a true equilibrium, the value of $p\text{-CH}_4/p\text{-(H}_2)^2$ was always found to be constant under different pressures if the temperature were the same, and the same modification of carbon used. With amorphous carbon, temporary equilibrium values were obtained, in which at all temperatures the amount of methane was greater than that corresponding with the true equilibrium with graphite. The relative difference between the equilibrium values for amorphous carbon and graphite increases with the temperature. It follows from this, by applying Kirchhoff's law, that the mean specific heat of amorphous carbon is, at all the temperatures concerned in this work, higher than that of graphite, and that the difference increases with the temperature. No appreciable effect was exerted by high pressures on the yield of acetylene and ethylene, and no other hydrocarbon was formed.

Producer gas [*; Removal of tar from* ——]. J. A. Weil. Engineer, Dec. 15, 1911, 622.

The author compared the wet and dry methods of scrubbing for the removal of tar from producer gas, previous to its use in gas engines. In the wet method, the gas from a 1000 H.P. producer was passed through a Mond washer, two centrifugal tar extractors fitted with water sprays, and finally through two sawdust scrubbers in parallel. The following particulars are given:—

	Temperature of gas entering.	Pressure of gas entering—(cm. water gauge).	Tar in gas leaving—(grms. per cub. m.).	Tar per cent. extracted.
Producer	—	—	11·68	0·0
Mond washer..	over 400° C.	—	4·30	62·9
No. 1 extractor	,, 49° C.	15·5	1·55	22·8
No. 2 extractor	,, 32° C.	23·5	0·30	10·8
Sawdust scrubber	,, 14° C.	24·0	0·04	2·2

In the dry method, the gas is cooled before coming into contact with water, in order to avoid the formation of "tar fog," and the tar is extracted in a Livesey washer, or a Pelouze and Audouin extractor. Since the gas has a dew-point of about 25° C., the author considers that "tar-fog" is usually formed. The progress of the purification is as follows:—

	Tar in gas leaving—(grms. per cub. m.).	Tar, per cent. extracted.
Producer	10·0	0·0
Coolers	7·0	30·0
Livesey washer	1·05	59·5
Sawdust scrubber	0·05	10·0

The wet process therefore requires less labour in cleaning out the sawdust scrubbers. The author suggests a combination of the two methods, in which the Livesey washer of the dry method would be replaced by centrifugal extractors with water spray.—A. T. L.

Natural gas from the petroleum fields of S. California. G A. Burrell. Bull. 19. Dept. of Interior, Bureau of Mines, U.S.A., 47—56.

Ten samples of the gas collected from different wells in various oil-fields in S. California gave the following analytical results :—Carbon dioxide 1·0 to 30·4 ; oxygen (3 samples) 0·1 to 0·2 ; total paraffins, 67·2 to 96·7 ; nitrogen, 0·9 to 5·2 ; methane. 54·2 to 88·0 ; and ethane, 0 to 35·6 per cent. Heating value (B. t. u. per cubic ft.). 724 to 1240. None of the samples contained hydrogen, carbon monoxide, olefine hydrocarbons or hydrogen sulphide.—C. A. M.

Petroleum oils of the San Joaquin Valley, Cal., U.S.A. ; Physical and chemical properties of ——. [Electrically heated still for fractional distillation]. I. C. Allen and W. A. Jacobs. Bull. 19. Dept. of Interior, Bureau of Mines. U.S.A., 1—46.

The results obtained in the analysis of a large number of samples of petroleum oils from different oil-fields in the San Joaquin Valley, are given in a series of tables. For the fractional distillation an electrically heated still was employed, the flask being encased in the two halves of a pear-shaped mould of heat-resistant material, on the inner or concave side of which was wound backwards and forwards a metal resistance wire for conducting the current. The material composing this heating device consisted of a mixture of 100 parts of powdered magnesia, 100 parts of powdered silica, 40 parts of finely-shredded asbestos and 10 parts of powdered sodium silicate, made into a paste with a saturated solution of magnesium chloride. The paste, after being moulded on wooden blocks into the required form. was dried at about 50° C. for 48 hours and then for several hours at 200° C. By the use of this method of distillation the temperatures could be well controlled, and uniform results obtained.—C. A. M.

Caucasian petroleum oils and derivatives and artificial mixtures ; Relationships between the viscosities of —— at corresponding temperatures. E. Pyhälä. Petroleum, 1911, 7, 207—229.

Investigation of 24 samples of Caucasian petroleum oils and derivatives showed that the curve representing the variation of the viscosity with rise of temperature was of a hyperbolic form in the case of oils containing paraffin wax, whereas in the case of oils free from paraffin wax the curve was of an exponential character. These exponential curves followed at first an almost linear course and then gradually became exponential. In the case of mixtures of oils the viscosity curve varied from an unmistakable exponential, to a completely linear course according to the nature of the components. Mixtures of two oils in different proportions show when graphically represented, viscosities corresponding to each percentage composition of the mixture. Each of these may be represented as the viscosity of special oils at the given temperature. When transformed into curve systems at corresponding temperatures, the viscosities of each mixture regarded as an individual oil, form their characteristic curve. When compared with one another at corresponding temperatures, all these viscosity curves cut the common ordinates in such a way that the viscosities of the mixtures form a nearly harmonic series, or the degrees of fluidity stand in arithmetical progression. The viscosity of a mixture of oils in the proportions of m and n may be calculated approximately from the viscosities, a and b respectively, of the components by means of the formula :—

$$x = \frac{(m+n).a.b.}{mb+na}\,k,$$

where k represents a correction factor to compensate for the deviation caused by the chemical and physical characteristics of the components. In the case of mixtures of oils of similar nature the factor, k, is found from the relationship between the specific gravity of the mixture, δ_2, and that of the more fluid component δ :—

$$k = \frac{\delta_2}{\delta}$$

But when the mixture consists of oils of widely different density it may be necessary to determine experimentally the value of the correction factor according to the rise or fall in the percentage of the components.—C. A. M.

Oil emulsions ; Properties of ——. I. The electric charge. R. Ellis. Z. physik. Chem., 1911, 78, 321—352.

Most of the experiments were made with an emulsion prepared from a cylinder oil containing very little free acid (less than 0·3 per cent., calculated as oleic acid). This was shaken for 2—3 days with distilled water free from carbon dioxide, the non-emulsified oil separated, and the emulsion filtered ; the finished emulsion contained about 1 part of oil in 10,000, and the average diameter of the oil globules was $2{\cdot}0.10^{-4}$ cm. For measuring the velocity of migration of the oil globules under the influence of an electric current, and the effect on this of the addition of electrolytes, the methods involving the use of a U-tube or a straight tube were found unsatisfactory and the microscopic method was adopted. From the data obtained, the average charge on each oil globule was calculated and was found to be $(2{\cdot}05—2{\cdot}18).10^{-6}$ electrostatic units. The contact potential between the oil globules and water is of the same order as that between water and suspended particles of colloidal metals, lycopodium, quartz, etc., and that at the boundary surface glass-water. It is at a maximum with neutral or faintly alkaline water and diminishes at first rapidly and then slowly on addition of hydrochloric acid. On addition of caustic soda, the contact potential first increases, and then, when the alkali concentration exceeds $N/1000$, it falls at first rapidly and then slowly. The contact potential is of the same order whether the oil be pure or highly contaminated (with 3 per cent. of wool fat for instance). It appears to depend almost entirely upon the dielectric constants of the dispersed and continuous phases respectively, and its diminution on addition of hydrochloric acid or caustic soda is probably due to adsorption of an electrical character. —A. S.

Coal production and consumption in the principal countries of the world. (Also lignite and petroleum.) Board of Trade J., Dec. 28, 1911. [T.R.]

The following particulars relating to the production and consumption of coal in the principal countries of the world are extracted from a Return [Coal Tables, 1910, 284/1911] recently issued by the Board of Trade :—

Production.—The production of coal in the five principal coal-producing countries of the world in 1908, 1909, and 1910 was as follows :—

Countries.	1908.	1909.	1910.
	Tons.*	Tons.*	Tons.*
United Kingdom	261,529,000	263,774,000	264,433,000
Germany	145,298,000	146,397,000	150,372,000†
France	36,044,000	36,519,000	37,254,000†
Belgium	23,179,000	23,140 000	23,532,000
United States of America‡	371,288,000	411,432,000	447,837,000†

* Tons of 2240 lb. † Provisional figures. ‡ Including lignite.

Of the remaining countries not included in the above table, Russia alone has a production exceeding 20 million tons. The total known coal production of the world (exclusive of brown coal or lignite) in 1910 was about 1035 million tons.

The following statement shows the production of coal in the principal parts of the British Empire in the years

1908, 1909, and 1910 (the amounts are in every case stated in tons of 2240 lb.) :—

Country.	1908.	1909.	1910.
	Tons.	Tons.	Tons.
British India	12,770,000	11,870,000	12,047,000
Australia	10,194,000	8,186,000	9,759,000*
New Zealand	1,861,000	1,911,000	2,197,000*
Canada	9,720,000	9,376,000	11,425,000*
Union of South Africa	4,938,000	5,534,000	6,436,000*

* Provisional figures.

Consumption.—The consumption of coal in some of the chief consuming countries is shown in the following statement :—

———	1908.	1909.	1910.
	Tons.	Tons.	Tons.
United States†	360,935,000	398,942,000	434,815,000*
United Kingdom	176,228,000	177,745,000	179,939,000*
Germany	129,845,000	129,628,000	130,226,000*
France	52,095,000	54,193,000	54,861,000*
Russia	30,008,000	28,513,000*	27,429,000*
Austria-Hungary	25,028,000	25,329,000	24,590,000*
Belgium	22,515,000	22,413,000	23,850,000

* Provisional figures. † Including lignite.

The consumption of coal per head of population in the countries included in the preceding table is shown in the following statement, which applies to the years 1908, 1909, and 1910 :—

Year.	United Kingdom.	United States.†	Belgium.	Germany.	France.	Austria-Hungary.	Russia.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1908	3·99	4·06	3·05	2·06	1·35	0·51	0·19
1909	3·99	4·41	3·01	2·03	1·38	0·51	0·18*
1910	4·01	4·72*	3·17	2·01*	1·40*	0·49*	0·17*

* Provisional figures. † Including lignite.

Both in France and Germany the consumption per head appears small, but in these countries a large quantity of fuel of other sorts, such as lignite, wood, peat, and denatured spirits, is also used.

Lignite.—The principal countries producing lignite are Germany, Austria, and Hungary, which in 1909 produced 67,554,000 tons, 25,625,000 tons, and 7,536,000 tons respectively; in 1910 the output in Austria was 24,729,000 tons, whilst the provisional figures available show a production of 68,357,000 tons in Germany and 7,610,000 tons in Hungary in the same year. The quantity of lignite produced in the United States is included in the figures of coal produced. The latest available figures giving the production of lignite separately relate to 1905, when it amounted to 6,149,000 tons. In no other country does the recorded production reach one million tons. In the United Kingdom it has for some years been nil.

Petroleum.—In 1910 the total petroleum production of the United States, according to the provisional figures available, was 7369 million (Imperial) gallons, as compared with 6372 million gallons in 1909. The Baku and Groznyi oil fields of Russia yielded 2254 million gallons in 1909. The quantity exported from Russia has, in recent years, been less than one-sixth of that exported from the United States. The combined output of Germany, Austria, Roumania, Japan, Canada, British India, and the Netherlands East Indies in 1909 amounted to 1708 million gallons.

Mineral oil production in Australia. Oil, Paint, and Drug Rep., Dec. 18, 1911. [T.R.]

The present Australian production of kerosene from shale is 2,000,000 to 3,000,000 gallons per annum, with an immediate prospect of a large increase. The conditions under which the government bonus for oil production is paid read :—

"On kerosene, the product of shale, having a flash point of not lower than 73° F., a bonus of 2d. per gallon. The maximum amount to be paid for the year ending June 30, 1910, to be £8000, and the maximum for each of the two succeeding years to be £16,000. On refined paraffin wax a bounty of 2s. 6d. per cwt., to be paid up to £2000 for the first year, and to £4000 for each of the two succeeding years. The minimum quantity on which bounty shall be paid to be 12,000 gallons of kerosene, or 20 tons of refined paraffin wax."

The Commonwealth Oil Corporation is operating at Newnes and in the neighbourhood with a capital of £1,250,000, and the British Australian Oil Company at Temi, near Murrurundi, in the Liverpool Ranges, with a capital of £300,000. There are also Tasmanian ventures, especially the Tasmanian Oil and Shale Company, at Latrobe, but they are said to be badly handicapped, owing to lack of capital.

Patents.

Fuel briquettes; Production of smokeless ——. S. O. Cowper-Coles, London. Eng. Pat. 26,744, Nov. 17, 1910.

Powdered "Osbornite," a smokeless fuel prepared in accordance with Eng. Pat. 14,678 of 1907 (this J., 1908, 797), is mixed with about 15 per cent. of a binding agent, such as a mixture of 1 part of tar and 3 parts of pitch, and the mass is heated to about 115° C. and compressed into briquettes. The briquettes thus formed are finally heated for two or three hours at 300° C. to remove all smoke-producing constituents and cooled out of contact with air. About 13 per cent. of volatile matter remains in the briquettes.—H. H.

Fuel briquettes and the like; Manufacture of ——. A. A. Zimmer, London, and G. F. Forwood, Limpsfield, Surrey. Eng. Pat. 22,835, of 1910, date of Appl., May 3, 1911.

The process consists in subjecting bituminous coal dust to heat until it becomes plastic, adding the material to be briquetted with it while the mass is in a plastic condition, and then forming the briquettes while the mixture is still subjected to extraneous heat. For instance, the mixture may be forced through a heated tube of the required shape and the briquettes cut off as the mass emerges through the open end of the hot tube.—H. H.

Fuel; Artificial ——. A. H. Stanley, London. From D. C. Morris. Eng. Pat. 10,651, May 2, 1911.

Small coal or coal mixed with coke breeze is ground together with lentils or rice and lentils, with or without other agglutinants, and pitch or equivalent waterproof substance. The mixture is subjected to the action of steam before moulding. In an example 75 per cent. of anthracite is incorporated with 1 per cent. of lentils, 19 per cent. of bituminous or steam coal, and 5 per cent. of pitch.—H. H.

Fuel-briquette and method of making same. E. H. Ellis, Somerville, Mass., Assignor to E. H. Ellis and A. D. Chandler, Brookline, Mass. U.S. Pats., 1,009,960, and 1,009,961, Nov. 28, 1911.

The finely divided coal or other fuel is mixed with a "carbonised reaction product of sulphuric acid and molasses or starch " as a binder. The mixture is moulded into briquettes by pressure, and the briquettes are then heated to render them hard and waterproof.—W. H. C.

Agglomerating (briquetting and waterproofing) mineral or vegetable powders ; Process for ——. E. M. Heckel. Fr. Pat. 432,369, July 13, 1911.

Powdered materials are agglomerated by means of a paste formed by treating starchy materials with dilute sulphuric acid at 100° C. For example, coal blocks may be made by adding 100 parts of coal dust to a paste formed in the above manner from 2 to 3 parts of rice flour, 0·17 to 0·20 part of sulphuric acid, and 13 parts of water, moulding the material, and drying. H. H.

Gas retorts. R. J. Milbourne, Newport, and J. W. Turner, Scunthorpe. Eng. Pat. 1847, Jan. 24, 1911

In order to avoid the blocking of the ascension pipes, the latter are formed with an enlarged portion next to the retort. The pitch, or carbon, deposits in the enlargement, and can be easily removed each time the retort is charged.—W. H. C.

Gas retorts ; Apparatus for facilitating combustion in ——. G. Reschotzkowski. Fr. Pat. 432,218, July 13, 1911.

In order to burn out the retort carbon which forms upon the walls of gas retorts, air is conveyed to the far end of the retort through a channel formed by a number of interlocking blocks introduced into the retort, each block being of H-section and covered in by a plate at the top so as to form a channel for air passing substantially through the centre of the retort.—H. H.

Gas-producer. A. B. Duff, Pittsburgh, Pa. U.S. Pat. 1,010,242, Nov. 28, 1911.

The claim is for a water-luted and water-cooled top for a gas producer, which is capable of being revolved. Water-cooled pokers pass through the top into the mass of fuel in the producer.—W. H. C.

Gas producer ; Horizontal rotary —— more especially for use with coal dust. Oesterreichischer Verein für Chemische und Metallurgische Produktion. Fr. Pat. 431,658, June 27, 1911.

A horizontal rotary gas producer adapted for rapid rotation, for example 80 revolutions a minute in the case of a producer 1 metre in diameter, is supported at one end upon a hollow shaft, which rotates in bearings and serves for the introduction of air, and at the other end upon a large tube projecting through the end of the producer, which serves for the introduction of coal dust and as an outlet for the gas. Leakage of gas is prevented by suitable packing, and the moving bearing surfaces are lubricated by means of powdered graphite. The producer is rotated by means of a belt pulley on the hollow shaft.—H. H.

Coal gas and water gas ; Process and apparatus for the treatment of various materials applicable particularly to the continuous production of ——. General Reduction Gas and By-Products Co. Fr. Pat. 432,217, July 13, 1911

An apparatus for drying, heating, fractionating or otherwise treating either solids or liquids, such as sugar, starch, salt, milk, coal, lignite, peat, sawdust, petroleum, tannic acid, molasses, minerals, etc., but specially suitable for the continuous production of coal gas and water gas from carboniferous materials, consists of a series of three inclined rotary heating chambers or gas producers arranged one above the other and adapted to be heated by hot gases which flow successively through them from bottom to top, while the material to be treated passes slowly from top to bottom. The hot gases are conducted through annular heating flues in the two lower chambers but pass through the centre of the top chamber, where they come into contact with the material to be treated which is thereby dried. After treatment in each chamber the material is fed to the next chamber or to the final discharge outlet by a suitable conveyor. When coal is to be treated, coal gas is produced in the middle chamber and water gas in the bottom chamber, which is hottest, steam being injected for the purpose.—H. H.

Petroleum ; Process and apparatus for the distillation of —— by means of spraying. Comp. Ind. des Pétroles. Fr. Pat. 432,043, Sept. 26, 1910.

The petroleum is sprayed in a very finely divided condition into one end of a long vapourising chamber surrounded by a heating jacket, and the vapour so produced is condensed in a series of condensing chambers maintained at various temperatures so as to obtain fractions of different boiling point in each chamber. The tarry matter collects at, and is run off from, one end of the vapourising chamber which is slightly inclined for the purpose.—H. H.

Fuel blocks or briquettes ; Manufacture of ——. J. Wetter, London. From Naamlooze Vennootschap Briquet Co., Amsterdam. Eng. Pat. 29,247, Dec. 16, 1910.

See Fr. Pat. 429,781 of 1911 ; this J., 1911, 1243.—T. F. B

Combustible or fuel gases ; Process and apparatus for treating house refuse for the production of ——. C. Birault, Paris, and H. Riché, Lisors, France. Eng. Pat. 9550, April 19, 1911. Under Int. Conv., April 30, 1910.

See Fr. Pat. 415,413 of 1910 ; this J., 1910, 1293.—T. F. B.

Vertical retorts ; Method of heating ——. Driving-gear of apparatus for discharging coke from continuously-operated vertical retorts. S. Glover, St. Helens, and J. West, Southport. U.S. Pats. 1,011,424 and 1,011,425, Dec. 12, 1911.

See Fr. Pat. 412,194 of 1909 ; this J., 1910, 1000.—T. F. B.

Emulsion products from asphalt, coal tar pitch, petroleum pitch, paraffin, montan wax, and Japan wax or mixtures of these substances ; Process for the manufacture of —— R. Wallbaum, Charlottenburg, Germany. Eng. Pat. 28,178, Dec. 3, 1910.

See Fr. Pat. 423,291 of 1910 ; this J., 1911, 675.—T. F. B.

Recovering sulphuric acid from acid sludge. U.S. Pat. 1,010,221. *See* VII.

IIb.—DESTRUCTIVE DISTILLATION ; HEATING ; LIGHTING.

Incandescent lamp purposes ; Commercial manipulation of refractory elements for ——. R. E. Myers. Trans. Amer. Inst. Chem. Eng., 1911, **3**, 172—187.

After discussing the characters required in an element for the manufacture of electric incandescence lamp filaments, the author describes briefly the manufacture of tungsten filaments. The raw material is crude tungstic acid, which has first to be very carefully purified ; molybdenum, arsenic, and phosphorus are the most deleterious impurities likely to be present. For the purification, Smith and Exner's process (Proc. Amer. Phil. Soc., **43**, 123) is used. Ammonium paratungstate crystals are added to boiling nitric acid (1 : 1 by vol.), and portions of hydrochloric acid are added from time to time, the heating being continued until only traces of chlorine remain. The tungsten oxide is then washed, again converted into paratungstate and the operations repeated until the tungsten oxide will dissolve completely when digested with dilute sodium carbonate solution. For the preparation of the plastic mass from which the filaments are squirted, three methods may be used :—(1). The tungsten compound, preferably the brown oxide (WO_2) or the violet oxide (W_2O_5), is mixed with an organic binding agent (nitrocellulose dissolved in amyl acetate, gelatin, starch, gum tragacanth, etc.). (2). Tungstic acid is reduced to finely divided metallic tungsten, and the latter is mixed with an organic binder or dissolved in an amalgam of cadmium or bismuth. (3). Ammonium tungstate or tungstic acid, without the addition of a binder, is worked into a pasty mass, which will flow under pressure. The diamond dies used in squirting the filaments have apertures of from 0·001 to 0·015 inch diameter. The filaments at this stage are usually practically non-conducting and are subjected to a heat treatment to reduce their electrical resistance. Those consisting of tungsten oxide and an organic binder are heated to 400° C. or 1200 C. in an atmosphere of hydrogen; those consisting of metallic tungsten and an organic binder are heated to 600° C. in a non-oxidising atmosphere produced by the decomposition of the binder, but if an amyl acetate solution of nitrocellulose has been used as binder, they are heated slowly to 1200° C. *in vacuo;* filaments obtained by the amalgam process are heated, preferably in a vacuum, at comparatively low temperatures. All the filaments are next subjected to a final heating by means of an electric current in a non-oxidising atmosphere to remove the last traces of the binding agent. The author refers to the recent production of ductile tungsten and molybdenum (compare Fink, this J., 1910, 825) and to the advantages of the "wire type" tungsten lamp, both with respect to mechanical strength and to electrical properties. It is intended to manufacture lamps of this type of 400—500 candle power to compete with arc lamps; it is stated that the 400-candle power lamp gives more light than the ordinary enclosed arc lamp and has a slightly higher efficiency. Lower power "wire type" lamps are specially suitable for car lighting. Molybdenum is of no use for lamp filaments, but is quite suitable for the manufacture of supports for the filaments.—A. S.

Patents.

Heat-producing compound. A. S. Isaacs, Pittsburgh, Pa. U.S. Pat. 1,010,768, Dec. 5, 1911.

The claim is for a mixture of aluminium and dry caustic alkali formed into a block.—W. H. C.

Electric conductors more especially suitable for use as incandescing bodies for electric lamps, furnaces and the like. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 13,021, May 30, 1911.

The invention is an improvement on the process described in Eng. Pat. 19,398 of 1906 (this J., 1907, 1131) for making filaments from pure graphite, and consists chiefly in the production of a pure graphite filament of the highest attainable specific gravity, viz. about 2·27. The graphite is produced by heating ground petroleum coke or lampblack made from volatile hydrocarbons to 3000° or 4000° C. in an electric furnace. The fired material is then ground in petroleum, naphtha, or carbon tetrachloride, dried, and incorporated with a special binder prepared by extracting hard coal tar pitch with a solvent such as benzol or carbon tetrachloride and evaporating the solution to dryness. The graphite and binder in the proportion of about 45 to 55 parts respectively are ground for 50 to 100 hours in a roller mill working at about 200 revolutions a minute, and the mixture is then squirted into a filament at a temperature of about 225° C. and a pressure of 30,000 to 40,000 lb. per sq. in. The filaments are baked first at 400° C. in the air and then at 600° C. in a protecting atmosphere, and are finally graphitised by packing in graphite and heating to 3000° or 4000° C. or by firing in a vacuum furnace as described in Eng. Pat. 20,809 of 1904 (this J., 1905, 976). The filaments are preferably coated in the usual manner by flashing. Instead of the special binder referred to, petroleum pitch, glucose, caramel solution, waxes, or mixtures of these substances may be used.—H. H.

Arc-light electrode. B. Monasch, Berlin, Assignor to General Electric Co., New York. U.S. Pat. 1,010,942. Dec. 5, 1911.

See Eng. Pat. 4762 of 1908; this J., 1909, 973. The anode consists of iron with a core of copper.—T. F. B.

Filaments for incandescence lamps; Manufacture of ——. The Westinghouse Metal Filament Lamp Co., Ltd. Second Addition, dated May 30, 1911, and Third Addition, dated June 7, 1911 (both under Int. Conv., Aug. 6, 1910), to Fr. Pat. 414,257, Mar. 30, 1910 (see this J., 1910, 1195; 1911, 530).

(1) The patent is for an improved mercury contact device for use in the manufacture of continuous tungsten filaments by the process described in the main patent, the filament now being arranged horizontally instead of vertically. The contact comprises a metal cup with two upwardly projecting arms. The cup is filled with mercury, and the arms are amalgamated so that the mercury is drawn up between them above the level of the mercury in the cup, and the top edge of this film of mercury is concave. The filament rests freely at the lowest point of this concave surface. The cup may be connected with a larger cup serving as a reservoir, and the whole may be surrounded by a cooling coil. (2) The resistance coil by which the squirted filament is heated and carbonised is arranged to increase in resistance, and therefore to give a higher temperature, in the direction of travel of the filament. This may be effected by connecting in series several coils of different resistances, by using a single coil wound more closely towards one end, or by leading current to the coil at several points so as to divide it into sections having different resistances. —A. T. L.

Filaments and incandescence bodies for electric lamps; Drawn ——, and manufacture of same. Soc. La Lampe Osram. Fr. Pat. 431,531, June 23, 1911. Under Int. Conv., Aug. 13, 1910.

Tungsten filaments which do not deteriorate when used with alternating current are made by mixing with the tungsten a small quantity (0·3 to 0·6 per cent.) of lime or other oxide which is not reduced by hydrogen. The mixture may also contain nickel or other metal which is removed by heating during the finishing of the filament. —A. T. L.

Electric arc lamp electrodes. Gebr. Siemens und Co., Lichtenberg, Germany. Eng. Pat. 13,817, June 9, 1911. Under Int. Conv., June 29, 1910.

See Fr. Pat. 431,040 of 1911; this J., 1911, 1368.—T. F. B.

Electrode for arc lamps. J. T. H. Dempster, Schenectady, Assignor to General Electric Co., New York. U.S. Pat. 1,010,402, Nov. 28, 1911.

See Eng. Pat. 26,915 of 1904; this J., 1905, 269.—T. F. B.

Conductors [filaments]; Process of making composite ——. W. D. Coolidge, Schenectady, Assignor to General Electric Co., New York. U.S. Pat. 1,010,866, Dec. 5, 1911.

See Eng. Pat. 282 of 1909; this J., 1910, 163. T. F. B.

Filaments; Machine for treating ——. J. W. Howell, Newark, N.J., Assignor to General Electric Co., New York. U.S. Pat. 1,010,914, Dec. 5, 1911.

See Eng. Pat. 2456 of 1904; this J., 1905, 190. T. F. B.

Lamp-filaments; Method of and apparatus for the treatment of ——. W. G. Abbott, Schenectady, Assignor to General Electric Co., New York. U.S. Pat. 1,011,396, Dec. 12, 1911.

See Eng. Pat. 2389 of 1909; this J., 1910, 79. T. F. B.

III.—TAR AND TAR PRODUCTS.

Naphthalene in road tars. I. Effect of naphthalene upon the consistence of refined tars. P. Hubbard and C. N. Draper. J. Ind. Eng. Chem., 1911, 3, 903—907.

Tars used as road binders are usually prepared by distilling from 15—30 per cent. of the lighter products from crude tar and would be more correctly termed soft pitches. An investigation of the principal chemical constituents of road-tars and their effect upon the quality of the products is being conducted in the Office of Public Roads, U.S. Dept. of Agriculture, and the present paper deals with the effects produced by naphthalene. The naphthalene was removed from samples of coal tar and water-gas tar by distillation and then the effect of the addition of varying quantities of naphthalene to the resulting hard pitches was studied. It was found that the consistence (measured at 55° C.) was remarkably diminished by small additions of naphthalene, whilst with further additions the effect was not so marked. With the pitch from coal tar the most fluid product was obtained with 20 per cent., and with that from water-gas tar with 25 per cent. of naphthalene; larger additions gave less fluid products owing to crystallisation of the naphthalene. The fluxing power of naphthalene for tar pitches is somewhat greater than that of heavier distillates, free from naphthalene, obtained from tar, but the effect would be less permanent owing to the ready volatilisation of naphthalene. The fluxing effect of naphthalene is more marked with harder than with softer pitches.—A. S.

Pitch ; New method for determining the melting point of ——. H. F. French. J. Ind. Eng. Chem., 1911, 3, 907—910.

The method consists in suspending the ground pitch in dilute sulphuric acid and heating the latter electrically until the pitch agglomerates. About 20 grms. of the pitch are ground in an iron mortar until the bulk of it passes through a 40-mesh screen of plain double crimped brass wire cloth (wire No. 32 Old English standard gauge, diam. of wire 0·01125 in., size of aperture 0·0137 in.), and 2 grms. of the freshly-ground sample are placed in an 8 oz. medium mouth Erlenmeyer flask together with 50 c.c. of dilute sulphuric acid (25—30 c.c. of a stock solution containing 20 c.c. of acid of sp. gr. 1·84 per litre are diluted to 1 litre and standardised so that when it is heated under the conditions of the method, the amperage is 2·2 when a temperature of 25° C. is attained). The electrodes consist of two $\frac{3}{16}$ in. copper rods the lower ends of which are covered with rubber and have lead tips; they are fastened together at a distance of $\frac{3}{16}$ in. and with a thermometer between. The current is taken from a 220-volt direct current circuit. During the determination the flask is rotated continuously in the same direction, at about the level of the eyes, until the greater part of the pitch agglomerates to form a drop, when the current is switched off, and the temperature read. Several determinations must be made and the average taken. The method gives concordant results, but it is essential that the sample be freshly ground, as the melting point of the ground material rises considerably on keeping.—A. S.

Patent.

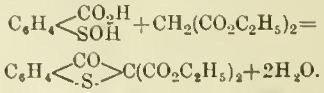
Phenylglycine salts ; Process of making ——. K. Schnitzspahn, Offenbach. Assignor to Chem. Fabr. Griesheim-Elektron, Frankfort-on-Maine, Germany. U.S. Pat. 1,011,500, Dec. 12, 1911.

See Eng. Pat. 3980 of 1911 ; this J., 1911, 884.—T. F. B.

IV.—COLOURING MATTERS AND DYES.

Thioindigo ; Synthesis of ——. (*Prelim. note.*) W. G. Prescott and S. Smiles. Chem. Soc. Proc., 1911, 27, 317.

When o-thiol- or o-dithio-benzoic acid is treated with malonic acid or its ester in the presence of warm concentrated sulphuric acid, a vigorous reaction occurs, and "thioindigo" is formed. From preliminary experiments the yield of the latter substance appears to be as high as about 85 per cent. of the theoretical, exclusive of thioindigosulphonic acid which is simultaneously produced. Traces of hydroxybenzothiophen were also isolated. There is no doubt that the preliminary stage of the interaction depends on the formation of the sulphoxylic acid, which then reacts as follows :—



$$C_6H_4{<}\begin{smallmatrix}CO_2H\\SOH\end{smallmatrix}+CH_2(CO_2C_2H_5)_2=$$

$$C_6H_4{<}\begin{smallmatrix}CO\\S\end{smallmatrix}{>}C(CO_2C_2H_5)_2+2H_2O.$$

Condensation of these thio-acids with ethyl acetoacetate, substituted malonic acids, and similar substances may also be effected ; these interactions are now being more closely investigated.

Separation of the seven permitted coal tar colours [*U.S.A.*] *in mixtures.* Price. *See* XIXa.

Patents.

Condensation products and dyestuffs from indigo or its substitution products ; Manufacture of ——. O. Imray, London. From Soc. of Chem. Industry in Basle, Basle. Eng. Pat. 29,368, Dec. 17, 1910.

See U.S. Pat. 994,988 of 1911 ; this J., 1911, 886. The compounds may be fixed on the fibre in the form of their leuco derivatives, and subsequently developed by oxidation.—T. F. B.

Vat [*anthracene*] *dyes.* A. Lüttringhaus, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pats. 1,010,930 and 1,011,068, Dec. 5, 1911.

See Ger. Pat. 237,236 of 1910 ; this J., 1911, 1152. 3.4-Dichloro-aniline and β-naphthylamine are the arylamines used.—T. F. B.

Dyestuffs containing sulphur ; Production of blue ——. Badische Anilin und Soda Fabrik. Fr. Pat. 431,981, May 19, 1911. Under Int. Conv., Nov. 28, 1910, Jan. 17 and March 11, 1911.

New vat dyestuffs which are practically insoluble in alkali sulphides are obtained by a prolonged treatment of any of the following substances with polysulphides rich in sulphur :—(*a*) The *p*-amino-*p*-hydroxydiphenylamines, mono- or di-alkylated or unsubstituted in the amino group, their homologues or substitution products, especially those chlorinated in the ortho position to the hydroxyl group), or the corresponding indophenols. (*b*) The indophenolthiosulphonic acids, which are obtained by the simultaneous oxidation of *p*-phenylenediaminethiosulphonic acids (mono- or di-alkylated or unsubstituted in the amino group), and phenol, their homologues or substitution products (notably those chlorinated in the ortho position to the quinone oxygen), the mercaptans obtained by the reduction of these products, and the corresponding thiazines. (c) Those sulphur dyestuffs soluble in alkali sulphides which are themselves produced from indophenols, indophenolthiosulphonic acids, the corresponding thiazines, the condensation products of nitrosophenols with carbazole or its alkyl derivatives or the leuco compounds of any of these substances. The new dyestuffs dye cotton from a hydrosulphite vat in blue shades of exceptional fastness, especially to lye-boiling, cross-dyeing and potting. Example : 8 kilos. of *p*-dimethylamino-*p*-hydroxydiphenylamine are mixed with a solution of 32 kilos. of crystallised sodium sulphide and 19·4 kilos. of sulphur in 16 litres of water and the mixture is boiled under a reflux condenser for about 60 hours. When the reaction is complete, the mass is extracted several times with a warm 10 per cent. solution of sodium sulphide, then washed with boiling water and finally made up into a paste.—P. F. C.

Vat dyestuffs of the anthracene series ; Manufacture of ——. F. Ullmann. Fr. Pat. 432,323, July 18, 1911. Under Int. Conv., Oct. 17, 1910.

By brominating or chlorinating anthraquinonethioxanthones, products are obtained which combine with aminoanthraquinones and their derivatives to form new vat dyestuffs. For example, 4·2 parts of the bromo-derivative of anthraquinone-1.2-thioxanthone are condensed with 2·3 parts of a aminoanthraquinone in the presence of 4 parts of potassium acetate, 0·1 part of copper, 0·1 part of cupric acetate and 40 parts of nitrobenzene. The product, which is precipitated in the form of small violet crystals, dyes cotton in reddish-brown shades from a hydrosulphite vat.—P. F. C.

[Azo] *colouring matters; Manufacture of black* ——. Read Holliday and Sons, Ltd., J. Turner, and H. Dean, Huddersfield. Eng. Pat. 8069, March 31, 1911.

See Fr. Pat. 430,321 of 1911; this J., 1911, 1306.—T. F. B.

Anthraquinone derivatives; Manufacture of — and the application thereof in dyeing and printing. A. G. Bloxam, London. From Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. Eng. Pat. 12,010, May 18, 1911.

See Fr. Pat. 431,176 of 1911; this J., 1911, 1373.—T. F. B.

Azo dye: Bluish red ——. Red-violet colouring matter. O. Günther, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,009,740 and 1,009,741, Nov. 28, 1911.

See Eng. Pat. 21,199 of 1910; this J., 1911, 1371.—T. F. B.

Diazotisable [*azo*] *dye.* C. Heidenreich, Leverkusen, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,009,745, Nov. 28, 1911.

See Eng. Pat. 25,292 of 1910; this J., 1911, 276.—T. F. B.

Monoazo dye. Disazo dyestuff. H. Schweitzer, Elberfeld, and A. Zart, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,009,796 and 1,009,797, Nov. 28, 1911.

See Eng. Pat. 21,473 of 1910; this J., 1911, 1109.—T. F. B.

Azo dye; Brown ——. W. Bergdolt, Leverkusen, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,009,952, Nov. 28, 1911.

See Eng. Pat. 9529 of 1911; this J., 1911, 1112.—T. F. B.

Trisazo dye; Blue ——. H. Jordan and W. Neelmeier, Leverkusen, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,010,433, Dec. 5, 1911.

See Fr. Pat. 427,572 of 1911; this J., 1911, 1109.—T. F. B.

Vat [*anthracene*] *dye.* P. Thomaschewski, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co. Elberfeld, Germany. U.S. Pat. 1,010,463, Dec. 5, 1911.

See Ger. Pat. 235,094 of 1910; this J., 1911, 885.—T. F. B.

Pyrazolone dyes and process of making them. P. Julius and E. Fussenegger, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,010,919, Dec. 5, 1911.

See Addition of Feb. 21, 1910, to Fr. Pat. 398,602 of 1909; this J., 1910, 1099.—T. F. B.

Azo dye for wool. H. Geldermann, Gross-Lichterfelde-Ost, Assignor to Act.-Ges. f. Anilinfabr., Berlin. U.S. Pat. 1,011,770, Dec. 12, 1911.

See Fr. Pat. 423,809 of 1910; this J., 1911, 611.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Silks; The protective treatment of weighted ——. O. Meister. Z. angew. Chem., 1911, **24**, 2391—2395.

Heavily weighted silks are liable to undergo deterioration in two ways, viz., by the development of reddish stains, apparently connected with the presence of chlorides, and by a general loss of strength (tendering) which occurs after exposure to sunlight and atmospheric influences. The effect of chlorides is possibly due to the formation of free chlorine by the catalytic action of iron or copper oxides, whilst the effect of sunlight has been attributed to a sort of electrolytic action or polarisation of oxidising and reducing functions. Certain substances, notably thiocyanates, have been found to exert a marked protective influence, possibly in virtue of their tendency to oppose oxidising conditions; thiourea, thiosulphates and hydroxylamine have also been employed. The author particularly recommends formaldehyde-bisulphite in the form of its stable isomeride, methyleneglycolsulphonic acid, which combines the reducing properties of the aldehyde with those of the sulphurous acid (Ger. Pat. 238,883; this J., 1910, 1154). Silk weighted to 50—70 per cent. over par was treated with 1, 1·5 and 3 per cent. respectively of formaldehyde-bisulphite and exposed to exceptionally strong sunlight for 21 days, sufficient to fade the fastest dyestuffs. The average diminution in strength of the treated silk was extremely small, although the elasticity had suffered considerably after the exposure. The elasticity however is a factor of prime importance only in the weaving process, and its diminution in woven fabrics is of little account. These results support the view that the tendering of silk by the action of light is the result of a semi-physical modification of the colloidal condition either of the silk or the weighting substance. Tendered silk may be partially restored by extracting the weighting material by means of hydrofluoric acid. —J. F. B.

Silk; Tryptic digestion of ——. W. S. Hubbard. J. Amer. Chem. Soc., 1911, **33**, 2032—2035.

The silk fibroin product known as "winder's waste" was purified by extraction with alcohol and digested in alkaline solution with trypsin during 2 and 7 months at 40° C. Hydrolysis took place, tyrosine and tryptophan being identified among the products as well as a peptone, having $[\alpha]_D^{20} = +25°$ in aqueous solution and containing 14·71 per cent. of nitrogen.—E. F. A.

Use of sulphite-cellulose [*tanning*] *extracts for blending.* Yocum and Faust. *See* XV.

New Zealand hemp; Prize offered by the New Zealand Government in connection with ——. Engineering, Dec. 29, 1911.

The New Zealand Government has agreed to pay £12,000 as a bonus or bonuses for improvements in connection with:—

1. The extraction and dressing of fibre from the New Zealand hemp plant (*Phormium tenax*); or

2. The utilisation of the by-products obtained during the processes of extracting the fibre;

on condition that the machine or process in regard to which the whole or any part of the bonus is to be paid shall be recommended by the New Zealand Flax-Millers' Association, and approved by the Government.

The £12,000 will be paid, wholly or in part, for any of the following, viz.:—

1. A process of extracting and dressing the fibre of New Zealand hemp (*Phormium tenax*), whether by machinery or otherwise, whereby there shall be obtainable (*a*) a greatly improved quality of fibre marketable at a higher price, or (*b*) a substantial reduction in the cost of producing the fibre.

2. Any such process that shall produce a fibre fit for use in manufactures other than rope and twine-spinning.

3. Any such process that shall render unnecessary any of the present operations involved in extracting and dressing the fibre, such as stripping, paddocking, or scutching.

4. Any improved method of separating the green envelope or the flinty or coloured matter from the green leaf of the phormium plant so as to produce a strong white fibre, the whole of which can be saved with little or no tow or waste.

5. Any means whereby the by-products obtained during the processes of extracting and dressing New Zealand hemp-fibre—such as the gum, dye, stripper-slips, tow-dust, or waste vegetable matter—shall be converted into a marketable commodity.

Applications for the bonus must be addressed to the President of the New Zealand Flax-Millers' Association, Palmerston North, New Zealand, and must reach him not later than noon of November 30, 1913. They must be enclosed in an envelope clearly marked "Application for Bonus."

Each applicant shall state what lump sum (including the bonus of £12,000, or any part thereof) would be required to purchase the New Zealand rights of his machine or process in the event of such rights being acquired by the New Zealand Government for free use by the hemp-millers of this Dominion; or, if any applicant is unwilling to sell his rights, he shall state what amount of bonus (not exceeding £12,000) and what royalty he would require for the use of his machine or process.

Patents.

Material [Rubber-coated cotton]; Wear-resisting —— and a process for its production. G. Metcalfe, Christchurch, New Zealand. Eng. Pat. 19,328, Aug. 17, 1910.

The fibres of cotton wool are first separated or loosened, and then passed through a bath of rubber solution containing sulphur. The fabric is finally withdrawn from the bath and allowed to become semi-dry before passing it between pressure rollers.—B. N.

Artificial threads; Arrangement for spinning twisted ——. C. C. Leclaire. Fr. Pat. 431,681, June 28, 1911.

In this apparatus the cluster of spinning jets and the completely filled coagulating bath receive a rotation in the same direction and at the same speed, so that the filaments issuing from the jets in fluid form are not subjected to torsion through the resistance of the coagulating liquid. The coagulating liquid is in constant upward circulation, being introduced preferably through a pipe passing centrally up the axis of the spinning member, and emerging at the centre of the annular cluster of spinning orifices. Thence it spreads centrifugally to the periphery of the coagulating bath, and the freshly issuing filaments thus constantly meet a supply of fresh coagulating liquid. The excess of coagulating liquid flows away through an orifice in the centre of the lid of the coagulating bath, the bundle of coagulated threads being led away upwards through the same orifice.
—J. F. B.

Cellulose esters [acetates]; Manufacture of new —— and their products of transformation. H. Dreyfus. Fr. Pat. 432,046, July 5, 1911.

An acetylating agent, such as acetic anhydride or acetyl chloride, is caused to act on cellulose or any modified product of cellulose in presence or absence of a diluting agent and in presence of a condensing agent, such as sulphuric acid, under such conditions that cellulose esters are obtained which are insoluble or sparingly soluble in chloroform, but readily soluble in a mixture of alcohol and tetrachlorethane or alcohol and chloroform. A series of cellulose acetates having the specified solubility may be obtained by varying the following conditions: the quantity of acetylating agent, the quantity of condensing agent relatively to that of the cellulose, and the degree of humidity of the cellulose relatively to the quantity of condensing agent. Example: using about 10 per cent. of sulphuric acid on the weight of the cellulose, the quantity of acetic anhydride may vary from 1·8 to 3·0 times the weight of the cellulose, the latter containing 5—6 per cent. of moisture; or using 20 per cent. or more of sulphuric acid on the weight of cellulose, the quantity of acetic anhydride mentioned above should be increased by an amount equal to four times the quantity of sulphuric acid taken.—J. F. B.

Celluloid, plastic masses, etc.; Manufacture of non-inflammable ——. H. Dreyfus. Fr. Pat. 432,047, July 6, 1911. Under Int. Conv., July 5, 1911.

For the manufacture of non-inflammable celluloid or plastic masses, cellulose acetates, of the type which is insoluble or sparingly soluble in tetrachlorethane alone but readily soluble on the addition of alcohol, are treated by the help of ordinary machinery with solvents of the class of chlorinated derivatives of acetylene, with or without alcohol or other substances capable of replacing it, and with or without "mannol" or other camphor substitute. When a mixture of tetra- or pentachlorethane with alcohol is employed, the total quantity of solvent should not exceed 80—100 per cent. of the weight of cellulose acetate. When tetrachlorethane is used in conjunction with "mannol," the quantity of total solvent may be 100—150 per cent. of the weight of the cellulose ester. Examples: 80 kilos. of cellulose acetate of the specified type are ground with 40 litres of alcohol and 40 kilos. of tetrachlorethane; or 40 kilos. of cellulose acetate are ground with 20 litres of alcohol and 20 kilos. of tetrachlorethane to which are added 5 kilos. of "mannol." Tetrachlorethane and pentachlorethane may be partially replaced by trichlorethylene.—J. F. B.

Celluloids; Manufacture of new non-inflammable and inflammable ——. H. Dreyfus. Fr. Pat. 432,264, July 15, 1911. Under Int. Conv., July 17, 1911.

In the manufacture of celluloid from nitrocellulose or cellulose acetate, or a mixture of both, substances are used which, except for their solvent action, behave towards the esters of cellulose as neutral and indifferent bodies and, like camphor, possess neither acid nor free phenolic functions; these compounds may be employed with or without alcohol. A large number of suitable compounds are specified, notably: anisol, phenetol, the chloranisols, safrol, oil of camphor, benzyl alcohol and its chloro derivatives, *o*-dichlorbenzene, the chlortoluenes, the simple and chlorinated acetophenones and benzophenones, and the halogen derivatives of camphor. For 1 kilo. of cellulose ester, 250—500 grms. of one or a mixture of these compounds, in 500—1000 c.c. of alcohol should be used. These compounds may be advantageously employed in conjunction with other solvents, *e.g.*, the series of chlorinated derivatives of acetylene. The process is particularly applicable to the cellulose acetates insoluble in chloroform but soluble on the addition of alcohol, but it is not confined to acetates of that type.
—J. F. B.

Vegetable fibres; Combined chemical and mechanical process for treating ——. V., G., V., C., and M. del Prato, Naples, Italy. Eng. Pat. 27,570, Nov. 26, 1910.

See Fr. Pat. 423,307 of 1910; this J., 1911, 615.—T. F. B.

Artificial bristles; Production of ——. B. Borzykowski, Charlottenburg, Germany. U.S. Pat. 1,010,222, Nov. 28, 1911.

See Fr. Pat. 424,428 of 1910; this J., 1911, 740.—T. F. B.

Milk of resin for the sizing of paper; Preparation of ——. J. Barat, Paris. Eng. Pat. 29,553, Dec. 20, 1910.

See Fr. Pat. 422,061 of 1910; this J., 1911, 532.—T. F. B.

Paper, glass, and other materials; Process of applying coatings of metal and collodion to ——. J. and B. Galay, Moscow, Russia. U.S. Pat. 1,011,181, Dec. 12, 1911.

See Eng. Pat. 19,772 of 1909; this J., 1910, 483.—T. F. B.

Preserved wood and process of making same. U.S. Pat. 1,010,122. *See* IX.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Dyeing; The electrical theory of ——. W. Harrison. J. Soc. Dyers and Col., 1911, 27, 279—290.

Various dyeing phenomena have been investigated by the methods described previously (see this J., 1910, 484).

It was found that generally speaking the effect of different salts and acids on the contact potential difference between cotton and water corresponds closely with the effect of these salts and acids on the amount of absorption by the cotton fibre of dyestuffs or mordants which are negatively charged in water. Moreover, if cotton is treated with various reagents such as caustic soda and nitric acid under different conditions and is subsequently dyed, the increase in the absorption of dyestuff runs parallel with the decrease in contact differences. The absorption and fixation of direct dyestuffs is explained as follows: The colour ions of direct dyestuffs are negatively charged; the metallic ions positively. The cotton is negatively and the water in immediate contact with it is positively charged. The fibre, therefore, repels the colour ions but attracts the metallic ions and by absorbing them reduces its own negative charge. Simultaneously the negative charge of the colour ions is reduced by the positive ions in the water next to the fibre. The repulsion of the fibre for the dyestuff being thus neutralised, the colour ions are able to approach and be absorbed by the fibre and again increase its negative charge. This process is repeated until the dilution becomes too great. The actual fixation as distinguished from the absorption of the dyestuff is attributed to the precipitating action of the positive hydrogen ions set free by the fibre on the colour ions. Since acid dyestuffs are not precipitated by dilute acids, they are not fixed under these conditions. The author finally considers the influence of the size of the dyestuff particles and the size of the pores of the fibre on the course of the dyeing process. A large number of experimental results are recorded.—P. F. C.

Dyeing and finishing of silk fabrics; Some problems in the ——. W. P. Dreaper. J. Soc. Dyers and Col., 1911, **27**, 291–293.

(1) In raw silk a number of filaments are bound together by silk gum to form a single thread. This is advantageous for spinning and weaving the material, but if the woven fabric is subjected to strain during subsequent processes it is very liable to crack and form creases which are most markedly visible when the fabric is viewed at an acute angle to the surface. Therefore, until the fabric has been rendered pliable by the removal of the silk gum, it should be worked in open folds with a minimum of tension. (2) White surface marks, irregular in shape and resembling mildew in appearance, are occasionally found on silk fabrics. This fault is due to the fracture of the silk filaments, which causes the broken and loose ends to stand out. Since these broken ends are remarkably inert towards dyestuffs; this defect shows up most on dyed goods. (3) Any unnecessary tension in the handling of "boiled-off" silks has a tendency to draw the filaments together to form threads of smaller diameter and increased density. This lessens the "covering power" of the silk and makes the finished fabric appear and feel thinner. (4) It was proved by Sisley that the rusty stains which cause great trouble in many districts can be induced by treating the fabric before storage with a dilute solution of sodium chloride. Concentrated solutions have no effect, and Sisley, therefore, suggests that the stains are due to hydrochloric acid liberated by the hydrolysis of the sodium chloride. The author suggests that this explanation is the more probable since silk has the property of absorbing hydrochloric acid from dilute solutions and would thus prevent the hydrolysis from immediately reaching an equilibrium. Further, the following reversible reaction is known to take place:

$\longrightarrow$

$2HCl+O \rightleftarrows H_2O+Cl_2$. So long as the silk retains any affinity for chlorine, this reaction will take the course indicated by the large arrow. The author therefore extends Sisley's hypothesis by suggesting that the chlorine forms chloramine compounds with the amino constituents of the silk fibre and that the stains are formed by the decomposition of these compounds and the resulting liberation of hydrochloric acid during the storage of the goods. An alternative explanation of these stains is as follows. The equilibrium of the reaction $NaCl+C_2H_4O_2 \rightleftarrows HCl+C_2H_3O_2.Na$ would never be attained so long as the silk retained any affinity for hydrochloric acid and the acid thus absorbed during the dyeing or other process would be sufficient either directly or indirectly (through the formation of chloramine compounds), to produce the stains.—P. F. C.

Experimental investigation of the bleaching process. Higgins. *See* VII.

Colloidal reactions applied to the staining of wood. De Keghel. *See* IX.

Patents.

Dyeing machine. J. Leisel, Charlotte, N.C. U.S. Pat. 1,010,274, Nov. 28, 1911.

The machine comprises a vat and a chamber adjacent to one end, the chamber having an inclined top provided with openings so that the liquid may overflow from the vat into the chamber. The vat is provided with a movable perforated false bottom and a hinged cover. An overhead mechanism swings the vat cover up and down, and also raises and lowers the false bottom, tilting it when raised into an inclined discharging position. The false bottom is held against movement during the time the dyed material slides off it, by means of a flexible connection between one end of the false bottom and the opposite end of the bottom of the vat. Liquid is circulated through the vat and chamber by means of a pump, actuated by a reversible motor, the latter also working the overhead mechanism in either direction. Provision is also made for heating the liquid in the chamber.—B. N.

Dyeing animal fibres [*furs*]. H. R. Vidal. Fr. Pat. 431,971, Sept. 24, 1910.

By adding alkali sulphites to the solutions prepared as described in Fr. Pat. 391,465 of 1907 and addition thereto (this J., 1908, 1150), brighter shades are obtained on fibres which have been previously treated with oxidising agents. If the quantity of sulphite equals 10—20 per cent. of the weight of the skin to be treated, the hair is dyed whilst the skin remains unstained.—P. F. C.

Waterproofing composition. C. Casteleyn, Zeebrugge, Belgium. Eng. Pat. 2703, Feb. 2, 1911.

A damp-resisting emulsion, for the protection of walls, ceilings or the like, consists of wood or vegetable pitch, 155 grms.; mineral creosote, 408 grms.; coal or coke oven tar, 432 grms.; and caustic soda, 5 grms., mixed together in the cold.—B. N.

Finish on fabrics; Permanent ——. E. Watremez. Fr. Pat. 432,013, July 6, 1911.

(1) Borax is added to a solution containing gelatin and aluminium acetate and the precipitate which is formed is applied to fabrics by the ordinary processes. (2) A permanent finish is produced on the fibre by impregnating the fabric in a solution containing a sizing material such as gelatin, a soluble aluminium salt such as alum, a weak acid such as formic acid, and borax. This solution is stable in the cold owing to the presence of the formic acid, but when the padded material is thoroughly dried, the precipitation of aluminium borate takes place in the fibres and thus produces a finish which is permanent to water. In place of borax, any substance can be used which gives an insoluble aluminium salt.—P. F. C.

Indigo dyeing; Process and apparatus for ——. C. Rachou and E. Chaumat, Camares, France. Eng. Pat. 1247, Jan. 17, 1911. Under Int. Conv., Jan. 18, 1910.

See Fr. Pat. 422,414 of 1910; this J., 1911, 534.—T. F. B.

Dyeing with benzoquinone derivatives; Process of —— R. Lesser, Berlin, Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,009,981, Nov. 28, 1911.

See Eng. Pat. 876 of 1911; this J., 1911, 417.—T. F. B.

Brown to violet to black shades on the fibre; Production of ——. H. Schmid, Mülhausen, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pats. 1,011,084 and 1,011,085, Dec. 5, 1911.

See Ger. Pats. 218,484 and 223,456 of 1909; this J., 1910, 484 and 1154.—T. F. B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Nitric acid by light; Decomposition of ——. W. C. Reynolds and W. H. Taylor. Chem. Soc. Proc., 1911, **27**, 306.

The authors have investigated the decomposition of nitric acid by light, and find that the reaction (see below) is reversible, the products of decomposition slowly recombining more or less completely in the absence of light. The extent of the decomposition and recombination was illustrated by a series of curves. They have proved that pure anhydrous nitric acid decomposes very slowly in the dark, giving the same products of decomposition. In discussion V. H. Veley said that the observations of the authors that the reaction, $4HNO_3 = 2H_2O + 2N_2O_4 + O_2$, is reversible on alteration of conditions, appeared to be of special interest, and was in accordance with results obtained in the study of other reactions in which nitric acid took part.

Halogens; Absorption of —— *by dry slaked lime.* W. A. R. Wilks. Chem. Soc. Proc., 1911, **27**, 308.

It was shown that bromine is absorbed from carbon tetrachloride solution by slaked lime (dried in a vacuum), with the production of an "adsorption compound," which is brick-red. The colour of "bromine bleaching powder" is due to this product. Iodine gives a similar adsorption compound, which is almost black. The concentrations of bromine in the solution (C_2) and in the lime (C_1) are connected by the formula $\frac{C_1}{C_2^n} = k$, when n is one-third. The adsorption of iodine obeys a similar formula, n being still one-third, but the constant k has a different value in the two cases.

Adsorption phenomena could not be detected when chlorine was absorbed by dry slaked lime under the same conditions as before, but the results showed that in this case a chemical compound was formed.

Bleaching process; An experimental investigation of the ——. S. H. Higgins. Chem. Soc. Proc., 1911, **27**, 314.

Solutions of the hypochlorites of lithium, sodium, and potassium prepared from bleaching powder solution by precipitation with solutions of the alkali sulphates or carbonates have identical bleaching properties; the bleaching efficiencies of these solutions are almost equal to that of the original bleaching powder solution. Curves showing (1) the evolution of oxygen from hypochlorite solutions and from solutions of sodium peroxide in contact with copper oxide; (2) the rate of bleaching of solutions of hypochlorites and of sodium peroxide; (3) the rate of oxidation of oxalic acid by potassium permanganate and the rate of liberation of iodine from potassium iodide by acidified sodium peroxide solution (Harcourt and Esson, Phil. Trans., 1866, **156**, 193), point to the conclusion that the actions in all these cases are similar, that is, unimolecular. Hypochlorites therefore bleach because of their readiness directly to produce nascent oxygen. Those substances which accelerate the evolution of oxygen from solutions of hypochlorites or of peroxides also assist the evolution of that gas when they are heated along with potassium chlorate; hence it is taken that the main action in the latter case is a unimolecular one. Chlorine water is a much weaker bleaching agent than solutions of hypochlorites; therefore the bleaching action of the latter cannot be due to the generation of free chlorine as stated by Taylor (Chem. Soc. Trans., 1910, **97**, 2541; see also this J. 1911, 1302). Chlorine water probably owes its bleaching properties to the presence of hypochlorous acid in solution. The proof that the production of chlorine from bleaching powder solution and the stimulation of the bleaching action of that solution have no connection with one another has led the author to consider the two questions separately. In pursuit of this line of argument he gave further experiments supporting previous conclusions (see Taylor, this J., 1911, 1250).

Potassium permanganate solutions: Reduction of neutral —— *by sulphates.* P. A. Tscheishwili. J. Russ. Phys.-Chem. Soc., 1911, **43**, 1402—1420.

The author has investigated the action of a number of normal sulphates on potassium permanganate in neutral solutions, these being subsequently filtered through washed, ignited asbestos and the permanganate estimated by titration. With all the sulphates employed except chrome alum, a slow reducing action on the permanganate was observed, while in certain cases the percentage of the permanganate reduced was less after, say, eight months than after three months. Chrome alum exerted a far more rapid action, as much as 80—90 per cent. of reduction occurring in 24 hours and 100 per cent. in a month; this result is probably due to the conversion of the chromic oxide into chromic anhydride: $Cr_2O_3 + O_3 = 2CrO_3$. A solution of permanganate in distilled water alone showed no reduction after the lapse of eight months. The general conclusion drawn from the results is that, in many cases, mineral salts play the part of positive or negative catalysts towards the reduction of permanganate in neutral solution. This action not only depends on the chemical nature of the constituent ions of the salts but varies with the physical condition of the surrounding medium. The concentration of the sulphate also influences the intensity of the catalytic action, which appears always to increase with increase of the concentration.—T. H. P.

Chlorates; Analysis of ——. v. Buttlar. Chem.-Zeit., 1911, **35**, 1374.

In the determination of the chlorine in chlorates, calcium carbonate is usually employed for neutralising the acid solution obtained after reduction to chloride. The neutralisation can, however, be effected much more conveniently by magnesium hydroxide mixed to a "milk" with water. The magnesium hydroxide is added until a slight turbidity persists even on boiling. No filtration is necessary before proceeding with the titration of the chloride.—A. S.

Salts of silver and of mercury; Formation of complex compounds of ——. B. Finzi. Gaz. chim. ital., 1911, **41**, II., 538—543.

Further experiments have been made on the solubility of silver chloride in presence of mercuric salts (see this J., 1903, 494). The amount of silver chloride dissolved increases with increase of the quantities of mercuric salt and of water. In a solution containing a silver salt in presence of a large excess of a mercury salt, no precipitate is produced at first on addition of hydrochloric acid, and it is assumed that complex compounds are produced which are stable within certain limits of concentration and of acidity.—A. S.

Silver-mercuric compounds; Some new basic ——. B. Finzi. Gaz. chim. ital., 1911, **41**, II., 543—549.

If a cold saturated solution of silver sulphate be boiled with freshly-precipitated yellow mercuric oxide, the mixture filtered, and the filtrate allowed to stand, crystals separate in the course of 6 or 7 days. These crystals have the composition, Ag_2SO_4,HgO; they are soluble in sulphuric and nitric acids, and insoluble in, but decomposed by water; they rapidly blacken on exposure to the light. When treated in a similar manner, silver nitrate yields

the compound, $AgNO_3.2HgO$, which has similar properties to the compound obtained from silver sulphate.
—A. S.

Silicic acid; Coagulation and gelatinisation of ——. N. Pappadà. Gaz. chim. ital., 1911, **41**, II., 495–517. Z. Chem. Ind. Kolloide, 1911, **9**, 164–175.

The coagulation of silicic acid sol must be distinguished from the gelatinisation of the same. On coagulation, flocks of silicic acid separate, whilst on gelatinisation a translucent gelatinous mass is obtained, retaining the whole of the water in which the silicic acid was suspended. The author regards colloidal silicic acid as consisting of membranes possessing a capillary structure, and the gelatinisation on addition of solutions of electrolytes is considered to be due first to neutralisation of the electrical charge of the colloid by the ions of opposite electrical sign, followed by penetration of water into the capillaries owing to osmotic effects due to diffusion of the dissolved electrolyte. When this entering water comes in contact with the surface of the capillaries, an electrical double layer is again produced; and the processes of neutralisation of the electric charge by ions of opposite electrical sign, and penetration of water owing to osmotic effects continue until the maximum quantity of water has been taken up, whereupon coagulation takes place if the solution be dilute (0·6 per cent. SiO_2) or gelatinisation in stronger solutions (6 per cent. SiO_2). Experiments in support of this view of the process are described. If a layer of silicic acid sol be placed above a layer of a solution of an electrolyte, gelatinisation takes place from the zone of contact upwards, in consequence of diffusion of the electrolyte: the uppermost layer remains liquid and is found to consist almost entirely of diffused electrolyte solution. If the silicic acid sol be mixed with a solution of an electrolyte, gelatinisation takes place uniformly throughout the mass. The osmotic effects due to dissolved substances are effective in causing gelatinisation only after the electrical charge on the colloid particles has been neutralised, *e.g.* by ions. A solution of a non-dissociable organic compound, such as sucrose, for example, will not produce gelatinisation in absence of an electrolyte, but if a silicic acid sol be mixed with a solution of an electrolyte and the mixture placed above a layer of sucrose solution, then the osmotic effects due to the dissolved sucrose become evident, gelatinisation of the sol taking place from the zone of contact upwards. That the penetration of water into the capillary vessels of the silicic acid, owing to osmotic effects, is an essential part of the gelatinisation process is borne out by the fact that a silicic acid sol can be coagulated but not gelatinised by a ferric hydroxide sol. The colloidal ferric hydroxide has an electrical charge opposite to that of silicic acid sol, but exerts practically no osmotic pressure. The author states that using 12 c.c. of a $N/100$ silicic acid sol and 8 c.c. of a $N/100$ ferric hydroxide sol, both colloids are precipitated quantitatively, and if excess of either colloid be taken, the excess is apparently unaffected, retaining its original electrical charge.—A. S.

Metals; Separation of —— from aqueous solutions of their salts by hydrogen at high temperatures and pressures. III. W. Ipatiew. Ber., 1911, **44**, 3452—3459. (See this J., 1911, 900.)

Hydrogen reduces $N/1$ nitric acid completely to ammonia at 100 atmospheres and 150°—160° C., in the presence of a little copper. It is therefore found, when copper has been separated from copper nitrate by the action of hydrogen under pressure, that the solution is always alkaline. From $2N$-solutions of copper nitrate, hydrogen at 100 atmospheres and 100° C. begins to separate the basic nitrate, $Cu(NO_3)_2.3Cu(OH)_2$, the nitric acid being reduced to nitrous acid. At higher temperatures cupric oxide begins to appear as hard black crystals, and the solution becomes colourless. If the time of reaction is prolonged, the basic salt disappears and the precipitate is found to consist of cupric oxide and metallic copper. In $N/1$ solutions the tendency to form the basic nitrate is not so evident, while metallic copper is much more readily formed. At lower temperatures (100°—120° C.) crystalline cuprous oxide with traces of metal is the principal product. From $2N$ cupric chloride colourless crystals of cuprous chloride are formed at 155° C., while from $N/5$ cupric chloride a mixture of cuprous chloride and copper is obtained. Nickel sulphate in $N/5$ solution, with hydrogen at 100 atmospheres begins to deposit nickel at 180° C., the reaction taking place much more readily in a glass vessel than in quartz. When the concentration of the nickel sulphate is $2N$, heating to 100° C. under a pressure of 100 atmospheres of air, nitrogen or hydrogen, leads to the separation of a very insoluble salt, $NiSO_4,H_2O$. This compound does not give off water at 270° C., and only dissolves on prolonged treatment with concentrated nitric acid. If the separation of this salt takes place in the presence of hydrogen, traces of nickel are usually found, but quantitative separation of the metal is not accomplished. From nickel nitrate in $2N$ and $N/1$ solutions, very little deposit was obtained by the action of hydrogen. In $N/5$ solution at low temperatures the greenish nickelous hydroxide, $Ni(OH)_2$, was formed, while at higher temperatures (in a quartz tube) the precipitate was grey black and contained metallic nickel. No metallic nickel was obtained from the nitrate in glass vessels. From nickel acetate ($N/5$) at 120° C., only nickel hydroxide was deposited, while at 168° C. pure metallic nickel separated and the solution became colourless. Nickel chloride ($N/5$) gave only metallic nickel, and only in small quantity even at high temperatures (250° C.). There are thus striking differences between the behaviour of copper and nickel salts with hydrogen at high temperatures and pressures.—W. H. P.

Thiophosphates and thiophosphites. F. Ephraim and R. Stein. Ber., 1911, **44**, 3405—3413.

The authors have prepared various thiophosphates and thiophosphites by the action of sulphides of phosphorus on sulphides of the alkali and alkaline earth metals. To avoid hydrolysis and decomposition, the soluble sulphide was always taken in great excess and in concentrated solution. Potassium tetrathiophosphate (K_3PS_4,H_2O) separates in a crystalline form on treating a concentrated solution of potassium sulphide with phosphorus pentasulphide. The salt is very soluble in water, and the crystals are comparatively stable in air. They lose their water of crystallisation at 90° C. Ammonium tetrathiophosphate, $(NH_4)_3PS_4$, is obtained in a similar manner in larger quantities, and is also very stable in air. Barium tetrathiophosphate is obtained by acting on barium sulphide solution with sodium tetrathiophosphate, and is not so stable in air as the alkali salts. A strontium salt obtained in a similar manner to the barium salt only crystallises on the addition of alcohol, and has the composition, $Sr_3H_6(PS_3O)_4$, *i.e.*, it is a trithiophosphate, or more correctly a trithiosesquiphosphate. The reaction of crystalline sodium sulphide (as dry as possible) with phosphorus heptasulphide (P_4S_7) gives a thick liquid which after filtering deposits crystals of sodium trithiophosphite, Na_3PS_3,aq., which readily reduce permanganate. If phosphorus trisulphide (P_4S_3) is used instead of the heptasulphide the same product is obtained, although the water content is different. Barium trithiophosphite, $Ba_3(PS_3)_2$,aq., is obtained by the reaction of phosphorus heptasulphide with barium sulphide, while phosphorus trisulphide gives a product with the formula, $Ba_3(PS_{5\cdot4}O_{1/4})_2,8H_2O$. It will be noted that thiophosphorous acid is apparently tribasic, while phosphorous acid is always dibasic.—W. H. P.

Cerium earth double sulphates with the alkali sulphates; Decomposition of the —— by fusion with charcoal. P. E. Browning and P. L. Blumenthal. Amer. J. Sci., 1911, **32**, 164—166.

The insoluble double sulphates of the cerium earth metals, obtained as a by-product in the separation of these earths from the earths of the yttrium group, are intimately mixed with a moderate excess of charcoal and heated for about an hour over a Bunsen flame. The mass is then treated with dilute hydrochloric acid, when the cerium earth metals are readily dissolved.—F. Sodn.

Sodium nitrate. Shipments and consumption from 1909 to 1911. W. Montgomery and Co., Dec. 30, 1911. [T.R.]

Oxides of nitrogen; Process of manufacturing ——. O. Bender. Potsdam, Germany. U.S. Pat. 1,011,014, Dec. 5, 1911.

See Ger. Pat. 217,079 of 1908; this J., 1910, 152.—T. F. B.

	1909.	1910.	1911.
	Tons.	Tons.	Tons.
Shipments from South American Ports to all parts for the twelve months ending 31st December	2,100,000	2,300,000	2,406,000
Consumption in United Kingdom for the twelve months ending 31st December	111,000	120,000	132,000
,, in Continent ,, ,, ,, ,,	1,354,000	1,531,000	1,564,000
,, in United States ,, ,, ,, ,,	407,000	501,000	550,000
,, in other Countries ,, ,, ,, ,,	66,000	89,000	103,000
,, In the World ,, ,, ,, ,,	1,938,000	2,241,000	2,349,000

Patents.

Sulphuric acid from acid sludge; Process of recovering ——. J. S. and A. A. Blowski, Oakland, Cal. U.S. Pat. 1,010,221, Nov. 28, 1911.

Sulphuric acid is liberated from petroleum sludge by means of water, so as to obtain a dilute acid containing sufficient organic matter to decompose the acid on subsequent heating. Finally, the sulphur dioxide produced by such heating, is purified, and reoxidised to give sulphuric acid.—F. Sodn.

Hydrosulphites; Manufacture of anhydrous ——. R. E. Ellis, London. From Chem. Fabrik von Heyden, Aktienges., Radebeul, Saxony. Eng. Pat. 26,765, Nov. 17, 1910.

Alkali acetonesulphoxylates are heated with bisulphites or loosely bound bisulphite compounds, such as acetone-bisulphite, in the absence of extraneous salts and in the proportion of less than two mols. of the latter to one mol. of the former (compare Eng. Pat. 16,540 of 1910; this J., 1910, 1204). For example, a mixture of 250 parts of sodium bisulphite solution (40° B.) with 60 parts of acetone and 100 parts of water is heated to 70° C., and 180 parts of sodium acetone sulphoxylate are added at 60°—70° C., whilst stirring. Acetone is liberated and distilled off, preferably *in vacuo*, and the precipitated sodium hydrosulphite is separated from the mother lye in the usual manner.—F. Sodn.

Potash salts from seaweed; Process of obtaining ——. H. S. Firman, San Diego, Cal. U.S. Pat. 1,010,403, Nov. 28, 1911.

Seaweed is made to undergo slow combustion in a chamber, in which the admission of air and outflow of combustion products are so regulated that the temperature is maintained at a point allowing practically all the potassium to be retained in the residue, and the greater part of the carbonaceous matter to be burned. The combustion residue is treated with water, or with a solution of potassium salts, while the temperature is still high enough to cause the residue to set to clinker.—F. Sodn.

Cyanogen compounds [cyanides, etc.] and the like; Process for producing ——. W. G. Heys, Manchester. From The Nitrogen Co., Ossining, N.Y., U.S.A. Eng. Pat. 21,628, Sept. 17, 1910.

See Fr. Pat. 425,699 of 1910; this J., 1911, 956.—T. F. B.

Nitrogen compounds [cyanides and cyanamides]; Method of producing ——. W. G. Heys, Manchester. From Nitrogen Co., Ossining, N.Y., U.S.A. Eng. Pat. 22,745, Oct. 1, 1910.

See Fr. Pat. 425,025 of 1910; this J., 1911, 1013.—T. F. B.

Nitrogen compounds from carbides; Apparatus for producing ——. A. R. Frank, Spandau, Germany. U.S. Pat. 1,010,404, Nov. 28, 1911.

See Eng. Pat. 21,786 of 1907; this J., 1908, 898.—T. F. B.

Compounds of vanadium, molybdenum, tungsten, and similar metals; Extraction of ——. A. H. Perret, Paris. Eng. Pats. 26,777, Nov. 17, 1910, and 15,181 of 1911, dated Nov. 17, 1910. Under Int. Conv., Nov. 24, 1909.

See Fr. Pat. 412,641 of 1910; this J., 1910, 1016.—T. F. B.

Alkali sulphides and alkaline earth sulphides; Manufacture of ——. G. W. Johnson, London. From Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. Eng. Pat. 28,261, Dec. 5, 1910.

See Fr. Pat. 424,417 of 1910; this J., 1911, 747.—T. F. B.

Superoxides of the alkali earths; Process for the preparation of ——. F. Bergius, Hanover, Germany. Eng. Pat. 8503, April 5, 1911. Under Int. Conv., April 18, 1910.

See Fr. Pat. 427,866 of 1911; this J., 1911, 1160.—T. F. B.

Verdigris; Process of producing ——. G. Schneider, Freideburg, Assignor to E. Abresch, Neustadt, Germany. U.S. Pat. 1,009,864, Nov. 28, 1911.

See Fr. Pat. 391,603 of 1908; this J., 1908, 1152.—T. F. B.

Ammonium sulphate and sulphur from gas; Process of making ——. W. Feld, Linz, Germany. U.S. Pat. 1,011,043, Dec. 5, 1911.

See Fr. Pat. 431,241 of 1911; this J., 1911, 1381.—T. F. B.

Hydrogen; Process of and apparatus for the production of —— by auto-combustion. G. F. Jaubert, Paris. Eng. Pat. 9623, April 20, 1911. Under Int. Conv., May 21, 1910.

See Fr. Pat. 427,191 of 1910; this J., 1911, 1058.—T. F. B.

Electric resistance furnace for making aluminium nitride. Addition to Fr. Pat. 427,066. *See* XI.

VIII.—GLASS; CERAMICS.

Silicate mixtures [glasses]; Density of ——. E. W. Tillotson, jun. J. Ind. Eng. Chem., 1911, 3, 897—900.

Winkelmann and Schott (Ann. Phys. Chem., 1893, **49**, 401; 1894, **51**, 697) showed that the approximate specific gravity of a glass can be calculated by means of the formula: $\frac{a_1}{z_1}+\frac{a_2}{z_2}+\frac{a_3}{z_3}=\frac{100}{S}$ where S is the specific gravity of the glass, a_1, a_2 and a_3 are the percentages of the constituent oxides, and z_1, z_2 and z_3 are their respective specific gravities in the glass. Winkelmann used the values 3·3 for lime, 3·8 for magnesia, and 4·1 for alumina for the respective specific gravities of the oxides when present in a glass. The author from a study of the more accurate data afforded by recent work on silicates proposes the values 4·1 for lime, 4·0 for magnesia, 2·75 for alumina, and 3·7 for lithia, and states that with these factors the calculated specific gravity does not differ by more than 1 or 1·5 per cent from the true value for a large variety of glasses.—A. S.

Patents.

Glass plates ; Method of, and means for, cooling —. W. W. Pilkington, Prescot, Lancs. Eng. Pat. 27,280, Nov. 23, 1910.

The apparatus comprises a pair of casting tables and a pair of cooling kilns, combined with a single series of annealing kilns. Each of the cooling kilns receives a freshly cast plate in turn, while the other cooling kiln remains empty, in order to cool down to a temperature suitable for the reception of the next plate that is cast. The plates are transferred from each of the cooling kilns, alternately, to the single series of annealing kilns.—W. C. H.

Kiln ; Continuous ——. G. E. Goldner, Assignor to Vincent Clay Products Co., Fort Dodge, Iowa. U.S. Pat. 1,011,050, Dec. 5, 1911.

The upper part of the kiln is provided with a number of horizontal tables for receiving glazing material, and burning liquid fuel is directed through openings in the top of the kiln immediately above the tables. Air is supplied to the kiln through a space between one wall and an interior " bag wall " and a down draught is maintained within the kiln.—W. H. C.

Kilns. Eng. Pat. 11,309. *See* I.

IX.—BUILDING MATERIALS.

Wood ; Colloidal reactions applied to the staining of ——. *II.* M. de Keghel. Rev. gen. Chim., 1911, **14**, 348—355.

The mordanting and staining of timber in the log is performed by injecting the solutions longitudinally under hydraulic pressure. The pressure necessary for penetration will vary with the nature of the wood, but is constant for the same wood ; the time will vary according to the length of the log, and to a certain extent with the capillary properties of the liquid. It is important that the timber should be freshly felled and at the season of the rise of the sap. The impregnating apparatus consists of a horizontal steel cylinder with a conical cap inside at each end. One end of the cylinder is fixed and closed ; this end is extended in the form of an internally screwed tube through which passes a hollow shaft serving for the introduction of the liquid. This shaft terminates in the conical cap inside the cylinder, so that the cap at this end may be adjusted to or fro to suit the length of the log The other end of the cylinder forms a detachable door to which the other conical cap is attached. The log is suitably trimmed at the ends to fit the conical caps, so that, when inserted, and the cylinder closed, the log can be firmly clamped with liquid-tight joints between the two conical caps. The liquid is then pumped into the cylinder through the hollow shaft ; it surrounds the log, thus preventing all danger of bursting the fibres, but only enters the log at one end through the conical cap. When sufficient pressure is attained, sap begins to flow out through the other cap attached to the door of the cylinder, and when the operation is ended, the liquid flows out at the same concentration as it was introduced. In staining timber, the first treatment consists of a mordanting with a solution containing 3 per cent. of soap and 1·6 per cent. of sodium carbonate. The log after impregnation is allowed to remain for 48 hours and then treated with a solution of dyestuff. The stains have next to be fixed by the mutual action of the colloids : soap and dyestuff. This is aided by heat, the impregnated logs being steamed at a moderately low pressure for a time which varies according to their diameter. After cooling, the logs are sawn up into boards of convenient thickness, which then have to be dried. The drying is the most difficult operation of all, seeing that the impregnated boards may contain as much as 65—70 per cent. of moisture. Drying is performed systematically on wagons which are introduced into a tunnel through which heated air is circulated. The temperature and degree of saturation of the air have to be carefully regulated so as to produce an evaporation of moisture from the interior to the exterior of the wood. Soft woods may be dried more rapidly than hard woods and at a higher temperature. Details of the various processes of treatment are given. —J. F. B.

Naphthalene in road tars. I. Effect of naphthalene upon the consistence of refined tars. Hubbard and Draper. *See* III.

Patents.

Portland cement and the like ; Mixers for ——. W. Gilbert, London. Eng. Pat. 648, Jan. 10, 1911.

The raw meal mixers are of the continuous type, and have one or more sets of ported horizontal rollers, arranged in the same vertical plane, which deliver into an external mixing well, and not into a central compartment formed between two vertical groups of rollers. Material raised from the mixing well is passed through a rotary, fixed, or shaking screen in order to remove hard foreign substances before delivery to the mixer chamber and ported rollers. The leading edge of each roller casing is also rounded so as to prevent hard foreign substances from becoming wedged between the edges of the roller ports and the casing. Each roller is driven by a separate belt, the driving power of which is less than that of the gearing driving each roll, so as to prevent breakage of the rollers, or gearing, should accidental stoppage of the roller occur. —W. C. H.

Wood ; Preserved —— *and process of making same.* J. A. De Cew, Montreal, Canada. U.S. Pat. 1,010,122, Nov. 28, 1911.

The product is obtained by treating a fibro-cellular body with waste sulphite liquor under the action of heat and pressure.—W. C. H.

X.—METALS ; METALLURGY, INCLUDING ELECTRO-METALLURGY.

New element [" *canadium* "], *probably of the platinum group ; Discovery of a* ——. A. G. French. Chem. News, 1911, **104**, 283.

A supposed new metallic element has been discovered in the trap-dyke of the Nelson District of British Columbia. It has been found along with platinum and metals of that group in the form of grains and scales, in quantities varying from a few grains weight to 3 ounces per ton. The new metal is white, of brilliant lustre, softer than platinum, ruthenium, palladium, or osmium, and has a melting point close to that of silver. It is unaffected by moist air or by heating in air for a long time. Iodine, hydrogen sulphide, or soluble sulphides have no action on it, but it is soluble in nitric and hydrochloric acids, and acts electronegatively to silver in dilute acids. It is not precipitated from its solutions by alkali chlorides or iodides.—F. Sodn.

Gold ; Premature precipitation of —— *in the cyanide process.* R. S. Browne. Trans. Amer. Metallurgical Soc. ; through Min. and Eng. World, Dec. 2, 1911, 1108—1111.

The author considers that losses of gold stated to be due to premature precipitation are often due to other causes, *e.g.* de-aeration of the cyanide solution. Experiments on an ore containing graphite showed that the latter does not precipitate gold from a cyanide solution. The action of charcoal as a precipitant is considered to be due to occluded gases perhaps aided by osmotic pressure. Some experiments on precipitated gold showed that even

after removal of zinc, the black amorphous gold is much less easily soluble in cyanide solution than yellow gold.
—B. M. V.

Zinc dust as a precipitant [of gold from cyanide solutions]. M. T. Murray. J. Chem. Met. and Min. Soc., S. Africa, 1911, **12**, 109—110.

THE average size of the particles constituting zinc dust was measured by screening tests followed by examination under the microscope of the finer particles. The following are some of the results obtained :—None of the material remained on a screen with aperture 0·0197 in.; 94·54 per cent. of the whole passed the smallest screen used (aperture 0·0030 in.). The average diameter of the particles was calculated as 0·0011506 in., which corresponds to a surface of 144·8 sq. ft for 1 lb. of material ; this is about 3 times the surface exposed by 1 lb. of filiform zinc. Zinc oxide and other impurities were seen to be present, but quite separate from the metallic particles which were approximately spherical and retained their bright metallic lustre even after several weeks' exposure to the atmosphere. H. A. White stated that a three-fold increase of surface was insufficient to account for the very greatly increased rate of precipitation by zinc dust compared with that obtained in the usual extractor boxes, so that there must be another factor involved.—B. M. V.

Zinc dust. Eng. and Mining J., 1911, **92**, 1173.

A NEW ruling of the Interstate Commerce Commission (U.S.A.) lists zinc dust and zinc flue dust as "inflammable solids" and directs that they must bear a yellow shipping label, as prescribed in paragraph 1834, which reads : "Packages must be tight and strong, and the interior packages must be so cushioned and secured that no rupture of either package can result from the ordinary shocks incident to transportation." Zinc dust is commonly shipped in wooden casks containing 1500 lb. It has been for a long time recognised as a dangerously inflammable substance and there has been a strong suspicion that it is also explosive, although the causes of explosions in which it has figured have not, perhaps, been conclusively traced to the zinc dust.

Cobalt and zinc ; The alloys of ——. F. Ducelliez. Bull. Soc. Chim., 1911, **9**, 1017—1023.

COBALT and zinc form a compound having the composition $CoZn_4$. When alloys rich in zinc are treated with dilute hydrochloric acid, the zinc dissolves first, leaving behind an alloy of this composition. This compound and alloys richer in zinc are non-magnetic. The curve representing the electro-motive force of the alloys against zinc in $N/2$ zinc sulphate solution shows a break at the composition corresponding with the compound, $CoZn_4$.—F. SHDN.

Aluminium ; A re-determination of the density and coefficient of lineal expansion of ——. F. J. Brislee. Faraday Soc., Dec. 6, 1911. [Advance proof.]

THE determinations were made on aluminium of about 99·5 per cent. purity, containing about 0·25 per cent. each of iron and silicon. The specific gravity was found to be 2·708 for the cast metal, 2·705 for hard-drawn rod, and about 2·68 for re-melted aluminium. The coefficient of lineal expansion was determined directly by measuring the increase in length of a rod of the metal when heated from 10° to 100° C. The following formulæ are given for calculating the variation in length of an aluminium rod between 0° and 100° C. :—

Hard-drawn aluminium :

$$L_t - L\,(1 - 0{\cdot}00002432t)$$

Annealed aluminium :

$$L_t - L\,(1 - 0{\cdot}00002454t).$$

In discussion R. Seligman gave 2·727 as the average of a large number of determinations of the specific gravity of rolled sheet aluminium, and suggested that the great decrease of specific gravity on re-melting might be due to absorption of gases, notably nitrogen.—A. S.

Aluminium dust explosions ; Production and prevention of ——. R. J. Zink. Chem.-Zeit., 1911, **35**, 1370—1372.

ACCORDING to Richter (this J., 1906, 430 ; Chem.-Zeit., 1908, 136 ; 1909, 220 ; compare also this J., 1906, 639, 1099), aluminium dust alone is not explosive but becomes so in presence of a quantity of an inflammable gas corresponding to about one-third of the lower limit of inflammability of the gas. In the case of explosions in aluminium bronze factories, the presence of the inflammable gas was attributed to the decomposition of water by the aluminium powder or by electrical discharges produced in the machinery. The ignition of the mixture of dust and gas was attributed to electrical sparks produced in the machinery. The author states, however, that even if the aluminium powder be carefully dried, explosions cannot be entirely prevented, and he considers that a more probable source of inflammable gas is the presence of a small quantity of aluminium carbide in the aluminium powder ; this might escape complete decomposition in the preliminary working up of the metal, owing to a protective film of alumina, but the latter would be gradually removed in the polishing mill. From 10 kilos. of aluminium containing 0·1 per cent. of aluminium carbide and only about 0·15 per cent. of moisture, 4·8 litres of methane would be produced, or sufficient to form 160 litres of an inflammable mixture of dust and gas. Since, at present, it appears impossible to prevent electrical phenomena in the machinery, it is necessary to provide means to minimise the danger arising from the explosions, and the author suggests that in addition to the rules formulated by the "*Suddeutsch. Edel- und Unedelmetall-Berufsgenossenschaft für die Herstellung von Aluminium in Pulver* (*Aluminiumbronze*)," the mills should be closed dust-tight by a plate of a material (plaster, earthenware, etc.) permeable to gases, but not opposing any considerable resistance to an explosion. By this means the explosion would be propagated, as in the firing of a cannon, mainly in one direction, *e.g.*, into the open air, and risk of injury to workpeople and to other machinery considerably lessened.
—A. S.

Electrolytic determination of lead. Fairchild. *See* XXIII.

Iron ore, pig-iron, steel, and manganese ore ; Output of —— in principal countries. Board of Trade J., Dec. 21, 1911. [T.R.]

THE following particulars of the output of iron ore, pig iron, steel, and manganese ore in the principal producing countries of the world are extracted from a Return ("Iron and Steel, 1910," H.C. 283) recently issued by the Board of Trade :—

Iron ore.—The following statement shows the total output of iron ore in the principal countries in which it is mined, or in which the smelting of iron is an important industry, in each of the years 1908—1910, the figures for the last year being provisional :—

Country.	1908.	1909.	1910.
	Tons.	Tons.	Tons.
United States*	35,925,000	51,155,000	56,890,000
Germany (including Luxemburg)	23,888,000	25,095,000	28,248,000
United Kingdom	15,031,000	14,804,000	15,226,000
France	9,895,000	11,699,000	14,250,000†
Spain	9,123,000	8,645,000	‡
Russia (excluding Finland)	5,392,000	5,090,000§	‡
Sweden	4,637,000	3,824,000	5,463,000
Austria-Hungary	4,495,000	4,384,000	4,548,000
Canada	212,000	239,000	228,000‖
Belgium	186,000	196,000	121,000

* Excluding ore for fluxing. † Provisional figures. ‡ Not available. § Excluding Caucasus. ‖ Excluding Quebec.

Pig-iron.—The total quantity of pig-iron produced in the world in 1910 was about 65 million tons. The United

States, Germany, and the United Kingdom together accounted for about four-fifths of the total output of the world.

The following statement shows the total output of pig-iron in the principal producing countries in each of the years 1908 to 1910 :—

Country.	1908.	1909.	1910.
	Tons.	Tons.	Tons.
United States	15,036,000	25,795,000	27,304,000
Germany (including Luxemburg)	11,616,000	12,442,000	14,556,000
United Kingdom	9,057,000	9,532,000	10,012,000
France	3,346,000	3,516,000	3,968,000
Russia (excluding Finland)	2,754,000	2,822,000	2,983,000
Austria-Hungary	1,958,000	1,964,000	2,011,000
Belgium	1,250,000	1,590,000	1,822,000
Canada†	563,000	676,000	715,000
Sweden	559,000	438,000	594,000
Spain	397,000	422,000	*

* Not available. † Exclusive of output of electric furnaces making ferro products.

Steel.—The world's output of steel in 1910 may be estimated at between 59 and 60 million tons. The following statement shows the quantity of steel produced in the years 1908—1910, in the principal countries :—

Country.	1908.	1909.	1910.
	Tons.	Tons.	Tons.
United States	14,023,000	23,955,000	26,095,000
Germany (including Luxemburg)	11,006,000	11,856,000	13,470,000
United Kingdom	5,438,000	6,018,000	6,515,000
France	2,679,000	2,990,000	3,450,000
Russia (excluding Finland)	2,628,000	3,071,000	3,479,000
Austria-Hungary	1,958,000	1,909,000	2,120,000
Belgium	1,230,000	1,606,000	1,914,000
Canada	526,000	674,000	734,000
Sweden	431,000	308,000	464,000
Spain	*	159,000	*
Italy	528,000	651,000	720,000
Bosnia and Herzegovina	34,000	29,000	33,000

* Not available.

Manganese ore.—The following statement shows the production (or exports) of the chief countries in 1908, 1909, and 1910 :—

Country.	1908.	1909.	1910.
	Tons.	Tons.	Tons.
Russia (excluding Finland)	295,000	652,000	*
British India	674,000	643,000	801,000
Brazil (exports)	163,000	237,000	*
Germany (including Luxemburg)	67,000	76,000	79,000
Spain	17,000	8,000	*

* Not available.

PATENTS.

Metals; Sealing and annealing ——. S. O. Cowper-Coles, London, and Metalloids Ltd., Tipton, Staffs. Eng. Pat. 23,744, Oct. 13, 1910.

In a process for sealing and annealing metals by heating them in an atmosphere of a reducing gas, it is claimed that the formation of deleterious films upon the metal surfaces during cooling is obviated by the employment of suitable containing vessels or envelopes for the metals under treatment. The envelope may be made of iron, unglazed earthenware or other material through which the reducing gas will diffuse at the annealing-temperature of the metal; and complete enclosure of the latter is unnecessary provided the distance between the metal and any opening in the envelope exceeds four times the smaller dimension of such opening.—W. E. F. P.

Ore concentration. Minerals Separation Ltd., and E. H. Nutter, London. Partly communicated from H. Lavers, Broken Hill, N.S.W. Eng. Pat. 23,870, Oct. 14, 1910.

In a process for the concentration of complex ores by differential flotation of metalliferous particles in a liquid, the ore, crushed but not sized, is repeatedly agitated with water to which various frothing-agents are successively added with the object of producing two or more different mineral-bearing froths or scums. It is claimed that, by this means, the metalliferous portion of the ore is obtained as a series of comparatively simple products amenable to separate and efficient classification by the usual methods. —W. E. F. P.

Ore concentration; Method and apparatus for ——. E. H. Nutter, T. J. Hoover and Minerals Separation Ltd., London. Eng. Pat. 23,949, Oct. 15, 1910.

In an apparatus for concentrating ores by a process of gaseous flotation in a liquid, the ore pulp is passed through a series of mixing vessels in each of which it is agitated with air for the production of a mineral-bearing froth. The mixing vessels are connected in pairs by openings in the partitions between them; and one vessel of each pair is connected with the adjacent vessel of the next pair by means of external passages, each provided with a trap, discharging into a common launder, for effecting the removal of the froth produced at each stage of the agitation. —W. E. F. P.

Ore-dressing. G. T. Holloway, London. Eng. Pat. 26,262, Nov. 11, 1910.

The treatment is more particularly applicable to "slime" and consists in the addition of lime or calcined gypsum to the ore at any suitable stage of the dressing process. It is claimed that the material is thus rendered granular and more amenable to subsequent treatment by water- or oil-concentration processes.—W. E. F. P.

Zinc; Process for the manufacture of ——. Soc. l'Air Liquide (Soc. anon. pour l'Étude et l'Exploit. des Proc. G. Claude). Fr. Pat. 431,969, Sept. 23, 1910.

In a process for the reduction of oxidised (roasted) zinc ores by carbon, claim is made for the employment of carbon monoxide (produced at a high temperature by the combustion of carbon in oxygen) as the means of raising the charge to the necessary temperature. The mixture of calcined ore and coal, in briquette form, is charged on to a bed of incandescent fuel contained in a vertical furnace provided with an oxygen blast. The metal is condensed in a chamber adjacent to the combustion chamber, the heat of the gas (carbon monoxide) issuing from the former being utilised for drying and pre-heating the briquettes, the cool surfaces and pores of which serve at the same time to condense any zinc vapour remaining in the gas. Ultimately the gas is used as fuel for the calcination of the ore and for the generation of the power required in the preparation of the oxygen from liquid air.—W. E. F. P.

Zinc; Furnace for extracting ——. O. Schneemilch, Wilhelminenhütte, Germany. U.S. Pat. 1,009,863, Nov. 28, 1911.

The furnace consists of a chamber in which vertical retorts are heated by means of hot gases. The retorts are removable through holes in the bottom of the furnace. Suitable arrangements are provided for supporting and discharging the retorts.—T. St.

Blast-furnace. C. F. Jenkins, Washington, D.C. U.S. Pat. 1,010,265, Nov. 28, 1911.

The waste heat from the furnace is used to work an oxygen-generating plant, composed of separate units. The oxygen is obtained from the air, and by suitable arrangements, working automatically, air is led to, and oxygen is taken from the units in turn, whereby an approximately constant flow of oxygen is supplied to the combustion zone of the furnace.—T. St.

Ores; Treatment of —— for recovering metal values therefrom. H. W. Kent, Milwaukee, Wis., Assignor to Kent Ore Reduction Co., Chicago, Ill. U.S. Pat. 1,009,906, Nov. 28, 1911.

The ore is broken into coarse lumps and roasted, then while still hot is dropped into water in a closed receptacle. The water may have previously been used to wash the gases escaping from roasting the ore, thus recovering any metallic dust in the gases and absorbing the waste heat. The ore is disintegrated by the quenching action of the water, and is at once ground to pulp. The hot pulp is immediately conveyed through a closed conduit and discharged deeply within a body of mercury, thereby heating the mercury sufficiently to effect hot amalgamation.—T. St.

Metalliferous ores; Process of treating ——. J. C. Clancy, New York. U.S. Pat. 1,010,347, Nov. 28, 1911.

The ore containing precious metals is subjected to the action of a non-electrolysed solution containing an amide or cyanamide, and a cyanogen-bearing compound. *e.g.*, a ferro- or ferricyanide.—T. St.

Precious metals such as silver and gold; Treatment of chemically pure iron in order to obtain ——. M. Roux. Second Addition, dated Sept. 19, 1910, to Fr. Pat. 420,535, Nov. 25, 1909 (this J., 1911, 370).

Claim is made for the extension of the treatment to all forms of metallic iron and to all compounds of iron capable of being reduced to metal; and it is stated that any convenient material in a finely-divided condition may be used in place of powdered quartz. It is also claimed that, in addition to the members of the iron family and their reducible compounds, the metals zinc, antimony, tin, copper, lead, bismuth and their reducible compounds may be transformed into other metals by the same or similar treatment.—W. E. F. P.

Copper-zinc-silicon alloys. A. Schmid. Fr. Pat. 432,260, July 15, 1911.

Claim is made for alloys of copper, zinc and silicon—containing from 56 to 60 per cent. of copper and from 0·2 to 0·5 of silicon—which, in addition to being resistant to acids, saline solutions and alkalis, are stated to possess great tenacity and to be capable of great elongation. Two varieties are specified: "hard" alloy containing 56—58, and "soft" alloy containing 58—60, per cent. of copper; they are characterised by having micrographic structures identical with those of copper-zinc alloys containing 54—57 and 57—59 per cent. of copper respectively.—W. E. F. P.

Lead; Process for eliminating zinc from ——. F. Roderbourg. Fr. Pat. 432,269, July 17, 1911.

The lead (*e.g.*, metal which has been desilverised by means of zinc) is heated with a mixture of zinc chloride and lead oxide or sulphide, whereby the zinc is removed from the lead as oxide, the reactions being probably as follow: $Zn+PbO+ZnCl_2=Zn+PbCl_2+ZnO$; and $Zn+PbCl_2+ZnO=ZnCl_2+Pb+ZnO$. The zinc chloride, which may be replaced by a mixture of zinc and sodium chlorides in equal parts by weight, is recovered by solution in water, followed by filtration and subsequent evaporation; the necessary lead compound may be added in the form of lead ashes.—W. E. F. P.

Smelting furnace with electric refining hearths connected thereto. A. Helfenstein, Vienna. Eng. Pat. 5140, March 1, 1911. Under Int. Conv., March 10, 1910.

See Fr. Pat. 426,694 of 1911; this J., 1911, 961.—T. F. B.

Metals; Extraction of —— from their ores. W. Hommel and H. T. Durant, Assignors to The Metals Extraction Corporation, Ltd., London. U.S. Pat. 1,009,750, Nov. 28, 1911.

See Fr. Pat. 417,208 of 1910; this J., 1911, 34.—T. F. B.

Metals from their ores; Process for extracting ——. H. S. MacKay, Assignor to MacKay Copper Process Co., Riverside, Cal. U.S. Pat. 1,011,459, Dec. 12, 1911.

See Fr. Pat. 428,521 of 1911; this J., 1911, 1167.—T. F. B.

Thomas converters; Method of preparing bottoms for ——, E. J. Planche, Assignor to Soc. Anon. des Forges et Fonderies de Montataire, Paris. U.S. Pat. 1,010,312, Nov. 28, 1911.

See Fr. Pat. 418,449 of 1910; this J., 1911, 92.—T. F. B.

Aluminium and its alloys; Process for pickling —— prior to galvanising or coating the same with other metals. S. Jahn, Charlottenburg, Assignor to Aktienges. Mix und Genest, Telephon- u. Telegraphen Werke, Berlin. U.S. Pat. 1,011,203, Dec. 12, 1911.

See Fr. Pat. 415,123 of 1910; this J., 1910, 1315.—T. F. B.

Electric alternating furnaces. Fr. Pats. 432,151—432,153. *See* XI.

XI.—ELECTRO-CHEMISTRY.

Electrolytic determination of lead. Fairchild. *See* XXIII.

Patents.

Furnace; Electric resistance —— for making aluminium nitride. O. Serpek. Second Addition, dated Aug. 31, 1910, to Fr. Pat. 427,066, May 18, 1910 (this J., 1911, 1071 and 1169).

The resistances are constructed of bars mounted at the interior of the furnace, at a certain distance from the internal lining, and supported by projecting wedges in each of which the extremities of two neighbouring bars are brought into contact, thus forming one or more polygonal or rectilineal closed circuits. These may be connected in parallel or in series, or the resistance may consist of a single bar of suitable dimensions following the axis of the furnace. The resistances are constructed from a mixture of carbon with one or more materials, such as oxide of iron, chromite, magnesia, etc.—B. N.

Furnace; Electric alternating ——. J. Bally. Fr. Pats. (1) 432,151, (2) *for alloys*, 432,152, (3) *with retorts*, 432,153, July 11, 1911.

(1) The furnace comprises a movable primary, supported on a vertical axis in a space which is surrounded by the secondary. The latter consists of a series of cavities or wells formed in refractory material, parallel to the vertical axis of the inductor, the wells being surrounded by a magnetic body embedded in the refractory mass. The magnetic body is formed of sheets carried by the metallic shell surrounding the refractory mass, and spaces are left between the sheets to permit of cooling. The upper part of the wells may be bell-shaped, thus forming working chambers for facilitating the operations, or may be conical, the cross-section decreasing progressively from top to bottom. The wells are connected by trenches, or circular conduits, arranged alternately above and below, the upper trenches forming a common working chamber, and the wells may be divided into several distinct phases, the conduits connecting wells of the same phase being in the same plane or at different levels, but the different phases are short-circuited by communicating channels, for example, by a common working chamber. The space in which the inductor turns may be surmounted by a ventilating chimney, preferably made in two pieces, and the wells may be closed at the top by plugs covered with refractory material, so as to avoid loss of heat by radiation. (2) The cavities or wells are connected by channels, so as to form distinct circuits which contain different metals or alloys. This arrangement permits of several metals or alloys being melted simultaneously and automatically at the different temperatures required, by simply giving to the

different circuits an appropriate length and cross-section, according to the quantities of the different metals to be treated and their ohmic resistances. These circuits may be combined in a monophase or polyphase system. The connecting conduits may be superposed, or disposed in the same horizontal plane at the upper and lower parts of the furnace. The various circuits containing the different metals may be formed in distinct sections of the furnace, which are bound together, and each section may be arranged to be tipped independently of the others. (3) The furnace is constructed similarly to the above, but the secondary takes the form of retorts of conducting material, disposed vertically or horizontally in a circle around the movable primary. The retorts are connected in series by metallic pieces, in the form of sectors insulated one from the other, arranged alternately at the top and bottom of adjacent retorts. As an alternative, the retorts may take the form of wells or cavities in a metallic crown, the Foucault currents produced being also utilised for the heating. The inner ring of retorts may be surrounded by an outer ring, a lower temperature being developed in the latter, and the retorts may be constructed of refractory material, the substances contained in the retorts acting as the conductor of the current. The vapour produced in the retorts is led off into a suitable condenser.—B. N.

Electrically insulating compound and process of preparing the same. O. V. Thomas, Penang, S.S. Eng. Pat. 28,069, Dec. 2, 1910.

See Fr. Pat. 425,618 of 1911; this J., 1911, 905.—T. F. B.

Dielectric films in aluminium and other electrolytic cells; Method of forming ——. R. D. Mershon, New York. Eng. Pat. 28,352, Dec. 6, 1910. Under Int. Conv., Jan. 5, 1910.

See Fr. Pat. 423,598 of 1910; this J., 1911, 632.—T. F. B.

Insulating films or coatings on coils especially of aluminium and its alloys; Process for securing ——. Spezialfabrik f. Aluminium-Spulen und Leitungen, Berlin. Eng. Pat. 9941, April 24, 1911. Under Int. Conv., April 25, 1910. Addition to Eng. Pat. 20,436 of 1910, dated Sept. 4, 1909.

See Fr. Pat. 419,961 of 1910; this J., 1911, 221.—T. F. B

Gases; Electrical purification of —— and apparatus therefor. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 60, Jan. 2, 1911.

See Fr. Pat. 425,593 of 1911; this J., 1911, 906.—T. F. B.

Magnetite electrodes; Manufacture of ——. Chem. Fabrik Buckau, Buckau, Germany. Eng. Pat. 16,902, July 21, 1911. Under Int. Conv., July 22, 1910.

See Ger. Pat. 235,307 of 1910; this J., 1911, 1021.—T. F. B.

Carbon electrode for galvanic elements. S. Benkö, Assignor to Company Ltd. for Exploitation of Inventions by Stephan Benkö, Budapest. U.S. Pat. 1,011,559, Dec. 12, 1911.

See Eng. Pat. 12,677 of 1909; this J., 1910, 703.—T. F. B.

Electric conductors more especially suitable for use as incandescing bodies for electric lamps, furnaces, and the like. Eng. Pat. 13,021. *See* II B.

Utilisation of the deposit in electric accumulators in the manufacture of white lead. Fr. Pat. 431,599. *See* XIII.

XII.—FATS; OILS; WAXES.

Properties of oil emulsions. I. The electric charge. Ellis. *See* II A.

Composition of the solid matter (scud or filth) which separates out in the dung bate during the bating of sheep-skins with dog puer. Eberle and Krall. *See* XV.

Influence of certain preservatives on the keeping qualities, etc., of butter and margarine. Fischer and Gruenert. *See* XIX A.

Patents.

Cotton-seed oil; Process of refining crude ——. J. C. Chisholm, Dallas, Tex. U.S. Pat. 1,010,017, Nov. 28, 1911.

The oil is treated with a "metal substituted base" in which a metal has replaced hydrogen; this may be added in aqueous solution. An alkaline hydroxide is then added and the oil is separated from the precipitate formed. Heat, and agitation, may be used. The oil may be at 80° F. at first, and elevated temperatures may be employed afterwards. In a particular case the oil is treated with an aqueous solution of a "metal substituted base" until the fatty acids present in the oil are neutralised. The mixture is agitated at an elevated temperature, an aqueous solution of an alkaline hydroxide is added and the mixture is agitated at about 75°—90° F. This temperature is maintained till the liquid shows the required colour, additional alkali is added till in a test portion heated to 120°—140° F. the precipitate settles rapidly, and the mixture is heated to about 100°—120° F. till the precipitate will settle rapidly. The oil is then separated after standing.
—H. E. P.

Palm oil; Process of manufacturing ——. E. H. Cookson. Fr. Pat. 431,672, June 28, 1911.

The entire fresh fruit of the palm tree is crushed, and the oil separated in the usual manner.—C. A. M.

Soap; Manufacture of ——. F. J. Lothammer. Fr. Pat. 432,025, July 7, 1911.

A mixture of hydrocarbons (*e.g.* petroleum products) and ordinary fats is emulsified with a decoction of the bark of *Quillaia saponaria* and converted into soap as described in Fr. Pat. 338,636 of 1903 (this J., 1904, 655).—C. A. M.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Turpentine; Examination of Finnish ——. L. M. Nash. Analyst, 1911, **36**, 577—579.

A sample of Finnish turpentine flashed at 67° F. instead of 90° to 100° F. (close test), although normal in other respects. The low flash-point was found to be due to about 0·5 per cent. of crude wood alcohol, the methyl alcohol in which was probably kept in solution in the turpentine oil through the presence of traces of other substances. After removal of the methyl alcohol by washing the turpentine with water, the sample had a flash-point between 90° and 100° F. The yellow colouration given with sulphurous acid (Conradson's reaction) showed that this Finnish turpentine had been distilled from wood. As is usual in this variety of turpentine oil, it yielded in Armstrong's process about 10 per cent. of unpolymerisable residue (chiefly cymene). Stress is laid upon the fact that a concentrated solution of sulphurous acid was required to give Conradson's reaction.—C. A. M.

Oil of turpentine; Detection of excess of colophony, or of added rosin oil, in ——. H. Delfour. Bull. des Travaux Soc. Pharm. Bordeaux, 1911, 373. Bull. de Commerce, 1911, **39**, 561—562.

Two drops of a 1 : 100 alcoholic solution of fuchsin are diluted to 10 c.c. with distilled water; 1 c.c. of oil of turpentine is added, and well shaken up; then 2 drops of ammonia solution are added. In presence of excess of colophony, a red precipitate will be thrown down; if the oil be of good quality, the liquid will remain clear. On adding a further 20 to 30 drops of ammonia solution, and allowing the mixture to stand, the upper layer will be colourless if the turpentine be free from excess of rosin. Rosin oil gives similar results to colophony. The test will indicate the presence of 3 per cent. of either of these. The limit of rosin which may be tolerated is 2·5 per cent. The test is not, therefore, too stringent; good commercial turpentine oil will yield only 1 per cent. of solids on evaporation. The above reaction was originally employed by Mennechet to detect "white spirit" in turpentine oil. It is not due to that adulterant, however, but solely to the presence of resin acids in the oil.—J. O. B.

Dammar resin; A recent —— from Central Borneo (Dammar Daging). E. Gottlieb. Arch. Pharm., 1911, **249**, 701—705.

A SPECIMEN of recent Dammar resin was obtained in Central Borneo from the plant *Vatica Rassak* Bl. It is known to the natives as Dammar Daging. In appearance it is yellowish white with reddish streaks here and there. It contains no nitrogen. The lower and upper melting points are 130° and 150° C. respectively. The direct acid value is 140—142, the indirect 148·4—151·2. The cold saponification value after 1—3 days lies between 159·6 and 162·4; the hot saponification value after 1—2 hours is between 163·5 and 165·2. The resin was extracted successively with alkaline solutions. By extraction with sodium carbonate solution, about 35 per cent. of a resin-acid, $C_{24}H_{44}O_4$, was separated, whilst subsequent extraction with potassium hydroxide solution gave about 30 per cent. of another acid, $C_{13}H_{26}O_3$. Upon distilling the residue with steam, 15 per cent. of essential oil passed over, leaving 16 per cent. of a resene, $C_{22}H_{25}O$.—F. SHDN.

Dammar resin; A recent fossil —— from Central Borneo. E. Gottlieb. Arch. Pharm., 1911, **249**, 705—710.

THE Dammar resin examined was found buried in the earth in Central Borneo. It is darker in colour than the recent Dammar resin (see preceding abstract), and like the latter contains no nitrogen. The lower melting point is 130° and the upper, 150° C. The resin was extracted first with ether, then with a mixture of ether and alcohol. The ether-extract was treated successively with alkaline solutions. The portion soluble in ether yielded an acid, $C_{16}H_{26}O_2$, on extraction with ammonium carbonate, an acid, $C_{14}H_{32}O_2$, with sodium carbonate, and an acid, $C_{12}H_{18}O_2$, with potassium hydroxide. In addition a resene and an essential oil were found. The portion soluble in alcohol and ether contained an acid and a resene, $C_{12}H_{22}O_2$. A portion of the residue left after the above extractions was soluble in alcohol, the remainder not being soluble in any organic solvent. The resin has the properties of a copal.—F. SHDN.

Resins of jelutong. Dubosc. *See* XIV.

PATENTS.

White lead; Utilisation of the deposit in electric accumulators in the manufacture of ——. Soc. Anon. Française pour la Fabrication des Ceruses. Fr. Pat. 431,599, June 26, 1911.

THE deposit from electric accumulators is heated with sodium carbonate in a reverberatory furnace at a temperature below the melting point, and the resulting lead oxide (litharge) converted into white lead in the usual manner. The sodium sulphate formed in the reaction is reconverted into sodium carbonate by being heated with milk of lime under pressure, and saturation of the resulting sodium hydroxide with carbon dioxide.—C. A. M.

Ultramarine; Synthetic manufacture of ——. L. Royer and D. Lance. Fr. Pat. 432,290, Sept. 30, 1910.

KAOLIN is calcined so as to expel its water of crystallisation, and the residue is decomposed, by the action of sulphuric or other acid at a moderate temperature, into silica and aluminium sulphate (or other salt). The aluminium sulphate is then converted, by the action of sodium carbonate, into gelatinous alumina and sodium sulphate, after which the latter is transformed by known methods into sodium sulphide, which combines with the gelatinous alumina to form green ultramarine. This is dried in the absence of air, and then heated to about 800° C. to convert it into blue ultramarine.—C. A. M.

Pigments; Manufacture of white ——. J. Meurant, Liege, Belgium. Eng. Pat. 28,553, Dec. 8, 1910. Under Int. Conv., April 1, 1910.

SEE Fr. Pat. 423,411 of 1910; this J., 1911, 636.—T. F. B.

Red lead; Manufacture of ——. W. Eckford, Rhyl, Assignor to Walkers, Parker, and Co., Ltd., London. U.S. Pat. 1,010,356, Nov. 28, 1911.

SEE Eng. Pats. 26,258 of 1908 and 15,423 of 1909; this J., 1910, 166.—T. F. B.

Lac; Treatment of ——. J. Johannes, Calcutta. Eng. Pat. 26,759, Nov. 17, 1910.

SEE Fr. Pat. 424,261 of 1910; this J., 1911, 756.—T. F. B.

Amber and like material; Substitute for —— and method of manufacturing same. H. Kunisch and G. Brunn, Vienna. Eng. Pat. 28,491, Dec. 7, 1910.

SEE Fr. Pat. 426,568 of 1911; this J., 1911, 946.—T. F. B.

Varnishes; Manufacture of ——. E. H. Strange, Assignor to E. R. Burrell, London. U.S. Pat. 1,011,659, Dec. 12, 1911.

SEE Eng. Pat. 4878 of 1909; this J., 1910, 501.—T. F. B.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Manihot Glaziovii latex; New coagulant for ——. A. Zimmermann. Der Pflanzer, 1911, **7**, 499—500. Chem. Zentr., 1911, 2, 1891.

A $1\frac{1}{2}$ PER CENT. solution of calcium chloride is stated to be an efficient coagulant for the latex of *Manihot Glaziovii*, the rubber produced being of good quality. The cost is only $\frac{1}{10}$—$\frac{1}{20}$ of that of coagulation with acetic acid or $\frac{1}{5}$—$\frac{1}{10}$ of that of coagulation with a mixture of 2 parts of phenol and 1 of acetic acid. Barium chloride, magnesium chloride, and magnesium sulphate also produce coagulation, but are not so efficient as calcium chloride.—A. S.

Rubber; Production and preparation of —— from Ficus elastica. A. van Gelder. Tropenpflanzer, 1911, **15**, 651—660.

IN *Ficus elastica* the rubber practically all comes from laticiferous vessels in the bark, nearest to the cambium. The outer part of the bark is very hard, whereas the inner part is very soft and fibrous. The laticiferous vessels run parallel with the axis of the tree and do not appear to be laterally anastomosed. The *Ficus* thus does not show the phenomenon of "wound reaction" as does the *Hevea*. Tapping offers difficulties since when the cambium is cut through, the yield is much diminished at subsequent tappings, falling to less than one-quarter in one particular case. To protect the cambium as far as possible, a pricking method is used, an instrument comprising a knife and pricker being employed. A vertical shallow channel is cut, and a beaker placed below. Shallow side channels running upwards at an angle of 45°, are cut 30 cm. (12 in.) apart, running all round the tree except for a space of 5 cm. (2 ins.). As soon as a side channel is cut, it is pricked at distances of 2—3 cm. (0·8 to 1·2 ins.). The pricking must be done rapidly, horizontally, yet directed slightly upwards, to cut as many laticiferous vessels as possible. Although further experiments are required, it appears that the tree can be tapped again without injury and with practically no diminution in yield, after two months. The advantages of pricking are: (1) the comparatively high yield as against cutting methods. (2) The very small injury to the tree. (3) The possibility of tapping several times a year without diminishing the yield appreciably. (4) Much of the rubber is obtained as liquid latex, producing better rubber. (5) The work is easily performed by coolies. The disadvantages are:—(1) The tree is injured, even though very slightly. (2) The rubber in the tree is not completely obtained. Tables are given in support of these contentions. The treatment after tapping is as follows:—The latex is passed through a sieve which is not too fine. Coagulation is effected by adding a small quantity of already thickened latex, the so-called "Bibit." During addition of the fresh latex, stirring should not be too prolonged, or coagulation of the last portions is hindered. When the latex is all added, stirring is continued, and the mass allowed to stand over-night. It is then washed and turned out as crêpe, or kneaded, cut up, and rolled into balls. The rubber remaining on the sieves, etc., is washed, the rubber in the filtrate is separated by heating and made into crêpe or balls. The rubber remaining on the tree is taken next day for "scraps." The coagulated rubber remaining in these the sieve is "lump." The approximate amounts of varieties is 40 per cent. of No. 1. (from screened latex); [illegible] per cent. of lump; 4½ per cent. from the wash-water; 55 per cent. of scraps. The product fresh from the latex loses 20—25 per cent. on drying. The latex contains 42 per cent. of rubber. The cost of tapping was 1·01 Fl. per kilo. of dry rubber (11d. per lb.).—H. E. P.

Jelutong; The resins of ——. A. Dubose. Caout. et Guttapercha, 1911, 8, 5756—5761.

The sample of Jelutong examined contained 45·37 per cent. of moisture (determined by drying for 8 days *in vacuo* over sulphuric acid). The liquid obtained by squeezing the mass contained chlorides and sulphates, which probably owe their presence to the use of sea water in the preparation of the gum by the Dyaks. The ash amounted to 0·66 per cent. and consisted mainly of silica, lime and magnesia. The resins, which are present to an extent varying from 35·75 to 48·98 per cent. in different samples, consist of an α- and a β-constituent, both of which have the probable formula, $C_{26}H_{44}OH$. The α-resin was isolated by extracting the mass with acetone, and recrystallisation from that solvent. It was obtained in the form of a mass of rosettes, and when dried to constant weight in a desiccator, melted at 80°—82° C., and boiled between 195° and 200° C. The β-resin was obtained by extracting the acetone-extracted gum with ether, and was purified by recrystallisation from that solvent. It was in form similar to the α-resin, but was of a yellowish colour, and had a melting point of 105° C. and a boiling point between 280° and 290° C. The resins differ, also, from one another in solubility in alcohol, amyl acetate, formalin and acetone, and in their behaviour towards sulphuric acid (66° Bé.), the α-resin dissolving readily in the acid, giving a red solution with a distinct green fluorescence, whereas the β-resin gives a red solution, without fluorescence, which becomes black on heating. The resins have, however, many properties in common. They are characterised by their indifference towards bases, and by the readiness with which they can be esterified by means of organic acids. They are probably ethylenic-alcohols, closely allied to gum elemi.—E. W. L.

Vulcanised rubber; Determination of total sulphur in ——. G. Hübener. Gummi-Zeit., 1911, 26, 410.

The author points out that the method described by Waters and Tuttle (this J., 1911, 1268) as Hübener's method for the determination of total sulphur is, in reality, part of a method for the determination of sulphur of vulcanisation, and that, as explained in his original paper (this J., 1909, 1321) this figure is obtained by subtracting the "free sulphur" (which includes all sulphur oxidisable by bromine to soluble sulphates) from the "total sulphur." In the case where there is a possibility of the formation or presence of insoluble sulphates, however, the methods recommended by the author are such as to eliminate this portion of the sulphur from both "free" sulphur and "total" sulphur determinations, these insoluble sulphates being filtered off in both instances, before precipitation with barium chloride.—E. W. L.

Patents.

Guttapercha and the like; Manufacture of plastic products resembling ——. E. C. R. Marks, London. From Düsseldorfer Celluloid-Fabrik G. m. b. H., Lank a. Rhein, Germany. Eng. Pat. 15,915, July 10, 1911.

Plastic products are produced from nitrocellulose, camphor or camphor substitutes, fats or oils, by heating the fats and oils, before mixing with the celluloid mass, with organic substances containing negative constituents, such as nitrotoluenes, chlorophenols and the like.—H. E. P.

Rubber; Purification of natural and reclaimed ——, *and other materials soluble in hydrocarbons, by dialysis.* H. Debauge. First Addition, dated May 26, 1911, to Fr. Pat. 426,457, Feb. 3, 1911 (this J., 1911, 968).

Two forms of apparatus are described by the aid of which the process described in the principal patent (*loc. cit.*) may be realised. One form consists of a number of narrow chambers connected in series, through which the rubber or other colloidal solution to be purified can be passed, and around which the solvent flows in the opposite direction. The walls of the chambers are formed of a suitable membrane such as rubber or asbestos or other porous material. In the second form of apparatus the rubber solution enters at the bottom of an upright vessel, and rises through porous tubes, flowing out at the top through a suitable outlet, whilst the solvent enters the vessel at the top of the space between the upper and lower tube plates and, circulating round the porous tubes, leaves the vessel at the bottom of that space, carrying with it the soluble impurities—such as resins, sulphur, etc.—removed by dialysis.—E. W. L.

Rubber; Process for separating —— *from the resins accompanying it in various materials.* J. Dybowski. Fr. Pat. 431,966, Sept. 23, 1910.

The resinous gum, for example Pontianac, is first worked up with a neutral solvent, such as carbon bisulphide, ether, chloroform, etc., into a pasty or gelatinous condition. The mass is then transferred to a vertical mixer, in which it is treated with acetone or alcohol for half an hour. The solution of resins is then run off through cocks placed at different heights in the side of the mixer, and the treatment with acetone or alcohol is repeated two or three times. The solvents are separated from the solution of resins by distillation, and the purified rubber is transferred to a heater containing a 0·2 per cent. solution of formaldehyde, in which it is heated by the introduction of live steam, and the solvents driven off and recovered. The rubber is then subjected to pressure in a hydraulic press in order to unite the particles and squeeze out liquids from the mass.—E. W. L.

Indiarubber, guttapercha, and balata; Process for manufacturing hot vulcanised froth from ——. F. Pfleumer, Dresden, Germany. Eng. Pat. 11,624, May 13, 1911. Under Int. Conv., Aug. 6, 1910.

See Fr. Pat. 430,474 of 1911; this J., 1911, 1323.—T. F. B.

Wear-resisting material [*rubber-coated cotton*]. Eng. Pat. 19,328. *See* V.

XV.—LEATHER; BONE; HORN; GLUE.

Hides and skins; Prevention of anthrax infection due to imported ——. (*The Seymour-Jones formic-mercury process.*) C. W. Ponder. Lancet, 1911, 181, 1260—1262.

The dry hides are soaked for 24 hours in a solution containing 1—2 per cent. of formic acid and 0·02 per cent. of mercuric chloride. They are then drained and salted in the usual manner, with sodium chloride. Bacteriological experiments show that this treatment destroys practically all anthrax organisms, and renders the material perfectly safe to handle. The treatment also improves the appearance of the hides and retards putrefactive changes. It is suggested that the importation of all hides and skins should be forbidden, unless they have been either previously treated by the ordinary "wet salting" process, or by the above method.—J. O. B.

Tan-bark oak; California ——. W. L. Jepson. Bull. No. 75, Forest Service, U.S. Dept. Agric. J. Amer. Leather Chem. Assoc., 1911, **6**, 597—600.

The economic possibilities of the tan-bark oak, in California, are described. At present there are 1,425,000 tons of this bark standing in California, or a supply sufficient for 50 years at the present rate of consumption. The bark is a valuable tanning agent for the production of heavy leather, the percentage of tannin varying with the distance of the bark from the ground, from 30 per cent. at the base, to 10 per cent. at a height of 80 feet. Bark from second growth trees gives an average tannin content of 16 per cent. The wood of the tree does not contain much tannin, but is excellent for fuel, burning with little smoke and ash. Recommendations are made for more systematic methods of cultivating and peeling the crop.—J. R. B.

Sulphite-cellulose [*tanning*] *extracts for blending; Use of* ——. J. H. Yocum and T. A. Faust. J. Amer. Leather Chem. Assoc., 1911, 6, 537—543.

The use of sulphite-cellulose liquors for tanning has hitherto not met with much success, for if used in too great concentrations, the resulting leather often has a "tinny" feel and a harsh grain. On blending the sulphite cellulose extract with other extracts, difficulties have also been met with, because of the different behaviour with the different materials. The object of the present work was to determine the best conditions and the most suitable materials to blend with the cellulose liquors. A commercial sulphite cellulose extract was used in the experiments. With every material which was tried, with the exception of liquid quebracho extract, there was a loss of tannin produced by mixing. Mixtures of mangrove cutch with sulphite-cellulose, show no loss until more than 30 per cent. of sulphite-cellulose extract is used in the mixtures. In most cases, the greater the amount of the sulphite cellulose extract present, the greater the loss. With a mixture of equal parts of chestnut and cellulose extracts, the loss was 6 per cent. With a similar mixture containing myrobalans, the loss was 3·4 per cent. The losses with valonia are not quite so high as with myrobalans. With more than 30 per cent. of the cellulose extract, the resulting leather had a "tinny" feel.—J. R. B.

Dung bate; Composition of the solid matters (scud or filth) which separate out in the —— during the bating of sheep-skins with dog puer. G. Eberle and L. Krall. Collegium, 1911, 445—449.

Eitner has shown (Gerber, 1887, 270) that by treatment of skins with acid, not only the lime is removed, but also a portion of the skin-substance which was combined with the lime, and that a similar action takes place in the dung bate, resulting in the liberation and solution of fats and a deposit of "scud" on the grain. The solid constituents of the "scud" must be removed by mechanical working after the bate, and the authors have investigated the composition of the solid material which collects on the scudding knives used in a glacé leather factory working Italian and French lamb-skins and employing dog puer only. The scud was neutral to litmus and contained water, soda, potash, lime, hydrochloric acid, fat and proteins. The amount of water was 24—32 per cent., ash 3·5 per cent., and lime 2·0 per cent. The fat, estimated by extraction of the dried material with ether, varied from 42 to 54 per cent. on the wet scud and was transparent, semi-solid and of a yellow-brown colour. It had the acid value 9·3, Hehner value 91·9, iodine value 31·6, and contained no glycerin. Cholesterol was found to be present, but no iso-cholesterol. The fat contained 0·442 per cent. of calcium oxide. Soluble albuminoids were removed by extracting the dry fat-free material with warm water. A neutral solution was obtained, which was unchanged by boiling. The soluble material constituted 3·83 per cent. of the wet "scud." Nitrogen determinations showed that the solution contained strongly hydrolysed proteins. The insoluble proteins were found to consist almost entirely of "short hair" and constituted 26 per cent. of the wet "scud." The fat is very similar to wool-fat and a sample examined by Fahrion gave the following results:—

			Iodine value.
Unsaponifiable (alcohol)	47·6	per cent.	27·3
Fatty acids (soluble in petroleum ether)	39·3	,,	30·2
Oxy-acids (soluble in ether)	13·5	,,	13·4

All three substances are solid at ordinary temperatures and solidify, after melting, in a wax-like state. The alkali salts of one or more of the fatty acids are insoluble in alcohol and the estimation of the unsaponifiable matter is consequently difficult.—D. J. L.

Leather analysis; Report on ——. F. P. Veitch. J. American Leather Chem. Assoc., 1911, **6**, 565—579.

The questions studied by the Committee on Leather Analysis, this year, were the following:—1. The time required for the extraction of fats from leather. 2. A comparison of several methods of extracting the water-soluble matter. 3. A comparison of the uses of basic and normal lead acetates for the detannisation of the solution of water-soluble matter in the estimation of glucose. With regard to the first question, the figures obtained by the different collaborators on known samples agreed very closely, showing that the ordinary Soxhlet method of extracting fats from leather by petroleum ether, is a reliable one. The length of time required for complete extraction was found to be 6—10 hours, but it is important that the leather be packed very loosely in the Soxhlet. The methods for extracting the water-soluble matter were:—1. The ordinary water extraction in a Koch's or Procter's extractor. 2. The method of the U.S. Bureau of Chemistry. 3. The alcohol method of Riker. The results by the first method varied from 19·2 to 25·9 per cent. and averaged 23·5 per cent.; by the second method from 22 to 25·2 per cent., averaging 24 per cent. The results by the alcohol method varied from 20·3 to 26·1 per cent. and averaged 24·9 per cent. The variations between the results by different workers were greatest with the first method and least with the second method. The alcohol method does not possess the advantages originally claimed for it, but it may serve a useful purpose in the study of leather. The results of glucose estimations in samples of leather containing known quantities, by the two different methods, the one using normal lead acetate, and the other using basic lead acetate for the detannisation of the solution of water-soluble matter, agreed fairly closely with the different workers; the results with normal acetate were approximately 1½ per cent. higher than with basic lead acetate, and were more accurate than the latter. The recommendation for the determination of glucose is, therefore, to add 25 c.c. of a saturated solution of normal lead acetate to 200 c.c. of the extract. The excess of lead is removed by solid potassium oxalate, and the subsequent process as usual.—J. R. B.

Patents.

Hides; Preparation of —— for tanning. P. E. Chambard. Fr. Pat. 432,387, July 20, 1911.

The hides are treated first in an acid solution in which oxides of nitrogen are liberated from a nitrite, and secondly in a sulphite, bisulphite, or thiosulphate bath. The acid bath is made up as follows:—Sulphuric acid (66° Bé.) 18 kilos.; bay-salt, 20 kilos.; water sufficient to reduce the density to 6° Bé. The hides are placed in this solution, and for every 100 kilos. of hides 2 kilos. of sodium nitrite are added gradually, the liquid being frequently stirred. The hides are left in the bath until they have assumed a bright yellow tint, when they are transferred to the second bath which consists, per 100 kilos. of hides, of 10 kilos.

of sodium thiosulphate dissolved in water to a solution of 8° Bé. In this they are kept agitated for from 4 to 5 hours until all free oxides of nitrogen are removed; this point is reached when a section does not blacken when treated with a weak solution of quebracho extract. Finally the hides are washed with water, and are then ready for tanning.—E. W. L.

Leather; Preparation of supple, vulcanisable ——, and manufacture therefrom of pneumatic tyre outer-covers, soles and heels of boots and shoes, etc. G. G. Johnston. Fr. Pat. 432,399, July 20, 1911. Under Int. Conv., Feb. 2, 1911.

The raw hides are freed from flesh and adherent fat, and soaked in water for a day or two; they are then placed for a day in a bath containing, per hide, about 550 grms. of sodium carbonate and 450 grms. of lime, after which the lime is completely removed and the hides softened by scraping. The hides are then fleshed by machine and treated with a preparation of pigeon's dung; afterwards they are fleshed by hand and immersed in a liquor containing 0·75 per cent. of sulphuric acid and 8 per cent. of common salt for one hour. After standing overnight they are placed in revolving drums and treated for 5 to 7 hours with a tanning solution containing potassium bichromate, 6; sulphuric acid, 5; and sugar, 7 per cent.; then transferred to a much weaker chrome liquor in which they are kept immersed for about a week; after this they are washed in water in a revolving drum for from one to three hours; in cold water for one hour; in a hot 3 per cent. solution of borax for half-an-hour; and again in cold water for half-an-hour. The hides are then treated on the stocking machine (*machine à butter*); then fleshed and put back into the drums, and agitated with a mixture containing 4 per cent. of olive oil soap and 2 per cent. of neat's-foot oil for from half-an-hour to an hour and a half; then suspended without stretching and allowed to dry. The dried hides are thoroughly de-greased by means of benzene or other solvent, and the leather thus obtained may be utilised for many purposes. In the case of shaped articles the leather is moulded by heat and pressure (150° F.) before being de-greased, and the grease afterwards removed by benzene. The de-greased leather, if to be rubbered, is coated first of all with one or more layers of vulcanising rubber solution, then with a layer of the rubber compound to be applied, which can be vulcanised by dry heat at any temperature up to 325° F. without damaging the leather. Sundry details in the manufacture of soles and heels of boots, etc., are claimed.—E. W. L.

XVI.—SOILS; FERTILISERS.

Creatinine; Origin of —— in soils. M. X. Sullivan. J. Amer. Chem. Soc., 1911, 33, 2035—2042.

The presence of creatinine in vegetable matter is reported for the first time: it is identified by the formation of the characteristic double salt with zinc chloride and by the colour reactions. It has been found in planted soils as well as in soils which had not been recently cultivated. It is present in the water in which wheat seedlings have been grown, also in wheat seeds and seedlings, wheat bran, rye, alfalfa, cowpeas and potatoes. If it arises as the result of the decomposition of protein, creatinine might be expected to be present in practically all plants. The amount present in vegetable matter is small: on decay it will be returned to the soil and exercise a favourable effect on subsequent plant growth.—E. F. A.

Patent.

Phosphorites or phosphate rock; Treatment of —— to render the same suitable for fertilising purposes. H. V. Dunham, Bainbridge, N.Y., U.S.A. Eng. Pat. 19,045, Aug. 24, 1911.

A mixture of ground phosphate rock and a converting reagent or reagents (*e.g.*, about 12 per cent. of a carbonate and 12 per cent. of a sulphate), together, preferably, with sufficient water to form a thin mud, is subjected suddenly to a high temperature which is caused continuously to increase up to the point of discharge from the furnace. The available phosphate thus obtained contains less than 1 per cent. of sulphuric anhydride or "its other sulphur equivalent," and is formed without any substantial reduction of the total phosphoric acid content of the rock, the calcium not present as phosphate being left in the form of oxide, and not as carbonate or sulphate.—F. Sodn.

XVII.—SUGARS; STARCHES; GUMS.

Cane products; The Andrlik urea method of polarisation [in the Clerget process] for ——. W. E. Cross and W. G. Taggart. Intern. Sugar J., 1911, 13, 662—668.

In reference to the Andrlik (Zeits. Zuckerind. Böhm. **31**, 417) modification of the Clerget process, in which the direct reading is taken in an acid solution, urea or betaine being added to inhibit inversion whilst making the observation, the authors have carried out a series of experiments with pure solutions of sucrose, both with and without the addition of invert sugar. They conclude that while betaine and urea inhibit inversion to some extent, at 28° C. the retardation is insufficient to allow of the polarisation being taken before the commencement of inversion. It was found that at 20° C. inversion was slower, but that even at this comparatively low temperature a fall of polarisation occurs before sufficient time has elapsed to make the reading. Clerget determinations were made, using pure sucrose solutions, and a temperature of 20° C., with the result that whereas the readings made in the ordinary way gave a value of 100 per cent., with the Andrlik polarisation one of 99·41 per cent. was obtained. When invert sugar was present, the ordinary Clerget value was 95·97, and using the Andrlik polarisation, 95·75. Concluding, the authors say that "it is possible that at some lower temperature, say 15° C., the method might be a possible one, but at 20° C., and especially at 28° C., the temperature of working in cane-producing countries, it would appear to be quite impracticable."—J. P. O.

Evaporator; Cleaning the steam chamber of an —— [in the sugar factory] with benzine. A. Franken. Archief Suikerind. Nederl.-Indië, 1911, **119**, 1224—1225. Intern. Sugar J., 1911, 13, 672.

In the steam chamber of the first vessel of the multiple effect, a troublesome deposit of non-conducting substance, derived largely from oil in the steam used, may collect, retarding the transmission of heat, and diminishing the efficiency of the apparatus. In order to remove this, benzine, used in the following manner, is the most suitable and economical solvent: Directly after the campaign, the effect is thoroughly cleaned and repaired. In the top tube plate, an opening 1½—2 in. in diam., closed by a locked screw cap, is made, or else one of the tubes is removed. After ensuring that the shut-off valves opening into the steam chamber close tightly, the ammonia pipe is broken at a flange joint, as close as possible to the next vessel, and the section of the pipe near the steam chamber is closed by a ½ in. cock, the same thing being done in the case of the condensed water pipe. The steam chamber is filled with water through the 1½—2 in. opening in the top tube plate, and from the ½ in. cock in the condensed water pipe about 15 gallons are drawn off. This volume is then replaced by benzine, and the 1½—2 in. opening tightly closed. Lastly, the ½ in. cock in the condensed water pipe is opened, but only to such an extent that the contents of the steam chamber will be emptied at the end of two months, during which time the layer of benzine will gradually descend, coming into contact with all parts of the heating surface, and dissolving all the adhering oily matter from it. In this way the cost of the benzine required is reduced to a minimum, and the only supervision necessary is the regulation of the amount of water dropping out daily.—J. P. O.

Incrustations, scum, defecation lime, sulphur, and ultramarine [in sugar works]; Analyses of ——. J. J. Hazewinkel. Archief Suikerind. Nederl.-Indië., 1911, **19**, 1485—1493. Intern. Sugar J., 1911, **13**, 679—680.

In the case of an incrustation, taken from the sulphur oven pipe close to the thick-juice sulphiters, the following figures were obtained: free sulphur, 11·92; organic matter, 5·29; sulphuric acid, 23·09; ferrous oxide, 22·35; silica, 0·98; water, 32·90; lime, magnesia, etc., 3·27 per cent. An incrustation, taken from the dome of a vacuum pan, was found to have the following composition: water, 3·24; loss on ignition, 10·48; matter insoluble in hydrochloric acid, 5·76; oxide of iron and alumina, 80·00; and sulphuric acid, 0·80 per cent. Deposits found in the steam chamber of the second and third vessels respectively gave the following figures: water, 9·48, 2·22; silica, 0·40, nil; matter insoluble in hydrochloric acid, nil, 2·12; copper sulphate, 29·88, 34·92; cuprous oxide, 50·51, 57·06; organic matter, etc., 9·73, 3·68 per cent. Each of the above three incrustations is the result of the action of free sulphur dioxide on the metal. From the interior partition of the drum of a centrifugal, a deposit was removed, and on analysis was found to consist of: water, 1·86; loss on ignition, 38·22; matter insoluble in hydrochloric acid, 2·96; silica, 1·10; iron and aluminium oxides, and probably also some phosphoric acid, 13·70; sulphuric acid, 23·60; lime, 17·64 per cent.; and copper and lead, traces. The gum content was found to be 15·62 per cent., and as cane gum may combine with calcium sulphate, the deposit is really composed of 56·86 per cent. of the gum complex, the remainder being insoluble matter from the juice. In a sample of defecation lime, the carbon dioxide was found to be 3·09, the magnesium oxide 1·15, and water 4·12 per cent., which is much below the standard required for the sugar factory. Some Indian sulphur gave satisfactory figures, as follows: water, 0·10; ash, 0·10; and sulphur (by extraction with carbon bisulphide), 99·80 per cent. Lastly two samples of ultramarine were examined, with the following results: silica, 41·90, 39·60; alumina, 25·40, 27·00; sodium oxide, 18·11, 18·91; calcium oxide, 0·49, nil; sulphur as sulphates, 0·05, nil; sulphur as sulphides, 1·50, 0·99; sulphur as polysulphides, 10·70, 12·37; sulphur as sulphites, nil, 0·32; water, 1·50, 0·73; and undetermined matter, 0·35, 0·08 per cent.—J. P. O.

Patents.

Sugar juices; Process for purifying —— by mechanical action, and treatment with lime jointly. L. L. J. A. Wackernie. Fr. Pat. 432,267, July 17, 1911.

The apparatus used includes two horizontal cylindrical "malaxeurs" in which the juice is defecated and further purified respectively. Each vessel is traversed by a horizontal rotatable shaft carrying stirring blades, and is fitted with the necessary inlet and outlet cocks and with a manhole. The crude juice is treated with about 1 per cent. of lime in the form of milk of lime, and with sufficient baryta to precipitate the sulphates. The defecating vessel is filled with the juice thus treated, and the stirring device is set going at the rate of about 150 revolutions per minute. Ten minutes stirring generally suffices to render the juice clear and colourless and the precipitate therefrom of a uniform ochreous colour; at this stage, without interrupting the stirring, the inlet cock for fresh juice and the discharge cock for defecated juice are opened, the defecated juice being pumped into the heaters in which the first carbonatation is effected, whilst the fresh juice is defecated as before. At intervals of about 12 hours, the defecating vessel is emptied and cleansed with a few hectolitres of lime water. In the first carbonatation, the alkalinity of the juice is reduced to about 0·1 per cent.; the juice is then heated to 50° C., transferred to a back and thence to filter-presses. The desaccharification of the residues is carried out in the ordinary way, but the temperature of the water employed for extraction should not exceed 50° C. The filtered juice passes to a back where it is treated with 1 per cent. of slaked lime, and, at the same time, slaked lime is introduced into the vessel (30 kilos. per hectolitre) in which the further purification of the juice is to be effected. The vessel is completely filled with the juice, and the stirring device is set going at the rate of about 100 revolutions per minute. A sample of the juice is examined after the lapse of about 10 minutes, and, when colourless, the juice is decanted, the residue of lime in the vessel serving for further operations of the same kind, and finally for preparing the milk of lime used in defecation. The decanted juice, filtered if necessary, is subjected to a second carbonatation just sufficient to effect the complete precipitation of the lime, and is then boiled for a few minutes, and filtered.
—L. E.

Kilns for revivifying animal charcoal. Fr. Pat. 432,044. See I.

XVIII.—FERMENTATION INDUSTRIES.

Yeast-cell; Permeability of the ——. S. G. Paine. Proc. Roy. Soc., 1911, B **84**, 289—307.

Some preliminary experiments on the degree of plasmolysis undergone by yeast on immersion in aqueous solutions of various substances appeared to indicate that the envelope of the yeast-cell is impermeable to inorganic salts generally, whilst it allows of the ready diffusion of such substances as alcohol, acetone and urea, which have been known to pass with ease through many forms of living protoplasm. In the main series of experiments yeast was immersed in solutions of alcohol, sodium chloride, ammonium sulphate, copper sulphate, disodium phosphate, sodium hexosephosphate and sodium arsenate, and determinations were made of the quantity of the dissolved substances taken up by the yeast cells. In solutions of alcohol of 5—20 per cent. concentration, diffusion occurs readily, and within three hours equilibrium is attained. The concentration of alcohol within the cell never attains that of the surrounding solution, however, but bears to it a fairly constant ratio (K=0·85) independent of the actual concentration. It would seem that the whole of the water of the cells (driven off at 98° C.) is not available for the diffusion of alcohol, and the amount thus bound up, possibly as a constituent of the protoplasmic complex, appears to vary somewhat at different stages of the life history of the cell. All the salts tried are taken up by yeast from moderately concentrated solutions, and in the cases of sodium chloride and ammonium sulphate even from dilute solutions, but the rate of entry is very much slower than in the case of alcohol, and the amount entering is also relatively small. No sodium chloride diffused into the cells from decimolar solutions within three hours. From decimolar solutions of disodium phosphate no entrance of phosphorus was appreciable even after twenty hours, but from stronger solutions (0·3 molar) a well marked entrance was observed The quantity of phosphates required for the life of the yeast during such periods would be very small and quite undeterminable. Except in the case of copper sulphate, the ratio (K) of the final concentration of the various salts within the cell to the concentration outside, never exceeded 0·25 : 1. Copper sulphate entered the cells in much larger amount, the observed ratio (K) being 3·36 : 1; the copper salt entered into combination with the cytoplasm, precipitating the latter and killing the yeast. Special interest attaches to the experiments with hexosephosphate, as this substance is present in yeast, and is readily hydrolysed and fermented by yeast-juice. When it is added to yeast it does not undergo fermentation and it would seem therefore that it is not able to penetrate to the seat of fermentative activity. The author found actually, that it is taken up by yeast cells to a well marked extent from strong solutions (0·23 molar), but this may be merely a surface phenomenon. Indeed, as in all these experiments the yeast was necessarily analysed *en masse*, no light is thrown by them on the question how far into the cells the various substances penetrate.—J. H. L.

Amylomyces Rouxii; Investigations on ——. R. Goupil. Comptes rend., 1911, **153**, 1172—1174.

The fermentation produced by *Amylomyces Rouxii* is characterised by the production of considerable quantities of succinic acid. After completed fermentation the succinic acid present may amount to 6 per cent. of the sugar fermented, and during the earlier stages the proportion may even exceed 25 per cent. The formation of acid appears to proceed *pari passu* with the growth of new tissues, both processes being retarded by acidity of the culture-medium and by anaerobic conditions of growth. When the mould has developed completely in one medium and the latter is then replaced by a fresh sugar solution, containing nitrogenous matter or not, the production of alcohol proceeds normally without any notable formation of succinic acid: under these conditions the organism appears to form no new tissue.—J. H. L.

Aspergillus niger; Influence of calcium on the development and mineral composition of ——. Mlle. Robert. Comptes rend., 1911, **153**, 1175—1177.

Aspergillus niger appears to be able to develop normally in media quite free from calcium salts. When, however, minute quantities of the latter are present, they are completely taken up by the growing organism, whilst from media almost saturated with calcium sulphate about 80 per cent. of the calcium is assimilated.—J. H. L.

Aspergillus niger; Is iron indispensable for the formation of the conidia of ——? M. Javillier and B. Sauton. Comptes rend., 1911, **153**, 1177—1180.

Sporulation of *Aspergillus niger* may occur in absence of iron, but small quantities of zinc such as are present in Raulin's culture medium, exert an inhibitive influence and may, under some conditions, completely check the formation of spores.—J. H. L.

Detection and determination of small quantities of ethyl and methyl alcohols and formic acid. Bacon. *See* XIXa.

Patents.

Yeast; Manufacture of dry ——. K. Kruis, Prag, Austria. Eng. Pat. 27,845, Nov. 30, 1910.

The yeast is grown in juices prepared by pressure, maceration, or diffusion of beetroots or other vegetables containing sugar, such as green peas, green maize, millet or opuntia. The juices are rendered clear and limpid by boiling, if necessary under pressure, until all coagulable matter has separated, and then filtering. The cool filtered liquid is suitably acidified by means of mineral acid or by lactic fermentation and is then used for growing the yeast. Before boiling, the juices may be mixed with such liquids as potato-extract free from starch, extract of "malt-sprits" (malt-coombs) obtained by diffusion, molasses, or solutions of phosphates, which provide necessary nutriment for the yeast and also assist clarification on boiling. For carrying out the process in the summer, juices prepared in the winter from fresh beets may be concentrated *in vacuo* to a gravity of 41° Bé. and stored until required. Or the beets may themselves be stored, after desiccation in a strong current of air at a comparatively low temperature until they contain only about 10 per cent. of water; thus dried, they may be kept for several years without loss of sugar. —J. H. L.

Malt; Process and apparatus for decreasing the respiration loss in the production of green —— *for breweries and distilleries.* H. Kropff. Fr. Pat. 432,243, July 1, 1911.

If in the germination process, access of air to the grain be prevented, respiration, and the loss of material due thereto, soon cease, but modification of the endosperm continues; the grain dies, however, about 30 hours after it has been deprived of oxygen. In the present process, access of air is prevented after modification has begun, and the grain is only aerated thereafter at intervals of 10 or 12 hours. The walls of the vessel in which the process is effected, are insulated or maintained at a suitable temperature in order to prevent condensation of water thereon. The stratum of air above the couch tends to become richer in oxygen than that below the couch, and the upper part of the couch therefore tends to become warmer than the lower part; to prevent this, means, such as a pipe extending through the depth of the couch, are provided for making communication between the strata of air immediately above and below the couch. —L. E.

Musts, wines, liqueurs and brandy; Process and apparatus for purifying, clarifying, maturing and ageing (after concentration, if desired) vegetable extracts and especially ——. E. Monti. Fr. Pat. 431,619, Sept. 16, 1910.

The liquid is introduced into one of a number of recipients in which it is saturated with air at a low temperature (near the freezing point of the liquid). The walls of these recipients are preferably made of reinforced concrete or glazed cement blocks, and are surrounded by a layer of perforated bricks so placed that the perforations form a number of tubes through which a refrigerating agent (air at the desired temperature) is passed. Between the layer of bricks and an external wall, and between the layers of bricks covering adjacent sides of the recipients, a layer of air-tight and externally polished boxes containing perfectly dry sawdust or other pulverulent material, is placed as an insulator. Cold, compressed air is introduced into the bottom of the recipient through a perforated pipe, and excess of it, which escapes through an outlet at the top of the recipient, may be used in another recipient, loss of volatile substances being thus avoided. The liquid is pumped from the recipient as slowly as possible through one or more vessels containing wooden chips, and encounters therein a finely divided stream of sterilised, dry air moving in the opposite direction. The liquid passes from these vessels, through a filter, and finally to a second recipient maintained at the ordinary temperature, and is heated in its passage from the filter to the second recipient by the agent used in keeping the latter at the desired temperature. This agent, partially cooled by the liquid under treatment, is subsequently further cooled and used in the first recipient. The apparatus may be used in conjunction with an apparatus for concentrating the liquid, before or after treatment, by a freezing process.—L. E.

Wines and fresh or partly fermented sulphited grape musts; Process of desulphitation permitting the treatment and preservation of ——. J. B. Gailhat. Fr. Pat. 432,368, July 13, 1911.

The sulphited wine or must is treated with hydrogen sulphide in quantity sufficient to decompose the whole or part of the free or combined sulphurous acid. The reaction proceeds according to the equation:

$$2H_2S+SO_2=2H_2O+3S.$$

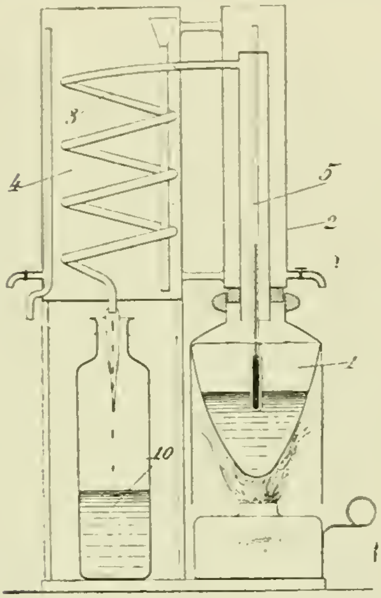
The sulphur precipitated carries down yeasts and bacteria, so that, on filtration, a partial sterilisation of the liquid is effected. In the case of wines or musts that have been treated with only a small quantity of sulphur dioxide or bisulphite, the hydrogen sulphide may be replaced by the equivalent quantity of a sulphide of an alkali or alkaline-earth.—L. E.

Cider of uniform quality; Process, applicable in a large factory, for making ——. C. L. G. Lefrançois. Fr. Pat. 432,166, July 12, 1911.

Selected and just sufficiently ripened apples are used, and the pulp and must are left in wooden vessels for 24 hours before pressing, in order that the liquid may acquire colour. Large vats, half filled with crushed selected apples freed from seeds, are successively filled with the cider, and as soon as the primary fermentation is at an end, the clear juice is racked into large casks. The cider is subsequently pumped into turbines provided with wooden screw conveyors whereby it is transferred to other large casks to undergo secondary fermentation under pressure.—L. E.

Alcoholic liquids; Still-ebullioscope for analysing ——. P. Beraud. Fr. Pat. 431,736, June 24, 1911.

The apparatus includes a vessel, 1, surmounted by a condenser, 2, and communicating with a coil, 3, contained in a condenser, 4. A thermometer, 5, extends into the vessel. About 20 c.c. of distilled water are introduced into the vessel and heated until the thermometer indicates a constant temperature, which is noted. The vessel is then emptied and rinsed out with some of the liquid to be analysed. A measured quantity of the liquid (50 c.c.) is introduced into the vessel, the condensers are filled with water, and the liquid is heated until the thermometer indicates a constant temperature, which is noted. A current of water is then made to flow through condenser, 2, and heating is continued until about half the liquid has been collected in the receiver, 10. The distillate is made up to the original volume with distilled water. The vessel is rinsed, the diluted distillate is introduced therein, the condenser, 2, is filled with water, and the vessel is heated until the thermometer indicates a constant temperature which is noted. In the case of ordinary wines, the alcohol-content may be found, by means of a table, from the constant temperature attained with the original liquid, whilst with liqueurs, etc., it is found from the constant temperature attained with the distillate. The difference between the constant temperatures attained with a liqueur and the distillate therefrom, is a measure of the amount of non-volatile substances in the liqueur.—L. E.



Distillery vinasse; Treatment of ——. A. and E. Lederer. First Addition, dated May 24, 1911, to Fr. Pat. 417,950, June 8, 1910 (see this J., 1911, 44).

The original process is modified in that a mixture of alcohol and benzene is used for extracting glycerol from the dried mixture of vinasse and carbonised cellulose; the glycerol may be separated from the solution by addition of more benzene. Again, that part of the solvent retained in the residue from the extracted material (vinasse and absorbent, or crude glycerol) is recovered by washing the residue, preferably in a centrifugal apparatus with perforated walls, with a saturated solution of salts or vinasse or concentrated vinasse freed from glycerol, or with petroleum. The apparatus used in carrying out the original process includes three vessels. The first vessel serves for drying the mixture of vinasse and absorbent which is introduced at the bottom of the vessel and carried to the top by a hollow screw conveyor which may be heated internally by steam. To facilitate the removal of water from the material, a liquid (or the vapour thereof) which yields a mixture with water of lower boiling point than that of the latter, is made to descend through the vessel; a mixture of alcohol and benzene, or the latter only, may be used, and the vapour which leaves the top of the vessel is freed from water and used again either as such or after condensation. The material, freed from water, passes from the top of the first to the bottom of the steam-jacketed, second, or extracting, vessel, and is carried to the top thereof by a perforated screw conveyor, encountering a descending stream of solvent in its passage. The solution thus obtained passes to a distilling column in which the glycerol remains whilst the distilled solvent is used again. The material, freed from glycerol, passes from the top of the second column to the top of the third column and is carried downwards by a steam-heated screw conveyor; an ascending current of steam frees the descending material from solvent, and the vapour which leaves the vessel is freed from water and returned, as such, or after condensation, to the extracting vessel.—L. E.

Alcohol meter. Eng. Pat. 14,510. *See* XXIII.

XIXa.—FOODS.

Flour; Ageing [bleaching] of —— *and its effect on digestion.* J. A. Wesener and G. L. Teller. J. Ind. Eng. Chem., 1911, 3, 912—919.

The authors criticise the work of some other investigators on the effect of bleaching flour with oxides of nitrogen on its digestibility. Experiments are described showing that nitrites do not interfere with the action of diastase on starch even when present to the extent of 1 part of sodium nitrite per 1000. Pancreatic digestion also is not inhibited by relatively large quantities of nitrites, nor by previous treatment of the protein with appreciable quantities of nitrous and nitric acids. Nitrous and nitric acids may wholly replace hydrochloric acid in peptic digestion. It is pointed out, however, that the presence of either mineral nitrite or nitrous or nitric acid in commercial bleached flours has never been demonstrated and hence results of experiments with nitrites and nitrous and nitric acids cannot be applied directly to bleached flours. The authors consider that the oxides of nitrogen are absorbed by the colouring matter of the flour during the bleaching process. After being isolated and purified, the colouring matter will combine with comparatively large quantities of oxides of nitrogen or nitrosyl chloride, and the substances so formed respond to the Griess nitrite reaction. Direct experiments by Vaughan with the compound of the colouring matter of the flour with oxides of nitrogen showed that this is not poisonous nor does it have any perceptible action on the blood.—A. S.

Milk; Determination of the total solids of ——. A. Splittgerber. Z. Unters. Nahr. Genussm., 1911, 22, 583—599.

Of the many methods which have been proposed for determining the total solids in milk, that in which from 3 to 4 grms. of the milk are dried in a flat-bottomed basin, with or without the addition of alcohol or acetone, yields results agreeing closely with those calculated from Fleischmann's formula. When an ordinary water-oven is employed, the drying takes about 1 hour, but only 30 minutes are required for this purpose when a Soxhlet water-oven containing a 55 per cent. glycerin solution is used. It was found that if three drops of acetic acid or of "formalin" be added to the milk, before evaporation, the results are much too high. Normal, rich, skimmed, and watered milks yield results which agree with the calculated figures, but in the case of old milk the results are from 0·11 to 0·27 per cent. lower. If the milk contain calcium sucrate or sodium carbonate, the quantity of total solids found by direct determination is unreliable, but in such cases the calculated figure may be relied on as trustworthy.—W. P. S.

Butter and margarine; Influence of certain preservatives on the keeping qualities, etc. of ——. K. Fischer and O. Gruenert. Z. Unters. Nahr. Genussm., 1911, **22**, 553—582.

Results of numerous experiments showed that common salt is the best preservative for butter and margarine. Specimens of the latter, containing 3 per cent. of salt, were quite fit for consumption after the lapse of three months, whilst other specimens, which had been treated with benzoic acid, salicylic acid, boric acid, etc., had rapidly become rancid. When salt was employed, the decomposition of the fat and casein was practically, although not quite, inhibited, but the other preservatives mentioned, failed to effect this result, even (in the case of butter) when added in amounts as high as 1 per cent. of its weight.—W. P. S.

Phosphorus compounds in foods; Quantitative separation of organic —— from phosphates. G. Fingerling and A. Hecking. Biochem. Zeits., 1911, **37**, 452—456.

The method described by Stutzer (Biochem. Zeits., **7**, 471) for the separation of phosphates from organic phosphorus compounds has been tested on mixtures of nucleoalbumin with phosphates and also on mixtures of lecithin, nuclein, sodium nucleate and phosphates: it gives satisfactory results in both cases. Lecithin can be removed completely by extraction with alcohol from such a mixture as the above. When phytin is present the method no longer gives reliable results, more or less of the phytin phosphoric acid being returned as inorganic phosphate. In view of the wide distribution of phytin in vegetables, the use of Stutzer's method is restricted. The proceaure adopted was as follows: the material was stirred from 3—4 hours with 1 per cent. hydrochloric acid, filtered and an aliquot portion precipitated by calcium chloride and ammonia. The precipitate was collected, washed and dissolved in dilute nitric acid and the phosphorus finally precipitated by ammonium molybdate.—E. F. A.

Coal tar colours [for colouring foods in the United States]; Method for the separation of the seven permitted —— in mixtures. T. M. Price. U.S. Dept. Agric., Bureau of Animal Ind., Circular No. 180, July 22, 1911. (See also this J., 1911, 302.)

The following table gives the author's scheme for the separation and detection of the food colours permitted in the U.S., in mixtures. Any prohibited colour is readily detected; its identification is not essential. As a preliminary test a little of the powdered dyestuff is sprinkled on water, alcohol and sulphuric acid to determine whether one or more dyestuffs are present. The following reagents should be of the strengths given:—Ammonium sulphate and sodium chloride solutions; hot supersaturated solutions are allowed to cool and are kept in contact with undissolved crystals of the respective salts; they should be shaken before being used; calcium chloride, 25 grms. of the granulated salt in 100 c.c. of water; dilute ammonia, 1 c.c. in 100 c.c.; dilute acetic acid, 5 c.c. of glacial acid are added to 95 c.c. of water: hydrogen peroxide, 3 per cent.; alcohol, 95 per cent.; stannous chloride: 30 grms. of granulated tin, free from iron, are dissolved in 125 c.c. of hydrochloric acid of 1·19 sp. gr., the solution diluted to 250 c.c. and filtered through asbestos; the filtrate is mixed with 250 c.c. of hydrochloric acid of 1·124 sp. gr., and 500 c.c. of water.

About 0·2 grm. of the sample is triturated with supersaturated ammonium sulphate solution, the mixture filtered, and the residue washed with this solution until the washings are no longer coloured red:—

Filtrate. Shake with ethyl acetate.		Residue. Dissolve in water, acidify with acetic acid and shake with ether.					
The ethyl acetate may contain a small quantity of Naphthol Yellow S. This solution is discarded.	The ammonium sulphate solution contains Amaranth which is extracted with acetone. Water is added to the acetone solution and the acetone driven off.	The ether contains Erythrosin. It is washed with water and shaken with dilute ammonia to extract the Erythrosin. The excess of ammonia is then driven off.	The aqueous solution is freed from ether, saturated with sodium chloride on the water-bath, cooled, filtered, and washed with supersaturated sodium chloride solution until the washings are colourless.				
			The filtrate is shaken with acetone. The acetone and salt solutions are separated.		The precipitate is dissolved in water and shaken with three successive portions of ethyl acetate.		
			The acetone solution is washed with supersaturated sodium chloride solution, water is then added, and the acetone driven off on the water-bath. The aqueous solution is acidified with acetic acid and shaken with amyl alcohol to extract traces of Orange I. The aqueous solution freed from amyl alcohol is then tested for Naphthol Yellow S.	The sodium chloride solution is freed from excess of salt by evaporation and taking up the residue with alcohol. The alcohol is then driven off and the residue tested for Light Green S.F. Yellowish.	The ethyl acetate is washed with supersaturated sodium chloride solution and then shaken with water to extract Orange I.	The aqueous solution is heated on the water-bath till free from ethyl acetate, cooled, and diluted to 125 c.c. with water. 40 c.c. of 25 per cent. calcium chloride solution are added, and the mixture allowed to stand for 15 min. 15 c.c. of stannous chloride solution are added, the mixture stirred till the blue colour is destroyed, and then filtered.	
						The filtrate is treated with hydrogen peroxide which gives a deep blue colour if Indigodisulphonic acid be present.	The precipitate contains Ponceau 3R. It is washed with calcium chloride solution till free from blue colour. It is then dissolved in ammonia and the excess of the solvent driven off.
	Amaranth.	Erythrosin.	Naphthol Yellow S.	Light Green S.F. Yellowish.	Orange I.	Indigodisulphonic acid.	Ponceau 3R.

—A. Sbld.

Ethyl and methyl alcohols and formic acid [in foodstuffs, etc.]; Detection and determination of small quantities of ——. R. F. Bacon. U.S. Dept. Agr., Bureau of Chem., Circular 74, July 14, 1911.

The author suggests a procedure for the detection and determination of such small quantities (0·1 to 1·0 per cent.) of ethyl alcohol as occur frequently in partly decayed foodstuffs. Aqueous extracts containing only a minute proportion of alcohol may, on distillation, be made to yield up the whole of the latter in a comparatively small volume of distillate if they are first partially saturated with calcium or sodium chloride. The author found that 500 c.c. of a 0·2 per cent. solution of alcohol, after treatment with 200 grms. of calcium chloride, gave up on distillation 96·8 per cent. of its alcohol in the first 100 c.c. of distillate, and 100 per cent. in the first 150 c.c. A 0.2 per cent. solution, about three-quarters saturated with sodium chloride, also gave up 96·8 per cent. of its alcohol in the first 100 c.c. of distillate, and on similarly salting the latter and redistilling, the alcohol was obtained without any further loss in 50 c.c. of the second distillate. A litre of a 0·1 per cent. solution of alcohol, three-quarters saturated with salt, was distilled, the first 150 c.c. of distillate being similarly salted and redistilled; 96 per cent. of the alcohol originally present was obtained in 25 c.c. of the second distillate. The author recommends that in determining alcohol present in extremely dilute solutions the concentration should be increased to 2—4 per cent. by the methods given above. If acids are present in the original solution they should be exactly neutralised, a trace of solid phenolphthalein being used as indicator. If both the specific gravity and the refractometric reading (see Ackermann and Steinmann, this J., 1905, 563) of the final distillate correspond to the same alcohol-content, it is almost certain that ethyl alcohol is present in the amount indicated. To confirm this, however, the ethyl ester of *p*-nitrobenzoic acid may be prepared by the Schotten-Baumann method. The distillate is treated with a slight excess of *p*-nitrobenzoyl chloride and an equivalent quantity of sodium hydroxide. The liquid is shaken until the odour of the acid chloride disappears. The ester is a beautifully crystalline solid, melting at 57° C., and the amount obtained, when working with only small quantities of alcohol, represents about 70—90 per cent. of the theoretical yield, so that by weighing it an additional rough check on the alcohol determination is obtained. If *p*-nitrobenzoyl chloride is not available the ethyl ester of benzoic acid which boils at 212° C. may be similarly prepared from benzoyl chloride.

For the detection of methyl alcohol in minute traces, the following method is suggested:—100 c.c. of the aqueous liquid are treated with 5—8 grms. of chromic acid and distilled, the first 10 c.c. of distillate being tested for formaldehyde by the method of Leach or Hehner (see Richmond and Boseley, this J., 1895, 772). If the original liquid contains other oxidisable substances such as acids, sugars, proteins, etc., it is first exactly neutralised with sodium hydroxide and distilled to the extent of one-third, the distillate being oxidised as above. By this method one part of methyl alcohol in 100,000 parts of water may be detected. When methyl alcohol is tested for in presence of strong ethyl alcohol, the liquid should first be diluted with water to obtain approximately a 20 per cent. solution, as otherwise the oxidation with chromic acid may become explosive. The presence of 0·1 per cent. of methyl alcohol in 80 per cent. ethyl alcohol may be easily detected. Potassium permanganate may be substituted for chromic acid in this oxidation, but the sensitiveness of the reaction for aqueous solutions is then only about 1 part in 4000. For the determination of methyl alcohol the principles and method given above for ethyl alcohol may be applied.

The following method of detecting formic acid in a liquid is based on the reduction of the acid to formaldehyde by means of magnesium (see Fenton, this J., 1907, 433). The liquid is strongly acidified with phosphoric acid and distilled until about one-third has passed over. The distillate is treated with dilute sulphuric acid (unless it is already strongly acid) and magnesium filings, in sufficient quantities to cause a vigorous but not violent ebullition of hydrogen. If the quantity of formic acid present is small (0·1 per cent.) the action should be continued for an hour; but if larger quantities are present the liquid will often give a positive formaldehyde test in 2—5 minutes. The author suggests the following method of determining formic acid, based on the reduction of platinic salts in neutral or weakly acid solution (many aldehydes, etc., reduce platinic salts in alkaline solution). The liquid containing the formic acid is distilled with a small quantity of phosphoric acid until the distillate is no longer acid. If the distillate is too large to handle conveniently it is neutralised and concentrated. An excess of platinic chloride is then added, together with sufficient acetic acid to make the liquid strongly acid (usually 1 or 2 c.c. of glacial acetic acid for less than 1 grm. of formic acid) and the solution is boiled for an hour under a reflux condenser, the reduced platinum being collected and weighed in the usual manner. The quantity of formic acid present is found by multiplying the weight of reduced platinum by 0·472.—J. H. L.

Patents.

Milk; Means for testing the freshness of ——. A. Faitelowitz, London. Eng. Pat. 26,264, Nov. 11, 1910.

One c.c. of a reagent prepared by mixing 0·1 c.c. of a saturated solution of methylene blue in absolute alcohol with 70 c.c. of water and 30 c.c. of absolute alcohol, is added to 50 c.c. of the milk, and the mixture is kept at a temperature of 37° C. Should the milk be not fresh, the colour of the mixture is discharged within 30 minutes. The test may be carried out in a bottle provided with a small side tube in which a portion of the original milk is placed for the purpose of comparison.—W. P. S.

Milk; Sterilising ——. T. McClelland, jun., Cathcart, N.B. Eng. Pat. 27,218, Nov. 23, 1910.

The milk is allowed to flow through a chamber packed with granular carbon, through which a current of electricity is being passed. The sterilising chamber may be cylindrical or in the form of a rectangular tank provided with partitions.—W. P. S.

Human-milk; Artificial ——. J. G. R. Howe, Eltham, and E. Davis, Sidcup. Eng. Pat. 14,114, June 14, 1911.

To 27·5 pints of cows' milk are added 2 pints of thick cream, 10 pints of "banana emulsion," 10 oz. of lactose, 20 oz. of malt extract of sp. gr. 1·24—1·26, and sufficient water to make the volume of the mixture up to 50 pints. The mixture is then sterilised. The "banana emulsion" is prepared by grinding sun-dried bananas to a thick paste with water, mixing 4 oz. of this paste with 9 oz. of water, diluting to 1 pint, boiling for 15 minutes, and filtering through cotton fabric.—W. P. S.

Coffee substitute. F. Wischmeyer, Osnabrück, Germany. Eng. Pat. 14,575, June 20, 1911.

Dough prepared from coarse rye meal, water, and molasses, is baked at a temperature of about 200° C. for 24 hours. The loaves are broken up into lumps which are dried and roasted at about 80° C., the roasting being frequently interrupted and the material slightly cooled to prevent the latter acquiring a bitter taste. The product is then ground.—W. P. S.

Coffee-beans; Process of "decaffeinizing" ——. K. H. Wimmer, Bremen, Germany. U.S. Pat. 1,009,610, Nov. 21, 1911.

Raw coffee beans are treated under a pressure of 1·5—4 atmospheres with acidified water at a temperature of 70°—120° C., and are then extracted with water at the same temperature. The caffeine is separated from the extract thus obtained and the beans are impregnated with the remaining extract, then dried, and roasted. —W. P. S.

Chocolate masses and the like; Apparatus for refining ——. F. E. F. Neumann, Wansbek, Germany. Eng. Pat. 20,363, Sept. 14, 1911. Under Int. Conv., Sept. 16, 1910.

Three or more circular roller mixing machines are mounted adjacent to one another, the containers or basins of the machines opening into each other in such a manner that the mass treated in one is transferred by the rollers therein into the adjacent container, and so on. The paths of the rollers of two adjacent containers overlap one another so that, at the point where the containers connect, the rollers of one container enter the next container for a short distance of their circular path. The walls of the containers are trough-shaped and scrapers are provided to move the material and to assist in discharging it when the direction of rotation of the rollers is reversed.—W. P. S.

Wheat; Treatment of —— before grinding, in order to improve the quality of the flour. C. Garz. Fr. Pat. 432,212, July 13, 1911.

The known process of mixing dry malt with the wheat is modified by using moist wheat which has been allowed to germinate, instead of the dry malt. The mixture may be stored in a closed chamber until uniformly moist, or the same result may be achieved by mixing the germinated wheat with successive quantities of the dry wheat.—A. T. L.

Flour from wheat; Art of milling and conditioning ——. L. M. Thomas, Strassburg, Germany, Assignor to H. Simon, Ltd., Manchester. U.S. Pat. 1,010,202, Nov. 28, 1911.

See Eng. Pat. 9946 of 1908; this J., 1909, 1059.—T. F. B.

Grains and legumes; Process of completely opening or disintegrating ——. F. Braunbeck, Berlin. U.S. Pat. 1,011,730, Dec. 12, 1911.

See Fr. Pat. 365,827 of 1906; this J., 1906, 1000.—T. F. B.

XIXb.—WATER PURIFICATION; SANITATION.

Patents.

Sewage sludge; Treatment of ——. J. Grossmann, Manchester. Eng. Pat. 28,434, Dec. 7, 1910. Addition to Eng. Pat. 16,397, Aug. 4, 1908 (this J., 1909, 1000).

The sludge is partially dried by allowing it to settle, and is then dried further by heating it in an apparatus such as that described in Eng. Pat. 28,516 of 1909 (this J., 1911, 237), after which it is subjected to distillation with superheated steam.—W. P. S.

Liquids; Apparatus for sterilising —— by means of the ultra-violet rays. P. G. Triquet, Paris. Eng. Pat. 9047, April 11, 1911.

Tubular mercury vapour lamps are fitted in a cylindrical chamber provided with a movable cover and connected at either end with a water-main by means of stuffing-boxes, the ends of the chamber being tapered so as to fit the ends of the water-main; baffle-plates are fitted in the chamber so that the current of water is directed around the lamps. The chamber may be rotated through any desired angle in order to start the action of the lamps, or the latter may be mounted in a frame and inclined by mechanism arranged outside the chamber. Various methods of mounting the lamps are described.—W. P. S.

Liquids; Apparatus for sterilising —— by ultra-violet rays. A. Helbronner and M. von Recklinghausen, Paris. Eng. Pat. 21,829, May 1, 1911.

In apparatus where the liquid is admitted to the sterilising chamber through a valve which is operated by an electromagnet in series with the lamp, an auxiliary valve is provided, so that any liquid, leaking through the main valve, when the latter closes owing to the lamp being extinguished, is conducted directly to a waste pipe and is thus prevented from entering the sterilising chamber.—W. P. S.

Water-purifying apparatus. H. Reisert, Cologne, Germany. U.S. Pat. 1,009,857, Nov. 28, 1911.

The apparatus consists of a cylindrical chamber, up which the water is caused to rise. The chamber is divided into upper and lower compartments, the bottom of the upper compartment being an inverted cone having "a self-clearing inclination." The water passes from the lower to the upper compartment through tubular uptakes arranged at the centre and at the sides of the bottom of the upper compartment, and therefore the water leaves the lower compartment at two levels. Similarly it enters the upper compartment at two levels. Two settling zones are formed in consequence, one in the lower compartment between the two exit levels, and one in the upper compartment between the two inlet levels.—T. St.

Water; Purification of waste ——. V. H. G. Devrez. Fr. Pat. 431,552, June 23, 1911.

Apparatus for the separation of suspended solids and of fatty or oily substances from the effluents of slaughter-houses, creameries, etc., or from sewage, comprises a vertical casing having an upper conical part, an intermediate cylindrical part, and a lower part of inverted conical shape. The impure water is admitted tangentially in the cylindrical part of the casing and is directed by a spiral baffle or guide plate towards the centre of the casing where the inlet pipe for the purified water is situated. The suspended solids sink into the lower conical portion which is provided near the apex with baffles to aid the settling of the sludge, and the fatty and oily impurities rise in the upper conical portion and collect in a cylindrical extension at the top of the casing.—A. T. L.

Water distilling apparatus. J. De S. Bennehoff, Alfred, N.Y. U.S. Pat. 1,011,016, Dec. 5, 1911.

A retort is fitted at the bottom with an inlet tube and with a circular shield between the inlet tube and the burner. Within the inlet tube is a condensing tube, through which a supply pipe passes and opens into the inlet tube. Siphons are provided in the inlet tube for controlling the level of the liquid in the retort, the crowns of the siphons being at different levels, whilst the "inlet ends of the siphons are remote from the retort."—W. P. S.

Mine air; Purifying ——. J. Penhale, Johannesburg, Transvaal. Eng. Pat. 15,365, July 1, 1911.

The place in which the air is to be purified is sprayed with a solution of an alkali hydroxide or carbonate, impregnated with air under pressure.—W. P. S.

Hyper ultra violet radiations having waves of short length, for sterilising purposes; Method of production and utilisation of ——. A. L. Billon-Daguerre, Asnières, France. Eng. Pat. 24,025, Oct. 17, 1910. Under Int. Conv., Oct. 18, 1909.

See Fr. Pat. 419,117 of 1909; this J., 1911, 106.—T. F. B.

Sterilising agents; Apparatus for the production of the —— in liquid sterilising plants. M. P. Otto, Paris. Eng. Pat. 4127, Feb. 18, 1911. Under Int. Conv., March 5, 1910.

See Fr. Pat. 413,296 of 1910; this J., 1910, 1130.—T. F. B.

Liquids; Treatment of ——. A. Brandes, Assignor to C. Neff, Hanover, Germany. Reissue No. 13,338, Dec. 12, 1911, of U.S. Pat. 904,114, Nov. 17, 1908.

See Eng. Pat. 12,258 of 1907; this J., 1907, 1129.—T. F. B.

Disinfectant. K. L. V. Zimmer, Hamburg, Germany. U.S. Pat. 1,010,210, Nov. 28, 1911.

See Eng. Pat. 12,157 of 1910; this J., 1910, 1268.—T.F.B.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Cocaine manufacture in Peru. O. Sperber. Tropenpflanzer, 1911, **15**, 684—687. (See also this J., 1911, 445.)

Since 200 parts of leaves are required to give 1 part of cocaine, it is advisable to work up the cocaine at the place of production. This is done in three stages. (1) The leaves are soaked for four successive periods of 24 hours in dilute sulphuric acid (5 parts of acid to 1000 parts of water). After one batch of leaves has been removed from a tank, a fresh batch is steeped in the same liquid. At the end of the fourth period the liquid is passed through a screen. (2) The solution is treated with sodium carbonate solution (60° salinometer). During the extraction tests are made by filtering a small portion of the liquid, If the filtrate gives no precipitate of cocaine with ammonia, the treatment with alkali is complete. A definite amount of petroleum is then added and the mixture is gently stirred for 3 to 4 hours. The oily layer is then separated and washed, first with water and then for 30 to 40 mins. with water containing acid (3 parts of acid to 1000 parts of water). (3) The liquid cocaine is mixed with sodium carbonate solution and allowed to stand for 12 hours. The amount of alkali required is fixed by trial. The cocaine is then separated, washed with water and pressed, yielding a pasty mass containing 87—93 per cent. of pure cocaine. If the processes have not been carefully carried out, the product is not white but brownish. In this case the mass is further purified by treatment with dilute sulphuric acid (5 : 100). Water is then added till the amount of acid falls to 3 parts per 1000 parts of water. The liquid is again treated with sodium carbonate solution as before. For all processes under (2) and (3) the water used must be well filtered. A small factory with 3—5 workers can turn out 1 kilo. (2·2 lb.) per 24 hours at an approximate cost of M. 200—220 per kilo. (88s. to 96s. per lb.), depending however on the price of the leaves.—H. E. P.

Belladonna powder; Commercial ——. P. Lemeland. J. Pharm. Chim., 1911, **4**, 552—557.

In the French Codex of 1908 belladonna powder is described as being prepared from the leaves of *Atropa belladonna*, which are collected when the plant is ready to flower. Most commercial samples contain a large proportion of the fruit and stems. Adulterations are frequent, the leaves of *Ailantus glandulosa*, *Phytolacca decandra*, *Scopolia* and even horse-chestnut, often being met with. Diagrams are given showing the microscopic appearance of genuine non-sifted belladonna powder, the ordinary commercial powder from plants which have flowered, and powdered leaves of *Ailantus*. The genuine powder is characterised by the presence of polycellular hairs, which disappear on sifting. The hairs of *Ailantus* are unicellular and strong, and are not destroyed or removed by powdering and sifting.—F. Shdn.

Corydalis alkaloids. Corytuberine. J. Gadamer. Arch. Pharm., 1911, **249**, 641—669.

The constitution of corytuberine has been ascertained by exhaustive methylation and by other methods. Corytuberine, corydine and apomorphine each possess the same ring-system in the structure of the nucleus. In order to obtain the alkaloid, the corydalis tubers are extracted with alcohol and the alcohol distilled off. The residue is treated with water to precipitate resinous matter, which is removed by filtration. Ammonia is carefully added so that there is only a very slight excess after the separation of the free alkaloids. The whole is shaken out with ether as rapidly as possible. The aqueous portion is at once shaken a second time with ether and allowed to stand. After a time the base crystallises out. The yield varies from 0·7 to 1·5 per cent. The alkaloid is best purified by dissolving in *N*/1-sulphuric acid and precipitating fractionally with *N*/1-ammonia. It crystallises with 5 molecules of water (see this J., 1911, 1332). When treated in alkaline solution with benzoyl chloride in the cold, mono- and dibenzoyl derivatives are produced. Monobenzoylcorytuberine melts at 211°—214° C. after crystallisation from ether, and has $[\alpha]_D = +151{\cdot}5°$ in chloroform at 20° C. Dibenzoylcorytuberine could not be crystallised. After drying in a desiccator, it melts at 135°—140° C., and has $[\alpha]_D = +128{\cdot}8°$ to $+133{\cdot}5°$ in chloroform at 20° C. A tribenzoyl derivative appears to be formed when the base is boiled with benzoyl chloride. The base was methylated with methyl iodide in methyl alcohol containing sodium and the product purified by means of mercuric chloride. In this way a mixture of the methyl chlorides of corytuberine and methylcorytuberine was produced. Methylation with diazomethane in ether led to the formation of a mixture of quarternary bases containing monomethylcorytuberine methiodide, isocorydine and corydine. Dimethylcorytuberine was obtained by treating the hydrochloride dissolved in isoamyl ether with nitrosomethylurethane and potassium hydroxide dissolved in methyl alcohol. The *l*-bitartrate melts at 219°—224° C., and has $[\alpha]_D = +150°$ in water at 20° C. More satisfactory results were obtained by methylating with dimethyl sulphate in alkaline and neutral aqueous solutions. The methyl chloride of dimethylcorytuberine melts at 234°—237° C., and has $[\alpha]_D = +197{\cdot}4°$ in water. After treatment with concentrated sodium hydroxide, the optically inactive methine base was obtained. The methiodide of the latter melts at 260° C. The methyl sulphate of dimethylcorytuberimethine was decomposed by means of concentrated sodium hydroxide solution, when trimethylamine and 3.4.5.6-tetramethoxy-8-vinylphenanthrene were produced. When reduced with zinc dust, α-ethylphenanthrene was formed, which gave a picrate melting at 138°—140° C. The vinyl compound was oxidised by means of permanganate solution, and 3.4.5.6-tetramethoxyphenanthrene-8-carboxylic acid, m. pt. 165°—167° C. was obtained.—F. Shdn.

Alkaloid of Pseudocinchona (corynanthine) and yohimbine; Isomerism of the ——. E. Fourneau and Fiore. Bull. Soc. Chim., 1911, **9**, 1037—1040. (See this J., 1910, 648).

After careful crystallisation from alcohol, yohimbine melts at 244° C. on the Maquenne block. When dried in a vacuum, or at 100° C., it has the composition, $C_{21}H_{26}N_2O_3$, which was confirmed by the analysis of the hydrochloride. The alkaloid is thus isomeric with corynanthine. The hydrochloride of yohimbine has $[\alpha]_D = +105°$, whilst corynanthine hydrochloride has $[\alpha]_D = -64{\cdot}15°$.—F. Shdn.

Gentian tinctures; The influence of the strength of the alcohol and the mode of preparation on the amount of active principles in —— *prepared from non-fermented roots.* M. Bridel. J. Pharm. Chim., 1911, **4**, 545—552. (See this J., 1911, 766).

It is possible to obtain a tincture of gentian containing about 0·8 per cent. of gentiopicrin without using heat to destroy the enzymes. For this purpose the drug may be macerated with 95 per cent. alcohol, or percolated with 60 per cent. alcohol. In the former case the amount of carbohydrates in the tincture is about one-fourth of that in the tincture prepared with the weaker alcohol. In the latter method, the powdered drug is macerated with half its weight of 60 per cent. alcohol, for 24 hours in a percolator. The percolation is then proceeded with till 500 grms. of tincture are obtained from each 100 grms. of the drug. The whole operation should not take more than three days. In this way an extract is produced from which gentiopicrin can be isolated.—F. Shdn.

Ergothioneine; The constitution of ——. *A betaine related to histidine.* G. Barger and A. J. Ewins. Chem. Soc. Proc., 1911, **27**, 305.

Ergothioneine, $C_9H_{15}O_2N_3S$, a crystalline base isolated from ergot by Tanret in 1909 (this J., 1909, 905; 958), has been found to be a betaine of thiolhistidine (α-amino-β-2-thiolglyoxaline-4(or 5)-propionic acid). On boiling with 50 per cent. aqueous potassium hydroxide, trimethylamine is eliminated, and an acid, $C_6H_6O_2N_2S$

(β-2-thiolglyoxaline-4(or 5)-acrylic acid), is obtained. On oxidation with dilute nitric acid the latter yields β-glyoxaline-4(or 5)-acrylic acid, from which on reduction β-glyoxaline-4(or 5)-propionic acid is produced. The treatment of ergothioneine with ferric chloride leads to the formation of histidine-betaine.

Ipomoea orizabensis ; Chemical examination of the root of ——. F. B. Power and H. Rogerson. Chem. Soc. Proc. 1911, **27**, 304—305.

The material employed for this investigation consisted of the root of *Ipomoea orizabensis*, Ledanois (Nat. Ord. *Convolvulaceae*), commonly known as " Mexican Scammony Root." The root contained 14·55 per cent. of resin, 71 per cent. of which was soluble in ether. After purification with animal charcoal, the resin was obtained nearly colourless. It then melted at 125°—130°, and had $[\alpha]_D$ —23·0°. For a complete examination of the root, 48·76 kilos. of the ground material were extracted with hot alcohol. The resulting extract, when distilled in a current of steam, yielded a small amount of a pale yellow essential oil. From the portion of the extract which was soluble in water the following compounds were isolated : (i) scopoletin, $C_{10}H_8O_4$; (ii) 3 : 4-dihydroxycinnamic acid, $C_9H_8O_4$, from which the methyl ester (m. pt. 158°—160°) was prepared. The aqueous liquid contained, furthermore, a quantity of sugar, which yielded *d*-phenylglucosazone (m. pt. 205—206°), and from a portion of the original alcoholic extract a small amount of sucrose was also obtained. The portion of the alcoholic extract which was insoluble in water consisted of a resin which possessed the above-mentioned characters. This resin, by successive extraction with various solvents, was resolved into a number of products which were for the most part amorphous, and not entirely glucosidic, but by the further treatment of these products many well-defined substances were obtained. It has thus been shown that the resin is exceedingly complex in character, and it follows that the so-called "jalapin," which includes all those constituents of the resin which are soluble in ether, cannot be represented by any of the various formulæ hitherto assigned to it.

Unsaturated hydrocarbons ; Addition of organic acids to ——. [*Acetylation of essential oils*]. A. F. Sievers. Bull. Univ. Wisconsin ; through Chem. and Drugg., Dec. 16, 1911, 60.

In the acetylation process, as used for the determination of free alcohols in essential oils, any unsaturated hydrocarbons present may also react with the acetylating mixture. For example when a sample of pinene (b.pt. 155°—157° C., sp. gr. 0·8575, optical rotation +15°) was mixed with an equal volume of glacial acetic acid, and the ester value of the product determined from time to time, it was found that this value rose steadily, being 13·80 after 6 months. In a similar experiment with limonene (sp. gr. 0·8562 at 20° C., optical rotation +92°47′, ester value 6·9), which was first saponified with potassium hydroxide to remove esters, the ester-value reached 3·86 after 5 months, whilst when anhydrous sodium acetate was also added, an ester value of 9·47 was obtained. At higher temperatures and pressures, the ester formation proceeded much more rapidly, a value of 30—40 being attained in 24 hours with pinene at 140°—150° C. and under pressure. When limonene and oil of turpentine were submitted to the usual acetylation process, the apparent amounts of esters (calculated as $C_{10}H_{17}O.COCH_3$) produced were : limonene (from orange oil), 29·35 ; oil of turpentine (crude), 4·0 ; oil of turpentine (rectified), 2·4—3·9.—A. S.

Citral in lemon oil ; The pharmacopœial assay of ——. J. R. Rippetoe and L. E. Wise. Amer. J. Pharm., 1911, **83**, 558—562.

A one per cent. solution of metaphenylenediamine in dilute alcohol is prepared. 1·5 c.c. of lemon oil are made up to 50 c.c. with 95 per cent. alcohol, 2—4 c.c. are mixed with 10 c.c. of the metaphenylenediamine solution and made up to 25 c.c. with alcohol in a Nessler jar. The reddish-yellow colour is compared with that produced by a portion of a standard citral solution in alcohol, treated in a similar way.—F. Shdn.

Peppermint oil ; Colour reaction of ——. J. C. Umney. Perfumery and Essent. Oil Rec., 1911, **2**, 275.

One c.c. of the oil is heated with 0·5 grm. of a mixture of equal parts of paraformaldehyde and citric acid, whereupon in the case of all peppermint oils except Japanese, a pink colour is produced, changing to reddish-brown in the course of 15—30 seconds. The reaction is not given by pure menthol nor by either natural or dementholised Japanese peppermint oils.—A. S.

Spearmint oil ; Physical and chemical properties of Hungarian ——. K. Irk. Pharm. Zentralh., 1911, **52**, 1111—1114. Chem. Zentr., 1911, **2**, 1863.

Hungarian spearmint oil (yield 0·53 per cent. from the fresh and 1·85—2·48 per cent. from the dried plant) is a yellow or greenish yellow liquid of characteristic odour ; it is colourless after rectification. It has the sp. gr. 0·9375—0·9513 at 15° C., 0·9328—0·9463 at 20° C. ; n_D^{20}=1·4899—1·4931 ; α_D=—44·38° to —49·85°. It is soluble in 1 part of 80 per cent., 0·5 part of 90 per cent., or 2 parts of 70 per cent. alcohol. The oil contains 62—71 per cent. of *l*-carvone. About 60 per cent. of it distils between 220° and 230° C. Hungarian *Mentha aquatica*, a plant which is allied to *Mentha crispa*, yields 0·42 per cent. (from the fresh plant) of an oil having the sp. gr. 0·9559 at 20° C. ; n_D^{20}=1·4900 ; α_D^{20}=+22·73°. The oil is soluble in 0·5 part of 90 per cent. alcohol and insoluble in 70 per cent. alcohol.—A. S.

Oil of Litsaea odorifera, Val. [*trawas oil*] ; *Essential* ——. P. Van Romburgh. Koninkl. Akad. van Wetensch. Amsterdam, Wisk. en Natk. Afd. 1911, **20**, 194—197. Chem. Zentr., 1911, **2**, 1863.

Trawas oil, a light yellow oil of unpleasant odour, was obtained by distilling with water the leaves of *Litsaea odorifera*, Valeton, a plant belonging to the laurel family, and growing in Java. It had the sp. gr. 0·836—0·846 at 15° C., *a*= —10′ to —7° (200 mm. tube). b.pt., 120°—125° C. at 10 mm. The oil contains methyl-*n*-nonylketone, methyl-2-nonyleneketone, $CH_3.CO.(CH_2)_7 \cdot CH : CH_2$ (solidif. pt. —7° C., b.pt. 235° C., sp. gr. 0·848 at 11·5° C.), methyl-*n*-nonylcarbinol, $CH_3.CH(OH) \cdot C_9H_{19}$ (α=—5° 40′ in 100 mm. tube), and methyl-2-nonylenecarbinol, $CH_3.CH(OH).(CH_2)_7 \cdot CH : CH_2$ (b.pt. 233° C., sp. gr. 0·835 at 10° C., α=—5° 10′ in 100 mm. tube).—A. S.

Camphor ; Test for ——. [*Detection of synthetic camphor*]. Jahresber. Pharm., 1911, **45**, 44. Pharm. J., 1911, **87**, 849.

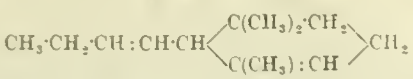
The following test is given in the third Italian Pharmacopœia for the detection of synthetic camphor in natural camphor. 0·5 grm. of the camphor is heated with 2—3 grms. of calcium oxide (from marble), the mixture is treated with 15 c.c. of boiling water, and filtered. If synthetic camphor be absent, the filtrate should only give the faintest opalescence when acidified with nitric acid and treated with silver nitrate.—A. S.

Duodecyl aldehyde in perfumery ; Use of ——. J. C. Umney. Perfumery and Essent. Oil Rec., 1911, **2**, 276.

The author states that duodecyl aldehyde is useless in the preparation of violet perfumes (compare this J., 1911, 1279), but is of service in perfumes of the orange type, especially lily of the valley perfumes. This view is confirmed by L. Givaudan, who adds that in general the use of duodecyl aldehyde is rather difficult, but that when added in moderate quantities, it imparts "a shade of freshness" to many artificial perfumes.—A. S.

Alkylidenehydrazines; Decomposition of ——: conversion of ionone and pseudo-ionone into the corresponding hydrocarbons. $C_{13}H_{22}$. N. Kijner. J. Russ. Phys.-Chem. Soc., 1911, **43**, 1398—1402.

Iononehydrazone readily decomposes in presence of potassium hydroxide, giving α-ionane,



$$CH_3{\cdot}CH_2{\cdot}CH:CH{\cdot}CH\left\langle\begin{array}{l}C(CH_3)_2{\cdot}CH_2\\C(CH_3):CH\end{array}\right\rangle CH_2$$

which is a colourless liquid, b.pt. 220°—221° C. (747 mm.), sp. gr. 0·8530 at 20° 0° C., $n_D = 1{\cdot}4784$. Pseudo-ionane, $CH_3{\cdot}CH_2{\cdot}CH:CH{\cdot}CH_2{\cdot}C(CH_3):CH{\cdot}CH_2{\cdot}CH:C(CH_3)_2$, obtained in a similar manner from pseudo-iononehydrazone, has the b.pt. 224°—225° C. (751 mm.), sp. gr. 0·8151 at 20° 0° C. and $n_D = 1{\cdot}4725$, and undergoes isomeric change into α-ionane when its acetic acid solution is boiled with a small quantity of acetic acid.—T. H. P.

Catalytic reactions at high temperatures and pressures. XXIII. Hydrogenation of acetone in the presence of copper oxide and zinc dust. W. Ipatiew and G. Balatschinsky. Ber., 1911, **44**, 3459—3461.

When acetone is heated with hydrogen at a temperature of 300° C. in an iron tube for 30 hours, very little change takes place. In the presence of copper oxide or zinc dust, however, acetone becomes partially converted into isopropyl alcohol at a pressure of 100—120 atmospheres. Condensation products are formed at the same time. The reaction is reversible, for when isopropyl alcohol is heated in hydrogen at 300° C. and at a pressure of 40 atmospheres, zinc dust being present, a portion of the alcohol becomes converted into acetone. (See this J., 1907, 492.)
—F. Shdn.

Catalytic reactions at high temperatures and pressures. XXIV. Hydrogenation of terpenes. W. Ipatiew and G. Balatschinsky. Ber., 1911, **44**, 3461—3466. (See this J., 1911, 108.)

Experiments were carried out on the hydrogenation of carvone, pulegone and menthone, using nickel oxide as catalyser. The double bonds, whether in the ring or the side-chain, become saturated with hydrogen between 220° and 240° C. The carbonyl group becomes reduced at 260°—280° C., though in the case of menthol, menthane is produced above 260° C. The optical rotation is higher, the lower the temperature at which the hydrogenation takes place. Carvomenthol and carvomenthone were obtained from menthol by this method. Pulegone yielded menthone and menthane. Menthone was converted into menthol at a temperature of 210° C. When thymol was hydrogenised, *i*-menthol was formed.
—F. Shdn.

Detection and determination of small quantities of ethyl and methyl alcohols and formic acid. Bacon. *See* XIXa.

Patents.

Wood; Extraction of volatile substances from ——. Aktieselskabet Lignum. Fr. Pat. 431,852, July 3, 1911.

With the object of removing the volatile oils and resins from woods, such as cedar and juniper, employed in the manufacture of pencils, musical instruments, etc., and thus facilitating the working and polishing of the same, the wood, contained in a suitably heated vessel, is treated with the superheated vapour of a solvent such as alcohol or benzol. The vapour issuing from the vessel is condensed, the resulting liquid being evaporated (ultimately in a vacuum) for the recovery of the oil and resin and for the regeneration of the solvent.—W. E. F. P.

1-Paradimethylaminophenyl-2.3.4-trimethyl-5-pyrazolone; Manufacture of ——. Farbwerke vorm. Meister, Lucius, und Brüning, Hoechst on Maine, Germany. Eng. Pat. 9740, April 21, 1911. Under Int. Conv., May 4, 1910.

See Ger. Pat. 238,256 of 1910; this J., 1911, 1333.—T. F. B.

Erythrene; Process of producing ——. Process of producing double olefines. F. Hofmann and L. Tank, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,010,050 and 1,010,405, Nov. 28, 1911.

See Fr. Pat. 425,967 of 1911; this J., 1911, 968.—T. F. B.

Hydroxylaminedisulphonic acid; Process for the manufacture of alkali earth salts of ——. F. Raschig, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,010,177, Nov. 28, 1911.

See Ger. Pat. 216,747 of 1908; this J., 1910, 87.—T. F. B.

Sulphocyanic acid [with albumin]; Manufacture of harmless combinations of ——. J. Nerking, Assignor to Chem. Fabr. Reisholz G. m. b. H., Dusseldorf-Reisholz, Germany. U.S. Pats. 1,010,447, 1,011,075, and 1,011,076, Dec. 5, 1911.

See Eng. Pat. 13,934 of 1911; this J., 1911, 1280.—T. F. B.

6.7-Methylenedioxy-3.4-dihydroisoquinoline. H. Decker, Hanover, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,010,598, Dec. 5, 1911.

See Ger. Pat. 234,852 of 1910; this J., 1911, 923.—T. F. B.

"Decaffeinizing" coffee-beans. U.S. Pat. 1,009,610. *See* XIXa.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Patent.

Photographic paper; Process of treating ——. J. Sury, Wyneghem, and E. Bastyns, Assignors to Soc. Anon. La Photographie des Couleurs, Antwerp, Belgium. U.S. Pat. 1,010,200, Nov. 28, 1911.

See Eng. Pat. 27,687 of 1908; this J., 1910, 174. The paper may be treated with a solution of a tanning substance (*e.g.*, formaldehyde) before the treatment with gum.
—T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Explosives; Annual Report of the Chief Inspector (J. E. Foakes) of —— for Cape Province for the year ending 31st December, 1910.

The amount and value of explosives imported into Cape of Good Hope Province during 1910, are shown in the following table:—

	Quantity	Value.
	lb.	£
Dynamite	106,000	3,211
Blasting gelatin	123,800	4,834
Gelignite	66,850	1,940
Gunpowder	57,045	5,819
Fuse	441,991	16,224
Detonators (number)	10,737,300	8,184
Collodion cotton	280	2
Blasting powder	11,450	220

The total value of imported explosives was £40,434, a decrease of £5206 compared with the previous year. 1004 samples were tested during the year, of which 952 were passed, 42 rejected, and 10 returned as doubtful. The total amount of explosives manufactured at the Cape Explosives Works was 373,273½ cases, or 1036½ in excess of last year's amount. The shipments to Australia amounted to 14,525 cases, as compared with 6132 in 1909.
—G. W. McD.

Explosives; Interim report of the Chief Inspector (Major A. B. Denne) of —— for the Transvaal and Natal Provinces, for six months ending 31st December, 1910.

Manufacture: The British South African Explosives Co., at Moddersfontein, manufactured 118,733·9 cases of explosives of 50 lb. each. Messrs. Kynoch, at Umbogintwini manufactured 103,565·4 cases, comprising Blasting gelatin (82,679·2), E.O. gelatin (3652), Gelignite (16,720·2), and Arkite (514).

Imports of explosives into the Transvaal.

	From oversea.	From Cape.	From Natal.
Blasting cartridges .	—	Cases. 137,970	Cases. 105,176
Detonators, No. 6 and 6D (number)	18,787,500	—	—
„ No. 8 (number)	3,010,600	—	—
„ Electric (number)	105,000	—	—
Safety fuse (cases of 500 coils)	10,328	—	—

The safety fuse came from Great Britain (6700), Germany (2746), and Belgium (880).

The imports into Natal were : Blasting gelatin (5 cases), Gelignite (320 cases), Dynamite No. 1 (309 cases). Permitted explosives (2453 cases), and Blasting powder (487 cases), Detonators No. 6 and 6D (220,000), electric detonators (300,000).

Storage : 152 magazine licences are now in force.

Samples tested : 97 samples were tested at Johannesburg, and 55 in Natal. 67 samples of safety fuse were tested and 6 rejected.—G. W. McD.

Smokeless powders ; Stability of various types of —— towards ultra-violet rays. D. Berthelot and H. Gaudechon. Comptes rend., 1911, **153**, 1220—1223.

Propellents containing nitroglycerin, and the French Service powders "B" containing no nitroglycerin, were submitted to the action of ultra-violet rays. The "B" powders were in the form of flakes, 5 mm. by 15 mm., and the cordite, ballistite, etc., were in the form of cylinders, 15—20 mm. long and 5—8 mm. in diameter. The quantities taken in the experiments were from 0·25—0·45 grm. The samples were placed in quartz tubes over mercury in atmospheres of carbon dioxide and nitrogen, and were exposed to the light from a quartz mercury lamp. The samples, kept at a temperature of from 25°—28° C., were placed at a distance of from 70—80 mm. from the lamp, and in other cases at a temperature of 40° C. at a distance of 50 mm. The decomposition was proved to be due to the action of the ultra-violet rays, similar samples, heated at 68°—70° C., showing no signs of evolution of gas. The French Service powder "B" remained unaltered in appearance under the conditions of the experiments, whilst powders containing nitroglycerin changed in colour and showed signs of exudation of nitroglycerin, and this latter phenomenon was more marked at the lower temperatures. The following tables give the composition of the gases evolved with the various powders mentioned. the results in Table I. being obtained after exposure for 6 hours in an atmosphere of nitrogen, and those in Table II. after the same time of exposure in an atmosphere of carbon dioxide :—

Table I.

	Carbon monoxide.	Carbon dioxide.	Nitric oxide.	Nitrogen.
"B" powder (1897) no amyl alcohol	46	23	—	31
C.G. powder (collodion cotton, dinitrotoluene and 20 per cent. nitroglycerin)	22	30	7	41
Powder containing 25 per cent. of nitroguanidine .	15	29	20	36
C_2 powder, containing nitroglycerin (25 per cent.), nitrocellulose (72), and sodium bicarbonate (3 per cent.)	22	40	9	27

Table II.

	Nitric oxide.	Carbon monoxide.	Nitrogen.	Nitrous oxide.
"B" powder (1903) containing 2 per cent. of amyl alcohol	—	38	62	—
"B" powder (1909) containing 8 per cent. of amyl alcohol	—	53	39	8
Ballistite (1889) containing 2 per cent. of aniline	20	45	32	3
Ballistite (S.A.) containing 2 per cent. of diphenylamine	16	48	34	2
M D. Cordite (1906)	26	44	26	4
A 1. powder containing nitroglycerin (25 per cent.), nitrocotton (72), and sodium bicarbonate (3 per cent.)	27	40	29	4

It was noted that when the powders were surrounded by atmospheres of carbon dioxide that no appreciable amount of carbon dioxide was evolved during decomposition. In some instances, a slight absorption of this gas took place. The authors consider that as the French Service powder "B" does not evolve nitric oxide, under the conditions quoted in the experiments, that it is of greater stability than the propellents containing nitroglycerin.—G. W. McD.

Nitrocellulose powders ; The moisture content of ——. N. L. Hansen. Z. ges. Schiess- und Sprengstoffw., 1911, **6**, 461—464.

The moisture content of nitrocellulose powders of various sizes was determined by drying samples in their normal condition for 3 hours at 80° C., then placing them in a magazine for 12 days, and subsequently weighing them daily during the course of a year. Taking the average for the whole of the year, the results show that the amount of moisture absorbed (y) is proportional to the surface of the powder exposed, and can be represented by the equation : $y = \frac{2}{\sqrt{x}}$, where x is the diameter of the grains in millimetres. This law does not hold below a diameter of 0·8 mm., in which case it was found that the amount of moisture absorbed was constant (about 2·1 per cent.). The results were obtained with nitrocellulose powders containing 12·7—12·8 per cent. of nitrogen.—G. W. McD.

Analysis of chlorates. v. Buttlar. *See* VII.

Patents.

Fuses of blasting charges ; Composition for coating a splint or the like for igniting ——. G. S. Kope, Johannesburg. Eng. Pat. 27,560, Nov. 26, 1910.

Wood is coated with a solution of nitrocellulose mixed with a combustible mixture, which may consist of 65—80 per cent. of potassium chlorate, 10—25 of sulphur and 3—12 of another oxidiser. A suitable composition is 74 per cent. (by weight) of potassium chlorate, 18·5 of sulphur, and 7·5 of potassium bichromate, mixed with a concentrated solution of nitrocellulose in about equal amount by volume.—H. E. P.

Explosive cartridges ; Process and apparatus for the preparation of —— by impregnating an oxygen carrier with a combustible liquid. S. Laszczyński. Fr. Pat. 431,884, July 4, 1911. Under Int. Conv., July 5, 1910.

The cartridge containing the oxygen carrier (*e.g.* 90 per cent. of potassium chlorate) is divided into several sections, and into each of these is introduced a measured quantity of combustible liquid (*e.g.*, 10 per cent. by weight of petroleum lamp oil), so that each section can only absorb the quantity of liquid conveyed to it. The apparatus for this purpose consists of a support in two parts, between which the cartridge may be placed so that it is enclosed on all sides. The definite quantities of liquid, delivered from a measuring device above, are conveyed to the different sections of the cartridge through tubes terminating in different parts of the cartridge bed, whilst the cartridge itself may be wrapped in a perforated envelope of *e.g.*, parchment paper. Cartridges thus prepared have the same percentage composition throughout.—C. A. M.

Explosive charges for projectiles, mines, and torpedoes and for other purposes. C. E. Bichel, Hamburg, Germany. Eng. Pat. 6956, March 20, 1911. Under Int. Conv., June 20, 1910.

See Fr. Pat. 427,566 of 1911 ; this J., 1911, 1089.—T. F. B.

Funnel for charging containers for bursting charges with fused explosives. E. Sokolowski, Hamburg, and G. Issler, Cologne. Assignors to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,011,511, Dec. 12, 1911.

See Eng. Pat. 8517 of 1911 ; this J., 1911, 1186.—T. F. B.

Fume-destroying composition. S. W. Young, Palo Alto, Assignor to Globe Chemical Works, San Francisco. U.S. Pat. 1,011,699, Dec. 12, 1911.

See Eng. Pat. 11,495 of 1911 ; this J., 1911, 1281.—T.F.B.

XXIII.—ANALYTICAL PROCESSES.

Copper ; Determination of ——. Modification of the iodine method. E. C. Kendall. J. Amer. Chem. Soc., 1911, 33, 1947—1952.

Delay in the determination of copper by the iodine method is due to the time necessary for the removal of the nitrous acid formed. This is now accomplished by the addition of a small amount of sodium hypochlorite, with the result that free chlorine is formed. This is removed from solution by means of phenol, chlorophenol being formed : as chlorine oxidises phenol to compounds which prevent the determination of copper, it is essential that all of the phenol must be added quickly to the solution. In dissolving the copper or copper salt, too much nitric acid is to be avoided, otherwise nitrophenol will be formed. The procedure is as follows : The copper if present as metallic copper, oxide or sulphide is dissolved in nitric acid, sufficient being taken to give between 100 and 300 mgrms. of copper. The volume of the solution should be between 50 and 60 c.c., and the acidity is adjusted to equal 4—5 c.c. of concentrated nitric acid. The sodium hypochlorite solution is made by boiling together a mixture of 112 grms. of calcium hypochlorite and 100 grms. of anhydrous sodium carbonate in 1200 c.c. of water. The solution is filtered and its strength ascertained with iodine and sodium thiosulphate : it is finally adjusted so that 5 c.c. are equivalent to 30 c.c. of $N/10$ sodium thiosulphate. 5 c.c. of hypochlorite solution are added to the copper solution, which is well mixed until the colour changes from a clear blue to a greenish tint. For weights of copper up to 200 mgrms., 2—3 c.c. of the hypochlorite are sufficient ; for larger amounts more may be needed, but 5 c.c. will be sufficient for any amount of copper which would be determined by this method. The solution is allowed to stand for about 2 minutes, as the reactions between the hypochlorous and nitrous acids require an appreciable time. 10 c.c. of a 5 per cent. colourless solution of phenol are now added as quickly as possible, the chlorine gas which remains in the flask above the liquid is removed by blowing, and the sides washed with a jet of water. Sodium hydroxide (20 per cent.) is at once added until a very slight precipitate is obtained : if the solution is allowed to stand before neutralisation, nitrophenol will slowly form. The solution is next made acid by the addition of a few drops of 50 per cent. acetic acid, 10 c.c. of a solution containing 3 grms. o potassium iodide are added and the titration is made wit standardised thiosulphate. For the accurate titratio two solutions are used, of the one, 1 c.c. = 6 mgrms. o copper ; of the other 1 c.c. = 1 mgrm. of copper. The strong solution is added until the iodine liberated gives a light straw colour to the solution, starch is then added and the titration finished with the weak solution. The colour at the end is somewhat cream ; when the end point is nearly reached a drop of the thiosulphate is allowed to fall into the centre of the flask : if a change of colour occurs another drop is added. The results quoted indicate a high degree of accuracy for the method.—E.F.A.

Lead ; Electrolytic determination of ——. J. G. Fairchild. J. Ind. Eng. Chem., 1911, 3, 902—903.

In the separation of lead as peroxide, the author has found that in order to obtain good deposits, the two most essential conditions are the use of hot solutions (50°—60° C.) and an initial low amperage. 200 c.c. of electrolyte are used, containing 30 c.c. of strong nitric acid and about 0·1 grm. of lead. The solution is heated to 50°—60° C. in a 250 c.c. beaker and electrolysis started with a current of 0·25 ampère between cylindrical platinum electrodes (anode, 25 sq. in., and cathode 12 sq. in.). After 1½ hours, the current is raised to 0·5 ampère, and after a further half hour the separation of the lead should be complete. The anode should be burnished frequently and ignited previous to use. For lead scrap and furnace dross, the lead is first precipitated as sulphate, which is dissolved in hot ammonium acetate solution ; nitric acid is added to the solution and electrolysis conducted as before. When a relatively large amount of copper is present, only 20 c.c. of nitric acid should be added.—A. S.

Determination of volatile matter in coal. Parr. *See* IIa.

Physical and chemical properties of petroleum oils of the San Joaquin valley, Cal., U.S.A. [Electrically heated still for fractional distillation]. Allen and Jacobs. *See* IIa.

Determining the melting point of pitch. French. *See* III.

Reduction of neutral permanganate solutions by sulphates. Tscheishwili. *See* VII.

Analysis of chlorates. v. Buttlar. *See* VII.

Detection of excess of colophony or of added rosin oil in oil of turpentine. Delfour. *See* XIII.

Determination of total sulphur in vulcanised rubber. Hübener. *See* XIV.

Report on leather analysis. Veitch. *See* XV.

The Andrlík urea method of polarisation [in the Clerget process] for cane products. Cross and Taggart. *See* XVII.

Still-ebullioscope for analysing alcoholic liquids. Fr. Pat. 431,736. *See* XVIII.

Determination of the total solids of milk. Splittgerber. *See* XIXa.

Quantitative separation of organic phosphorus compounds in foods from phosphates. Fingerling and Hecking. *See* XIXa.

Separation of the seven permitted coal tar colours [U.S.A.] in mixtures. Price. *See* XIXa.

Detection and determination of small quantities of ethyl and methyl alcohols and formic acid. Bacon. *See* XIXa.

Detection of æsculin in drugs by micro-sublimation. Tunmann. *See* XX.

Pharmacopœial assay of citral in lemon oil. Rippetoe and Wise. *See* XX.

Colour reaction of peppermint oil. Umney. *See* XX.

Addition of organic acids to unsaturated hydrocarbons. [Acetylation of essential oils]. Sievers. *See* XX.

Test for camphor. [Detection of synthetic camphor.] See XX.

PATENTS.

Alcohol meter. E. Gibaudan, Narbonne, France, and Comp. pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, Paris. Eng. Pat. 14,510, June 19, 1911. Under Int. Conv., Aug. 17, 1910.

CLAIM is made for an alcohol meter which records the total volume of pure alcohol contained in aqueous solutions (distillates) of variable strengths passed through it. It comprises a combination of a volumetric drum and an alcoholometric float. The latter, which is in the form of a portion of an upright ring (torus-shaped) movable about a horizontal axis at its centre, is contained in a vessel of similar shape and carries a pointer which indicates on a scale of equal divisions, the percentage of alcohol by volume contained in the liquid in the meter. Deviations from the normal temperature (15° C.) are automatically compensated by slight displacement of the scale effected by a thermometric device. A second, independent, pointer normally rests upon the one already mentioned, indicating the same reading on the scale; but each time the volumetric drum makes a complete revolution, *i.e.*, each time a certain volume of liquid has passed through the meter, the independent pointer is automatically brought back to the zero of the scale, traversing therefore a distance proportional to the alcohol-content of the liquor. The motion of the pointer in passing to the zero is communicated to a ratchet-wheel actuating a totalising mechanism, the reading of which at any time thus indicates the volume of pure alcohol which has passed through the meter. By means of a thermometric device immersed in the liquid, the motion of the independent pointer is adjusted in such a way as to introduce, when necessary, a temperature-correction in the volume of alcohol registered.—J. H. L.

Testing air or other gases and liquids by their action in changing the colour of a liquid reagent; Apparatus for ——. M. Arndt, Aachen, Germany. Eng. Pats. 27,253, Nov. 23, 1910, and 18,502 and 25,261 of 1911, dated Nov. 23, 1910.

SEE Ger. Pats. 231,117 and 231,178, and Fr. Pat. 422,883 of 1910; this J., 1911, 511 and 714.—T. F. B.

Testing the freshness of milk. Eng. Pat. 26,264. *See* XIXA.

Books Received.

CHEMIKER-KALENDAR, 1912. Ein Hilfsbuch für Chemiker, Physiker, Mineralogen, Industrielle, Pharmazeuten, Hüttenmänner, u.s.w. Von Dr. RUDOLF BIEDERMANN. In zwei Bänden. Dreiunddreissigster Jahrgang. Julius Springer's Verlag, Monbijouplatz 3, Berlin, 1911. Price M. 4.40. Bound in leather, M. 5.40.

PART I.—Arranged as a pocket-book and strongly bound in waterproof cloth or in leather. It contains an almanack for 1912, together with a table of the frequently used atomic weights and their multiples. The general text refers principally to matters of purely chemical interest. I. Atomic and molecular weights. II. Different properties of chemical substances. III. Gas and vapour densities. Specific gravities. (i) Alkalis. (ii) Acids. (iii) Salts. (iv) Alcohols, etc. IV. Solubilities. V. Analysis. VI. Volumetric analysis. VII. Electrochemical analysis. VIII. Gas analysis. IX. Spectrum analysis. The matter in these various groups is chiefly arranged in tables described as "Hilfstabellen." A note-book calendar with blank pages for notes, is arranged for the different days of the year. The subject matter, exclusive of the calendar and the blank pages for notes, fills 400 pages. A tabular arrangement of the relative coinage values of the world now follows. One side of the external cover of the little volume is utilised as a centimetre scale measure.

PART II.—Supplementary volume in size similar to the pocket book and similarly bound, accompanies PART I., and is more directly concerned with chemical technology. It contains tables relating to:—I. Physics and physical-chemistry. II. Mineralogy. III. Technical chemical analysis and investigation. IV. Special items, recipes, etc. Besides the tabulated matter, however, there are concise descriptive paragraphs of introductory character, with descriptions of analytical methods. The subdivisions are as follows:—(1) Water. (2) Assaying. (3) Fuels. (4) Sulphuric acid. (5) Alkali. (6) Bleaching powder. (7) Nitre and explosives. (8) Ceramics. (9) Glass. (10) Mortar and cement. (11) Illuminants. (12) Starch and sugar. (13) Fermentation industries. (14) Fats and oils. (15) Essential oils and perfumery. (16) Tanning agents. (17) Textile fibres and paper. (18) Photography. (19) Dyestuffs and colours. (20) Physiological chemical analysis. (21) Appendix. The subject matter fills 641 pages.

SPRECHSAAL-KALENDAR, 1912, FÜR DIE KERAMISCHEN, GLAS- UND VERWANDTEN INDUSTRIEN. Herausgegeben von Dr. J. Koerner. Verlag von Müller und Schmidt. Coburg, 1912. IV. Jahrgang. Price M. 2.50.

SMALL volume in pocket-book form, bound in waterproof linen. It contains a calendar with blank pages subdivided for each day of the year, and 46 blank pages for additional notes. The subject matter fills 160 pages devoted to the purely scientific data and tables to begin with, followed by carefully arranged tabulated and other matter relating to fuel, clays, etc., and likely to be of service to those engaged in the ceramic, glass, pottery and earthenware industries.

KOLLOIDCHEMISCHE BEIHEFTE. (Ergänzungshefte zur Kolloid-Zeitschrift.) Monographien zur reinen und angewandten Kolloidchemie. Herausgegeben von Dr. Wo. Ostwald. Bd. III. Heft 3—4. Theodor Steinkopff's Verlag. Dresden. 1911.

8VO size, and contains 160 pages of subject matter, as follows:—I. Adsorption equilibrium in Graham's ferric oxide hydrosol. By P. MAFFIA. This article fills 122 pages and has five illustrations. II. Studies on vegetable colloids. The swelling of starch in solution in presence of crystalloids. By MAX SAMEC. Fills 38 pages, and has seven illustrations.

COCOA AND CHOCOLATE. THEIR CHEMISTRY AND MANUFACTURE. By R. WHYMPER. J. and A. Churchill, 7, Great Marlborough Street, London. 1912. Price 15s. net.

LARGE 8vo volume, containing frontispiece showing cacao pods, 316 pages of subject matter, including a bibliographic list, and 19 illustrations, followed by an alphabetical index of subjects. In the classification of the subject matter, the latter is divided into three parts, as follows:—I. History, botany, and agriculture of cacao; including: A. Selection of site, soil, manure, and seed. B. Planting, diseases, pruning, and picking. Fermentation of the beans. Characteristics of the principal kinds of commercial cacao beans, and their composition. II. Manufacture of chocolates and cacoa powders. III. Chemistry of cacao. A. Survey of the components of cacao and chocolate. B. Methods of analysis. APPENDIX. Provisional definitions and standards of cacao and its preparations.

*New Books.

Adressbuch der Farben-, Lack- u. Firnis-Industrie sowie der Leim- u. Klebstoff-Industrie f. Deutschland u. Oesterreich-Ungarn. 1911-12. (X, 372 u. 56 S.) gr. 8°. Berlin, Union, Zweigniederlassg. Cloth M. 5.

Albe, E. E. F. d': Contemporary chemistry; a survey of the present state, methods and tendencies of chemical science. N.Y., Van Nostrand. 1911. 16+180 p. D. $1.25.

Allen, A. H., M.D.: Commercial organic analysis. v. 5. Tannins, analysis of leather, dyes and colouring matters, dyestuffs of groups 6 to 12, colouring matters in foods, inks. 4th ed. Phil., Blakiston. 1911. 9+704 p. 8°. $5.

Bernthsen, Prof. A.: Kurzes Lehrbuch der organischen Chemie. 11. Aufl., bearb. in Gemeinschaft m. Prof. Aug. Darapsky. (XXI, 668 S.) 8°. Braunschweig, F. Vieweg & Sohn. 1911. M. 12; cloth M. 13.

Beucker, J., u. W. H. *Schmidt*: Die Bezugsquellen v. Eisen- u. Metallwaren u. Maschinen in alfabetischer Artikel- u. Firmenfolge. Mit Warenbenenngn. u. besonderen Registern in deutscher, engl. u. französ. Sprache. 6. verb. u. verm. Aufl. (VI, 812 S.) 8°. Hagen, O. Hammerschmidt. 1912. Cloth M. 12.

Böttger, Prof. W.: Stand u. Wege der analytischen Chemie. (55 S.) Bd. 13. Sammlung v. Einzeldarstellgn. auf dem Gebiete der chem., technisch-chem. u. physikalisch-chem. Analyse. Hrsg. v. Dr. B. M. Margosches. Lex. 8°. Stuttgart, F. Enke. 1911. M. 1.80; cloth M. 2.40.

Boll, Dr. P.: Derivate der Strychninsulfosäure u. Oxydation des Bromstrychnins. (Diss.) (54 S.) gr. 8°. Berlin, E. Ebering. 1911. M. 1.30.

Brannt, W. T.: The practical dry cleaner, scourer, and garment dyer: cleaning; purification of benzine; removal of stains, or spotting; wet cleaning; finishing cleaned fabrics, comprising furs, skin rugs, mats, and dyeing feathers, felt, straw and Panama hats, gloves; garment dyeing; stripping; analysis of textile fabrics. 4th ed., rev. and enl., il. by 41 engravings. Phil., H. C. Baird & Co. 1911. c. 20+351 p. il. 12°. $2.50.

Burnell, S. W., and A. J. *Dicks*: Inorganic Chemistry. Cr. 8vo, pp. 372. Ralph Holland. London. 1911. 3s. 6d.

Coste, J. H.: The Calorific Power of Gas. Cr. 8vo. pp. 326. C. Griffin. London. 1911. Net 6s.

David, W. T.: Radiation in Explosions of Coal Gas and Air. 4to, sd., pp. 24. Dulau. London. 1911. Net 2s.

Draper, C. H.: Heat and the Principles of Thermodynamics. New and Revised Ed. Cr. 8vo, pp. 444. Blackie. London. 1911. Net 5s.

Duncan, R. K.: Some Chemical Problems of To-day. 8vo, pp. 262. Harper. London. 1911. Net 7s. 6d.

Formenti, C.: Residui industriali. Utilizzazioni, ricuperi. Milano. 16° fig., p. xx, 376. (Manuali Hoepli). 1911. Lire 3.50.

Hammarsten, O.: A Text-Book of Physiological Chemistry. 6th Ed. Roy. 8vo. Chapman and Hall. London. 1911. Net 17s.

Herwegen, L.: Zusammenfassende Darstellung der Kokereitechnik. (40 S. m. 107 Fig.) 33.5+26 cm. Gelsenkirchen, C. Bertenburg. 1911. Cloth M. 4.

Jaczewski, Prof. L.: Kritische Übersicht der Materialien zur Erforschung der physisch-chemischen Natur der Wasserquellen. (S. 1—54 m. Fig.) Mitteilungen aus dem Jahrbuche der königl. ungarischen geologischen Reichsanstalt. Hrsg. v. der dem königl. ungar. Ackerbauministerium untersteh. königl. ungar. geolog. Reichsanstalt. XIX. Bd., 1 Heft. Lex. 8°. Budapest (F. Kilián's Nachf.). 1911. M. 3.

Jahrbuch f. Photographie u. Reproduktionstechnik f. d. J. 1911. Unter Mitwirkg. hervorrag. Fachmänner hrsg. v. Prof. Jos. Maria Eder. 25. Jahrg. Mit 229 Abbildgn. u. 20 Kunstbeilagen. (VIII, 784 S.) 8°. Halle, W. Knapp. 1911. M. 8; cloth M. 9.50.

Javet, E.: Chimie (Agenda Dunod), 10×15, rel. Dunod et Pinat. Paris. 1911. 3 fr.

Jüptner v. Jonstorff, Prof. H.: Das Eisenhüttenwesen. Eine Übersicht seiner Entwicklg. sowie seiner kulturellen u. wirtschaftl. Bedeutg. (XII, 212 S. m. 123 Abbildgn). gr. 8°. Leipzig, Akadem. Verlagsgesellschaft. 1912. M. 6; cloth M. 6.80.

Knoblauch, Osc., u. Hilde *Mollier*: Die spezifische Wärme cp des überhitzten Wasserdampfes f. Drücke von 2—8 kg/qcm u. Temperaturen von 350—350° C. Berlin, J. Springer. M. 1.

Krusch, Prof. P.: Die Untersuchung u. Bewertung v. Erzlagerstätten. 2. neubearb. Aufl. (XXIV, 569 S. m. 125 Abbildgn.) Lex. 8°. Stuttgart, F. Enke. 1911. 1911. M. 17; cloth M. 18.40.

Levat, D.: Mines et métallurgie (Agenda Dunod), 10×15, rel. Dunod et Pinat. Paris. 1911. 3 fr.

Lodge, R. W.: Notes on Assaying and Metallurgical Laboratory Experiments. 3rd Ed. Roy. 8vo. Chapman and Hall. London. 1911. Net 12s. 6d.

Nernst, W.: Traité de chimie générale, trad. par A. Corvisy. 2^e partie. Transformations de la matière et de l'énergie, fig., in-8°. A. Hermann et fils. Paris. 1911. 10 fr.

Organische Chemie, Die Methoden der. Ein Handbuch f. die Arbeiten im Laboratorium. Hrsg. v. Th. Weyl. 15. (Schluss-) Lfg. (2. Bd. 12 Lfg.) (2 Bd. IV, XXI, XXI u. S. 1319—1462 m. Abbildgn.) Lex. 8°. Leipzig, G. Thieme. 1911. M. 6.20.

Ostwald, W.: L'évolution de l'électrochimie, traduit par E. Philippi (Nouvelle collection scientifique), in-16. F. Alcan. Paris. 1911. 3 fr. 50.

Pechmann, H. v.: Volhard's Anleitung zur qualitativen chemischen Analyse. Zum Gebrauche im chem. Laboratorium des Staates zu München. Im J. 1900 rev. durch: K. A. Hofmann u. O. Piloty. 13. unveränd. Aufl. (IV, 120 S.) kl. 8°. München, M. Rieger). 1912. M. 2.80.

Post, J., et B. *Neumann*: Traité complet d'analyse chimique appliquée aux essais industriels, 2^e édit. rev. et augm. par G. Chenu et M. Pellet. T. III., fasc. 1. Engrais commerciaux. Amendements et fumiers. Terre arable et produits agricoles. Air. Huiles essentielles. Cuirs et matières tannantes. Colle. Tabac. Caoutchouc et gutta percha. Matières explosives et allumettes, 56 fig., in 8°. A. Hermann et fils. Paris. 1911. 15 fr.

Price, W. B., and R. K. *Meade*: The Technical Analysis of Brass and the non-ferrous Alloys. Cr. 8vo. Chapman and Hall. London. 1911. Net. 8s. 6d.

Schmidt, Prof. E.: Anleitung zur qualitativen Analyse. 7. Aufl. (IV, 98 S. m. 6 Tab.) 8°. Halle, Tausch and Grosse. 1911. Cloth M. 2.80.

—— Ausführliches Lehrbuch der pharmazeutischen Chemie. II. Bd. Organische Chemie. 2. Abtlg (Schluss.) Organische Verbindgn. m. geschlossenem Kohlenstoffringe. Nachträge. Verzeichnis einiger älterer Autoren. Sachregister. Berichtigungen. Mit 25 Textabbildgn. u. 1 farb. Spektraltaf. 5. verm. Aufl. (XXVII u. S. 1021—2290). gr. 8°. Braunschweig, F. Vieweg and Sohn. 1911. M. 29; cloth M. 31.50.

Stich, C., u. C. *Wulff*, Drs.: Bakteriologie u. Sterilisation im Apothekenbetriebe. Mit eingeh. Berücksicht. der Herstellg. steriler Lösgn. in Ampullen. 2., vollständig umgearb. u. wesentlich erweit. Aufl. Mit 105 teils mehrfarb. Textabbildgn. u. 3 Taf. (VIII, 275 S.) 8°. Berlin, J. Springer. 1912. Cloth M. 8.

Urbain, G.: Introduction à l'étude de la spectrochimie, 9 pl., in-8°. A. Hermann et fils. Paris. 1911. 10 fr.

Vigneron, H.: Electrochimie (Encyclopédie électrotechnique, fasc. 44) in-8°. L. Geisler. Paris. 1911. 2 fr. 50.

Vogel, Dr. E.: Ueber die Temperaturänderung v. Luft u. Sauerstoff beim Strömen durch e. Drosselstelle bei 10° C. u. Drücken bis 50 at.—Soennecken, Dr.-Ing. Alfr.: Der Wärmeübergang v. Rohrwänden an strömendes Wasser. Berlin, J. Springer. M. 1.

Zänker, Dr. W.: Die Kalkulation u. Organisation in Färbereien u. verwandten Betrieben. Ein kurzer Ratgeber f. Chemiker, Koloristen, Techniker, Meister u. Kaufleute in Färbereien, Druckereien, Bleichereien, Chemisch-Wäschereien, Appreturanstalten, Textilfabriken usw. (X, 72 S.) 8°. Berlin, J. Springer. 1911. Cloth M. 2.40.

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* Compiled by H. Grevel and Co., 33, King Street, Covent Garden, London, W.C., from whom all the works in the preceding list can be obtained.

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Canadian Section.

Meeting held at Toronto on Thursday, 16th November, 1911.

DR. ANTHONY MCGILL IN THE CHAIR.

FOOD STANDARDS.

(Chairman's Address.)

All foodstuffs, whatever their origin, are by their very nature perishable; and the products of putrefaction and decay, while often positively harmful or poisonous, are always of a kind to lessen or totally destroy the value of the article. Hence it goes without saying that a first consideration in defining a food substance is that it shall be sound. In the case of unmanufactured foods, a condition of definition which can scarcely be objected to, is that the article shall have had its natural or normal origin. For example, milk must be entirely the product of the cow, and maple syrup must be entirely the product of the sap of the maple tree. That potatoes, apples, and other fruit should be of a certain size in order to claim legal currency may be argued, but is of less importance than that eggs should neither be required to be of stated size, or that they should come into commerce by weight rather than by number. The question of the size of eggs was less imperative in days when the purchaser saw what he was buying than it is now, when so many retail purchases are made by telephone. Definition through requiring that the article should have a stated origin is sometimes sufficient to ensure its genuineness, without the introduction of numerical data as to composition or content. Milk, when required to be solely the entire product of the complete milking of one or more cows, is assured of qualitative proximate composition. Not so, quantitatively. The skill of the breeder has resulted in producing Jersey cattle on the one hand, yielding milk with over 8 per cent. butter fat, and Holsteins on the other hand, yielding milk with barely two per cent. fat. It may yet be possible to lower this record, and make the cow but little better than a whey producer. It must surely be within the rights of a community, willing to pay for what it gets, to state just what it is willing to buy and pay for as milk. In Canada, since December, 1910, milk has been legally defined as follows:—"Milk, unless otherwise specified, is a fresh, clean and unaltered product, obtained by the complete, uninterrupted milking, under proper sanitary conditions, of one or more healthy cows, properly fed and kept, excluding that obtained within two weeks before and one week after calving, and contains not less than 3·25 per cent. of milk fat, and not less than 8·5 per cent. of milk solids, other than fat." This does not prevent the sale of any wholesome milk as food, if properly described. It only asserts that the article designated simply as milk, shall have a definite and fixed minimum value. This action of the Governor-in-Council, as empowered by Section 26 of the Adulteration of Food Act fixes a legal minimum value for milk throughout the Dominion of Canada. It does not, however, as I understand the matter, deprive any municipality or any individual of the right to set a higher standard for milk, within the limit of his own jurisdiction. The limit for butter fat in milk is defined by the Adulteration Act as 3·25 per cent. But the City of Ottawa by by-law fixes a limit of 3·5 per cent. The Cities of Brantford and Regina fix the same limit, and there is nothing to prevent the fixing of a 4 per cent. standard, locally, except the danger of excluding the article as producible in the locality.

The producer of a new food is naturally opposed to giving it a new name if an old and well-known name can be made to do. Demand for a new product under a new name has to be cultivated; the public has to be educated, which is a costly matter. Where (as in patent medicines) the name of a largely advertised article is proprietary, the man who would introduce something of a similar kind must devise a new and distinctive name for his preparation, not so much for his own protection, at first, as because the law protects the other man, and forbids infringement. It is different with food names, which are not legally protected; and one of the objects of food definition is the practical copyrighting of these terms in the interest of the public, whose property they are. The manufacturer of olemargarine would fain call his product "butter"; cottonseed stearin, tallow and oil in admixture are offered as "lard"; liquid glucose masks as "syrup"; solid glucose would like to be called "sugar"; acid calcium phosphate prefers to be called "cream of tartar"; dilute acetic acid chooses to be known as "vinegar"; a richly dyed glue solution aims at being sold as "red currant jelly"; cottonseed oil as "olive oil," and so on. It is not that, as in most of these cases, the thing in itself is not well worthy of a place among foods. Cottonseed oil is possibly as desirable a food material as olive oil, but olive oil came to be known first: the taste for it has been developed. There is a demand for olive oil. Only after great expenditure of money, extensive educational work, and much insistent advertising, can a wide demand for cottonseed oil be created. It was therefore introduced in disguise. One American manufacturer sells as "Cottolene," a lard substitute prepared from cottonseed. I wish I could point to more instances of that sort. Corn syrup is another good name for a product that scorns to parade for anything except what it really is—a corn product. The attempt to disguise a glucose syrup under the name simply syrup or table syrup or golden syrup, so long and widely known as a cane-sugar product, should be illegal.

The most important and fundamental conception that underlies the use of names is, of course, that they shall so designate the article as to prevent deception. Whatever a thing is called, that thing it should be. This assumes definite knowledge on the part of the producer and of the purchaser. But language has developed in exactitude only as the ideas held by the users of words have become clearer. It is still found necessary, in philosophic and scientific treatises, to begin by exactly defining the terms which the author proposes to employ. Examples pertinent to our subject are not difficult to find. The word *milk* as the name of a food material used in Canada, means *cows' milk;* but it is evident that this word, in a a Natural History of the Mammalia, would have a much wider comprehension. So with words like flour, bread, salt, alcohol, breakfast food, sugar syrup, &c. Many words which in the first instance, had a perfectly definite meaning, have come to be generic rather than specific. Such are vinegar, beer, syrup, sugar, alcohol, &c.

I have made some suggestions regarding the standardizing of vinegar in Bulletin 223, issued in April last. These exemplify the very converse of the recommendation made with regard to unmanufactured foods; that the definition should begin by requiring the article to have had a stated source or origin. Since changes in mode of manufacture or artificial production are consistent with and in the order of improvement, it would evidently be a mistake to require fixity of method in production. Vinegar, as the name implies, was originally the product of the souring of wine; and, in wine-growing countries, this is still a source of vinegar. But the vinegar made from wines bears a very small proportion to the total vinegar production of the world to-day. We are therefore compelled to look to other characters than its source, if we would define vinegar consistently with modern usage. Vinegar, as produced from wine, contains many other things than acetic acid; but if we would include under this term, all the modern vinegars, we shall find that acetic acid is the only characteristic component common to them all. In other words, the term *vinegar*, used without qualification, means nothing more than pure acetic acid of a certain degree of dilution. This suggested definition is open to criticism. It is not consistent with the definition of vinegar given in the 5th Schedule of the Adulteration Act, which defines vinegar as " A more or less coloured liquid, consisting essentially of impure dilute acetic acid, obtained by the oxidation of wine, beer, cider, or other alcoholic liquid." This is the legal definition of vinegar in Canada to-day. It is evident that it contemplated the acetous fermentation of alcohol, as essential to the production of vinegar. And there are many who would restrict the term as indicated. The Zeitschrift für Nahrungs und Genussmittel of July 15th contains a most interesting and intructive discussion of the subject by the Society of Food Chemists of Germany in its meeting at Dresden. They reached a conclusion in which nothing is concluded.

I think it practically hopeless so to define a manufactured food that we shall be able to say of a sample " This article fulfils the requirements of the definition, and is therefore genuine." What we may hope to achieve is the fixing of numerical or other constants such as shall enable us to say, " This article fails to meet requirements, and is therefore not genuine."

There are some who consider it unwise to publish the analyst's findings, or the basis of his interpretation of these as proving adulteration. They say, it is enough that such data be put in as evidence in Court ; and it is unwise as handicapping further police work, to make unnecessarily public the details of the matter. I remember being taken to task some years ago for mentioning that invert sugar was practically identical with honey, and that a carefully prepared invert sugar, if mixed with honey, was very difficult and often impossible of detection. My critic considered this to be a very dangerous admission, especially so when he learned how easily invert sugar could be prepared.

If we make widely known the characters upon which we base our conclusions as to genuineness, we must expect to have skilfully directed frauds to combat. Manufacturers of surrogate articles will endeavour to meet the requirements of our standards as closely as possible, and may succeed in doing so with such exactness that an imitation product shall be undistinguishable from the real. Where it can be shown that such is the case, and that expert methods, chemical or other, are unable to discriminate between the true and the false, there remains no other way of protecting the public than governmental inspection of manufacture, or the offering of rewards for information that will convict ; and I think that there should be a candid acknowledgment of this fact, as of all other facts.

The case of maple syrup affords a good illustration of the matter in hand. We have relied upon the persistent presence of certain non-sugars in maple syrup, as a means of distinguishing it from simple syrup. These are mainly its ash content, the character of the ash ; and most important, the presence of malic acid and other organic matters, to which the characteristic flavour is due. Based upon the examination of many hundreds of samples of maple syrup, we recommended standards which were made legal on the 25th April last. These required a minimum ash content of 0·5 per cent., a malic acid content of at least 0·4 per cent., and a lead subacetate number not less than 2·2, the process for determining such number being carefully described. Complaints, apparently well founded, were made to the effect that the numerical standards legalised caused undoubtedly genuine maple syrup to be suspected or even condemned. The question became so urgent that I made further investigation ; and 456 samples of syrup, of guaranteed genuineness, have lately been analysed with results confirming in large degree the objections taken to our standards. It appears to be a fact that, with increased care and cleanliness in handling the sap, and improved apparatus in concentrating it, the non-sugar components of maple syrup can be reduced below the amounts fixed as minima by our standards. Particularly is this true of malic acid and the lead subacetate number.

I am quite unable to sympathise with those who would keep hidden facts like these. We want to take no advantage that can be won through keeping others in ignorance. Such victory is contemptible, and is beneath the dignity of any self-respecting individual, to say nothing of officials. If it is, as I hear some say, the basis of profitable trade, then away with profitable trade, and let us remain poor and self-respecting.

An incidental advantage in having a recognised standard is that the article, when genuine and up to standard requirements, may be so described, without the need of giving actual percentage of purity. This may appear a small matter to some, and an undesirable restriction to others, who, if they produce a really superior article—better than standard requirements, would wish to have that fact made public. From the point of view of encouragement to industrial improvement, this contention is reasonable enough ; but in actual working out it amounts to an advertisement of the manufacturer, and a handicap to competitors who nevertheless produce standard goods. The case of cream of tartar may be cited in illustration. The British Pharmacopœia requires, for purified cream of tartar, a content of 97½ per cent. actual bitartrate of potash. It would be unreasonable to refuse recognition to an article which meets pharmacopœal requirements. Yet it is possible to put on the market an article of cream of tartar up to 99 per cent. of bi-tartrate, or even higher. The difference in baking value is not great—but it is easy to make the purchaser believe that the latter article is a very superior one. To the extent of the difference in percentage it unquestionably is superior, and if the object had in view by the Adulteration Act were primarily the encouraging of improvement in quality, it would be right to make note of this fact. But I regard the intention of the Act in question as fundamentally of police character, *i.e.*, the prevention of fraud. It must be left to the manufacturer of higher class goods than the standard demands, to do his own advertising.

The very large question of preservatives in foods demands most careful consideration. My own knowledge of the subject, although I have lost no opportunity of making it as full and complete as possible, is not such as to have led me to positive conclusions. Dr. Wiley wrote me recently as follows : " I expect to continue to work in this country until I see the whole company of preservatives and colouring matters in the bone yard." On the other hand, so great authorities as Dr. Lebbin, of Berlin, the late Professor Liebreich, and others, have, after exhaustive investigations, come to the conclusion that " no objection can be raised, on sanitary grounds, to the use of boric acid as a food preservative." * In his own country a board of thoroughly credible experts has reached the same conclusion † as regards benzoate of soda, which was at first placed under the ban, through the influence of Dr. Wiley. The whole question bristles with difficulties. It won't do to infer that because an article is harmful to health, in certain amounts, we must condemn foods containing it in smaller proportions. Cranberries contain benzoic acid ; spinach contains arsenic ; potatoes contain solanine ; toxalbumins occur in peas and beans ; prussic acid in cherries. Then on the other hand, while no one thinks of completely banishing the time honoured preservatives salt, sugar, vinegar, spices, smoke (creosote), alcohol, it is easily demonstrated that each of these is capable of doing positive injury to digestion in certain cases. It is quite rational to suppose that nature provides these substances to the fruits containing them for the very purpose of restraining too ready decay. And this may be true of tannic, citric, and other organic acids, so widely distributed throughout the vegetable kingdom. The following sentence from the pen of Dr. Roseman, a distinguished food chemist of Germany, is worth noting :—" When the advocates of total abstinence maintain that whatever is harmful in large quantities is not unharmful even when in small quantities, they are maintaining a proposition which is undoubtedly untenable." ‡ I cannot but endorse this statement. Indeed it is safe to say that there is no form of food which may not do harm, if used beyond a proper and needed amount. Very few of us die of starvation, while our hospitals and cemeteries are full of the victims of gluttony.

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* Die Medicinische Woche, 23 Sept., 1901.

† Food Inspection Decision 104. Cancelling F.I.D. 76 and 89.

‡ Pure Products, Vol. VII., p. 559.

It is in the nature of food that it is perishable. Few, if any, are so placed as to command fresh food throughout the whole year; many, perhaps most of us, are forced to resort to preserved foods all the year round. The canning of foods is expensive, and even when carried out with every practicable precaution is not a guarantee of safety. Apart from the possibility that here and there a can may escape complete sterilization, we must recognise that the material of the can and the solder used are elements of danger. No attempts to preserve meats, on the large scale, by hermetical sealing, can hope for commercial success. Think what it would mean to apply this method of preservation to ham and bacon, to fish and meat, in the large way.

For the conservation of these articles we must resort to chemical preservation, whether by the older antiseptics, salt, saltpetre, creosote, or by the newer ones, borax, benzoates, &c. All are objectionable, and I cannot help thinking that had the last named been used by our ancestors, and salt, sugar, and smoke but lately been introduced, the same objections would be urged against these as are now employed against their supplanters. It is wonderful how tolerant we become to old acquaintances. The natural products of decay are so wholly revolting and dangerous, that we are compelled to seek some method of preventing decay. It is asserted that, since 1906, there are 26,311 recorded cases of ptomaine poisoning in the United States, of which 1078 proved fatal. What the number might have been but for the use of preservatives, it is terrible to think of. Most of these cases, it is true, come from the improper use of canned meats and milk. The contents of a can are not wholly disposed of when first opened; the partially filled can is set aside, and putridity, not necessarily so intense as to appeal to the senses, sets in before the remainder is used as food. It is generally known that a sterilized food undergoes a more dangerous form of decomposition when once decay sets in, than is the case with a normal one.

Not all microbial life is inimical to health. Sterilization destroys all alike, and the putrefactive organisms are liable to be first in the field, when the way is left open to them. Whether we view the matter from the point of view of economy in production and distribution, or from that of safety to the health of the consumer, it is difficult to see how we can altogether dispense with preservatives.

It remains to devise means of regulating their use. Broadly speaking, they fall into two classes: 1st. Those which declare their presence to the senses; 2nd, those whose presence can only be ascertained by special (usually chemical) tests. To the first class belong most of the older preservatives; *e.g.*, salt, sugar, vinegar, spices, alcohol, smoke, essential oils, fixed oils and fats. The fact of their presence being known to the consumer, it only remains for him to acquaint himself regarding their dangerousness in his own case. While most of us are able to use sugar with impunity, there are some to whom it is harmful; and this is probably true of most of the other substances named. We cannot undertake to protect by legislation the wilfully ignorant.

The second class of preservatives comprises the so-called "chemical preservatives," of which boric acid and borax, benzoic acid and benzoates; salicylic acid and salicylates, formaldehyde, formic acid, fluorides, β-naphthol, abrastol, and saccharin, are most in evidence at present. They are characterised by a much greater potency than the older preservatives. There can be no doubt whatever that they are capable, in certain quantities, of doing serious injury to health. This is, however, true of the substances of the first class; indeed, must in the nature of the case be true of any effective preservative added to food. The only question for the expert is, can they be employed in quantities so small that, while efficacious for purposes of preserving otherwise perishable foods, they are without harmful effect on the health? This is clearly a matter to be established by evidence. We have available to us the results of prolonged, painstaking, and elaborate research, and the results are very contradictory in most cases. It is regrettable that some of the most elaborate of these researches have too evidently been undertaken and prosecuted with a bias. Sometimes the investigator has sought to establish a preconceived opinion hostile to preservatives; more frequently he has carried out his research in the interests of employers who had financial interests at stake; and however high principled he may have been, it remains that his hope took a certain definite direction. This is only human nature; and we know how often the wish is father to the thought.

It seems to me that the consensus of opinion of medical men, in actual practice, would go a long way towards giving us the information needed. The opinion of single individuals may be worthless, from many causes; the opinion of the profession, as a whole, would carry greater weight. I have before me information to the effect that the Medical Council of the Prussian Government at Berlin, has unanimously recommended that benzoic acid and its salts be excluded from all food products.*

Where foods are specially intended for the use of infants and invalids, I think it is desirable that they should be entirely free from potent chemical preservatives. It seems also reasonable to demand that whenever a preservative which does not indicate its presence to the senses of the purchaser, as by taste, smell, or other property, the fact of the presence of such preservative should be plainly stated on the label.

It is further clear that no greater amount of any chemical preservative should be permitted than the minimum amount necessary to give keeping quality to the food containing it; and, when it is ascertained that any substance requires to be added for efficient preservation, in amounts dangerous to health, such substance should be entirely prohibited by law.

It is often urged against the use of preservatives that they make it possible for the manufacturer to be careless as regards the soundness of the material he uses, or uncleanly in his methods of work. This is really not an argument against preservatives; but is a strong argument for the most efficient inspection and control of all places where food is prepared. If preservatives are capable of disguising decayed meats or vegetables, and making them saleable commodities, such preservatives must belong to the class which possesses distinct sapience and flavour. I can conceive of salt, vinegar, and spices being used to conceal putrefactive change; but it is difficult to see how the so-called chemical preservatives, in the minute quantities in which alone they can be used, and themselves being by nature tasteless and odourless, could possibly disguise organic decay.

No country in the world has taken the step of legally prohibiting the employment of preservatives, even of the newer, so-called chemical preservatives. I do not understand, how, in the light of our present knowledge, such a step could be taken and maintained. To forbid the use of the newer preservatives, while condoning the older ones, would be irrational, as there is no greater evidence of the harmfulness of boric acid than can be produced for the harmfulness of common salt, or vinegar, in excess. Of course the limit of danger has to be set lower, as a percentage weight, for boric acid than for salt; but when the specific inhibitive power of each is made the basis of comparison, these antiseptics are found to be in the same class.

The question of colouring matter is too large to be fully discussed here. The Act prohibits the use of colouring matters when these are harmful to health, or employed for the purpose of fraud, as in making an article seem to be what it is not, or in enhancing the apparent value of an inferior product. The use of colours to give attractiveness to a food, without violating the above-named conditions, cannot be objected to. Not only candies, but cheese, butter, cake-icing, and other foods are legitimately coloured for this reason. An interesting case is the use of copper in colouring peas. Canned peas, particularly those known as French peas, are given an attractive green colour by the use of copper salts. The copper appears to form an insoluble compound with the legumin of the pea, and it is found that the desired result can be attained with less than 100 parts of metallic copper per million parts by weight of the peas (1 part in 10,000). This minute amount of copper has not been shown to have any harmful effects upon health. When exceeded, the excess of copper can be washed out by water, in great part, and would therefore be extracted in boiling the peas. Since, however, the water used in boiling might be served with the peas, it has been recommended to fix 100 parts per million (0·7 grain per pound) as a maximum for copper in peas. I should like to have an expression of opinion upon this subject.

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* Private communication from Dr. Wiley.

Liverpool Section.

Meeting held at the University on Wednesday, November 22nd, 1911.

MR. ARTHUR CAREY IN THE CHAIR.

RECENT PROGRESS IN THE MANUFACTURE AND APPLICATION OF HYPOCHLORITE SOLUTIONS FOR BLEACHING AND DISINFECTING PURPOSES.

BY JOHN B. C. KERSHAW.

(ABSTRACT.)

The author in this paper reviewed the progress made recently in the manufacture and application of hypochlorite solutions for bleaching and disinfecting purposes, both chemical and electrolytic methods being dealt with. The reason for the comparatively slow progress of the electrolytic method in the United Kingdom will be evident from an examination of the figures for comparative efficiencies and costs given later. In other countries, and under other conditions of power supply and cost of raw materials, more rapid progress has been attained; and both in Germany and America, electrolytic methods of preparing hypochlorite solutions have been very widely adopted, over 700 electrolysers of the two leading types being now in use in the textile and allied industries or in Public Hospitals and similar institutions in those two countries.

I.—Chemical methods of preparing hypochlorite solutions.—The author described the processes of preparing bleaching powder solutions, and of converting this into sodium hypochlorite solutions by means of soda ash or salt cake. These methods possess the advantage of enabling solutions of any desired strength to be readily prepared.

II.—Electrolytic methods of preparing hypochlorites.—When a solution of sodium chloride is electrolysed, using carbon or platinum anodes, the caustic soda formed by the action of water on the sodium liberated, unites with the chlorine to form hypochlorite. This reaction only occurs satisfactorily below 25° C., chlorate being produced at higher temperatures. Charles Watt, in Eng. Pat. 13,755 of 1851, was the first to patent this process, and to recognise the necessary conditions, which are: (1) Insoluble electrodes; (2) absence of diaphragm; (3) low temperature of electrolyte; (4) rapid circulation of electrolyte from cathode towards anode. Following is a description of the electrolytic cells in use in this country at the present time.

The Haas and Oettel electrolyser.—The latest form of this electrolyser makes use of carbon as electrode material, and of the liberation of hydrogen at the cathode to effect automatic circulation and mixing of the liquid in the cell. The inner or working cell is a rectangular stone-ware tank divided by the carbons into 30 narrow compartments or cells, each of which has one hole at the bottom and two others at the sides about two inches from the top. The first and last carbons of the set form the main electrodes of the cell; the intervening carbons act as secondary electrodes *i.e.*, as anodes on the one face and cathodes on the other. This inner cell is supported on a brick foundation within a stone-ware tank measuring 72 in. by 48 in. by 36 in. deep, and is filled with a 15 per cent. solution of brine to within four inches of the top. The carbons are protected at their top and bottom edges with slips of glass of the same width as the carbons, which prevent short-circuiting due to dirt and sludge, and also prolonging the life of the carbons. A continuous current of 80 ampères at 100 volts is employed to work this electrolyser, and as soon as electrical connection is made the evolution of hydrogen at the negative or cathode surface of the electrodes causes the level of the liquid within the cells to rise above the overflow pipes and a rapid circulation of the brine occurs, fresh liquor flowing in at the bottom of the cells. The liquor passing away at the top of the cells flows over cooling plates, and when necessary the heat produced by electrolysis is further dispersed by aid of cooling pipes placed in the layer containing tank.

The following figures give the yields of the industrial type TE/3 of this electrolyser:—

Capacity.—750 litres of brine. Strength 15 per cent. Salt required, 112 kilos.

Current.—75 to 80 ampères at 110 volts for 10 hours, equivalent to 88 B. T. Units.

Yield.—750 litres hypochlorite solution containing 14 grms. of free chlorine per litre, equivalent to 10·5 kilos. of chlorine.

The carbon electrodes are reported to have a life of 18 months for a 10-hour working day and to cost for renewal £6 10s. 0d. per set. The labour required for operating this type of electrolyser is about 1 hour per day, as when once charged with fresh brine it can be left for 10 hours with but slight attention. The current efficiency falls from 95 per cent. to 52·8 per cent. during the 10 hours required to produce a solution containing 14·0 grms. of chlorine per litre, the highest efficiency being obtained with a concentration of 2·5 grms. of chlorine per litre.

The Kellner electrolyser consists of a shallow stone-ware tank divided into a large number of narrow cells by means of vertical glass plates so arranged that the electrolyte is obliged to take a zig-zag course in its passage through the electrolyser. The electrodes are formed of platinum-iridium gauze, and are arranged horizontally with the anodes below the cathodes so that the chlorine liberated at the former may be absorbed by the supernatant liquid. This electrolyser has only two terminal electrodes, and all the intervening electrodes function as secondary electrodes as in the Haas and Oetell apparatus. The electrolyser is constructed usually to take a current at 110 volts. Brine is passed continually through the apparatus until the desired concentration of chlorine is attained, a small centrifugal pump being employed to circulate the brine through the electrolyser and an external cooling vessel being used to keep down the temperature below 25° C. Using a 10 per cent. solution of salt the current efficiency falls from 87·5 per cent. to 45·8 per cent. in 10 hours, the free chlorine rising from 3·09 grms. to 12·95 grms. during this period. The following figures give the yield of the industrial type (2 ESn 60/9) of this apparatus:—

Capacity.—820 litres of brine. Strength 15 per cent. Salt required, 123 kilos.

Current.—90 ampères at 110 volts for 10 hours, equivalent to 99 B. T. Units.

Yield.—820 litres of hypochlorite solution containing 20 grms. free chlorine per litre, equivalent to 16·4 kilos. of chlorine.

The life of the platinum-iridium electrodes is of course much longer than that of the carbon electrodes employed in the Haas and Oettel electrolyser, and their scrap value is considerable; but on the other hand they are not indestructible, and if the brine contains magnesium salts the deposits of these cause trouble.

The Hermite electrolyser.—The distinctive features of this cell and process are the uses of a mixture of sodium and magnesium chloride as electrolyte, of magnesium hydrate as a preservative, and of zinc as negative element in the cells. The electrolyte is prepared in an elevated tank and is allowed to flow by gravity through a series of four double troughs. These troughs were formerly made of slate, but are now constructed of glazed earthenware and each is divided by a partition which causes the electrolyte to pass twice along the length. Each division of the trough contains five sets of electrodes, two negative electrodes of zinc enclosing one positive electrode formed by winding thin platinum wire upon a perforated porcelain slab of the required shape. There are thus six separate cells containing 40 pairs of electrodes in the one unit of plant, and a current of 15 ampères at 230 volts is employed, the electrodes and cells all being connected electrically in series. The electrolyte passes between each of the electrodes in its passage from the inlet to the exit; the flow from one trough to the next being controlled as shown by glass syphons and funnels. A small addition of sodium hydroxide solution is made to the liquid as it flows from the last trough, glass carboys being employed to receive the mixed solution of calcium and magnesium hypochlorites. The capacity of each unit of plant is 185—200 gallons of solution, at a strength of 4 to 6 grms. of chlorine per litre, per 8-hour day, the rate of flow of electrolyte being 3½ pints per minute. The first unit of plant at Poplar was erected at the beginning of 1906 and cost with all the necessary accessories £583; the second unit erected at the beginning of 1910 cost £501. The running cost (electricity, water, chemicals, and supervision and testing) for the half-year ending September 30th, 1910, amounted to £100, but this total does not contain any allowance for interest, depreciation, rent, or distribution charges. The net cost of one Hermite electrolyser is £325.

The Vogelsang electrolyser.—The original form of Vogelsang electrolyser resembled in its main constructive features the Hermite and Kellner electrolysers, the electrolyte being made to take a vertical zigzag course through a trough filled with a large number of secondary electrodes. Lead plates faced with platinum on the anode side, were used as the intermediate electrodes, and by varying the number of these the electrolyser could be made to take a current of 85 amperes, at 65 or 110 volts. An electrolyser of this type was said to have produced 20 kilos. of active chlorine in a 10-hours working day, equivalent to a yield of 1 kilo. of active chlorine per 6·6 E.H.P. hrs. or an energy efficiency of 35·8 per cent. The use of lead for electrodes did not however prove satisfactory and the Vogelsang cell has been considerably modified. The electrolyser now worked at Nottingham and other places abroad is constructed with composite electrodes. Narrow bars of slate extending the full width of the cell are wrapped with a sheet of platinum-iridium foil in zigzag fashion, the result being an electrode of great strength which can carry high current densities, and presents opposing surfaces of foil where required. The sectional area allowed for carrying the current through the electrode (from one face to the other) should be proportioned to the superficial electrode surface in contact with the electrode.

The Mather and Platt electrolyser resembles that of Kellner and is constructed with 39 electrodes made of a platinum-iridium alloy, and with two terminal electrodes for connection to the current mains. The 40 cells into which the electrolyser is divided by plate-glass strips and so arranged that the electrolyte takes a zig zag course, and attains a strength of 7 grms. of chlorine per litre at the exit of the electrolyser. A current of 19⅓ amperes at 2·2 volts for 10 hours is stated to yield 7 kilos. of active chlorine, equivalent to 6 K.W. hours per kilo. of active chlorine. The strength of salt solution used is 6 per cent., and cooling tanks are employed both for the brine and the electrolysed liquor.

Taking the figures given in the above descriptions of the various forms of electrolytic hypochlorite cell, we obtain the following figures for their relative yields and efficiencies:—

Type of cell.	Salt used.	K.W.-hours.	Active chlorine in kilos.
Haas and Oetell	112·5 kgs.	80 × 110 × 10 88	10·5
Kellner	90·0 kgs.	90 × 110 × 10 99	15·0
Hermite	35·7 kgs. NaCl 10·8 kgs. $MgCl_2$ equal to 49·00 kgs. NaCl	15 × 230 × 8 27·6	4·35
Mather and Platt ...	—	19·33 × 220 × 10 42·52	7·00
Theory demands	·947 kg.	1·00	0·574

	Salt used.		Power used.	
	Kilos.		K.W.-hours.	Energy efficiency.
		per cent.		per cent.
Hass and Oettel	10·70	15·5	8·4	21
Kellner	6·00	27·5	6·60	26·5
Hermite	11·20	14·5	6·34	27·0
Mather and Platt	—	—	6·07	28·6
Theory demands	1·65	100	1·74	100

These figures show that the Hermite cell is the most efficient as regards power consumption, and that the Kellner cell is the most economical in salt; although in neither case is a working efficiency of 50 per cent. attained. The superior energy of the Hermite cell is chiefly due to the fact that the hypochlorite solution finally obtained, has a concentration of only 5 grms. of chlorine per litre, as compared with 14·0 grms. for the Haas and Oettel electrolyser and 25·0 grms. for the Kellner type of cell. As already stated the current efficiency of any hypochlorite cell diminishes rapidly as the electrolysis proceeds, due to causes which are inherent to all processes of this character.

III.—Relative bleaching efficiencies of chemical and electrolytic chlorine.—The early claims made for the superior bleaching efficiency of chlorine produced by electrolytic methods have been modified by the results of recent independent research, and it is now generally accepted that there is but slight difference (not exceeding 5 per cent.) between the bleaching effects obtained, if the chlorine be present in the same form of combination and in the same degree of concentration in the various bleaching liquors. Important contributions to the subject have been made by Fraass (Papierfabrikant, 1909, 232,257, see this J., 1909, 380) and Higgins (this J., 1911, 185).

IV.—Comparative costs of chemical and electrolytic chlorine.—The costs of power, raw materials, and labour differ so much in various districts and localities that no very decisive figures can be given for the relative costs of the chemical and electrolytic methods of preparing bleaching liquors. The following estimate is for a bleaching installation in South-West Lancashire, within 50 miles of the Cheshire salt field, with cheap fuel, chemicals, and labour all at hand. The figure for power costs, namely 0·425 pence per unit, has been obtained from the chief Engineer of the City of Manchester Electricity Undertaking, and represents what would be charged to a consumer for a steady load of 80—100 units per day. It is interesting to note that the cost of generating electricity at Manchester is given in the official returns as 0·54 pence per unit, so that the power is sold to day-users at 20 per cent. under cost price. It is certainly doubtful if any small private installation could produce at so low a figure. The amounts charged for depreciation of the electrolysers is small; but glazed earthenware containing-vessels and platinum electrodes should have a long life, and with proper care 7·5 per cent. depreciation on the whole electrolyser plant, should be sufficient to meet the costs of necessary renewals.

A.—Chemical methods.

(1). *Calcium hypochlorite.*—Taking 35 per cent. bleach at £4 12s. 6d. per ton. d/d. and assuming that 5 per cent. of the chlorine is lost in making up the bleach solution, the cost per ton of active chlorine will be as follows :—

	£	s.	d.
3 tons bleach at £4 12s. 6d. per ton.....	13	17	6
Labour, 8 hrs. one man	0	4	6
Interest and depreciation on plant, 10 per cent. on £100	0	0	8
	£14	2	8

(2). *Sodium hypochlorite.*

(*a*). *Using soda ash* at £4 5s. 0d. per ton d/d to decompose the calcium hypochlorite solution, the cost per ton of active chlorine will be as follows, assuming as before that 5 per cent. of the chlorine is lost in the process.

	£	s.	d.
Bleach, 3 tons at £4 12s. 6d. per ton......	13	17	6
Soda ash, 1·9 tons at £4 5s. per ton	8	1	5
Fuel, 5 cwt. at 10s. per ton	0	2	6
Labour, two men, 8 hrs....................	0	9	0
Interest and depreciation on plant, 10 per cent. on £200........................	0	1	4
	£22	11	9

(*b*). Using salt cake at £2 2s. 6d. per ton and soda ash at £4 5s. 0d. per ton to decompose the calcium hypochlorite solution; the cost of active chlorine per ton will be :—

	£	s.	d.
Bleach, 3 tons at £4 12s. 6d. per ton......	13	17	6
Salt cake, 2·4 tons at £2 2s. 6d.	5	2	0
Soda ash, 3 cwt. at 4·25 shillings per cwt.	0	12	9
Fuel, 5 cwt. at 10s. per ton	0	2	6
Labour, two men, 8 hrs....................	0	9	0
Interest and depreciation on plant, 10 per cent. on £200	0	1	4
	£20	5	1

B.—Electrolytic methods.

Taking the best results in the table of comparative efficiencies already given namely, 6·07 K.W. hours and 6·0 kilos. of salt per kilo. of active chlorine, 15 kilos. chlorine per 10-hour day using the Manchester Corporation charge for electric power—salt at 16s. 6d. per ton—we obtain the following as the estimated cost of one ton of active chlorine by the electrolytic method of manufacture in S.W. Lancashire.

	£	s.	d.
Power, 6070 K.W. hrs. at ·425d.	10	14	11
Salt, 6000 kilos.=6 tons at 16s. 6d.	4	19	0
Labour, chr. per day=66 hrs. at 6d. per hour	1	13	0
Depreciation, 2·5 per cent. on £300 for 66 days	1	10	0
Interest, 5·0 per cent. on £300 for 66 days...	3	0	0
	£21	16	11

The relatively high charges for labour, interest and depreciation are due to the fact that an electrolyser costing £300 would only produce 15 kilos. of active chlorine per day of 10 hours; and that it would require to be worked for 66 days continuously to produce 1,000 kilos. or one metric ton of active chlorine. The labour interest and depreciation charges therefore cover this period, or 1/5th of a working year. These charges could not be materially reduced by enlarging the plant and producing one ton of active chlorine per week, for the capital outlay would then be correspondingly increased and the only saving would be a small one in wages. In order to show that this estimate of the cost of one ton of active chlorine by the electrolytic method is not incorrect, the following figures from an article by Dr. Engelhardt, one of the chief technical engineers in the electrochemical department of Messrs. Siemens and Halske's Werner works at Berlin may be given. With power at 0·250d. per K.W. hour one ton of active chlorine works out to £18 16s. 0d. for a small plant producing 48·9 lb. of chlorine per day of 10 hours and correcting this estimate for power at 0·425d., per K.W. hour we have a total cost of £23 0s. 6d. for the ton of active chlorine by the electrolytic method.

It is of interest to compare with these two estimates the actual working cost of the electrolytic hypochlorite installation at Poplar, as given in Dr. Alexander's annual report for the year 1910; although in this case the costs of raw materials and of electricity are increased owing to the fact that magnesium chloride and sodium hydroxide are used in addition to sodium chloride for preparation of the electrode, and that electric power costs 1½d. per unit. During 1910 50,726 gallons of hypochlorite solution were produced at the following cost for power and raw materials.

	£	s.	d.
Electricity, (8084 units at 1½d. per unit) ..	50	10	6
Magnesium chloride (5 tons, 3 cwt., 38 lb.)..	21	6	4
Sodium chloride (9 tons)	15	8	0
Caustic soda	9	7	6
Water	1	10	0
	£98	2	4

Taking the average strength of the solution as 5·3 grms. of active chlorine per litre we find that the above expenditure produced 1,218 kilos. of active chlorine; the cost per ton thus working out to £80 11s. 2d. without any allowance for labour, depreciation or interest.

Summarizing these results we have the following table of comparative costs :—

Costs per ton of active chlorine.

Method of preparation.	Form of combination.	Cost. £	s.	d.	Remarks.
Chemical	calcium hypochlorite	14	2	8	
do.	sodium hypochlorite	20	5	1	using salt cake.
do.	do.	22	11	9	using soda-ash.
Electrolytic	do.	21	16	11	Kershaw's estimate.
do.	do.	23	0	6	Engelhardt's estimate.
do.	sodium and magnesium hypochlorite	80	11	2	actual cost at Poplar.

V.—Practical developments and conclusions.—So far as can be ascertained, at the present date there are at work in the United Kingdom 22 installations of the Haas and Oettel electrolyser, with an aggregate capacity of 235 kilos. of active chlorine per day of 24 hours; three or four installations of the Hermite electrolyser, the most notable being that at Poplar; and one installation of the Vogelsang electrolyser at Nottingham. The aggregate daily output of active chlorine by the whole of these plants is certainly not more than 300 kilos., equivalent to the displacement of only 300 tons of ordinary bleaching powder per annum. The majority of these installations are operated in connection with steam laundries or the so-called dry-cleaning works.

The reason that the electrolytic method of producing hypochlorites has not been adopted by the larger and important bleaching industry of Lancashire and Yorkshire, is made apparent when one studies the tabular statement of comparative costs and the facts deduced by Higgins from the experiments made with the various forms of bleaching solution.

Calcium hypochlorite made by the lixiviation of bleaching powder is still by far the cheapest bleaching and disinfecting agent under the present conditions of power supply and costs of raw materials in South Lancashire and West Yorkshire; and when the subsequent souring and washing operations are carried out under scientific supervision, the colour and texture of the bleached goods are found to be entirely satisfactory. When finer goods such as lace and curtains are being dealt with, the arguments for the use of solutions of sodium hypochlorite in place of calcium hypochlorite have some reason; but here again the figures given above show that under the conditions obtaining in the Manchester district, it is practically cheaper to manufacture this sodium hypochlorite from bleaching powder with the aid of salt cake than to set up an installation of electrolysers, which, if the demand for active chlorine is larger, must involve considerable capital outlay. To produce one ton of active chlorine per day with the cheapest of the electrolytic cells described in this paper would require 50 electrolysers and involve a capital outlay of £7,500, while the more efficient and expensive types of electrolyser using platinum-iridium electrodes would cost double this amount or £15,000. This expenditure would be for electrolysers alone and would not cover buildings, transformers, or generators. The future of the electrolytic processes for manufacturing hypochlorite solutions for bleaching purposes in this country, would therefore seem to be restricted to the laundries and dry-cleaning works, where an installation of one or two electrolysers can supply all the bleaching solution required.

As regards the use of electrolytic hypochlorite for sanitary purposes, the analysis of the official figures of costs for the Poplar installation of the Hermite process, does not appear to be favourable to the adoption of the process elsewhere or to the extension of the existing plant at Poplar. It would seem quite unnecessary to spend between £100 and £200 per annum in producing (in an electrolytic plant) 1,218 kilos. of active chlorine, when this could be purchased in the form of bleaching powder in the open market for £25 or less. The official's argument that this 50,000 gallons of dilute hypochlorite liquid (costing say £150) has replaced an earlier expenditure of £533 upon other liquid disinfectants does not meet the case.

In conclusion the author expressed his indebtedness to Mr. Reuss, agent for the Haas and Oettel apparatus in Manchester, Messrs. Greeff & Co., agents for Kellner cell in London, Messrs. Siemens und Halske, of Berlin, Messrs. Mather & Platt, Manchester, Mr. Thorpe, of Edenfield, Manchester, and others for their kind assistance in connection with some of the data presented in this paper.

Discussion.

The Chairman emphasized the very great importance of scientific supervision being applied in the bleaching trade. One great advantage which electrolytic solutions appeared to him to have was, that they could not be tested merely by a Twaddell hydrometer, but they must be examined chemically. When using bleaching powder solutions, unfortunately, the Twaddell hydrometer was practically the universal instrument. The methods which bleachers adopt in making their solutions were frequently unsatisfactory, and the amount of waste unnecessary. Again, the production of a clear bleaching powder solution was an important point. In none of the bleaching works that he had visited had he ever seen anything but more or less efficient means of settling. He had never seen a filter, which would be a great safeguard.

From the best information he had been able to collect, it appeared that, with proper precautions, equally uniform and good results could be obtained by the use of bleaching powder and calcium hypochlorite as by the use of electrolytic hypochlorite.

Mr. Baker said there was a great deal of difference in the behaviour of different solutions due, not to the difference in the hypochlorite, but to the other bodies which are present—the large quantity of salt, calcium chloride, the amount of alkali, the amount of acid, and the absorption of carbon dioxide from the atmosphere, and so on. It was important for the bleacher to obtain a bleaching action very quickly without weakening the fibre.

Mr. R. E. Slade said that in a large installation the cost of electric power could certainly be reduced. With regard to the statement that the Manchester Corporation sold power at a figure below cost price, he did not think that was correct; it was not below the price it would cost them to supply it to those who took the power continuously, that is with a high load factor. He would like to know was bichromate or lime used in any of the electrolytic cells? These substances formed deposits on the cathode which hindered the reduction of the bleach after it had been formed, and in that way raised the efficiency of the cell. Was it possible in those bleaching operations, where the bleaching solutions were made and used at the same works, for the sodium chloride to be run back again into the cells, and thus a saving be effected.

Mr. Hardwick asked the author to give them an idea of the proportion of bleaching powder to sodium hypochlorite used. He presumed it was a large proportion. He knew that one large works was using sodium hypochlorite, and he would like to know why they utilised that in preference to the other.

Mr. Kershaw, in reply, said that in order to ascertain the cost of the electrolytic method in Manchester, he had asked Mr. Pearce to give the estimate for supplying a small plant with power, and these were the figures which he had made use of in his paper. He claimed to have proved that hypochlorite of soda could not be produced by electrolysis cheaper than it could be produced chemically, in S.W. Lancashire. It had been found impossible to use the liquid over and over again in the electrolytic cell in that way, as impurities extracted from the yarn or cloth accumulated in the electrolyte and upset the normal working of the cell. The use of bichromates to reduce the losses at the surface of the cathode was impracticable owing to the discolouration of the bleached goods. Replying to Mr. Hardwick, he did not think the whole of the electrolytic chlorine, produced as hypochlorite of soda, in this country at the present time, would be equal to more than 300 tons of chlorine, or to 300 tons of bleaching powder per annum.

Nottingham Section.

Meeting held on Wednesday, November 29th, 1911.

PRESENTATION TO MR. S. R. TROTMAN.

Mr. S. R. Trotman having resigned the hon. secretaryship of the Nottingham Section owing to the pressure of other engagements, members of the Section and other friends subscribed towards a testimonial to mark their appreciation of his devoted services. The testimonial took the form of a silver rose-bowl, which was presented on behalf of the Section by the President of the Society, Dr. Rudolph Messel, at a well-attended dinner given at the Mikado Café, Nottingham, on November 29th. The principal speakers at the dinner were the President, who also proposed the Nottingham Section, Mr. Trotman (Chairman of the Section), who welcomed the President to Nottingham, and returned thanks, and Messrs. Pentecost and Archbutt, who responded on behalf of the Nottingham Section. The rose-bowl bore the inscription: "Presented to Samuel Russell Trotman, Esq., by the Members of the Nottingham Section of the Society of Chemical Industry, in Recognition of his Valuable Services as Hon. Local Secretary from 1903 to 1911."

Meeting held at Nottingham on Wednesday, December 20th, 1911.

MR. S. R. TROTMAN IN THE CHAIR.

THE "LUMINATOR" TREATMENT OF WATER.

BY HENRY B. LAKE.

There appeared in Vol. XXX. (1910), p. 933. of this Journal an abstract of a paper read before the New York Section entitled "A new treatment of water by means of aluminium plates, for preventing scale in boilers without the use of chemicals." Therein it is held that hard water when allowed to flow over aluminium is ionically changed so that on boiling, scale is not formed, the temporary hardness is reduced, and the water so treated acts as a detergent on existing scale, converts the red oxide on boiler plates to black oxide and maintains the plates black, while the scale-forming salts are precipitated as sludge instead of adhering as scale. It is stated, on the contrary, that where water is being treated continuously day and night, it is necessary to give the apparatus a weekly rest, that the best results are obtained when the "luminator" is disposed north and south and exposed to direct light, also that "in the dark the apparatus almost ceases to work."

With the object of discovering what is the effect of passing water over aluminium the following experiments were undertaken :—

Experiment No. I.—A large sample of water was taken from the City service tap in the laboratory. A strip of aluminium 2 inches wide by 10 feet long by about 12 gauge in thickness, was formed into a channel V-shaped in section, and was disposed due north and south, and dipping to the north at an angle of 15°. Part of the sample of water was filled into a "Winchester" bottle provided with a syphon tube, the outlet being controlled by a screw pinch clip. This bottle of water was supported at the head of the aluminium chute, and a graduated measuring cylinder was placed at the lower end of the chute. The chute was facing north, daylight. Water was then allowed to flow down the chute, and the rate adjusted until the speed was 1 litre in 17 minutes. After discarding several lots, 500 c.c. were collected.

Experiment No. II.—A further quantity of water from the same sample as used in Experiment No. I. was passed in exactly the same manner, but the aluminium chute was replaced by an aluminium tube, also 10 feet long by ½-inch internal diameter. Velocity of flow of water and position of tube were identical with the chute treatment.

To ascertain the effect produced on the water, the original, and the water treated as in Experiments I. and II. (Table I.) were submitted simultaneously to the following tests :—Total hardness by soap solution ; permanent hardness by soap solution ; mineral analysis.

Before giving the tabulated results, a brief description of the method employed for the mineral analysis should be given :—

The water in each case was evaporated to dryness and the residue treated with hot distilled water and filtered, thus separating the insoluble carbonates from the more soluble sulphates. This separation is not absolute, but is largely effective, and it has been proved by constant use on all kinds of waters to effect a general separation, and when certain precautions are taken, repeat separations can be made with corresponding results. The water-soluble portion was set aside, and when cold was made up to the original volume with distilled water. The insoluble portion was dissolved with the aid of a few drops of hydrochloric acid and hot water, and when cold was also made up to the original volume. Both portions were then submitted to estimations of calcium and magnesium. The calcium and magnesium in the soluble portion were combined with sulphuric anhydride, separately determined, and the calcium and magnesium in the insoluble portion were combined with carbonic anhydride separately determined in the original sample of each lot of water.

The results tabulated are as follows :—

Experiments I. and II. as fully described were then repeated, the only difference being that the velocity was increased from 1 litre in 17 minutes to 1 litre in 6 minutes by increasing the angle of inclination of the chute and tube from 15° to 70° to the horizontal. Determinations of the total and permanent hardness only were made on these samples, as follows :—

Experiment III.	Hardness (French scale) by soap solution.	
	Total.	Permanent.
Original water	70·5°	39·6°
(3) After passing aluminium chute	70·5°	39·0°
(4) After passing aluminium tube...	70·5°	39·0°

The next question that suggested itself was to ascertain whether direct sunlight would have any considerable influence on the results.

Experiments Nos. I. and II. were therefore repeated, the apparatus being arranged exactly as described, but exposed on the flat roof of the laboratory to direct sunlight. The time was 11 to 12 in the forenoon, and the sun shining brightly. The velocity of flow was 1 litre in 6 minutes.

Experiment IV. in bright sunlight.	Hardness (French scale) by soap solution.	
	Total.	Permanent.
Original water	63°	45·6°
After passing aluminium chute	62·5°	40·2°
After passing aluminium tube	63°	42°

It was now decided to introduce a new factor into the experiments by adding aluminium sulphate with the object of discovering whether this would react as usual with a hard water by converting the carbonates of lime and magnesia into sulphates, and if so, would its action be retarded by passing the water so treated down the aluminium chute and tube and thus discover a difference between water so "alumed" and "luminated" and some of the same water only "alumed." Also, in order to show only the difference in permanent or residual hardness after boiling, all the samples were subsequently boiled and the precipitate filtered off.

The aluminium sulphate added to each sample was in the form of a clear solution of known strength, and it was added to each water in quantity equivalent to 3 parts of alumina per 100,000. The velocity of flow for the samples passed over metallic aluminium was 1 litre in

TABLE I.

Experiments I. and II.	Hardness by soap solution (French scale).		Mineral analysis, parts per 100,000.							
			Ionic estimations.				Combinations on evaporation.			
			Insoluble.		Soluble.		Insoluble.		Soluble.	
	Total.	Permanent.	Calcium.	Magnesium.	Calcium.	Magnesium.	Calc. carb.	Magnes. carb.	Calc. sulph.	Magnes. sulph.
			Velocity of flow, 1 litre in 17 minutes.							
Original water .	70·5°	39·6°	9·12	1·58	0·42	4·53	22·80	5·46	1·52	22·38
After passing (1) aluminium chute	70·5°	38·8°	9·42	1·74	0·35	4·47	23·55	6·02	1·19	22·08
After passing (2) aluminium tube	70·0°	38·2°	9·07	1·59	0·35	4·59	22·69	5·50	1·19	22·67

6 minutes. The resulting solutions then afforded the following results :—

Experiment V.	Hardness by soap.	Mineral analysis. Ionic determinations parts per 100,000.			
		Insoluble.		Soluble.	
+ Alum.	Permanent.	Calcium.	Magnesium.	Calcium.	Magnesium.
Original water ...	40·0°	0·47	0·23	3·18	4·58
After passing chute	36·2°	0·63	0·20	2·70	4·58
After passing tube	37·8°	0·59	0·23	3·00	4·46

The effect of the treatment with aluminium sulphate is very evident if this table be compared with the results obtained in Table I. The soluble calcium has been increased by the alum 7 or 8 times, whilst the insoluble has nearly all been removed by boiling and filtering off the residual insoluble carbonates.

Further experiments were conducted as tabulated in Table VI., the first being a repetition of those in Table I., but the speed being increased to 1 litre in 3 minutes. The second group with the previous addition of alum, but without final boiling. The third group of experiments were conducted on a water of a very different composition, without the use of alum.

TABLE VI.

Experiment VI.	Hardness by soap solution.		Mineral analysis, parts per 100,000.							
			Ionic estimations.				Combinations on evaporation.			
			Insoluble.		Soluble.		Insoluble.		Soluble.	
	Total.	Permanent.	Calcium.	Magnesium.	Calcium.	Magnesium.	Calc. carb.	Magnes. carb.	Calc. sulph.	Magnes sulph.
Velocity of flow = 1 litre in 3 minutes.										
Original water (tap water from laboratory)	52·0	42·8	8·70	1·47	0·36	6·20	21·75	5·09	1·22	30·63
(10) Passed chute	56·0	40·0	8·80	1·30	0·10	6·06	22·00	4·50	0·65	29·94
(11) Passed tube	54·0	40·0	8·73	1·30	0·22	5·08	21·82	4·50	0·75	29·54
$Al_2(SO_4)_3$ added equivalent to 3 parts per 100,000. Velocity of flow=1 litre in 3 minutes.										
Original water	52·0	39·0	7·25	1·53	1·49	5·33	18·13	5·29	5·07	26·33
(12) Passed chute	52·0	40·8	7·22	1·38	1·61	5·41	18·05	4·77	5·47	26·73
(13) Passed tube	54·0	39·4	7·42	1·31	1·36	5·60	18·55	4·53	4·62	27·66
"Austin" water. Velocity of flow=1 litre in 3 minutes.										
Original water	43·4	14·6	10·6	2·03	0·28	1·54	26·50	7·02	0·95	7·61
(14) Passed chute	40·8	15·4	10·35	1·78	0·52	1·63	25·88	6·16	1·77	8·05
(15) Passed tube	39·2	16·4	10·42	1·73	0 30	1·63	26·05	5·99	1·02	8·05

The effect of the previous treatment of the water with alum is again manifest in the reduction of insoluble calcium and the increase of the soluble calcium, the latter again showing an increase over the water not "alumed" of 6 or 7 times.

Conclusions.—Reviewing the results, comparing the water passed over the aluminium chute or through the tube, and considering the claims made that water so treated forms a different deposit from that untreated, we should expect to see a difference in the salts thus separated on evaporation. But it is evident that in none of the tests do we get a very considerable reduction or increase in the resultant salts, either in the "ionic" state or as combined salts on evaporation. In Table I., there is apparently a tendency to convert some of the calcium which would ordinarily be soluble, to the insoluble form, *i.e.*, from permanent to temporary hardness. This effect is confirmed in the first group of Table VI. But in the second group of experiments (Table VI.) when using aluminium sulphate, the action of the aluminium metal does not appear to have exercised any inhibiting on the usual action of the alum, and in the third group (Table VI.) when using a water from Austin of a very different kind, without the addition of alum, the effect of the passage over metallic aluminium was apparently the opposite of what it showed in the other water, namely to convert insoluble to soluble calcium, *i.e.*, from temporary to permanent hardness, yet great care was taken in the manipulations and extractions, and the results are undoubtedly comparative. In the addition of alum the usual expected change is marked decisively, yet there is nothing to indicate the passage over the metallic aluminium.

The tests do not show that there is any marked difference between passage in daylight or darkness, the other essentials, such as disposition due north and south having been carefully complied with.

If carbon dioxide is supposed to be rapidly evolved, surely this would have some effect on the steel above the water line in a boiler, where we often get serious "pitting," and surely zinc plates are hardly employed as scale detergents but rather to inhibit "pitting" action, and any detergent action is only incidental to the resulting zinc salts in solution.

All chemists and engineers experienced in hard water troubles are eagerly watching for any improvement in the methods of water softening, and would welcome any method so very simple as passing water over aluminium plates which would even prevent the scale adhering, but the process seems to be of little value, even if this can be effected (which seems very doubtful), unless the resulting acid gases and sludge can be removed, which appear to cause corrosion and over-heating of the plates, with subsequent "pitting" and "bulging" where the sludge is excessive.

DISCUSSION.

Mr. L. ARCHBUTT said he was afraid the "luminator" had not been the unqualified success which one would gather from reading the paper to which Mr. Lake had referred. It was very difficult to get at the true facts. His personal experience extended to only one apparatus, which was at the present time being used to treat a water of 34 degrees total hardness and 19·4 degrees alkalinity. The "luminator" had been at work on this water for several weeks, but up to the present appeared to be doing no good whatever. Scale was forming in the boilers apparently at the same rate as before the "luminator" was installed. He also knew of other cases where the results had been equally unfavourable. On the other hand, there were instances within his knowledge where the "luminator" was being used to treat waters of which the hardness was mainly temporary, in which it was stated to be working quite successfully, causing the calcium carbonate to deposit in the boiler in a loose pulverulent form instead of an adherent scale. He had not seen these particular "luminators" at work himself, but the facts were well authenticated by other chemists whom he knew personally. It was quite certain that by passing over the "luminator" the water was not softened in any way, the only change being a slight reduction in the amount of free carbon dioxide. He could confirm Mr. Lake's results in this respect. Thus, in two cases he had tested samples of water before and after passing over the "luminator." The first case was one in which the "luminator" was said to be treating successfully a water from the oolite. This water gave the following results :—

	Before "Luminator."	After "Luminator."
	Grains per gallon.	
Alkalinity as calcium carbonate	20·30	20·30
Free carbon dioxide	1·7	1·4

In the second case the "luminator" was working unsuccessfully on the water he had previously referred to, and the results were :—

	Before "Luminator."	After "Luminator."
	Grains per gallon.	
Lime (CaO)	11·73	11·87
Magnesia (MgO)	5·06	5·21
Hardness, degrees	33·5	34·1
Alkalinity as $CaCO_3$	19·35	19·35
Free carbon dioxide	1·50	1·15

In Neff and Brandes' original patent, there was no reference to the prevention of scale in boilers, but it was stated that the water after flowing over aluminium has wonderful cleansing properties and is enabled to wash soiled linen in a much shorter time than the untreated water. A friend of his who had made careful tests to prove the truth or otherwise of this assertion failed to obtain the slightest evidence of any new properties acquired by the water.

The manner in which this apparatus had been boomed and the exaggerated statements made in regard to it had made him, perhaps, unduly sceptical. He could not disbelieve what his friends told him as to the remarkable effects produced on chalk waters in changing the character of the deposit formed in boilers, but he was entirely sceptical as regards the suggestion that this was due to particles of aluminium acting as nuclei. A more likely explanation was contained in Mr. Jerome Alexander's remarks on Mr. Duncan's paper.

Mr. Law said the action of the "luminator" might perhaps be more physical than chemical.

Dr. Sand agreed, and said that if a very small amount of aluminium hydroxide were formed in the water by the "luminator" treatment in the state of colloidal solution, it would undoubtedly be deposited with the scale and might conceivably alter the mode of precipitation and the mechanical properties of the scale completely.

Mr. Wilkie asked whether any other grooved surface would answer as well.

Mr. Timmans asked whether the organic content of the water was affected by the treatment.

Mr. Archbutt said, in answer to a question by Mr. Duncalfe, that the combined carbon dioxide was not affected appreciably by the treatment. In reply to a question by Mr. Wood, he said the treatment would probably aerate the water. The questions of Messrs. Wilkie and Timmans he was unable to answer from personal knowledge. The makers laid great stress on the importance of keeping the aluminium surface bright, for which purpose it had to be cleaned frequently with acid followed by rubbing with emery cloth; in some cases the surface is then washed with caustic soda.

Journal and Patent Literature.

Patent Specifications may be obtained by post by remitting as follows :—

English.—8*d.* each, to the Comptroller of the Patent Office, W. Temple Franks, Esq., Southampton Buildings, Chancery Lane, London, W.C.

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German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

Patents.

Evaporating apparatus. J. S. Studer, Warrington. Eng. Pat. 28,925, Dec. 13, 1910.

The patent involves the application of the following devices in combination with "climbing-film" evaporators. 1. Means for regulating the flow of the liquid to be evaporated to the vertical tubes, consisting of plugs inserted in the lower end of these tubes. Each plug is formed of two cone frustums with the small ends abutting, the lower conical part determining the area of the opening of the tube while the upper part serves to convey the liquid on to the walls of the tube: the distance to which these plugs are inserted is controlled singly or in sets from the outside. 2. The steam enters the casing containing the evaporating tubes from a surrounding annular chamber or "belt," the opening from which is below the level of the pipe conveying the steam thereto. 3. An arc-shaped baffle-plate is placed over the tubes, inside the hood, to deflect the concentrated liquor into a V-shaped trough surrounding the upper end of the casing whence it is removed. 4. A space with no evaporating tubes is left in the centre of the casing to allow of the free accumulation of heat.—B. G. McL.

Cooling, heating or otherwise treating air or water or other gases or liquids; Apparatus for ——. Heenan and Froude, Ltd., and G. H. Walker, Manchester. Eng. Pat. 29,015, Dec. 14, 1910.

In apparatus for effecting the operations mentioned in the title, consisting of a spiral or of concentric cylinders alternately immersed in the liquid and exposed to the gas (see this J., 1910, 9 and 1446), the cylinders are held in position by radial tubes which are cut to receive the edges of the metal, which is bent over inside the tubes; the inside of the tubes may be filled with pitch or like material. Where the drum is built up of different metals, it is advisable to insulate them electrically one from the other by washers of suitable material.—B. G. McL.

Evaporating apparatus. C. Corne, New Orleans, La. U.S. Pat. 1,012,523, Dec. 19, 1911.

Between the vacuum pan and condenser of an evaporating apparatus a separator is interposed consisting of a cylindrical chamber divided by a vertical partition having an opening in the line of travel of the vapour coming from the vacuum pan and a chamber enclosed by a wire screen behind this opening. An adjustable sleeve or ring is arranged in the outlet from the vacuum pan for the purpose of directing the flow of vapour towards the opening in the partition. The liquid entrapped in the wire screen is run off from a pipe at the bottom of the chamber.—H. H.

Mixing, incorporating, or effecting the circulation of liquids and semi-liquids in vessels; Apparatus for ——. F. Titterton, Leyton, Essex. Eng. Pat. 9681, April 21, 1911.

In mixing apparatus of the type described in Eng. Pat. 22,861 of 1910 (this J., 1911, 941), a shield consisting of a thin horizontal circular plate with a central hole is placed immediately above the suction opening of the mixing device, the object being to eliminate the repellent action of the rotating part and to make the mixing effective when the vessel is comparatively empty. When the central movement of the liquid is upwards, the plate is placed below the suction opening.—B. G. McL.

Emulsions; Apparatus for the production of ——. W. G. Schröder. Ger. Pat., 240,874, Feb. 25, 1911.

The object of the invention is to provide means for equalising the working pressure on the two ends of the spindle carrying the surfaces by which emulsification is effected. The spindle is made in two halves united by a coupling member so that they rotate co-axially, and provided with bosses having right- and left-handed screw threads respectively. The screw threads on these bosses engage with a thread cut on the inside of the hub of a regulating wheel. On turning the latter, the two halves of the spindle are brought closer together or drawn further apart in an axial direction.—A. S.

Separating liquids and solids: Apparatus for ——. J. J. Berrigan, East Orange, N.J., Assignor to J. Bernstrom, Stockholm, Sweden, and F. J. Arend, New York. U.S. Pat. 1,005,800, Oct. 17, 1911.

The apparatus is of the centrifugal type and comprises a horizontal rotating cylindrical drum, with an axial feed-tube, which is provided with a conveyor and discharges at about the middle of the length of the drum. The drum is provided with an inside flange at each end, so that an annular layer of the material to be treated is retained. These flanges are of different height, and the lower one which determines the thickness of the annulus is at the end of the drum where the liquid is discharged. The solid material is moved towards the other end of the drum by a spiral conveyor mounted on a central shaft and rotating in the same direction as the drum, but at a different speed. The flange at the end of the drum where the solids are discharged retains a portion of the solid material in the form of an incline up which the material is forced by the conveyor. U.S. Pat. 834,043 (this J., 1906, 1081) is referred to.—A. T. L.

Dryer. J. F. Hanrahan, Buffalo, N.Y. U.S. Pat. 1,011,780, Dec. 12, 1911.

The apparatus comprises a retangular casing divided into an upper evaporating chamber, and a lower heating chamber, containing a heating coil at the lower part. The material to be dried is placed on a false bottom in the evaporating chamber, so that hot air may pass beneath as well as over it. Air is circulated by a fan past the heating coil, and passes by a flue from the top of the heating chamber to the top of the evaporating chamber at one end. After passing around the moist material the air is drawn by the fan from the bottom of the evaporating chamber and through a cooling coil in a condensing chamber, and circulates again in the same path.—A. T. L.

Desiccating apparatus. W. S. Osborne, Assignor to Osborne Desiccating Machinery Co., New York. U.S. Pat. 1,011,993, Dec. 19, 1911.

The side and bottom walls of a desiccating chamber consist of heating coils through which a heating medium is circulated and between which the air to be heated is drawn. A rotary liquid distributor may be arranged within the chamber, and the air may be initially separated from solid particles by centrifugal means.—H. H.

Filter-plate. J. M. Lithgow, Beaver Falls, and J. S. Sherwood, New Brighton, Pa., Assignors to Knott and Harker Co., Beaver Falls, Pa. U.S. Pat. 1,011,976, Dec. 19, 1911.

A filter plate having a passage way through the centre is formed with a ribbed and grooved surface, a grooved rim around its perimeter, and with ports establishing communication between the surface grooves and the outer peripheral groove. The ribs are rounded in order to diminish the cutting of the filter cloths.—H. H.

Condenser for vapours and gases. U. Wedge, Ardmore Pa. U.S. Pat. 1,012,487, Dec. 19, 1911.

A gas cooler or condenser consists of a box or casing containing a condensing chamber having a number of separate detachable vertical condensing units depending from the roof thereof. Cooling water circulates through the condensing units in series, and the units are "staggered" in order to prevent a straight flow of the gas through the condensing chamber.—H. H.

Furnace gases; Apparatus for purifying ——. U. Wedge, Ardmore, Pa. U.S. Pat. 1,012,488, Dec. 19, 1911.

The gases are passed through a passage in which is situated the pole-piece of an electromagnet, the core and coil of the magnet being protected from the gases by a heat-insulating layer.—H. H.

Evaporating pan. U.S. Pat. 1,012,550. *See* XVII.

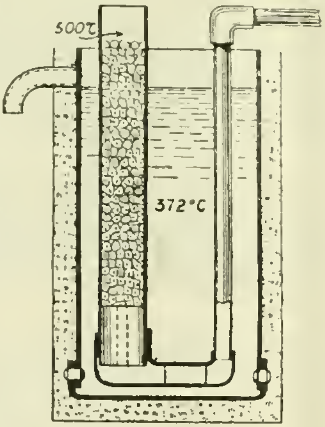
IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Calorific power in wood, peat, etc.: Relation of chemical composition to ——. H. C. Sherman and C. G. Amend. School of Mines Quart., 1911, 33, 30—33.

Eight substances—chestnut wood chips, raw and leached, hemlock tan, raw and leached, leached oak tan, bagasse, oil cake and peat—were subjected to ultimate analysis and their calorific power determined directly in a bomb calorimeter. The values calculated according to Dulong's formula ($x = 8080\,C + 34500\,(H - \frac{1}{8}\,O) + 2220\,S$) were in all cases seriously low, whereas when calculated according to Walker's rule ($x = 8080\,(C - \frac{3}{8}\,O) + 34500\,H + 2220\,S$) the results were high but afforded a very fair approximation to the true values. In the case of seven lignites analyses of which are given in Bull. 290 of the U.S. Geol. Survey, the calculated results were also better by Walker's method than by Dulong's formula.—B. M. V.

Surface combustion; Boiler-firing and metal-melting by ——. W. A. Bone. J. Gas Lighting, 1912, 117, 27—28.

Further experience as to the industrial applications of surface combustion (see this J., 1911, 527; compare also this J., 1909, 512; 1910, 1138, 1448; 1911, 406) has been obtained with a steam boiler utilising coke-oven gas which has made a continuous run of one month under ordinary working conditions, and also with a plant for melting lead, type metal, and similar alloys. The boiler consists of a cylindrical drum, 10 ft. in diameter and only 4 ft. from front to back, traversed by 110 tubes of 3 in. internal diameter and packed with fragments of firebrick. A mixture of gas with a proportion of air slightly in excess of that required for perfect combustion is drawn through the tubes from a feeding chamber by a fan producing a suction of 20 in. water-gauge. The products of combustion pass into a semi-cylindrical chamber at the back of the boiler and thence to a tubular feed-water heater of similar construction to the boiler. No brickwork setting or chimney is required. Under normal conditions the "mean evaporation" exceeds 20 lb. per sq. ft. of heating surface. The "evaporation gradient" along the tubes is very steep, 70 per cent. of the total evaporation occurring over the first third of the length of the tubes, 22 per cent. over the second, and 8 per cent. over the third. The gases leave the feed-water heater at 75° C., upwards of 90 per cent. of the net heat of combustion of the gas being transmitted to the water. The boiler can be forced to a 50 per cent. higher duty with only a slight drop in efficiency, and the steam-raising capacity can also be varied by shutting off some of the tubes. The front plate of the boiler can never be heated above the temperature of the water, however much the firing may be forced. Upon opening the boiler at the termination of the run, it was found that the scale had been deposited in thin films (about 1-30th of an inch thick) at the bottom of the boiler, the high rate of evaporation apparently preventing any adherence of scale to the tubes.



For melting lead, experiments have been carried out with iron tanks holding up to 8 tons of molten metal and fitted with a series of vertical combustion tubes of similar construction to that shown in the figure.

The following results were obtained with a single-tube apparatus to which lead ingots, weighing 30 lb. each, were added at intervals of 1½ minutes.

Temperature of metal charged, 15° C.
Temperature of metal tapped, 372° C.
Temperature of gases leaving apparatus, 500° C.
Lead melted per hour=1176 lb.
Heat required per hour to raise metal from 15° C. to 372° C. =1176 × 32·67=38,420 B. Th. U.
Gas burnt per hour=100 cub. ft. at N.T.P.
Net calorific value of gas = 559 B. Th. U. per cub. ft. at N.T.P.

$$\text{Ratio} = \frac{38{,}420}{55{,}900} = 0{\cdot}686.$$

From these results it is calculated that the efficiency of the melting operation is practically 80 per cent., having regard to the fact that the theoretical minimum temperature at which the gas could leave the apparatus is 372° C. With gas at 2s. per 1000 cub. ft. the cost of gas would be 5d. per ton of lead melted.—H. H.

Dust in blast-furnace gas; Determination of ——. O. Johannsen. Stahl u. Eisen, 1912, 32, 16—19.

The author discusses the various methods for the determination of dust in blast-furnace gases, and states that for general convenience and accuracy, especially for the purpose of works control, the most suitable method is to filter the gas through paper and subsequently incinerate the paper and separated dust, a correction being made for the loss on ignition as determined on a separate sample of dust from the work's dust-filter. The dust consists mainly of disintegrated slag, an average sample of that separated at the Halbergerhütte giving the following results: Silica, 29; alumina, 20; iron, 4; lime, 27; magnesia, 5; potassium oxide, 5; sulphur (as sulphide), 0·3; and loss on ignition, 3 per cent.—A. S.

Petroleum; The formation of ——. W. Ipatiew. J. prakt. Chem., 1911, 84, 800—808.

With the view of throwing light on the mechanism of the formation of petroleum, the author has repeated Cloëz's experiments (Comptes rend., 78, 1565) and has investigated the products of the action of dilute hydrochloric acid on various kinds of cast-iron. He finds that the gases contain, in addition to hydrogen, a considerable amount of saturated hydrocarbons but only a small quantity of olefines. The liquid products contain no saturated open-chain hydrocarbons but only ethylene hydrocarbons, and the higher fractions contain small amounts of what are probably polymethylene hydrocarbons. The author inclines to the theory of the formation of petroleum according to the "organic" as opposed to the "mineral" hypothesis.—J. C. C.

Petroleum oils of corresponding origin; Analogous composition of ——. M. A. Rakusin. Petroleum, 1911 7, 288—289.

The author has previously stated (this J., 1909, 514) that a relationship exists between the amount of paraffin wax in petroleum oil and the geological age of the oil. He here shows that on distilling oils of corresponding origin the amounts of the fractions obtained at equal intervals of temperature are inversely proportional to the specific gravities of the crude oils and consequently to the depths from which they were drawn. This is illustrated by the parallel results obtained with 18 oils from Bibi-Eybat, from which the following are taken :—

Depth in Russian fathoms.	Sp. gr. at 15° C.	Per cent. by weight of distillate				
		below 125° C.	125° to 150° C.	150° to 200° C.	200° to 250° C.	Total.
260	0·8604	6·14	6·82	16·72	13·64	43·32
233	0·8631	5·81	6·49	15·64	15·04	42·98
265	0·8680	2·97	4·33	14·48	12·85	34·63
298	0·8707	3·37	4·73	11·99	14·52	34·61
288	0.8765	1·45	3·06	12·60	14·21	32·32
317	0·8815	0·80	1·89	11·15	15·07	28·91
316	0·8866	0·55	1·75	9·06	15·26	26·62

Similar results have been obtained with oils from Balachany and Romany.—C. A. M.

Transformer oils; Examination of ——. F. Breth. Petroleum, 1911, 7, 290—291.

The apparatus used for testing the insulating power of transformer oils consists of a glass bath insulated from the earth. The oil is placed in this, and two brass electrodes, bent at right angles towards each other at the bottom, are immersed in the oil, whilst the upper parts of these electrodes pass through a cover of hard rubber and are insulated by means of porcelain supports. The tension of the current should be very gradually raised from a low voltage. Thus an oil which gave no sparking after one minute when the tension had slowly increased to 17,000 volts, allowed an immediate passage of the spark when the voltage was suddenly increased to 15,000. Parallel tests were made with three freshly-refined oils with viscosities ranging from 3·8 to 20° (Engler) at 20° C., the electrodes being set at a distance of 5 mm., and the current gradually increased from 10,000 to 40,000 volts. Transmission of the spark then took place after 5 seconds in the case of the most viscous oil, after 30 seconds with the medium oil, and after 60 seconds with the least viscous oil. The lower

insulation capacity, however, is not the only reason against the use of viscous oils as transformer oils. After being used, the insulation capacity of an oil decreases. Thus in the case of an oil of about 8° viscosity at 20° C., which had been used for three years in a transformer, sparking occurred immediately at 17,000 volts, whereas originally there was no sparking after 5 minutes at 18,000 volts. During use an oil becomes darker and resinified, and eventually a black powder separates, and, being a relatively good conductor, may produce a short circuit. This black powder, with sp. gr. 1·0 is soluble in benzene, ether, carbon bisulphide, and concentrated sulphuric acid, but insoluble in petroleum spirit, alcohol and lubricating oil. When heated, it carbonises without melting. In composition it corresponds to a strongly oxidised asphaltic substance poor in hydrogen, such as is formed in larger or smaller quantity on heating any petroleum oil in the air. The *Allgemeine Elektrizitäts Ges.* of Berlin tests transformer oils by heating them for 70 hours at 120° C. in the presence of a current of oxygen, and noting the amount of resinous deposit. This test may be made quantitative by diluting the oil with petroleum spirit, collecting the deposit on a dried and weighed filter, washing the filter with petroleum spirit, and drying the residue at 120° C. until constant in weight. The amount of deposit depends chiefly upon the degree of refining and the viscosity of the oil. The effect of refining upon the resinification properties is seen in the following results obtained with an oil of 6° viscosity at 50° C. after 70 hours' heating in each case: Unrefined oil, 1·09; after refining with 10 per cent. of sulphuric acid, 0·036; and after refining with 10 per cent. of sulphuric acid, and decolourisation with 4 per cent. of silicate, 0·019 per cent. of resin. According to these experiments the best sort of oil for transformers is a light spindle oil with a viscosity of 3° to 5° (Engler) at 20° C., and a flash-point of 150° to 160° C. Its greater volatility compared with heavier oils is more than compensated by its greater insulation capacity, smaller resinification property and its cheapness (see also this J., 1910, 406; 1911, 696).
—C. A. M.

Asphaltum; Determination of —— in mineral oils, bitumens, etc. F. Schwarz. Chem.-Zeit., 1911, 35, 1417—1419.

The easy solubility of clear mineral oils in butanone (methyl-ethyl-ketone) suggested its use for the separation of asphaltum from dark mineral oils. It was found that when the butanone was saturated with water, better results were obtained than when the anhydrous liquid was used. 2—4 grms. of the oil to be tested are heated for one minute with careful shaking, in a flask fitted with a dephlegmator, with 40—80 c.c. of butanone saturated with water at room temperature. The solution is filtered hot, care being taken that the oil at the bottom of the flask does not get on the filter. The extraction is repeated twice. The residue remaining in the flask is dissolved in benzene or chloroform and the solution poured through the same filter into a dish. After evaporation of the solvent, the residue still contains traces of oily matter which can be separated from the asphaltum by treatment with 5—10 c.c. of petroleum spirit (b. pt. 30°—50° C.). The mixture is filtered and washed with a little petroleum spirit, and the residue dissolved in benzene or chloroform; this solution is evaporated and the residue weighed. The asphaltum must be completely dry at 100° C. For the analysis of solid bituminous substances, the sample is first dissolved in chloroform and then treated with butanone as before. The mixture is filtered hot and washed with hot butanone; the asphaltum remaining on the filter and in the flask is dissolved in chloroform, the chloroform evaporated, and the residue weighed. From the filtrate the resin can be precipitated by addition of water and the mixture allowed to stand over night. The supernatant liquid is poured through a filter and the residue washed with the water-saturated butanone and weighed. In this way the bitumen in natural asphaltum can be separated into asphaltum, resin, and oil. The method can be used also for the determination of paraffin in mineral oils.
—J. H. J.

Sootfall in London. Times, Jan. 8, 1912.

As a result of a series of investigations extending over a period of twelve months, the "Lancet" calculates that the annual deposit of soot on the administrative County of London, including the City (117 sq. miles), amounts to 76,050 tons, containing over 6000 tons of ammonia, 8000 tons of sulphates, and 3000 tons of chlorine in chlorides. These figures are deduced from the amounts of soot collected at the City Station; taking the S.W. metropolitan station as a basis, the annual deposit would average 53,820 tons.

Use of coke-oven gas in the Martin furnace. Simmersbach. *See* X.

Patents.

Peat; Process for drying raw ——. E. Abresch, Neustadt on the Haardt, Germany. Eng. Pat. 20,145, Sept. 11, 1911.

The raw peat is mixed with hard dried compressed peat and the mixture is subjected to a continuously and gradually increasing pressure.—A. T. L.

Fuel similar to coal; Production of a solid —— by carbonisation of peat and similar combustibles. F. Fritz. Ger. Pat. 241,386, May 14, 1910.

The peat is charged into a retort and gas from a second retort, heated externally, is passed through until the water and other valueless constituents have been expelled. The retort is then closed gas-tight and the charge left for a time to the action of its own heat (250°—300° C.). It is stated that a uniform coal-like mass is obtained which burns without the production of smoke and possesses a high calorific value.—A. S.

Coke ovens, gas retorts and the like. G. Pyle and C. G. Crate, Blyth, Northumberland. Eng. Pat. 21,429 of 1910; date of appl., March 15, 1911.

The heating flues between the ovens, and also the air and gas flues are packed with chequer brick-work in order to ensure uniform heating. The combustion chambers are arranged beneath each heating flue and lateral recesses extend beneath the floors of the adjacent ovens.—A. T. L.

Coke; Method of, and apparatus for, quenching and removing ——. M. A. Bleichert, Leipzig-Gohlis, Germany. Eng. Pat. 3150, Feb. 7, 1911.

The coke is discharged into a receptacle having openings in the bottom and sides, and the receptacle is lowered into a water tank of suitable shape, carried on a truck on rails running along the bank of ovens. The bottom layers of coke are thus immersed, and the upper layers are quenched by the rising steam. In a modification the water tank is raised and lowered on the truck. The truck also carries a water-supply tank to make good the loss by evaporation.—A. T. L.

Coke ovens; Regenerative ——. W. Hiby, Wakefield, Yorks. Eng. Pat. 14,735. June 21, 1911.

In an oven built on arches, the collecting flues which lead the waste gases to the regenerators are arranged within the arches instead of beneath the regenerators or below the ground level.—A. T. L.

Coke ovens; Supply of gas to the flues of ——. Dr. C. Otto und Co., Ges. m. b. H., Dahlhausen a. d. Ruhr., Germany. Eng. Pat. 16,709, July 20, 1911. Under Int. Conv., Aug. 8, 1910.

In horizontal coke ovens, having a gas supply main below the heating flues, with outlets for admitting gas to each flue or set of flues, these outlets are controlled by needle valves which can be operated from outside the oven, and can be completely withdrawn when desired.—A. T. L.

Coke oven or gas furnace. W. Feicks, Bethlehem, Pa. U.S. Pats. 1,011,932 and 1,011,933, Dec. 19, 1911.

(1). In gas furnaces or coke ovens having vertical heating flues, air supply pipes separate from the structure of the oven are employed for conducting air to the lower ends of the flues, and openings are formed in the oven structure to facilitate access to such pipes. Regulating means may be fitted to the pipes for the purpose of separately adjusting the air supply to each flue. (2). Gas is supplied to a gas furnace or coke oven through a cast metal structure built into the body of the oven and containing a number of passages leading from a common gas supply chamber at one end of the oven to the different points of combustion. The supply of gas to each passage may be separately regulated.—H. H.

Water gas; Manufacture of ——. A. G. Glasgow, Richmond, U.S.A. Eng. Pat. 28,855, Dec. 12, 1910.

The twin-generator system in which two generators are blown separately with an upward blast during the air blow, and steam is passed downwards through one and upwards through the other in series during the steam-blow, is more economical than the single generator system, but the make of gas per sq. ft. of grate area is much lower. The patent is for an arrangement of two generators connected at the lower end and provided with suitable gas, air and steam valves, suitably interconnected so that the plant may be worked normally as a twin-generator, but when an increased output of gas is required, the plant may be worked as a pair of single generators running in parallel.—A. T. L.

Gas producers; Process of operating ——. C. Barmore, jun., Paterson, N.J., Assignor to The Improved Equipment Co. New York. U.S. Pat. 1,012,120, Dec. 19, 1911.

The process consists in supplying to a deep fuel bed a mixture of air, steam, and hot products of combustion, the temperature of the entering gases being thereby maintained well above 100° C. and the quenching of the fuel where the draught enters thus avoided. The volume of steam should exceed that of carbon dioxide present, and the proportion of air should be limited sufficiently to prevent the temperature of the fuel bed from reaching the clinkering point.—H. H.

Smoke; Apparatus for washing ——. A. H. Lennox, Newcastle-upon-Tyne. Eng. Pat. 28,984, Dec. 13, 1910.

The washing of the gases is effected in a horizontal flue in which vertical baffle plates are fixed, the vertical height of the flue being increased at this point to allow for the decrease in the cross-sectional area, caused by the baffle plates. The roof of the flue at this part consists of two sloping sides connected by a horizontal portion forming the bottom of the supply tank containing the washing water. The baffle plates may be strips of corrugated iron, expanded metal, woven wire, etc., or plates inclined at 45° to the sides of the flue; they pass freely through openings in the bottom of the water-supply tank and are supported there in such a manner that the water in passing downwards wets their entire surfaces. The water collects in a trough formed on the floor of the flue, whence, after passing to an outer trough, it is pumped to the upper supply tank and re-circulated. (See also this J., 1906, 231; 1908, 617 and 742; 1909, 510.)—B. G. McL.

Gas washer. A. Steinbart. Ger. Pat. 240,354, June 23, 1910.

The patent relates to gas washers of the type in which washing is effected by means of a falling spray produced by a distributor and a diaphragm. It is claimed that a more uniform distribution of the water over the surface of the diaphragm is attained when the distributor consists of a rotating vertical pipe provided with a slot through which the water issues in the form of a fan-shaped spray. Several forms of apparatus for attaining the desired object are described and illustrated in the specification. —A. S.

Benzine and the like, Preventing explosions of ——. W. Boehm, Berlin. Eng. Pat. 11,004, May 6, 1911.

Reservoirs or containers for storing benzine and the like are provided with pointed conductors for carrying away electricity. The conductors are connected with the earth through the reservoir, if of metal, or through insulated leads. They may be surrounded by protecting cages, and may be carried on floats, or a series may be arranged at different depths.—A. T. L.

Emulsion products from asphalt, coal tar pitch, petroleum pitch, paraffin, montan wax, Japan wax, or mixtures of these substances; Process for the manufacture and use of ——. R. Wallbaum, Charlottenburg, Germany. Eng. Pat. 23,468 of 1911; date of appl., Dec. 3, 1910.

Petroleum acids (*i.e.*, acids obtained from the waste products from refining mineral oil by means of alkali) or their salts, may be utilised for the emulsification of asphaltum, coal tar or petroleum pitch, montan wax, paraffin wax, or Japan wax, the petroleum acid and asphaltum, etc., being fused together, and the hot melted mass being added to a boiling solution of ammonia, with agitation; the products obtained in this manner may be further diluted with water. The paraffin emulsions may be used as the basis of salves, the emulsions of montan wax and Japan wax for polishing preparations, waxing compositions, etc., and the emulsions of asphaltum or pitch as dust laying oils on roads. (Compare Fr. Pat. 423,291 of 1910; this J., 1911, 675).—T. F. B.

Oil [petroleum]; Purifying ——. W. J. Travers, Assignor to J. Collins, Olinda, Cal. U.S. Pat. 1,004,219, Sept. 26, 1911.

In order to remove water from crude petroleum having an asphaltic base (when the water will not separate out on heating), the oil is heated to or above 212° F. and introduced at the bottom of a heated mass of the oil at the same temperature. As the oil rises to the surface, the hydrostatic pressure becomes less and the water evaporates.—A. T. L.

Coking coal; Apparatus for ——. H. L. Doherty, New York. Eng. Pat. 11,276, May 10, 1911.

See U.S. Pat. 997,941 of 1911; this J., 1911, 1005.—T.F.B.

Apparatus for determining the quantity of carbon dioxide in flue gases, producer gases, etc. Eng. Pat. 199. *See* XXIII.

Apparatus for testing the atmosphere of coal mines. Eng. Pat. 2590. *See* XXIII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Ammonia; Direct recovery of —— *from the gases of dry distillation, by means of sulphuric acid. The Mont-Cenis process.* Pfudel. J. Gasbeleucht., 1911, 54, 1272—1273. (See also this J., 1911, 1442.)

The gases are cooled to 30° or 35° C. and passed through a Pelouze tar extractor and are then bubbled through a saturated solution of ammonium sulphate containing 5 to 15 per cent. of free sulphuric acid, and the gases free from ammonia are passed through an acid separator. The ammoniacal liquor obtained from the coolers, etc., is distilled and the gases led to the gas inlet pipe of the ammonia absorption vessels. The gases leave the absorption vessels at about 50° C. and may be used at once for heating purposes or they may be cooled, and freed from benzene and hydrogen sulphide when used for lighting. Ammonium sulphate is precipitated in the absorption vessels, and is drawn off at the bottom. The final product is colourless, and contains 25·12 per cent. of ammonia, and 0·29 to 0·39 per cent. of free acid.—A. T. L.

Wood distillation in the United States. Oil, Paint, and Drug. Rep., Dec. 25, 1911. [T.R.]

According to a preliminary statement relating to the industry of wood distillation in the United States during the calendar years 1910, 1909, 1908, and 1907, issued by the Bureau of the Census, 147 establishments engaged in this branch of industry during both 1910 and 1909, as against 131 in both 1908 and 1907. The total reported quantity of wood consumed during 1910 was 1,450,439 cords, which was an increase of 185,282 cords over 1909; of 472 595 cords over 1908, and 168,319 cords over the reported consumption in 1907. Of the 147 plants in operation during 1910, 117 were engaged in the distillation of hardwoods, chiefly birch, beech, and maple. The quantity of hardwoods consumed during the year was 1,257,997 cords, or 86·7 per cent. of the total of all woods consumed in distillation. Thirty establishments were engaged during 1910 in the distillation of soft woods, chiefly yellow pine, with smaller quantities of Norway pine and Douglas fir. Growth has been much more rapid during recent years in soft wood distillation than in hard wood.

Quantity, in cords, of wood consumed.

Year.	Total.	Hard woods.	Soft woods.
1910	1,450,439	1,257,997	192,442
1909	1,265,157	1,149,847	115,310
1908	977,844	878,632	99,212
1907	1,282,120	1,219,771	62,349

Patent.

Arc lamp electrodes. The British Thomson-Houston Co., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 710, Jan. 10, 1911.

In electrodes containing or composed of titanium compounds, it is usual to add fluorides of the alkali or alkaline earth metals in order to obtain a steady arc. The present invention consists in adding a titano-fluoride, such as the calcium compound, $CaTiF_6$, or the cerium compound, $CeTiF_6$, which contain a larger proportion of fluorine relatively to the calcium or cerium than the corresponding fluorides.—A. T. L.

III.—TAR AND TAR PRODUCTS.

Creosote oils and creosote dips; The dimethyl sulphate test for ——; a substitute for the sulphonation test. R. M. Chapin. U.S. Dept. of Agric., Bureau of Animal Ind., Circular No. 167, June 30, 1911.

The author reverses the purpose of Valenta's dimethyl sulphate test (this J., 1906, 366; 1908, 114) and recommends it as a quick and clean method, giving definite results, for the determination of open chain hydrocarbons in commercial creosote oils and dips; the aliphatic oils being undissolved are thus directly determined and can be subjected to further examination. *Creosote oils.* The oil is distilled and 5 c.c. of one of the higher fractions are shaken with 8 c.c. of dimethyl sulphate in a narrow 25 c.c. burette; on standing, any aliphatic oils present soon separate as a clear supernatant layer. The following table gives a comparison of the residues obtained from several creosotes by the sulphonation and dimethyl sulphate tests; the data given by the latter are regarded as quite as valuable as those obtained with the former for determining the origin and composition of commercial creosotes:—

Kind of oil.	Fraction distilling at	By sulphonation on 10 c.c.	By dimethyl sulphate per 10 c.c.
	° C.	c.c.	c.c.
Commercial coal-tar creosote, so-called "crude carbolic acid, 20 per cent." ...	240—270	0·2	trace
	270—330	0·47	0·36
Blast furnace creosote.....	240—270	1·60	2·00
	300—350	2·00	3·20
Oil gas-tar creosote	240—270	2·10	3·70
	300—350	2·35	1·80

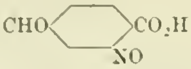
Creosote dips. These contain rosin soap and are tested as follows:— 20—50 grms. of the dip are treated with ether and potassium hydroxide solution; the ethereal extract of neutral oils obtained is distilled or evaporated until ether and moisture are completely driven off, and the residue is tested with dimethyl sulphate as stated above. If the result be negative, it is certain that the dip contains neither any large quantity of creosote of doubtful origin nor petroleum oils. Positive results, however, furnish only approximate and high estimations, probably on account of the petroleum dissolving unsaponifiable constituents of the rosin. If further information be required, 150 grms. of the dip are well shaken with 30—40 c.c. of dilute sulphuric acid (1 to 2); after the mixture has stood for an hour, the lower layer is completely drawn off; the residual oil is neutralised with calcium carbonate, dried by warming with calcium chloride, filtered through a folded filter and distilled. A test with dimethyl sulphate is made on the fraction distilling over at 240°—270° C. Neither the sulphonation nor dimethyl sulphate test can be applied to the higher fractions of a material containing creosote oil and rosin. This limitation of the temperature at which fractions may be taken allows, however, the recognition of blast furnace or oil-gas creosote, but an admixture with a coal-tar creosote of certain quantities of high boiling petroleum residues may thus escape detection. Care must be taken in using dimethyl sulphate owing to its poisonous and irritating properties. (See also this J., 1910, 341; 1911, 191, 193.)—A. Sbld.

Nitrobenzene; Electrolytic reduction of ——. R. C. Snowdon. J. of Phys. Chem., 1911, 15, 797—844.

The author finds that nitrobenzene can be electrolytically reduced to aniline in ferrous chloride solution, at 100° C., between iron electrodes. In the experiments recorded, the liquid was stirred so as to produce an emulsion, and 2·2 volts were required for a current density of 15 amps. per sq. dm. The reduction may also be effected by massive iron, as above, but without current, provided the stirring is sufficiently intense to bring all the substances into intimate contact. The presence of an iron salt, preferably ferrous chloride, seems to be essential, and the rate of corrosion of the iron depends on the concentration of its solution, though it is not proportional to it. The concentration of the ferrous chloride remains unchanged, however, and the catalytic action is apparently due to the salt being a reducing agent and keeping the iron from becoming passive. Nitrobenzene is reduced at 100° C. by alkaline sodium sulphide, ferrous hydroxide (ferrous sulphate and sodium hydroxide), and sodium arsenite solutions, a yield of 92—97 per cent. of aniline being obtainable with the first and 60—80 per cent. with ferrous hydroxide; with sodium arsenite the chief product is azoxybenzene, and the method is recommended for preparing this substance, of which a yield of 90 per cent. may be obtained by adding sodium arsenite to a mixture of nitrobenzene and alkali; in all cases, the yield of azobenzene is very small.—F. Sodn.

Nitroterephthalaldehyde ; Photochemical behaviour of ——. H. Suida. J prakt. Chem., 1911, 84, 827—830.

A solution of nitroterephthalaldehyde in xylene, when exposed to the action of light at the ordinary temperature, is readily converted into nitrosoterephthalaldehydic acid,



which separates out on the walls of the containing vessel. A solution of 1 grm. of the aldehyde gave 0·8 grm. of solid after exposure for 8 hours. The experiment lends itself readily to lecture demonstration.—J. C. C.

Patents.

Nitro-derivatives of aniline and its homologues ; Manufacture of ——. B J. Flürscheim, Fleet, Hants. Eng. Pat. 9520, April 19, 1911.

The reduction of *m*-dinitrobenzene or its homologues to the corresponding mono-amine can be effected without the use of organic solvents, by gradually adding to a hot aqueous suspension of the dinitro compound, a sulphide, polysulphide, or sulphydrate of an alkali or alkaline earth, with or without addition of free sulphur. *Example :* 190 parts of a solution containing 75 parts of crystallised sodium sulphide and 10 parts of sulphur is added, within 1½ hours, to a suspension of 50 parts of commercial dinitrobenzene in 200 parts of boiling water ; after cooling, the solid *m*-nitraniline is separated from the solution, which yields sodium thiosulphate on evaporation. The yields in this process are said to be much the same as when organic solvents are used, very little diamine being produced.—T. F. B.

Anthraquinone derivatives containing sulphur ; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 239,762, Nov. 28, 1909.

Anthraquinone diazonium compounds are treated with thioureas, the reaction being completed by heating in water the diazo compounds first formed ; the products may be used in the preparation of dyestuffs.—T. F. B.

Emulsion products from asphalt, coal tar pitch, etc. Eng. Pat. 23,468. *See* IIa.

IV.—COLOURING MATTERS AND DYES.

Patents.

Azo dyestuffs for cotton ; Production of new ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 27,861, Nov 30, 1910.

Diazotised acidyl-*p*-phenylenediamine or *p*-nitroaniline is combined with a suitable middle component, the monoazo dyestuff thus obtained is diazotised and combined with a naphtholsulphonic acid, and the acidyl group is eliminated from the acidyl compound or the nitro-group is reduced. The aminodisazo compound thus produced is diazotised and combined with 1 : 8-dihydroxynaphthalene-4-sulphonic acid, Example 1 : Oxalyl-*p*-phenylenediamine is diazotised and combined with 1-naphthylamine-6-sulphonic acid. the product diazotised and combined with 2-naphthol-7-sulphonic acid, the product saponified, diazotised and combined with 1 : 8-dihydroxynaphthalene-4-sulphonic acid, The dyestuff dyes cotton blue. Example 2 : The starting point is nitro-*p*-xylidine and this is combined as above, the nitro-group being reduced at the stage where, in the above example, the oxalyl group is split off. (Reference is directed to Eng. Pat. 16,484 of 1887 ; this J., 1888, 619.)—J. C. C.

Sulphur [sulphide] dyestuffs ; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 30,104. Dec. 28, 1910.

The indophenols or leuco-indophenols, produced by the simultaneous oxidation of mono- or dialkyl-α-naphthylamines and *p*-aminophenol or its substitution products, are converted by treatment with alkali polysulphides and copper or copper compounds, into dyestuffs which produce pure green shades, fast to boiling.—T. F. B.

Dihalogen-meta-oxybenzaldehyde and [triphenylmethane] dyestuffs derived therefrom ; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 30,105, Dec. 28, 1910.

See Addition of March 18, 1911, to Fr. Pat. 404,800 of 1909 ; this J., 1911, 1205. Dihalogen-*m*-hydroxybenzaldehyde may be obtained by treating one mol. of *m*-hydroxybenzaldehyde with two mols. of a halogen, or by treating one mol. of 2-chloro-5-hydroxybenzaldehyde with one mol. of a halogen.—T. F. B.

Sulphur colouring matters [from quebracho, mangrove, etc.] ; Manufacture of ——. A. Redlich and G. Deutsch, Vienna. Eng. Pat. 28,862, Dec. 12, 1910.

When mangrove bark or quebracho wood, or extracts prepared therefrom, are heated with sulphur and alkali sulphides, colouring matters are formed which dye cotton, directly, grey to brown shades. Instead of using the above materials, the phlobaphenes, obtained in making quebracho extract, may be utilised. Example : 100 kilos. of the sludge precipitated on cooling quebracho extract, is dried and heated gradually to 210° C. with 150—200 kilos. of crystallised sodium sulphide and 35—50 kilos. of sulphur ; the dry, brittle mass obtained can be pulverised and at once used as a colouring matter.—T. F. B.

Sulphurised vat dyestuffs of the anthracene series ; Manufacture of ——. Soc. Chem. Ind. in Basle, B. Mayer. L. Weil and A. Pfannenstiehl, Basle, Switzerland. Eng. Pat. 15,979. July 10, 1911. Addition to Eng. Pat. 20,094, Sept. 24, 1908.

Vat dyestuffs similar to those described in the chief patent (this J., 1909, 361) and in Eng. Pat. 11,422 of 1911 (this J., 1911, 1204) are obtained by substituting for the 2-methylbenzanthrone, a substitution product thereof or an isomeric methylbenzanthrone.—J. C. C.

Dyestuffs easily converted into vats ; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 241,141, Sept. 21, 1910. Addition to Ger. Pat. 237,368, Sept. 28, 1909.

Dyestuffs in a form similar to those produced by the process described in Ger. Pat. 239,338 (this J., 1911, 1372) are produced by oxidation of leuco compounds of the dyestuffs in presence of aromatic sulphonic or carboxylic acids, phenols, or amines. Thus, thioindigo is obtained in a very finely divided condition by air-oxidation of its leuco-compounds in presence of a salt of benzylsulphanilic acid.—T. F. B.

Thioindigo dyestuffs ; Process for preparing amino-substituted —— Kalle und Co. Ger. Pat. 241,326, Feb. 6, 1910. Addition to Ger. Pat. 239,673, Feb. 14, 1907.

Amino-derivatives of thioindigo dyestuffs are obtained by treatment of amino-oxythionaphthenes with mild oxidising agents in acid solution. The use of strong oxidising agents, such as permanganates, persulphates, and bichromates, results in the complete decomposition of the substances.—T. F. B.

Thioindigo scarlet and its derivatives ; Process for preparing ——. Kalle und Co. Ger. Pat. 241,327, March 27, 1910.

The dyestuffs are obtained by the condensation of 2·3-diketodihydro-(1)-thionaphthene or its derivatives with oxindole or its derivatives.—T. F. B.

Pentachlorobenzaldehyde; Manufacture of —— and [triarylmethane] dyestuffs therefrom. P. A. Newton. London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 29,143, Dec. 15, 1910.

See Fr. Pat. 428,369 of 1911; this J., 1911, 1153. T. F. B

Vat dyes of the anthracene series; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 29,352, Dec. 17, 1910.

See Ger. Pat. 239,544 of 1910; this J., 1911, 1372.—T. F. B.

Disazo dye; Bluish-violet ——. A. Zart, Vohwinkel. Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,012,960, Dec. 26, 1911.

See Eng. Pat. 27,627 of 1910; this J., 1911, 1109.—T. F. B.

Colouring matters from nigrosines and from indulines; Manufacture of deep black water-soluble ——. L. Stange, Berlin. Eng. Pat. 10,636, May 2, 1911. Under Int. Conv., July 26, 1910.

See Ger. Pat. 234,468 of 1910; this J., 1911, 796.—T. F. B.

Azo dyestuff. M. T. Bogert, New York. U.S. Pat. 1,012,055, Dec. 19, 1911.

See Ger. Pat. 228,796 of 1909; this J., 1911, 203.—T. F. B.

Indigo colouring-matter and derivatives thereof and process of making them. L. Kalb, Munich, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,012,363, Dec. 19, 1911.

See Ger. Pat. 216,889 of 1908; this J., 1910, 207.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Patents.

Wool fibre; Apparatus for supplying liquid [oil] to ——. W. J. Murray, Bristol, Pa., U.S.A. Eng Pat. 13,969, June 12, 1911. Under Int. Conv., Feb. 6, 1911.

An oil-box is provided with a number of stop-cocks which deliver oil into a series of vertical ducts arranged in a horizontal iron bar support having a longitudinal recess in its lower face. Into the recess is fitted an iron spreading bar provided on its upper face with a longitudinal trench which receives the oil from the ducts and delivers it through irregularly spaced perforations to the lower surface of the spreading bar. This bar finally transfers the oil to the wool which is passed underneath it. The machine is provided with a device for automatically stopping the cocks when the machine is checked.—P. F. C.

Cotton goods; Manufacture and treatment of raised —— to reduce their inflammability. J. Bright and Bros. and R. E. Oldroyd, Rochdale. Eng. Pat. 17,864, Aug. 5, 1911.

In raised cotton goods such as flannelettes, the nap is composed essentially of fibres from the weft yarns. It is proposed to weave such fabrics with a proofed, treated weft and an unproofed warp, subsequently raising the surface of the fabric.—J. F. B.

Cellulose and fibrous materials from plants; Isolation of ——. O. Silberrad, Buckhurst Hill, Essex. Eng. Pat. 28,193, Dec. 5, 1910.

Fibres are obtained from raw materials, *e.g.*, flax and other plants, by steeping the material in a retting bath containing compounds such as ricinoleo-sulphuric acid (Turkey-red oil), in such a manner that these compounds effect a hydrolytic action and at the same time also undergo hydrolysis, and in so doing are deposited on the fibre to form a substitute for the natural waxes which are usually removed by chemical retting. Example:—flax straw, either dried or green, is steeped in a bath, heated to 60°—100° C., composed of 1,000 gallons of soft water, 150 lb. of soap, 100 lb. of soda ash and 50 lb. of Turkey-red oil until thoroughly softened, the time required being generally 50—70 hours. The fibre is then separated from the stem by the usual mechanical processes.—J. F. B.

Wood pulp; Apparatus for producing ——. B. Jirotka, Berlin. Eng. Pat. 15,105, June 28, 1911.

Wood pulp is produced by forcing wood-flakes, which are either dry, heated, moistened or already converted into chip paste, between grindstones by hydraulic or steam pressure or by means of a mechanical conveyor. If desired steam or water may be introduced between the stones during the grinding process. Five different machines are described for carrying out these operations. —P. F. C.

Cellulose fibres, films, etc.; Process for preparing —— from cellulose by injecting viscose into mineral acid. Verein. Glanzstoff-Fabriken A.-G. Ger. Pat. 240,846, Sept. 26, 1908.

Viscose is introduced into a coagulating bath consisting of a solution of a mineral acid containing salts, such as ammonium or magnesium sulphate, and an organic compound, for example glucose, a polyhydric alcohol, or a fatty acid.—T. F. B.

Corks; Process for providing —— with a resistant, neutral covering. L. Pink. Ger. Pat. 240,563, March 9, 1911. Addition to Ger. Pat. 227,918, Feb. 9, 1910 (see Eng. Pat. 2455 of 1911; this J., 1911, 1376).

Corks are impregnated or coated with a solution of celluloid or nitrocellulose, and after drying they are treated with sulphuric acid.—T. F. B.

Fabrics; Method of producing an undulated or loosened surface upon ——. M. Ratignier, Lyons, and H. Pervilhac, Villeurbanne, France. U.S. Pat. 1,012,914, Dec. 26, 1911.

See Eng. Pat. 16,723 of 1910; this J., 1911, 1310.—T.F.B.

Collodion or celluloid composition and process of producing the same. S. de Medveczky, Budapest. Eng. Pat. 27,283, Nov. 23, 1910.

See Ger. Pat. 239,733 of 1910; this J., 1911, 1461.—T. F. B

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Vat-dyeings; Theory of ——. K. Gebhard. J. prakt. Chem., 1911, 84, 625—633.

Fibres dyed with Helindone Yellow 3GN(2 : 2′-dianthraquinonylurea) or the dyestuff obtained by blowing air through the vat, when treated with alkali become first brown and, with stronger alkali, violet, although the original dyestuff, even when finely divided, remains unchanged with alkali. When however the benzyl derivative is produced on the fibre no change is effected by alkali. The change observed is due to the hydrogen atom of the imido group which is thus more loosely combined with nitrogen in the fibre than it is in the free dyestuff. The author assigns the change of colour with alkali to the weakening of the linkings between nitrogen and hydrogen and carbon and oxygen respectively, according to the theory developed in a paper on the relation between the constitution of dyestuffs and their sensitiveness to light (J. prakt. Chem., 1911, 84, 561—625). The unsaturated character (partial valency) of the carbonyl group is necessary for the fixation of the dyestuff on the fibre, and this holds good in the case of indigo, for Binz has shown that indigo-oxime does not become fixed on the fibre. The author's explanation of the fixing of vat dyestuffs is stated to be opposed to the "colloidal-chemical" view and to the idea of a chemical union between dyestuff and fibre.—J. C. C.

Chrome dy stuffs; Influence of acids in dyeing with ——. E. Ristenpart. Färber-Zeit., 1911, 22, 477.

The nature and the quantity of acid used in dyeing wool with dyestuffs which require to be after-chromed has considerable importance for an excess of acid, especially of mineral acid, frequently weakens and dulls or even entirely alters the shade obtained.—P. F. C.

Adsorption [by fibres] in solutions; Studies on ——. *II. The dual nature of the adsorption phenomena.* G. v. Georgievics. Monatsh. Chem., 1911, 32, 1075—1087.

A continuation of the investigation by the author and Pollak (this J., 1911, 1247). Further experiments on the absorption of sulphuric and hydrochloric acids by wool lead to the following conclusions: (I.) The absorption of acids by wool is a dual process. In the case of the weakest solutions (containing up to about 0·05 grm. of acid in 250 c.c. of water) only a solution of the acid by the wool takes place. With stronger solutions both solution and adsorption occur. (II.) Rapid absorption of a substance cannot be regarded as evidence of an adsorption having taken place, as diffusion into the absorbent can also rapidly occur (when using concentrated solutions). Experiments made with silk (purified by treatment with very dilute hydrochloric acid) and picric acid solutions show that with very dilute solutions (containing up to about 0·01 grm. in 100 c.c. of water) the absorption of picric acid by the silk must be regarded as a solution phenomenon. At a somewhat higher concentration (0·01 to 0·02 grm. per 100 c.c.) a remarkable increase in the absorption of the acid was found to take place; this is shown to be a result of chemical action. With still stronger solutions the absorption of the picric acid follows the law of adsorption as previously shown by Walker and Appleyard (see this J., 1896, 650; 1911, 799). A curve is given illustrating the course of the whole process of absorption. The absorption of picric acid by silk is therefore a case in which the occurrence of solution, chemical action, and adsorption together can be shown with practical certainty. Adsorption processes, in general, cannot therefore be regarded as simple processes. In the absorption of substantive dyestuffs and probably also of leuco-compounds of the vat and sulphur dyestuffs, adsorption is regarded by the author as the chief process taking place, but with very dilute solutions of the colouring matters mainly a solution of the dyestuff by the fibre substance takes place (Witt's theory); chemical reactions between dyestuff and fibre (as in the case of picric acid and animal fibres) may occur, but only in a subordinate degree. (See also this J., 1891, 42; 1895, 149, 652, 653.)—A. Sbld.

Discharge on a chrome mordant with stannic lactate; White ——. A. Scheurer. Sealed note No. 1206, Aug. 13, 1900. Bull. Soc. Ind. Mulhouse, 1911, **81**, 228—229.

The fabric is chrome-mordanted, next printed with a suitably thickened solution of stannic lactate of 20° B. and then steamed, washed and dyed. To improve the white in the case of heavily mordanted goods, the addition of citric acid to the discharge paste is beneficial. M. Battegay in his report suggests that the discharging action is really due to lactic acid.—P. F. C.

Patents.

Scouring, boiling or washing of textile fabrics and fibrous materials. A. E. Roberts, Prestwich, and J. B. Turner, Manchester. Eng. Pat. 28,641, Dec. 9, 1910. Addition to Eng. Pat. 10,792, May 2, 1910 (this J., 1911, 679).

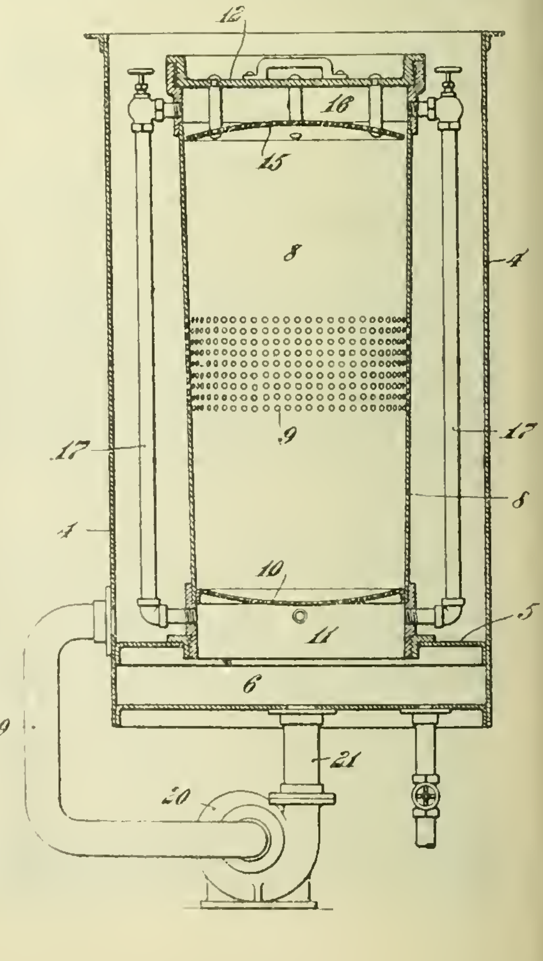
Means are provided for raising the cage containing the material to be treated, out of the liquor into the atmosphere of steam above it. This is carried out at regular intervals and whilst the material is suspended in the vapour, hot liquor is delivered on to it from a spraying device arranged in the upper part of the kier. In a modification of the process, the cage remains stationary whilst the kier is alternately and repeatedly filled and drained. It is advantageous in this case to work a number of kiers in pairs, the liquor from one kier of each pair being forced into the other. Two machines for the process are described in detail.—P. F. C.

Drying sized yarns and warps; Machine for —— A. N. Marr, Thorner, Yorks. Eng. Pat. 1303, Jan. 18, 1911.

The sized warp is passed through a drying chamber which is divided into compartments by vertical partitions and is heated by hot air forced through it by a fan. This chamber is provided at its top and bottom with guide rollers over and under which the warp travels during its vertical sinuous passage through the machine. The vertical partitions alternately extend from the roof of the chamber to just above the lower rollers and from the floor of the chamber to just below the upper rollers. Long blocks having a triangular cross-section are horizontally fastened to these partitions at suitable intervals in order to direct the current of hot air on to the travelling warp and thus keep the threads separate.—P. F. C.

Dyeing machine. J. Richardson and J. F Neef, Philadelphia. Eng. Pat. 16,524, July 18, 1911. Under Int. Conv., Jan. 27, 1911.

A dye-vat, 4, is provided near the bottom with a partition, 5, in which is removably mounted a receiver, 8, for the material to be dyed. A perforated bottom, 10, is arranged



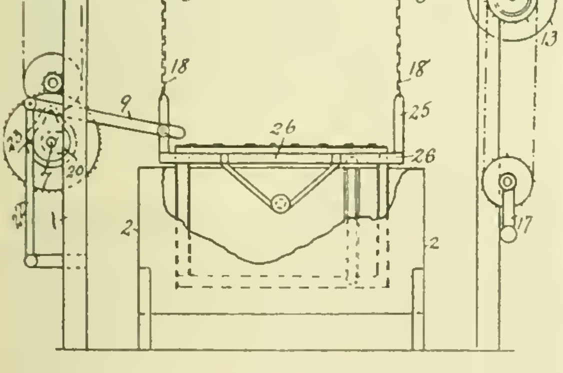
at the lower end of the receiver, the upper end is fitted with a lid, 12, and the cylindrical wall is provided with a zone of perforations, 9, situated midway between the two ends of the receiver. The cover, 12, supports a perforated partition, 15. Pipes, 17, which are fitted with valves, form communications between the chambers, 11 and 16. A pipe, 19, places that part of the dye-vat which is above the partition, 5, in communication with a pump, 20, which on the other side is connected by a pipe, 21, with the lower chamber, 6. In working this machine, the material is put into the receiver, the cover, 12, is fastened down, and dye liquor is circulated from the tank, 4, into the compartment, 6, and thence into the space, 11. The flow of liquor then divides, one part travelling through the perforated bottom, 10, and another part through the pipes, 17, into the upper chamber, 16, and thence into the receiver, 8. The two currents therefore flow through the material in opposite directions and return to the dye-vat through the perforations, 9.—P. F. C.

Dye-tub apparatus. W. M. Rossiter, Sunbury, Pa. U.S. Pat. 1,006,502, Oct. 24, 1911.

THE apparatus comprises a vat with metal ends and wooden sides and floor. The fabric passes from one driving roller above the vat over guide rollers within the latter, to another driving roller also above the vat. The driving rollers are operated from a water motor. The dye-liquor is heated by means of a steam coil placed on the floor of the vat, and connected at the discharge end with a pipe leading to the supply pipe for the motor. Suitable connections are provided so that the motor can be driven either by the condensed water from the steam used for heating or by a separate water supply. The discharge pipe from the motor is connected with a branched pipe, so that the water can either be run to waste or directed into the vat for washing the dyed material. When used for the latter purpose, it is directed within the vat into troughs formed by means of hinged plates around guide rollers on either side of the vat. The dyeing is effected by means of an endless band of absorbent material, which is partially immersed in the dye-liquor and passes over one of the guide rollers, above the dye liquor, over which the fabric is led.—A. S.

Skein dyeing machine. W. H. Fletcher, Paterson, N.J. U.S. Pat. 1,008,251, Nov. 7, 1911.

THIS machine comprises a standard, 1, which carries bearings for the shaft, 19, of drums, 8. Around these drums are wound the chains, 18, which support the arms, 25, of a frame support, 26, and this support in turn carries a framework for the sticks over which are arranged the skeins to be dyed. By means of fast and loose pulleys, 13, or by the handle, 17, the skeins can therefore be raised from or lowered into the dye vat, 2. A lever, 22, is provided with a stud, 23, which engages in a groove in the surface of a cam, 20, fixed on a rotating shaft, 7. The action of the cam is thus communicated to the lever, 22, through the lever to the bar, 9, and finally to the framework supporting the skeins. This causes the skeins to be periodically moved through the dye liquor with a minimum of disturbance to the fibres.—P. F. C.



Dyeing apparatus. O. Kircheis, Philadelphia, Pa. U.S. Pat. 1,010,637, Dec. 5, 1911.

THE dye liquor is placed in a tank which is fitted with a movable cover and this cover supports hangers which reach down into the tank and carry bearings for the shafting of a rotatable drum. The walls of the drum are formed by two perforated concentric cylinders and the space between them is divided into compartments for holding the material to be dyed. To assist the circulation of the dye-liquor, a radial stirring device is fixed in the open centre of the drum and made to rotate at a greater speed than the drum and in the opposite direction. —P. F. C.

Fireproofing and preserving fabrics, wood, and like material; Impregnating composition for ——. W. Smith, Seven Kings, Essex. Eng. Pat. 11,320, May 10, 1911.

THE material to be treated is impregnated with an aqueous solution containing 49 parts of ammonium phosphate, 1 part of boric acid, 0·25 part of borax and 0·25 part of ammonium sulphate together with an optional addition of about 5 parts of ammonium carbonate.—P. F. C.

Dyeings on cotton; Process of producing dischargeable ——. O. Ernst and H. Eichwede, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,012,619, Dec. 26, 1911.

SEE Fr. Pat. 419,559 of 1910; this J., 1911, 206.—T. F. B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Nitric acid; Action of nascent hydrogen on ——. M. N. Banerjee and S. C. Banerjee. Chem. Soc. Proc., 1911, 326.

NASCENT hydrogen was obtained from platinum-black which had occluded the gas. The interaction of the nascent hydrogen and nitric acid results in the ready decomposition of the acid and formation of various reduction products, the free oxygen being wholly converted into water.

Sodium carbonate; Hydrates of ——. R. Wegscheider. Z. anorg. Chem., 1911, 73, 256—258.

IN Doelter's "*Handbuch der Mineralchemie*" (1911), the author stated that of the hydrates of sodium carbonate described, the only ones of which the existence was established are the mono-, hepta-, and decahydrates, the unstable hepta-hydrate, and the hemipenta-hydrate, $Na_2CO_3,2·5H_2O$ (compare Ketner, Z. physik. Chem., 1902, 39, 642). The existence of the last-named hydrate was accepted chiefly on the ground of the difference in crystalline form between it and the monohydrate (*thermonatrite*). Closer examination of Morel's data (Bull. soc. franç. min., 1889, 12, 546) has now shown that the 108° 6′ given for the angle 110 : 110 is a misprint for 103° 6′, corresponding to a normal angle not much more than 2° different from the corresponding angle of the monohydrate. As most of the other experimental results of Morel are in accord the view that the hydrate is really the monohydrate, the author now considers the existence of the hemipentahydrate to be unproved.—A. S.

Percarbonates, Isomeric ——. E. H. Riesenfeld and W. Mau. Ber., 1911, **44**, 3595—3605. (See this J., 1908, 224, and 1910, 21).

DRY carbon dioxide was led into sodium peroxide mixed with ice-cold absolute alcohol. The passage of the gas was kept up till a test portion gave no red colouration with phenolphthalein. The sodium percarbonate, $Na_2C_2O_6$, which separated, was filtered off and dried. By adding hydrogen peroxide before passing in the carbon dioxide, a compound of the composition $Na_2C_2O_6,H_2O_2$ was produced. In the case of the percarbonate, $Na_2C_2O_6$, only half of the active oxygen liberates iodine from potassium iodide, whilst with the salt, $Na_2C_2O_6,H_2O_3$, only a quarter of the active oxygen reacts with the iodide. There are three carbonates containing peroxide oxygen: (*a*) carbonates crystallising with hydrogen peroxide, $Na_2CO_3,1\frac{1}{2}H_2O$, (*b*) monoperoxycarbonates, Na_2CO_4, (*c*) percarbonates (monoperoxydicarbonates), $Na_2C_2O_6$. The salts of the first two show isomerism, *e.g.*, $Na_2CO_3,H_2O_2,\frac{1}{2}H_2O$ and $Na_2CO_4,1\frac{1}{2}H_2O$. The carbonates crystallising with hydrogen peroxide do not react with neutral potassium iodide. One-third of the active oxygen in monoperoxycarbonates reacts with potassium iodide. Potassium percarbonate prepared by electrolysis liberates an amount of iodine from potassium iodide equivalent to the whole of the active oxygen, whilst that prepared by the interaction of carbon dioxide and the peroxide only liberates about one-third as much iodine. The acids corresponding to these salts have the following constitution, viz., monoperoxycarbonic acid, HO·O·CO·OH, and percarbonic acid, HO·CO·O·O·CO·OH.—F. SHDN.

Sodium thiosulphate; Action of ultra-violet rays on ——. L. Marmier. Comptes rend., 1912, **154**, 32—33.

SOLUTIONS of sodium thiosulphate containing less than 6 grms. per litre are decomposed by ultra-violet light, sulphur and hydrosulphite being formed; the latter is itself rapidly decomposed by the ultra-violet light, and after 75 minutes exposure, no traces remain. The liquid then contains chiefly sulphite. With concentrations above 5 grms. per litre no hydrosulphite could be detected.
—G. W. McD.

Calcium carbide industry: conditions of production. Times Eng. Suppl., Dec. 27, 1911.

THE chief factors which have to be considered in the choice of a site for a carbide factory are cheap supplies of raw materials (lime or limestone and coke or anthracite) and of power. Large works have mostly been established in places where a practically unlimited supply of water power is available, especially in Norway, where also there are large deposits of limestone. The limestone must be free from magnesia, and especially from phosphorus compounds. Rather more than the theoretical amount of lime is used, viz., 2000 lb. of lime to 1200 lb. of anthracite per ton of carbide. The process of manufacture is conducted in electric furnaces provided with two inclined electrodes capable of maintaining a temperature of about 5500° F. (3038° C.). In a modern works a furnace takes 1500 kilowatts and produces 50—60 tons of carbide per week. On a moderate scale the power consumption is estimated at about 1 e.h.p. per year per ton of carbide, but a much lower power consumption is attained in very large installations. At Odda, for example, more than 30,000 tons of carbide are produced per year with the aid of six turbo-alternators of about 4000 h.p. each, of which one serves as a stand-by.—A. S.

Calcium hypophosphite; A new method for determining ——. E. Rupp and Kroll. Arch. Pharm., 1911, **249**, 493—497.

THE purity of calcium hypophosphite can be ascertained by means of the volumetric solutions of potassium bromate and potassium bromide now included in the German Pharmacopœia, 5th edition. Instead of using the dilute solutions there prescribed, the authors dissolve 3·35 grms. of potassium bromate and 15 grms. of potassium bromide in a litre. 25 c.c. of this solution after acidifying and the addition of excess of potassium iodide, are practically equivalent to 30 c.c. of $N/10$ thiosulphate solution. 1·5 grms. of the sample of calcium hypophosphite are dissolved in 500 c.c. of water. 10 c.c. of the solution are transferred to a 300 c.c. stoppered bottle, and treated with 50 c.c. each of the official bromate and bromide solutions, or with 25 c.c. of the authors' solution made up to 100 c.c. with water. In either case the liquid is acidified with 10 c.c. of dilute sulphuric acid. After standing in the dark for an hour, 1 grm. of potassium iodide is added, and the free iodine titrated with $N/10$ thiosulphate. As the hypophosphite is oxidised to phosphate, 1 c.c. of $N/10$ solution is equivalent to 0·002126 grm. of calcium hypophosphite. The reaction is not complete if more than half of the bromine available for oxidation is used up.—F. SHDN.

Barium acetate and aluminium sulphate; Behaviour together of concentrated solutions of ——. J. F. Sacher. Chem.-Zeit., 1911, **35**, 1447.

THE fact that no precipitate is produced for some time on mixing concentrated solutions of barium acetate and aluminium sulphate is considered due, not, as has been supposed, to the formation of a soluble colloidal modification of barium sulphate, but to the feeble dissociation and high viscosity of the solutions, which cause the reaction to take place very slowly. Analogous phenomena are observed on mixing concentrated solutions of barium acetate and magnesium sulphate or sodium sulphate.
—F. SODN.

Phosphomolybdates from silicomolybdates; Separation of ——. P. Mélikoff. Comptes rend., 1911, **153**, 1478—1479.

AMMONIUM silicomolybdate is much less soluble than the phosphomolybdate in hydrogen peroxide solutions. If hydrogen peroxide produces permolybdate on reacting with ammonium molybdate, the solubilities of both silicomolybdate and phosphomolybdate will be decreased in the presence of excess of ammonium molybdate and hydrogen peroxide, and it should therefore be possible to choose conditions in which the silicomolybdate is practically insoluble, while the phosphomolybdate is sufficiently soluble to be extracted. By the use of a solution composed of equal volumes of 30 per cent. hydrogen peroxide and 8 per cent. ammonium molybdate (*i.e.*, about 4 per cent. of permolybdate) the author has been able to separate completely a mixture of ammonium silicomolybdate and phosphomolybdate, the former remaining entirely undissolved. This reaction is specially suitable for microchemical examination of minerals for traces of phosphoric acid.
—W. H. P.

Uranous oxide; Solubility of —— *in various acids.* A. Raynaud. Comptes rend., 1911, **153**, 1480—1482.

URANOUS oxide, UO_2, prepared by calcination of uranyl oxalate, is practically insoluble in hydrochloric, sulphuric, hydrobromic, and acetic acids. The small extent to which solution does take place is presumably due to preliminary oxidation. Nitric acid and *aqua regia* dissolve the oxide quite readily, oxidising it to a uranyl salt.—W. H. P.

Nitrogen; A chemically active modification of —— *produced by the electric discharge. II.* R. J. Strutt. Roy. Soc. Proc., 1911, **86A**, 56—63.

FURTHER experiments on the chemically active modification of nitrogen (see this J., 1911, 683) have shown that it is destroyed but not oxidised by oxygen, the latter probably acting catalytically in a similar manner to copper oxide (*loc. cit.*). Hydrogen has no effect on the active nitrogen. The greenish-yellow flame with a continuous spectrum which is produced by the interaction of nitric oxide and active nitrogen to form nitrogen peroxide is identical with that produced when nitric oxide reacts with ozone (compare this J., 1911, 1264). The reaction just mentioned has been utilised for the determination of active nitrogen, the nitrogen trioxide produced by the union of the nitrogen peroxide first formed with more nitric oxide being condensed by liquid air and weighed. It was found that the nitrogen as it leaves the electric discharge contains about 2·5 per cent. of the active modification, this being a much higher figure than that obtained previously by absorption with phosphorus; probably the active nitrogen in contact with phosphorus in part combines and is in part destroyed without combination. When diluted phosphorus vapour is introduced into glowing nitrogen, reaction does not take place until some time after the glow has disappeared. Glowing nitrogen has a large electrical conductivity, comparable with that of a salted Bunsen flame.—A. S.

Ammonia production of Great Britain in 1911. Bradbury and Hirsch, Liverpool. [T.R.]

The total production of ammonia from all sources, calculated as sulphate, in the United Kingdom (including that used in the manufacture of ammonia-soda and other chemical processes) in 1910 and 1911, was as follows:—

	1910.	1911.
	tons.	tons.
Gas works	168,000	169,500
Iron works	20,000	20,000
Shale works	59,000	60,000
Coke and carbonising works and producer gas plant	120,500	129,000
Total	367,500	378,500

Of last year's production it is estimated that England contributed 256,000 tons, Scotland 119,500 tons, and Ireland 3000 tons. The exports during 1911 amounted to 292,000 tons, and the home consumption 85,500 tons, the stock carried forward to 1912 being 13,000 tons.

Sulphur industry in the United States. U.S. Census Bureau Report. Oil, Paint, and Drug Rep., Dec. 25, 1911. [T.R.]

The following table shows the quantity and value of sulphur imported and produced by the United States from 1902—1909:—

	Imported.		Marketed from domestic production.	
	Quantity, long tons.	Value.	Quantity, long tons.	Value.
1902	171,380	$3,357,650	——	——
1903	191,033	3,709,690	——	——
1904	129,532	2,511,269	127,292	$2,663,760
1905	84,339	1,567,485	181,677	3,706,560
1906	74,241	1,323,580	294,153	5,096,678
1907	22,523	420,175	293,106	5,143,850
1908	21,136	362,379	369,444	6,668,215
1909	[illegible]0,589	549,632	239,312	4,432,066

Direct recovery of ammonia from distillation gases. Pfudel. *See* IIb.

Detection, separation, and determination of arsenic and antimony. Bressanin. *See* XXIII.

Patents.

Corrosive acids [nitric acid]; Method of and apparatus for recovery of —— from their absorbents. F. M. Hale, Catford, and A. C. Scott, Cardiff. Eng. Pat. 29,906, Dec. 23, 1910.

The material is heated in an aluminium basket, within a covered pan which is provided with a steam jacket, and hot air, which may be previously dehydrated, is blown in from above. The hot air and vaporised acid pass through a bed of filtering material in the bottom of the vessel, into a second steam-jacketed vessel, containing strong sulphuric acid (96—97 per cent.) at 90°—100° C., and then to a condenser.—F. Sodn.

Sulphuric acid in lead chambers; Manufacture of ——. H. Rabe. Ger. Pat. 240,474, Dec. 4, 1909. Addition to Ger. Pat. 237,561, July 24, 1909.

In order to favour the double spiral motion of the gases as described in the chief patent (see this J., 1911, 1159), means are provided to prevent, as far as possible, the entering hot burner gases from passing into the rear part of the chamber, without interfering with the desired spiral motion. This object may be attained by means of transverse partitions depending from the roof of the chamber, and cooled if desired, or by making the roof slope downwards from the front to the rear.—A. S.

Ammonia; Process and apparatus for purifying ——. J. D. Pennock and E. C. Witherby, Solvay, and W. H. Blauvelt, E. N. Trump and C. G. Tufts, Syracuse, Assignors to Semet-Solvay Co., Syracuse, N.Y. U.S. Pat. 1,012,272, Dec. 19, 1911.

The purification is effected in an apparatus of the scrubber type by means of a saturated solution of pure ammonia, with which the impure gas is brought into contact at successively decreasing temperatures. The impurities (oils, etc.) are thus absorbed in the inverse order of their volatility, the various fractions of the purifying solution being separately withdrawn at convenient points in the system.—W. E. F. P.

Ammonia; Art of recovering ——, from ammoniacal liquor, and apparatus therefor. J. D. Pennock and E. C. Witherby, Solvay, and W. H. Blauvelt, E. N. Trump and C. G. Tufts, Syracuse, Assignors to Semet-Solvay Co., Syracuse, N.Y. U.S. Pat. 1,012,273, Dec. 19, 1911.

In a continuous process for the recovery of pure ammonia from ammoniacal liquor, the latter is heated in a still the volatile products from which are brought into contact with fresh portions of the liquor in an apparatus of the scrubber type. The volatile impurities are removed from the ammonia as described in U.S. Pat, 1,012,272 (see preceding abstract). the concentrated liquor from the still being treated with lime. as usual, for the recovery of the combined ammonia.—W. E. F. P.

Lime; Process of burning ——. J. G. Jones, Carthage, N.Y. U.S. Pat. 1,011,804, Dec. 12, 1911.

Limestone is heated in a vertical kiln, to "substantially the point of disassociation," and passes thence through a rotary kiln, where it is converted into oxide, the heat and dust from the rotary kiln being made to pass back into the vertical kiln, into which also steam may be introduced.—F. Sodn.

Barium oxide from barium carbonate; Electrolytic manufacture of ——. Siemens und Halske A.-G. Ger. Pat. 241,043, July 5, 1910.

The claim is for the use of barium chlorate or perchlorate as electrolyte. The process is conducted in a diaphragm apparatus and if barium chlorate be used, the cathodes are of silver or platinum in order to reduce cathodic reduction to a minimum. Barium carbonate is suspended in the anolyte and serves to neutralise the liberated acid, whilst an equivalent quantity of barium oxide is formed in the cathode chamber.—A. S

Lead oxide; Manufacture of —— and apparatus therefor. W. Eckford, Rhyl. Eng. Pats. 30,354, Dec. 31, 1910, and 17,256, July 28, 1911.

The process consists in blowing air, or air and steam, through molten lead, whereby a coarse dross is produced and rises to the surface, where it is disintegrated by a beater, the finely divided particles being conveyed by means of a current of heated air to settling chambers wherein the lead oxide is deposited. The melting vessel has a well for containing the molten lead, above which the beating device rotates, the latter having a raised central part and lower outer blades fitted with ploughs, with or without an attached cutting bar. Air is forced through the molten lead in the well, and reduced pressure is maintained within the system by means of an exhaust fan in the final settling chamber or by means of the method of circulating the air described in Eng. Pat. 26,257 of 1908 (this J., 1909, 1313). By using a device for feeding pigs of lead to the melting vessel, as described in Eng. Pat. 30,355 of 1910, the process can be made continuous.—A. S.

Zinc formaldehyde sulphoxylate ; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 12,157, May 19, 1911.

Monozinc formaldehyde sulphoxylate, $Zn(HSO_2.CH_2O)_2$, can be obtained in a crystalline form from its solutions by evaporation, preferably under reduced pressure, provided that, when the solution has reached its saturation point, it is brought into contact with a crystal of mono-zinc formaldehyde sulphoxylate ; such crystals may be formed initially by stirring a highly concentrated solution of zinc formaldehyde hydrosulphite with alcohol. When the separation of the crystals of the mono-zinc salt has commenced, it is advisable to continue the evaporation until it is seen that no great increase occurs in the quantity of crystals ; these are then separated, washed with alcohol, and dried in a vacuum. The crystals thus produced are free from water of crystallisation, but crystals containing three and four mols. of water may be produced by varying the conditions of crystallisation.—T. F. B.

(1) *Potash from greensand ; Process of obtaining* ——. (2) *Process of producing metallic iron and alkaline* [*potassium*] *salts.* E. C. Eckel, Washington, D.C. U.S. Pats. 1,011,172 and 1,011,173, Dec. 12, 1911.

(1) Natural iron silicate containing potassium (such as greensand), mixed or not with a "sulphur bearing salt" or other substance necessary for the production of a suitable potassium compound, is heated at a temperature at which the potassium compound formed is volatilised, neither the proportion of added substance nor the temperature being sufficiently high to allow a cement clinker to form. The potassium compound is then recovered by condensing the volatilised product and by leaching the residue. (2) Glauconite or other natural alkali iron silicate is fused with reducing and fluxing materials (such as fuel and limestone), until the iron is reduced and the alkali salts are volatilised. The latter are then recovered, and the molten iron is drawn off.—F. Sodn.

Hydrogen gas ; Manufacture of ——. F. A. Barton, London. Eng. Pat. 28,534, Dec. 8, 1910.

Dilute sulphuric acid is allowed to act on zinc, and the zinc sulphate solution produced is filtered and mixed with a solution of sodium carbonate or bicarbonate, thus giving, as by-products, a precipitate, which is separated, washed, and dried, and sodium sulphate which is also recovered. The insoluble zinc precipitate is proposed as "an excellent substitute for oxide of zinc used in the paint and rubber industries." The apparatus claimed consists of a generating vessel, communicating with an acid tank by a feed pipe and a return pipe, and also with a gasometer and a mixing tank, the latter receiving the zinc sulphate solution from the generator and sodium carbonate solution from another vessel and communicating, in its turn, with a centrifugal separating and washing apparatus. The generator may be fitted with electrodes for the production of electrical energy.—F. Sodn.

Sulphuric acid ; Manufacture of ——. C. Opl, Assignor to Erste Oesterreichische Sodafabrik, Hruschau, Austria-Hungary. U.S. Pat. 1,012,421, Dec. 19, 1911.

See Fr. Pat. 394,739 of 1908 ; this J., 1909, 309.—T. F. B.

Alkaline and earthy alkaline carbonates ; Process for treating the —— *to obtain the respective peroxides and oxides or hydrated oxides.* V. Bollo and E. Cadenaccio, Genoa, Italy. Eng. Pat. 3992, Feb. 16, 1911. Under Int. Conv., April 16, 1910. Addition to Eng. Pat. 24,817 of 1910, dated Oct. 27, 1909.

See Addition of Oct. 13, 1910, to Fr. Pat. 420,470 of 1910 ; this J., 1911, 422.—T. F. B.

Sulphate of ammonium ; Manufacture of ——. G. N. Vis, Cuise-Lamotte, France. Eng. Pat. 9609, April 20, 1911.

See Fr. Pat. 427,065 of 1910 and Addition thereto ; this J., 1911, 1057 and 1160.—T. F. B.

Nitrogen compounds [*calcium cyanamide*]; *Process for producing* ——. K. Schick, and Act.-Ges. f. Stickstoffdünger, Cologne, Germany. Eng. Pat. 12,555, May 24, 1911. Under Int. Conv., Nov. 9, 1910.

See Fr. Pat. 430,060 of 1911 ; this J., 1911, 1313.—T. F. B.

Nitrogen compounds ; Electrolytic process of producing ——. C. E. Acker, Ossining, Assignor to The Nitrogen Co., New York, Reissue No. 13,343, Dec. 26, 1911, of U.S. Pat. 914,214, March 2, 1909.

See this J., 1909, 371.—T. F. B.

Brine ; Treatment of ——. G. W. Malcolm, Davenham, and J. T. Munton, Winsford. U.S. Pat. 1,012,387, Dec. 19, 1911.

See Eng. Pat. 13,415 of 1910 ; this J., 1911, 955.—T. F. B.

Alkali chlorides ; *Apparatus for electrolysis of* ——. E. Steinbuch, Monthey, Assignor to Soc. of Chem. Industry in Basle, Basle. U.S. Pat. 1,012.470, Dec. 19, 1911.

See Fr. Pat. 417,246 of 1910 ; this J., 1911, 27.—T. F. B.

Silica ; Manufacture of gelatinous ——. A. Poulson, Farnworth. U.S. Pat. 1,012,911, Dec. 26, 1911.

See Eng. Pat. 491 of 1909 ; this J., 1909, 1198.—T. F. B.

Process of electrically decomposing liquids. U.S. Pat. 1,011,413. *See* XI.

VIII.—GLASS ; CERAMICS.

Optical glass. W. Rosenhain. Phot. J., 1911, **51**, 393—404.

The chief essentials of optical glass are homogeneity and freedom from strain, colour, enclosures of bubbles or solids ("seed" and "stones"), and devitrification. Chemical durability, physical hardness, or suitable indices of refraction and dispersion are its requirements according to its purpose. The fundamental discovery with regard to homogeneity was made by Guinand, who used a stirrer of the same refractory fireclay of which the melting pots were themselves made. This process is still used, though requiring skill and endurance. Striae are discovered in glass by examining in parallel light between two lenses which reveals them as lines of either light or darkness. Freedom from strain is achieved by Schott and Abbé's process of fine annealing, which retards the rate of cooling from between 400° and 200° C. to 8°—10° in 24 hours. Colour should not be perceptible through a depth of 12 inches, which result is obtained by use of rigorously pure materials, especially free from iron. The use of "decolourisers" is deprecated ; they impart a neutral tint to the glass at the expense of additional absorption of light. Certain glasses however, such as flint glasses, are never free from colour owing to their lead content, and according to the Drude theory of refraction and dispersion, this yellow colour of lead oxide is essential to its intense power of refracting light. Bubbles are likely to occur in optical glass owing to its chemical composition being restricted within narrow limits, and further heating often results in the production of more bubbles. The optical constants usually measured are n_D, the index of refraction for sodium light, and the "mean dispersion" which is the difference between the refractive indices, n_C and n_F, for the red and green lines of the hydrogen spectrum, but for refined work partial and relative partial dispersions are required. A table of such constants is given for the optical glasses of Chance Bros. With ordinary Crown and Flint glasses the dispersive power increases with the refractive index, and the fundamental point of Abbé and Schott's work at Jena was that this relation did not persist if barium oxide and boric acid were also used as constituents of glass. It is now possible to achromatise three colours accurately. But the constants of optical glass lie in a narrow range; the refractive index is 1·56—1·7, and ν varies from 67—30. Minerals, on the other hand, have wider limits. Diamond has a refractive index of over 2, while ν in fluorite is 95. The use of minerals and artificial minerals is likely therefore to replace optical glass as we know it now. Hitherto the largest disc made for telescope purposes is 39 inches in diameter.—H. H. S.

Glass for X-ray tubes. Times, Eng. Suppl., Dec. 27, 1911.

It has recently been ascertained that glass made with lithium is about twice as transparent as soda-glass to the photographically active X-rays. Tubes have been provided with a lithium glass "window," through which the rays are discharged from the anti-cathode. The window is about 2 in. in diameter, and is fused into the bulb immediately opposite the anti-cathode. The result is that by using these tubes the exposures necessary for radiographic work are reduced by about 50 per cent.

Porcelain; "Bubbling" of ——. M. Larchevêque and C. Noble. La Céramique, 1911, 62—64, 122—125; Sprechsaal, 1911, 44, 759—761.

A blistered appearance is one of the most serious causes of loss in the manufacture of porcelain. Generally the defect must be attributed to the evolution of gas from the raw materials. Vogt suggested that sulphur compounds from the water, plaster moulds and fuel, evolved oxides of sulphur. Similarly Verneuil ascribed the effect to gaseous fluorine compounds from the mica in the clay body. The authors made several dry distillations of ground and dried pottery bodies and clays, and found that both sulphur and fluorine compounds are given off, besides steam which combines to form acids such as hydrofluosilicic acid. The fluorine gases are evolved at 800°—1000° C., which is said to be also the temperature at which mica loses water. The experiments are being extended to other raw materials, but the present conclusions are that fluorine is certainly contained in both the body and glaze of hard porcelain, and that its elimination is facilitated by moisture.—H. H. S.

Earthenware bodies; The composition of —— and its relation to scientific results. H. Harkort. Z. angew. Chem., 1911, 24, 2348—2353.

The author points out that less advantage has been taken of scientific methods and research in earthenware manufacture than in other industries. The strength of earthenware depends, not as in porcelain on the fusion of the felspar, but mainly on the close packing of the clay particles, and its determination merely by the ring of the articles when struck, leaves out of account such factors as thickness, shape, etc. The value of earthenware depends largely on the flawless adhesion of the glaze, and as a defect may not become apparent for months, some rapid method of testing is necessary. The author heats the test-pieces in an electrically heated oven, in which the temperature is slowly and regularly raised, and quenches them in water from different temperatures. A year's observations have shown that test-pieces which will stand higher temperatures, withstand ordinary variations of temperature longer, and that if no cracks are developed at a certain quenching temperature, a satisfactory behaviour towards changes of temperature can be predicted. Seger ascribed the formation of cracks, and the splitting off of a glaze to a difference between the coefficients of expansion of the body and the glaze. Measurements made by Damaur on earthenware bodies confirm Seger's assumptions and show that the coefficient of expansion increases with an increase in the silica content, but is affected by the temperature of firing, if this is raised to the point of fusion. Silica lowers the expansion in glazes, but in sintered bodies the reverse effect is found, as it checks the drawing together of the particles of clay substance. When the silica is fine grained the bodies are less liable to give rise to glaze cracks. By the quenching process, definite limits have been found for the ratio of clay substance to silica in earthenware bodies: on the one hand, a certain amount of clay substance must be present to yield an easily workable body, and on the other the silica content must be such that the coefficient of expansion represents an applicable value. Finely ground silica must be added as sand is eliminated from well washed clays. Its addition, however, tends to weaken a body, and a high temperature of firing which would tend to give strength would be a disadvantage from the point of view of the formation of glaze cracks, since the density developed promotes them. Briefly, the larger the fire-shrinkage is the smaller the coefficient of expansion, and the greater the sintering the larger the expansion. Every clay material possesses individual characteristics governed by the fineness of the clay particles, and the kind and amount of the impurities. Additions of lime and felspar increase the strength of the biscuit. This effect of the felspar is due to its fusion, but at that temperature deformation arises, though this is not noticed with the ordinary additions of lime (up to 20 per cent.). On the other hand lime softens a body, and slightly raises the burning temperature; the quenching limits are distinctly raised which is not the case with felspar earthenware.—W. C. H.

Seger cones 022—15; *Melting point of ——.* R. Ricke. Sprechsaal, 1911, 44, 726—729, 741—744.

Numerous tests were made on the melting points of Seger cones with regard chiefly to duration of firing and variety of kilns. These cones have no definite melting-points like metals and most chemical compounds. The chief factor is the duration of firing, which may affect the apparent melting point by 60°—100° C. Other conditions being similar, a cone will melt at a lower temperature if the firing be prolonged. But, according to the author, cones 012a—1 are an exception; they melt with more difficulty in a slow fire. Cones cannot be regarded as pyrometers for accurate measurement of temperature, but they have the advantage over optical and thermo-electric pyrometers in the burning of pottery that they are affected by the time factor as well as by the actual temperature attained. A cone that has remained unmelted in one fire cannot be reliably used in a subsequent one.—H. H. S.

Patents.

Glass; Strengthened ——. E. Benedictus, Paris. Eng. Pat. 18,856, Aug. 22, 1911. Addition to Eng. Pat. 10,324, April 28, 1911 (this J., 1911, 1059).

The sheets of gelatin, gelose and the like, whatever be their initial hygrometric state, can be dipped or tempered in a bath of 95 per cent. alcohol, and thus brought to the same state of final hygrometric equilibrium at which the gelatin acquires its maximum adhesion when heated. The strengthened glass may consist of one glass plate backed with gelatin, or celluloid, or of any number of glass plates with sheets of gelatin, etc., interposed between them.—W. C. H.

Quartz or silica; Manufacture of articles of ——. F. W. Burckhardt, Biebrich, Germany. Eng. Pat. 25,887, Nov. 8, 1910.

Before being fired in an electric or gas furnace, the powdered material in the mould is subjected to a pressure of not less than ½ a ton, and preferably 3—4 tons, per square inch, by which means the shaping and solidification is considerably accelerated.—H. H. S.

Ceramic articles ; Production of —— by casting. Porzellanfabrik Hentschel und Müller. Ger. Pat. 241,174, Nov. 19, 1909.

A core prepared from a ceramic mass is first fixed in the plaster mould and then a fluid porcelain or other ceramic slip is poured in. If desired, the core may be coated with a layer of glaze in order to obtain a firm union between the core and the outer layer. The process is intended for the production of very thick-walled articles or of partly thick- and partly thin-walled articles.—A. S.

Silicon carbide ; Process for the manufacture of solid-fashioned bodies containing ——. G. Egly, Assignor to Gebr. Siemens und Co., Charlottenburg, Germany. U.S. Pat. 1,012,531, Dec. 19, 1911.

See Eng. Pat. 21,347 of 1905 ; this J., 1906, 122.—T. F. B.

IX.—BUILDING MATERIALS.

Treated wood ; Determining the penetration of salts in ——. Forest Service Circular, 190. U.S. Dept. of Agriculture. Eng. and Min. J., 1911, 1218.

The degree of penetration of zinc chloride into wood may be ascertained by completely immersing a freshly-cut representative disc of the treated wood in a 1 per cent. solution of potassium ferrocyanide for a period not exceeding 10 seconds. The excess of liquid is then removed with filter paper, and the moist wood dipped into a 1 per cent. solution of uranium acetate and allowed to dry. The untreated parts of the wood will now appear of a dark brown or maroon colour, whilst the treated parts will appear of a whiter shade than the original wood, owing to the formation of zinc ferrocyanide. The test will detect a quantity of zinc corresponding to as little as 0·2 lb. of zinc chloride per cb. ft. of wood, but cannot be applied to red oak, the red colour of which masks that of the uranium compound. In the case of copper salts the copper may be detected by the dark red colour produced on dipping the wood into potassium ferrocyanide solution ; iron salts by the blue colour with the same reagent ; and mercuric chloride by testing the wood with an acidified solution of sodium sulphide.—C. A. M.

Portland cement ; The constitution and the formation of ——. E. Leduc. Bull. Soc. d'Encourag., 1911, **116**, 280—330.

The author has prepared, and investigated the properties of, the silicates, aluminates and ferrites of calcium, and by the preparation of cements of varying composition, has thrown into relief the effects of the several ingredients on the properties of Portland cement. Great care was taken throughout to ensure thorough mixing of the ingredients by repeated grindings and siftings, and to obtain each ingredient free from interfering impurities. *Mono-calcium silicate*, SiO_2,CaO, has no hydraulic properties. *Di-calcium silicate*, $SiO_2,2CaO$, has no hydraulic properties, and on cooling, falls spontaneously to powder. It is decomposed by water into mono-calcium silicate and calcium hydroxide. It cannot therefore be prepared in the wet way. Attempts to prepare *tri-calcium silicate*, $SiO_2,3CaO$, were unsuccessful. *Mono- and di-calcium aluminates*, Al_2O_3,CaO, and $Al_2O_3,2CaO$, both possess hydraulic properties and are stable in hot water. *Tri-calcium aluminate*, $Al_2O_3,3CaO$, as prepared, hardened quickly, but swelled out in boiling water. *Ferrites* do not possess hydraulic properties. *Silico-aluminates and silico-ferrites.*—The most basic of these compounds prepared had the composition :—$SiO_2,2{\cdot}6CaO$ + 4 per cent. of alumina or ferric oxide in the form of $Al_2O_3,2CaO$ or $Fe_2O_3,2CaO$. *Cements.*—The temperature of burning of normal products, and those containing 24 per cent. of clay is 1400°—1500° C. As the proportion of clay diminishes the temperature required is higher. The replacement of alumina by ferric oxide weakens the cement. A high content of magnesia causes the cement to swell. The author, having noticed that certain Seger cones appeared to melt at temperatures somewhat distant from those indicated, made tests of the cones in comparison with a Le Châtelier pyrometer, the results of which are tabulated. —T. St.

Portland cement clinker ; Constitution of ——. E. Jänecke. Z. anorg. Chem., 1911, **73**, 200—222.

A detailed account of the theoretical and experimental work leading to the results already published (see this J., 1911, 1453), including a discussion of the discrepancies between the author's results and those of Shepherd and Rankin (this J., 1911, 543).—A. S.

Portland cement on public works. G. T. Edwards. J. Gas Lighting, 1912, **117**, 30—31.

For the shrinkage test a tapered mould 4½ in. diameter at the top and 4 in. diameter at the bottom is suggested. For setting, the test recommended is the determination of the pressure necessary to penetrate with a standard drill a standard distance into the block. The tensile strength test is regarded as of little value. —H. H.

Rusting of iron in presence of blast-furnace slag. Heyn and Bauer. *See* X

Patents.

Stone and like building materials ; Process for preserving —— and for producing cement. H. W. Hemingway, Stratford. Eng. Pat. 28,284, Dec. 5, 1910.

Solutions of an alkaline silicate, and of arsenic acid, respectively are applied successively to stones, etc., in such proportions that the arsenic acid attacks both the alkaline silicate and the base or bases of the material treated to form an insoluble intimate mixture of silica and of arsenate of the base or bases. The solution of arsenic acid may be applied first, in excess of the amount required to react with the material, and then the solution of alkaline silicate to react with the excess acid. The pores of stone and similar material may be filled to any desired depth by the alkaline silicate solution, and silica deposited from this by the action of arsenic acid. Cement is produced by treating a pasty mixture of alkaline silicate and an alkaline earth with arsenic acid, or by mixing the latter and finely-divided silica with an alkaline mixture of alkaline silicate and caustic baryta or magnesia. Fissures, holes and other injuries in building material may be repaired by producing this protective and filling cement *in situ*.—W. C. H.

Bituminous paving blocks ; Process for manufacturing ——. G. B. Upham, Boston, Mass., U.S.A. Eng. Pat. 16,506, July 18 1911.

Compressed bituminous blocks, formed from a mixture of heated stone particles, "fines," and a bituminous cement, are made by subjecting segregated portions of the mixture to a number of compressions in a closed receptacle. The pressure may be maintained, or almost entirely removed between the successive compressions, and is continually increased. The heat is transmitted from the stony aggregate to the bituminous component during the interruption between successive compressions. —W. C. H.

Cement ; Process of producing ——, [and recovering zinc from tailings] and products thereof. A. C. Spencer, Washington, D.C. U.S. Pat. 1,012,467, Dec. 19, 1911.

The patent relates to the simultaneous production of cement and recovery of zinc from the tailings of calcareous zinc ores (containing zinc oxide or silicate) or from a concentration product of a franklinite ore (zinc, iron and manganese oxides). The finely-divided material (to which additions are made, if necessary, to ensure the production of a cement clinker of suitable composition) is fed into the upper end of an inclined, rotary kiln through which the heating gases pass in the opposite direction. The charge is finally heated to a sintering temperature, the zinc being recovered as oxide fume.—W. E. F. P.

Timber; Process of impregnating ——. A. Kolossváry and S. Ifaltenberger, Budapesth, and E. Berdenich, Püspök-Ladány, Austria-Hungary. U.S. Pat. 1,012,207, Dec. 19, 1911.

See Eng. Pat. 24,483 of 1910; this J., 1911, 285.—T. F. B.

Wood; Process of colouring ——. K. K. Schmidt, Dresden-Hellerau, H. Wislicenus, Tharandt, and M. Kleinstück, Dresden, Germany. U.S. Pat. 1,012,283, Dec. 19, 1911.

See Fr. Pat. 425,085 of 1911; this J., 1911, 896.—T. F. B.

Fireproofing and preserving fabrics, wood, and like material. Eng. Pat. 11,320. *See* VI.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Coke oven gas; Use of —— *in the Martin furnace.* O. Simmersbach. Stahl u. Eisen, 1911, **31**, 1993—2000, 2094—2100.

A detailed account is given, mostly in tabular form, of experiments on the employment of coke oven gases, alone or mixed with producer gas or blast furnace waste gas in a Martin steel furnace, and the results as regards economy, etc., are compared with the ordinary producer gas working. It is concluded that (1) a more regular combustion is obtained, (2) no gas heater is required and repairs are less, (3) a different shaped top of furnace more easily repaired may be introduced, and (4) the coke oven gas being a waste product is cheaper from its origin. —A. H. C.

Iron; Rusting of —— *in presence of blast-furnace slag.* E. Heyn and O. Bauer. Mitt. Kgl. Materialprüfungsamt, 1911, **29**, 454—461.

Experiments to ascertain to what extent the presence of blast-furnace slag is likely to assist the rusting of iron exposed to the action of weather were carried out with polished plates of mild steel and four slags containing from 1·76 to 2·97 per cent. of sulphide-sulphur. The plates were weighed and exposed to the action of the slags for 22 days. They were then carefully freed from rust and re-weighed, the loss in weight being taken as a measure of rusting. Three methods of procedure were adopted:—I. The plates were suspended in water containing finely ground slag. The slag-powder, which settled to the bottom of the containing vessel, was stirred up twice each day. Some of the plates were partially and others wholly immersed. Blank tests were also made in which (1) slag was replaced by pure quartz sand, (2) only distilled water was used. The partially immersed plates were in all cases more strongly attacked than those wholly immersed, but the effect of the different slags varied. II. The plates were suspended as in the first method, but the liquids in which they were immersed contained no solid slag. They were prepared by stirring slag ground to the size of peas in distilled water, and after allowing to stand, decanting off the clear liquid and diluting it with more distilled water. Fresh solution was supplied to the plates each day. Only one of the slags gave rise to more action than resulted from water which had been stirred with gravel. III. The plates were packed round with slag ground to the size of peas, and twice each day, a measured volume of water was poured over. The water drained through the slag surrounding the plates and collected below. An overflow regulated the depth of the standing water. A blank test was made in which slag was replaced by gravel. The plates surrounded by slag were all markedly more strongly attacked than those surrounded by gravel, and the attack was greatest at the points where the slag had been in contact with the plates. There was no marked difference in the effects produced by the different slags.—T. St.

Manganese; Rapid colourimetric determination of —— *in iron and steel.* Stanichitch. Rev. Mét., 1911, **8**, 891—892.

When the manganese content of the iron or steel is between 0·02 and 1·50 per cent., 0·5 grm. of the sample is dissolved in 20 c.c. of nitric acid (1 : 1), in a 100-c.c. flask, and the solution heated till the red fumes have disappeared. 20 c.c. of silver nitrate solution (6 grms. per litre) are then added, and when the solution has become only lukewarm, about 1 grm. of ammonium persulphate is added and the solution made up to 100 c.c. with water free from hydrochloric acid. The contents are then well shaken. The maximum colour is developed in a very short time. 5 c.c. of the solution are transferred to an Eggertz tube and comparison made with a standard. The standard may be prepared by treating a steel of known manganese content in the same manner as the sample, or 10 c.c. of a manganese solution containing 0·1 grm. of manganese per litre may be taken and treated like the steel solution with silver nitrate and ammonium persulphate. The manganese solution is made by dissolving a pure oxide of manganese in nitric acid. Higher percentages of manganese may be estimated in the same way by taking smaller weights of the sample, using a stronger solution of silver nitrate, and suitably diluting the final solution. Silica and graphite, if present, may be allowed to settle, or a portion of the solution may be filtered through ignited asbestos, or guncotton. If the solution is too hot when the ammonium persulphate is added, manganic hydroxide may separate. The solution should then be transferred to a Jena flask, boiled, cooled, and treated with a few drops of hydrogen peroxide. The clear solution is then boiled to destroy excess of hydrogen peroxide, again cooled, and the determination continued in the ordinary manner by the fresh addition of ammonium persulphate. The determination succeeds equally well in sulphuric or nitro-sulphuric acid solutions. Large quantities of nickel, chromium or copper do not interfere. The time required for a determination does not exceed 15 minutes.—T. St.

Manganese industry of the Caucasus. Board of Trade J., Jan. 4, 1912. [T.R.]

According to a report by the Council of Manganese Miners, the quantity of manganese ore mined in the Tchiaturi district of the Caucasus in 1910 was 33,805,900 pouds (about 545,250 tons), or 7·39 per cent. less than in 1909. The producing power of the fields, however, increased by 31·77 per cent. Of the 609,350 tons of manganese ore exported from Poti and Batoum in 1910, 137,850 tons were shipped to the United Kingdom, and 256,650 tons to the Netherlands. The results of the industry were most disappointing to the producers; from the outset prices of ore declined, and they remained low throughout the year. It is generally believed that the maintenance of the high railway tariff was responsible for the distressed situation at the mines during 1910.

British mercury statistics. A. S. Pickering, London. [T.R.]

	Imports.	Exports.	Price.					
	Bottles.	Bottles.	Highest.			Lowest.		
			£	s.	d.	£	s.	d.
1911	46,547	31,438	10	0	0	7	10	0
1910	44,595	24,748	9	15	0	7	9	0
1909	43,163	22,050	9	17	6	7	19	0
1907	39,448	29,465	8	5	0	6	15	0
1905	34,024	21,320	7	15	0	7	1	0
1903	34,886	18,846	8	15	0	8	5	0

Molybdenum in Canada. Times, Eng. Suppl., Dec. 27, 1911.

A REPORT issued by the Canada Department of Mines on the molybdenum ores of the Dominion states that although 150 lb. are recorded as having been produced in 1886 there has been no regular production in Canada up to the present. In 1902 about four tons were produced in the township of Laxton, Victoria County, Ontario, in the following year 85 tons of crude ore containing about 4 per cent. of molybdenum were mined in Sheffield, Ontario, and in 1909 two tons were brought from the north shore of the Gulf of St. Lawrence.

Nickel steel; Heat treatment of a ——. W. Campbell and H. B. Allen. School of Mines Quart., 1911, **33**, 72—83.

PYROMETRIC, micrographic and tensile tests were performed on a cold drawn steel containing 3·15 per cent. of nickel, 0·27 of carbon and 0·65 of manganese. The arrest points were found to be as follows:—Ac_1 begins 670°, max. 695° C.; Ac_{2-3} begins 725°, max. 750°, ends 780° C. (?); Ar_3 begins 795° (?), max. 760° C.; Ar_2 begins 725°, max. (705°) 660° C.; Ar_1 begins 630°, max. 590° C. That the proper refining temperature is that of the point Ac_{2-3} was confirmed by micrographic tests on samples reheated to 680° C. and upwards. Hardening was complete on quenching from the Ac_{2-3} point (750° C.) which is about 75° lower than the corresponding point for carbon steel. but higher tensile strength (maximum say 270,000 lb. per sq. in.) was obtained by quenching at about 900° C. The strength does not decrease rapidly immediately above the maximum (as has been stated) but overheating is serious above 1200° C. The increase of ductility and decrease of strength on tempering is almost proportional to the temperature of reheating until at 650° C. the steel is slightly softer than the original.
—B. M. V.

Special steels; Electrical resistance of ——. O. Boudouard. Comptes rend., 1911, **153**, 1475—1478.

THE author has measured the electrical resistance of various steels with the following results. In carbon steels the resistance increases with the carbon content. In nickel steels with a constant percentage of carbon, a rise in the percentage of nickel increases the resistance considerably up to a nickel content of 30 to 35 per cent., which corresponds with $NiFe_2$. The resistance is higher in the steels with higher carbon content. In manganese steels the carbon content appears to have little or no effect, the resistance showing a maximum at 12 to 13 per cent. of manganese. Chromium steels whether they contain much or little carbon show remarkable irregularities, the resistance rising and falling periodically as the chromium content increases. Tungsten steels show similar irregularities which are not notably affected by the thermal treatment the metal has received.—W. H. P.

Ferro-uranium; Analysis of ——. *II.* W. Trautmann. Z. angew. Chem., 1912, **25**, 19.

ALUMINIUM, which is a frequent impurity in ferro-uranium, should be determined by fusing the ammonium carbonate precipitate with sodium peroxide, not the alloy as stated in error in the former communication (this J., 1911, 132) Rose's method of separating iron from uranium by means of ammonium sulphide in the presence of ammonium carbonate gives very accurate results:—The solution of 0·5 to 1 grm. of the alloy in *aqua regia* is diluted, completely oxidised, and treated with a large excess of solid ammonium carbonate. A small excess of ammonium sulphide is next added, and the contents of the flask shaken, made up to 500 c.c., and filtered. An aliquot part (250 c.c.) of the filtrate is boiled for a long time to precipitate the uranium, which is filtered off after the addition of a few drops of ammonia solution. Or the liquid may be acidified with nitric acid and boiled, and the uranium precipitated by means of ammonia. The precipitate is washed with dilute ammonium nitrate solution, since it is somewhat soluble in water. Any black glittering particles undissolved by *aqua regia* consist of silicon carbide. When ignited in a platinum crucible they leave a residue of silica.—C. A. M.

Gold and silver; Volatilisation of —— *from their copper alloys.* E. F. Kern and A. A. Heimrod. School of Mines Quart., 1911, **33**, 34—64.

No loss of silver occurred when copper containing 113 to 1311 oz. of silver per ton was heated at temperatures up to 1415° C. in presence of carbon for a total period of 27½ hours in four heats of five to nine hours duration. Pure gold was found to volatilise at 1350° C. when treated for 28 hours (in four heats) in covered porcelain crucibles. A loss of gold occurred from copper containing from 10 to 100 oz. of gold per ton when heated in presence of carbon at temperatures between 1130° and 1451° C.; the loss was small up to 10 hours, but increased rapidly after 14 hours heating. The loss appeared to be due to formation of volatile gold carbides, as more than 0·7 per cent. of carbon was found in gold that had been heated in contact with carbon for 28 hours at a temperature above 1100° C., and the metal exhibited characteristic eutectic structure. Molten copper also slowly absorbed carbon and when saturated. rapid loss of copper occurred, the loss being insignificant up to 10 hours, moderate between 10 and 23 hours, and rapid after 23 hours heating. For the methods of assay used, see this J., 1911, 1259.—B. M. V.

Ore roasting; Efficiency in ——. A. S. Dwight. School of Mines Quart., 1911, **33**, 1—17.

A GENERAL summary of ore-roasting, dealing briefly with the following methods:—I. Heaps and stalls. II. Reverberatory furnaces; hand worked, mechanically stirred, and revolving. III. Blast roasting in pots. IV. Blast roasting in thin layers. Stress is laid on the advantage of the last method.—B. M. V.

Zinc sulphate; Behaviour of —— *at high temperatures.* W. Mostowitsch. Metallurgie, 1911, **8**, 763—791.

ON roasting blende, more or less zinc sulphate may be formed. The author has made an extensive series of experiments to determine the influence of other substances on the decomposition of zinc sulphate on heating, the results being given in detailed and tabulated statements. When zinc sulphate is heated in a current of pure dry air, dissociation begins at 600° C., with liberation of sulphur dioxide and oxygen, and is practically complete at 850° C. The degree of dissociation is a function of time and temperature, and depends on the speed of removal of the liberated sulphur dioxide. Complete dissociation of zinc sulphate is possible at a lower temperature than 850° C. but the speed of decomposition is low. The degree and rapidity of the dissociation is independent of the presence of silica, the temperature of complete dissociation of zinc sulphate being much lower than that of formation of zinc silicate. Up to 700° C. ferric oxide has no influence on zinc sulphate. At higher temperatures decomposition of the latter takes place more rapidly in presence of ferric oxide, and the temperature of complete dissociation can be thus lowered. This is explained by the fact that ferrites of zinc are formed at temperatures over 700° C. The reactions between zinc sulphate and lime or calcium carbonate result in the quantitative formation of calcium sulphate. These reactions begin at comparatively low temperatures, and are completed at 800° to 850° C. The desulphatising effect of lime combined as epidote, etc., is much less than that of calcium oxide or carbonate, and only part of the lime reacts. Zinc oxide, sulphate, and sulphide, when heated to 1100°—1130° C. in a current of pure dry carbon monoxide, act as follows: (*a*) Zinc oxide is entirely reduced to metallic zinc and volatilised. (*b*) Zinc sulphate loses the greater part of its sulphuric anhydride with formation of zinc oxide, sulphur dioxide and oxygen. The liberated oxide is reduced and distils. A small quantity of zinc sulphate is reduced to sulphide by the carbon monoxide. The quantity of zinc thus escaping reduction and distillation depends on the rapidity and length of time of heating of the zinc sulphate at temperatures below that of its reduction. (*c*) Zinc sulphide is distinctly volatile at the temperature mentioned: using 0·5 to 0·7 grm. of sulphide, about 6 per cent. is volatilised in one hour. Experiments with calcium and barium sulphates and sulphides show that, in a current of carbon monoxide at 1100°–1130° C., neither of these substances has any influence on zinc oxide, and therefore no harmful action during the reduction and distillation of roasted blende. Zinc oxide absorbs oxides of sulphur, with formation of sulphate, most readily at from 400° to 500° C. Thus in the hot freshly discharged material from the roasting furnace, impregnated as it is with sulphur dioxide and trioxide, some zinc sulphate may be formed during cooling. The experimental results show that, in view of the high temperature and the length of time of distillation, the presence of a few per cent. of zinc sulphate cannot affect the yield of metal. As to the proved deleterious effect of a calcareous charge, it is shown that the low yield must be caused indirectly, as for example, by the formation of basic slags which dissolve zinc oxide, as no direct influence seems to be exerted by calcium compounds.—R. W. N.

Metals; Distillation of binary mixtures of —— in vacuo. I Isolation of a compound of magnesium and zinc. A. J. Berry. Roy. Soc. Proc., 1911, **86**A, 67—71.

A mixture of magnesium with excess of zinc was placed in one limb of a tube of Jena glass closed at one end and bent near the middle at an obtuse angle. The tube was heated, and exhausted first by a water pump and then by means of cocoanut charcoal cooled by liquid air, after which it was sealed and the limb containing the mixture heated in a furnace so as to distil over the excess of zinc. In all cases there was some interaction between the magnesium and the glass, with formation of magnesium silicide. The residue hence was always contaminated by traces of silicon, but analysis showed that it consisted essentially of the compound, $MgZn_2$. On heating to a higher temperature under similar conditions, it was found possible to distil over this compound without decomposition.—A. S.

Colloidal silver. N. Pappadà. Z. Chem. Ind. Kolloide, 1911, **9**, 265—270.

In general the coagulation of colloidal silver is quite analogous to the coagulation of other electro-negative sols. For example, coagulation is not effected by solutions of undissociable organic compounds (methyl or ethyl alcohol, dextrose, sucrose), whilst in the case of electrolytes, the cation is the active agent in effecting coagulation, and the activity of different cations varies according to their valency and diffusibility. In the coagulation of colloidal silver, however, some irregularities are observed, mainly owing to the fact that in addition to the coagulating action of the cation, there may be chemical action between the silver and the anion. Colloidal silver is an energetic reducing agent. It reduces mercuric to mercurous chloride and ferric to ferrous chloride, in both cases with simultaneous formation of silver chloride. It reduces permanganate in sulphuric acid solution. It reacts with hydrocyanic acid and cyanides, and also with the halogens with formation of the corresponding silver halide. With $N/10$ potassium iodide solution it gives a precipitate of silver iodide, and the solution becomes alkaline. It is coagulated by $N/10$ nitric or sulphuric acid, but the coagulum is deep red in colour instead of black as in the case of coagulation with hydrochloric acid. It is probable that with the two first-mentioned acids, there is some reduction to nitrite or sulphite ions in addition to coagulation.—A. S.

Colloidal gold and platinum. N. Pappadà. Z. Chem. Ind. Kolloide, 1911, **9**, 270—275.

Colloidal gold and platinum solutions, especially the latter, are much more stable than other electronegative sols, such as Prussian blue, copper ferrocyanide, etc. The sols prepared by Bredig's method of cathodic disintegration are much more stable than those prepared by chemical reduction methods. The activity of electrolytes in causing coagulation of gold and platinum hydrosols follows in general the same order as with other electronegative sols. Colloidal gold and platinum act as reducing agents but are much less active in this respect than colloidal silver (see preceding abstract). When colloidal gold is treated with potassium cyanide or hydrocyanic acid, the dark violet colour changes to yellow, and the colloidal character is destroyed, for even trivalent cations such as $Al^{\cdot\cdot\cdot}$ or $Fe^{\cdot\cdot\cdot}$ now fail to produce flocculation. With chlorine, colloidal gold reacts energetically, forming gold chloride. With iodine, reaction proceeds much more slowly, and colloidal particles are still present after 2 days; colloidal platinum behaves in a similar manner.—A. S.

Boiler firing and metal melting by surface combustion. Bone. *See* IIa.

Determination of dust in blast-furnace gases. Johannsen. *See* IIa.

Suitability of aluminium for the construction of brewery plant. Chapman. *See* XVIII.

Patents.

Alloys [Iron]. C. A. Allison, London. From The International Metal Products Co., Newark, N.J., and Middletown, O., U.S.A. Eng. Pat. 5015, Feb. 28, 1911. Addition to Eng. Pat. 27,201 of 1909 (this J., 1910, 960 and 219).

Highly purified iron is made by the basic process described in the original patent, with the addition that not more than 20 per cent. of an alloying metal (or metals) is added at any suitable stage of the manufacture. The principal object of the process is to obtain a metal resistant to corrosion. The impurities finally present should not exceed the following quantities:—carbon or manganese, 0·04 per cent.; carbon and manganese together, 0·07; carbon, manganese, silicon, sulphur and phosphorus together, 0·10; oxygen (by Ledebur's method), 0·04; and total impurities, 0·20 per cent.—B. M. V.

Steel; Process for casting —— in several layers. O. Imray, London. From Akt. Ges. der Briansker Schienen-Eisenhüttenwerke und Maschinenfabriken, St. Petersburg. Eng. Pat. 11,900, May 17, 1911.

By means of vertical partitions composed of soft iron containing a small percentage of carbon, the mould is divided into two or more compartments into which the different qualities of metal are simultaneously poured. The partitions are provided with a number of pins or other similar projections for effecting a proper bonding between the different layers.—W. E. F. P.

Iron and steel; Manufacture of ——. F. A. Wilmot, Bridgeport, Conn. U.S. Pat. 1,012,310, Dec. 19, 1911.

Iron ore is smelted in a series of blast-furnaces for the production of low-grade pig iron (the silicon content of which is immaterial), the proportions of limestone and coke used being below those normally employed in the production of basic pig iron. The molten pig iron is continuously supplied to a regenerative basic open hearth furnace, operated at a temperature materially lower than that usually employed in steelmaking, in which the silicon, phosphorus and sulphur are only partly eliminated. The molten metal is then transferred to a second open hearth furnace for final purification and conversion into steel.—W. E. F. P.

Iron and other metals and metalloids from ores, scrap, and very impure iron; Process for obtaining ——. P. Schwalb. Ger. Pat. 241,320, May 3, 1910.

The process which is intended specially for the treatment of fine ores, burnt pyrites, scrap iron, etc., consists essen tially in the use of an open hearth furnace with an annular hearth in which a bath of slag is continuously circulated. The ore or other material is first heated in a separate chamber, then introduced into the bath of slag to which also suitable reducing agents are added. Then at suitable places in the circuit, the more easily reducible metals or metalloids, or alloys of the same, the iron, and a portion of the slag are tapped off separately. Agitation of the circulating bath is effected by alternately forcing in gas and exhausting it.—A. S.

Metallic coatings; Production of ——, upon non-metallic materials. King's Norton Metal Co., Ltd., T. A. Bayliss and H. W. Brownsdon, London. Eng. Pat. 21,260, of 1910; date of appl., Feb. 4, 1911.

Claim is made for the production of alloys which, on heating, pass through a pasty stage before actually melting. While in the pasty condition the alloy is applied, with a brush or by similar means, to the surface of paper, glass or other non-metallic material, the latter being maintained at about the same temperature as the alloy during the operation, which may be conducted in a reducing atmosphere if necessary. To impart the necessary "spreading" property to the alloys, or to increase their "covering power," zinc, cadmium or magnesium is employed: but the main constituents vary according to the purposes for which the alloys are required. Thus, for coating paper, various alloys of bismuth, lead and tin containing from 12 to 15 per cent. of cadmium (or 2 of zinc), and lead-tin alloys containing 60 per cent. of lead and 10 of cadmium (or 2 of zinc), have been found satisfactory.
—W. E. F. P.

Metals from ores; Extraction of ——. B. Bradley, Manchester. Eng. Pat. 28,274, Dec. 5, 1910.

In processes in which ores are leached with dilute acid solutions, silica, in the gelatinous or soluble state, which interferes with the agitation of the solution or electrodeposition of metals therefrom, is rendered insoluble by evaporation. Ore slime may be added to prevent bumping during boiling; or, slime may be spread on a heated surface and the solution sprayed on to this. The soluble residue is then leached out by any convenient method. In a continuous leaching process, such as that described in Eng. Pat. 26,711 of 1908 (this J., 1910, 160), a portion of the solution may be withdrawn from the circuit, evaporated, re-lixiviated and the solution returned to the circuit.—B. M. V.

Ores and the like; Process for the lixiviation of —— under pressure. Hernadvölgyi Magyar Vasipar Részvény, Társaság. Ger. Pat. 241,265, Dec. 16, 1909.

The ore is contained in a closed vat with perforated floor and the lixiviating solution is distributed over its surface. In order to accelerate the passage of the liquid through the mass of ore, the air in the vat is pumped out before introducing the liquid, and afterwards compressed air is introduced. Instead of using compressed air, the vat may be partly filled with ore, closed air-tight, and the lixiviating solution forced in under pressure. The floor of the vat is mounted so that it can be rotated around a vertical axis and is independent of the body of the vat. When the latter is to be emptied, either the floor is lowered or the body of the vat raised, and a scraper brought into position, so that on rotating the floor, the material is discharged.—A. S.

Ores; Method of reducing ——. O. Frick, Stockholm, Sweden. U.S. Pat. 1,010,490, Dec. 5, 1911.

In a reduction furnace of the regenerative type, a portion of the furnace gas is continuously circulated through the reduction chamber, the remainder being utilised for preheating the circulating portion. The latter is finally heated by electrical means and simultaneously enriched before re-entering the furnace.—W. E. F. P.

Engraving metals. J. A. Dejey, St. Maurice, France. Eng. Pat. 11,026, May 6, 1911.

In order to produce an etching resist consisting of a layer of tin as described in Eng. Pat. 21,287 of 1903, a bath prepared in the following manner is used:—2 kilos. of sodium pyrophosphate are dissolved in 10 litres of boiling water, and 2 kilos. of a tin salt (*e.g.*, stannous chloride) are added gradually, with constant stirring. A white precipitate is obtained which must form rapidly and be of sandy appearance. This is washed 3 or 4 times with boiling water by decantation, and dissolved by means of about 10 litres of boiling water and 2 kilos. of sodium pyrophosphate, the solution being diluted with cold water to 100 litres in the tinning vat, after which 200 grms. of dry "leiocomme" (roasted fecula) (see also this J., 1894, 824) dissolved in a little hot water, 250 grms. of powdered tartaric acid and 600 grms. of sodium chloride are added.—B. M. V.

Smelter smoke-washer. W. G. Bulgin, Franklin, N.C. U.S. Pat. 1,011,025, Dec. 5, 1911.

The apparatus consists of a tank containing a liquid above which a number of fans, partly immersed, are disposed upon a horizontal shaft. A horizontal partition, the ends of which do not extend to the sides of the tank, is situated beneath the surface of the liquid, the arrangement being such that, by the rotation of the shaft, the gaseous products are drawn into the upper part of the tank where they impinge upon the wet surfaces of the fans, while the liquid is simultaneously circulated in the tank. From the latter the gas is conducted over a second bath of liquid to a vertical tower provided with inclined baffles over which a continuous flow of liquid is maintained.
—W. E. F. P.

Copper bearing substances; Treating ——. C. S. Bradley, New York, Assignor to Bradley Copper Process Co., Jersey City, N.J. U.S. Pat. 1,011,562, Dec. 12, 1911.

Copper ore is treated with calcium chloride solution, whereby, by the aid of "an acid radical developed from the materials used," the copper is dissolved as chloride. The copper is precipitated from the solution by calcium carbonate. calcium chloride being thus regenerated.
—B. M. V.

Ore separation, Hydraulic system of ——. W. Polglase and F. Bates, Great Falls, Mont. U.S. Pat. 1,012,151, Dec. 19, 1911.

The apparatus consists of a series of separators arranged at different levels and connected by launders. Each separator comprises a number of "nesting compartments," each of which—excepting the outermost—is provided at the bottom with an adjustable water supply and with a suitable outlet for the classified ore product. The innermost compartment overflows into the next, and so on, the final overflow being into the outermost compartment (practically a circular launder) from which the material passes through an inclined launder to the centre compartment of the next separator. The connecting launders are provided with baffles so disposed as to effect a further classification of the material passing through them; and the overflow from the lowest separator passes to a distributor connected with slimes separators.—W. E. F. P.

Furnace [, Metallurgical ——]. T. S. Blair, jun., Elmhurst, Ill., Assignor to The Blair Engineering Co., New York. U.S. Pat. 1,012,236, Dec. 19, 1911.

In a regenerative furnace having a down-take leading to regenerative chambers beneath the furnace, a removable slag pocket mounted upon a wheeled carriage is arranged at the foot of the down-take and at the entrance to the regenerative chambers. The walls of the slag pocket register with but are spaced from the walls of the down-take and of the adjacent regenerative flues, the spacea being temporarily filled in when the slag pocket is in position.
—H. H.

Furnace for the separation of metals of different melting points or of metal, dust, slag, etc. L. Weiss. Ger. Pat. 240,849, Aug. 16, 1910.

The furnace, which is heated to a temperature above that at which the metal of lowest melting point melts; has a moderately inclined floor and, at the top, a feed hopper and working openings provided with covers or doors. Discharge openings are provided in the upper part for the unmelted and in the lower part for the melted material. Gases or vapours produced in the furnace pass away through an opening in the upper part to the smoke flues, and the furnace is closed by a cover which is sufficiently heavy or is so fastened as not to be displaced by the material charged into the furnace.—A. S.

De-tinning, Method of ——. H. Brandenburg, Kempen-on-the-Rhine, Germany. U.S. Pat. 1,012,511, Dec 19, 1911

The scrap is alternately immersed in a solvent and exposed to the air, until all the tin is removed. Two equal masses of the scrap are suspended from the ends of a horizontal beam supported at the middle after the manner of a balance; a bath of solvent is situated beneath each mass, the immersion of the one and the exposure of the other thus taking place simultaneously.—W. E. F. P.

Steel castings; Process for hardening ——. J. W. Gebhard, Chicago. Eng. Pat. 15,555, July 4, 1911.

See U.S. Pat. 997,801 of 1911; this J., 1911, 1019.—T. F. B.

Ores of volatile metals [*zinc*], *Method of and apparatus for reducing* ——. H. H. Hughes, Springfield, Mo., U.S.A. Eng. Pat. 570, Jan. 9, 1911.

See U.S. Pats. 980,640 and 980,641 of 1911; this J., 1911, 135.—T. F. B.

Ores: Treatment of complex ——. E. A. Ashcroft, Sogn, Norway. U.S. Pat. 1,011,897, Dec. 19, 1911.

See Eng. Pat. 6670 of 1910; this J., 1911, 493.—T. F. B.

Lead sulphides; Metallurgy of zinc-bearing —— *with or without small admixtures of other metals.* E. A. Ashcroft, Sogn, Norway. U.S. Pat. 1,011,898, Dec. 19, 1911.

See Eng. Pat. 7329 of 1910: this J., 1911, 552.—T. F. B.

Metal sulphides; Metallurgy of ——. E. A. Ashcroft. Sogn, Norway. U.S. Pats. 1,011,899 and 1,011,900. Dec. 19, 1911.

See Eng. Pats. 7444 and 7536 of 1910; this J., 1911, 553. —T. F. B.

Zinc-lead ores; Treatment of refractory ——. P. C. C. Isherwood, Leytonstone. U.S. Pat. 1,011,962. Dec. 19. 1911.

See Eng. Pat. 21,584 of 1909; this J., 1910, 1391.—T.F.B.

Magnetic body; Process of improving certain magnetic qualities of a ——. R. A. Hadfield, Sheffield. U.S. Pat. 1,012,845, Dec. 26, 1911.

See Eng. Pat. 6426 of 1906; this J., 1906, 889.—T. F. B.

Apparatus for purifying furnace gases. U.S. Pat. 1,012,488. *See* I.

Obtaining potash from greensand, and producing metallic iron and alkaline salts. U.S. Pats. 1,011,172 and 1,011,173. *See* VII.

Producing cement [*and recovering zinc from tailings*]. U.S. Pat. 1,012,467. *See* IX.

Laboratory utensil holder. U.S. Pat. 1,012,391. *See* XXIII.

XI.—ELECTRO-CHEMISTRY.

Bismuth silver thermopile. W. W. Coblentz. J. Franklin Inst., 1911, 172, 559—567.

The author has made thermopile junctions from thin bismuth wire (0·1 mm. diameter) fused to silver wire (0·051 mm. diameter). The welding is carried out by melting a bead of tin on to the silver and then attaching the bismuth, using a small electric heater of "nichrome" wire filed thin at the point. The junction cannot be flattened on account of the brittleness of the bismuth, so a small rectangle of pure tin or silver is melted on under the junction. A pile of 20 such junctions was shown to have a high thermoelectric power, about 74 per cent. greater than an iron-constantan thermopile. The radiation sensitiveness is also much greater than that of either the Rubens' silver thermopile or the modern thin wire iron-constantan instrument. For the construction of larger surface thermopiles built up of such units as the above, bismuth wires of 0·15 mm. and 0·06 mm. diameter were used. In the former case there was a much higher radiation sensitiveness but a serious lag in attaining temperature equilibrium.—W. H. P.

Examination of transformer oils. Breth. *See* IIA.

Electrolytic reduction of nitrobenzene. Snowdon. *See* III.

Patents.

Electrically resistant material, and process for producing same. H. T. Jones, East Orange, N.J., U.S.A. Eng. Pat. 1459, Jan. 19, 1911.

A material for rheostats, controllers, or electric heaters, is formed by impregnating graphite in solid block form with a substance of lower electric conductivity, such as pine tar dissolved in carbon bisulphide or a refractory material such as burnt magnesia in the same medium. In the latter case the medium is allowed to evaporate, but in the former, heat is required in order to convert the tar into a refractory substance.—H. H. S.

Batteries; Primary galvanic ——. A. Sandrini and C. Sanguineti, Genoa, Italy. Eng. Pat. 9528, April 19, 1911.

The negative electrode consists of 8 parts of zinc and 2 parts of aluminium, and the electrolyte consists, for ordinary purposes, of a solution of 2 parts of sodium bichromate, 8 parts of sodium chloride, and 0·6 part of crystals of pyrosulphuric acid, or where a constant intensity of current is required over a long period, a solution of 8 parts of bichromate, 2 parts of chloride, and 1 part of the acid. The mixture is placed in a porous pot acting as the positive electrode, which is prepared by heating a mixture of retort-carbon, manganese peroxide, tar, sulphur and water in a mould, and afterwards waterproofing on the outside.—B. N.

Battery; Electric ——. G. Pfleiderer, Gross-Lichterfelde, Germany. U.S. Pat. 1,011,485, Dec. 12, 1911.

The battery is provided with an adhesive electrolyte mass, composed of an electrolytic material which becomes active on addition of water. An ingredient is added, which is dry at the moment of addition, but which contains water of crystallisation, and may be so slightly hygroscopic that it gradually furnishes liquid to the mass, or may do so on heating, in quantity sufficient to make it sticky. —B. N.

Electrically decomposing fluids; Process of ——. W. H. Cone, Assignor to L. G. Fixen, Chicago, Ill. U.S. Pat 1,011,413, Dec. 12, 1911.

The liquid, such as a solution of sodium chloride, is passed in a continuous stream through the apparatus, and a current of electricity is passed through it in the same direction. The products of decomposition, namely, the chlorine and sodium compounds, are withdrawn at different points of the stream near to the cathode end. —B. N.

Furnace; [*Electric*] *Induction* ——. E. F. Gehrkens, Pittsfield, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,011,769, Dec. 12, 1911.

The furnace comprises a charge-receiving chamber or crucible, a primary inductive winding, and a secondary winding surrounding the same. The secondary consists partly of a conductive wall or metallic shell, having zones of unequal cross-section, and corresponding unequal resistance, the zone of higher resistance forming part of the charge-receiving chamber.—B. N.

Dielectric films; Art of forming ——. R. D. Mershon, New York. U.S. Pat. 1,012,889, Dec. 26, 1911.

See Fr. Pat. 423,598 of 1910; this J., 1911, 632.—T. F. B.

Electrolytic manufacture of barium oxide from barium carbonate. Ger. Pat. 241,043. *See* VII.

XII.—FATS; OILS; WAXES.

Grape seeds. G. Paris. Staz. sperim. agrar. ital., 1911, **44**, 669—727. Chem. Zentr., 1912, **1**, 40.

The author estimates that if the seeds contained in grape marc produced in Italy were utilised for the separation of the oil they contain, there are sufficient to yield 18,000 litres of oil, the annual Italian production of wine being taken as 60,000,000 hectolitres. The grape seeds contain 8·74 per cent. of crude protein, 17·33 of crude fat, 47·65 of "crude fibre," 3·03 of ash, and 0·58 per cent. of phosphoric anhydride. After separation of the oil, the residue contains 10·60 per cent. of water, 9·12 of crude protein, 4·25 of crude fat, 45·27 of "crude fibre," 3·15 of ash, and 27·61 per cent. of non-nitrogenous extractives, of which 11·54 per cent. are carbohydrates and 12·41 per cent. pentosans; the ash contains 14·33 per cent. of phosphoric anhydride and 22·33 per cent. of potassium oxide. Grape seed oil has a sp. gr. 0·9502 at 15° C., acid value, 16·8; saponification value, 179·8; iodine value, 96·0; acetyl value, 143·1. It contains erucic, linolic, oleic, stearic, and palmitic acids, and 0·57 per cent. of a phytosterol which melts at 132°—133° C., has $[\alpha]^{16}_{D}=-32{\cdot}8°$, and gives an acetate crystallising in leaflets of m.pt. 120°—121° C. The composition of the grape seeds dried at 100° C. is given as:—protein, 12·00; fat, 22·00; phytosterol, 0·12; lecithin, 0·12; phytin, 0·72; tannin, 4·95; sugar, 3·16; starch, 9·66; hemicelluloses, 9·63; lignin, etc., 25·63; cellulose, 10·77; and ash. 3·00 per cent.—A. S.

Mineral oils; Detection of —— in fatty oils [by means of aniline]. Jablokoff. Rep. de Pharm., 1911, **23**, 532.

One part of the oil is mixed with four parts of pure aniline. If the vegetable or animal oil be pure, the mixture will be clear at 20° C. Mineral oil is insoluble in aniline. It is stated that an admixture of 1 : 50 of hydrocarbon oils with fatty oils may be detected by this test.—J. O. B.

Oil-nut from Portuguese East Africa. Board of Trade J., Jan. 4, 1912. [T.R.]

A large tree, a species of *Balanites*, which is stated to reach a height of 40—50 feet, has been found growing in large numbers in the Lebombo mountains near and on the banks of the Umbeluzi river. This tree produces at maturity about 1,200 lb. of nuts, the almond or kernel of which is stated to give 60 per cent. of a fine oil similar to olive oil. Samples of the nuts may be seen by British firms at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

Determination of fat in feeding stuffs by cold extraction. Grimme. *See* XIXa.

Patents.

Cooker for oil-bearing meal and the like. F. Wolfenden, West Point, Miss. U.S. Pat. 1,012,312, Dec. 19, 1911.

The meal is heated in a series of kettles arranged in descending order and provided with conveyors between the bottom of each and the top of the next one. There are also means for breaking up lumps within the kettles, for interrupting the connections between them, and for excluding any kettle from the series without stopping the work of the remainder.—C. A. M.

Emulsions; Preparation of a product for use in making high-percentage, stable ——. G. Nohl. Ger. Pat. 239,828, Feb. 26, 1908.

Substances rich in proteins, and as free as possible from fatty matter, are dried and heated, and kneaded with concentrated caustic alkali solutions, containing up to 40 per cent. of sodium hydroxide, until the mass becomes lumpy, when it is allowed to cool; loss of nitrogen is avoided as far as possible. The product can be used in the preparation of high-percentage, stable emulsions of mineral, animal, vegetable and tar oils, and also in the manufacture of soaps.—T. F. B.

Palm oil; Process of manufacturing —. E. H. Cookson, Liverpool. From C. Sanders, Chilsanto, S.W. Africa. Eng. Pat. 14,723, June 21, 1911.

See Fr. Pat. 431,672 of 1911; this J., 1912, 38.—T. F. B.

Oils and fats; Process for the extraction of ——. W. S. Simpson, London. U.S. Pat. 1,012,572, Dec. 19, 1911.

See Eng. Pat. 4661 of 1910; this J., 1911, 814.—T. F. B.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Ochres: Action of heat on ——. *Allotropic modifications.* A. Bouchonnet. Bull. Soc. Chim., 1912, **11**, 6—12. (See also this J., 1911, 635.)

Certain ochres, when gradually heated, become at first red and then on further heating return to the original yellow colour. This only takes place between tolerably narrow limits of temperature (about 50°) and the duration of heating must not exceed 40—50 minutes. At a higher temperature the product blackens. The allotropic yellow modification is distinguished as the α-form; it is magnetic, whereas the red form is non-magnetic. If removed from the oven at the temperature of transformation (960° C.), a mixture of red and yellow forms in sharply marked zones is obtained. All ochres do not yield this α-form and iron oxides precipitated from the sulphate or chloride only assumed red, brown, violet and black colours, in no case giving the magnetic α-modification. When this is heated above 970° C. it begins to blacken and melts to a spongy black mass above 1200° C., giving at 1600° C. a very hard black vitreous substance which scratches glass. Both the red and the α-forms contain only traces of ferrous oxide; the decomposition of ferric oxide does not begin until above 1050° C. and the rate increases with rising temperature, but even at 1600° C. the ferric oxide is still only partially decomposed. The density increases in passsing from yellow ochre (3·37) to the red modification (3·55), to the α-modification (3·77), and the black modification (3·84), the figures quoted being for an ochre from Vaucluse. There is a loss of magnetic permeability from 950—980° C., but this increases again at 1200° C. and the black form obtained at 1600° C. is strongly magnetic, owing no doubt to the presence of magnetic oxide, Fe_3O_4. In contrast to the yellow and red forms, the α-modification is insoluble even in hot acids. It is regarded as a molecular modification of ferric oxide, it does not contain any magnetic oxide and its magnetic properties are due to its molecular structure.—E. F. A.

Paint and varnish manufacture in the United States. U.S. Census Bureau Report. Oil, Paint, and Drug. Rep., Dec. 25, 1911. [T.R.]

In the following tables are given the general statistics for the paint and varnish industry, as gathered from the census returns of 1904 and 1909. The report as to paints and varnishes does not include kaolin and ground earths, or the blacks made by establishments reporting bone, carbon, and lamp black as chief products, or the lead and zinc oxides made by lead and zinc smelters. Increases are shown in all the items at the census of 1909, as compared with 1904

	Census.	
	1909.	1904.
Number of establishments.	791	639
Capital	$103,905,000	$75,486,000
Cost of materials used ...	79,016,000	59,827,000
Salaries	10,378,000	5,677,000
Wages	8,271,000	6,264,000
Miscellaneous expenses ...	13,538,000	9,651,000
Value of products	124,889,000	90,840,000
Value added by manufacture (products less cost of materials)	$45,873,000	$31,013,000
Employés—		
Number of salaried officials and clerks . .	7,200	4,408
Average number of wage earners employed.....	14,240	11,633
Primary horse-power	56,162	41,288

Principal products, by kinds, and quantity, 1909 *and* 1904.

	Census.	
	1909.*	1904.
Pigments, lb.	502,465,692	307,078,996
White lead, dry	85,234,414	62,395,868
Oxides of lead	68,344,813	49,734,330
Lampblack and other blacks	1,810,445	757,241
Iron oxides and other earth colours	111,674,675	48,345,978
Other dry colours	157,469,598	98,194,081
Barytes	49,496,025	22,299,980
Pulp colours, sold moist .	28,435,722	25,351,515
Paints in oil:—		
White lead, in oil, lb. ..	246,567,570	216,496,450
Paste, lb..............	162,356,330	131,940,464
Already mixed for use, gals.	33,273,461	22,379,020
Varnishes, gals.:—		
Oleoresinous	18,476,523	17,162,719
Damar and similar turpentine and benzine ..	3,481,231	
Spirit, not turpentine ..	1,181,746	1,553,562
Pyroxylin	1,880,141	148,320
Fillers:—		
Liquid, gals.	1,159,569	1,051,148
Paste, lb..............	14,050,329	68,761,174
Dry	157,966,172	
Putty	63,502,048	
Water paints and kalsomine—		
Dry or in paste, lb. ...	47,465,265	27,932,447
Already mixed for use, gals.	522,283	123,400

* In addition, in 1909 144,472,173 lb. of pigments, 2,682,023 lb. of paste in oil, 1,006,956 gallons of paints already mixed for use, 344,033 gallons of varnishes, and 4,379,894 lb. of paste fillers and putty; and in 1904, 66,353,181 lb. of pigment, 2,101,536 lb. of paste in oil, 375,998 gallons of paint already mixed for use, 465,241 gallons of varnishes and 668,376 lb. of paste fillers and putty were made by establishments engaged primarily in the manufacture of other products.

Patents.

Enamel or like compositions. J. S. Kruse, London. Eng. Pat. 29,387, Dec. 17, 1910.

An unfired enamel surface is obtained by means of magnesium oxide and chloride mixed with gum or resin, the proportions by weight being: magnesia 3, saturated magnesium chloride solution (sp.gr. 1·7) 4, and a 25 per cent. solution of orange shellac dissolved in 90 per cent. alcohol to which a little lavender oil has been added, 1 part.
—H. H. S.

Binding agents for pigment colours, ground cork and like materials, also lacquers, varnishes and like products; Manufacture of ——. R. Lender, Neu-Babelsberg, Germany. Eng. Pat. 21,667, Oct. 2, 1911. Under Int. Conv., Jan. 3, 1911.

Binding materials are prepared by mixing Chinese wood (tung) oil wth polymerisation products of cumarone and indene, separately or in admixture. The products when dissolved in a suitable solvent and mixed with pigments, etc., dry rapidly and yield hard, glossy elastic coatings, which are impermeable to liquids and gases, and resist the action of acids, alkalis, heat and cold.—C. A. M.

Paint-screening apparatus. R. L. Holliday, New Brighton, N.Y. U.S. Pat. 1,012,134, Dec. 19, 1911.

The paint is introduced from an upper reservoir, provided with a stopcock, into a receptacle which contains a cylindrical strainer supported above the bottom. A spindle carrying a brush at its lower end revolves above the strainer, whilst a hinged frame maintains the latter in such a position that the brush can sweep its interior. Means are also provided for releasing the hinged frame so that the strainer can be tipped downwards for cleaning.
—C. A. M.

Ultramarine blue and the like; Manufacture of ——. J. Luciani, Paris. Eng. Pat. 7271, March 23, 1911. Under Int. Conv., April 7, 1910.

See Fr. Pat. 425,585 of 1910; this J., 1911, 908.—T. F. B.

Paint; Submarine ——. H. Terrisse, Assignor to Fabr. de Vernis et Prod. Chimiques, Vernier, Switzerland. U.S. Pat. 1,012,177, Dec. 19, 1911.

See Eng. Pat. 24,001 of 1909; this J., 1910, 577.—T. F. B.

Material for casting and painting; Process for manufacturing ——. S. Medveczky, Budapest. U.S. Pat. 1,012,887, Dec. 26, 1911.

See Ger. Pat. 239,773 of 1910; this J., 1911, 1461.—T. F. B.

Lac; Treatment of ——. J. Johannes, Calcutta. Eng. Pat. 25,721 of 1911, date of appl., Nov. 17, 1910.

See Fr. Pat. 424,261 of 1910; this J., 1911, 756.—T. F. B.

Manufacture of lead oxide and apparatus therefor. Eng. Pats. 30 354 and 17,256. *See* VII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Vine rubber. J. Claessens. Bull. Agric. du Congo Belge; through Gummi-Zeit., 1911, 26, 500—501.

Data are given as to the yields from cultivated *Landolphia Owariensis.* The average yield of rubber per vine, when the whole plant was cut up, was 388 grms. (13½ oz.): about two-thirds of this is obtained from the bark, while the remainder is obtained from the latex and from the rubber which separates out. Wild vines of the same species gave an average yield of 41 grms. (1½ oz.) when the plant was not destroyed. The method adopted is that of removing a portion of the bark, rubbing the wound with a leaf, and spreading the mass upon the breast or forearm of the worker, to coagulate it. The operation can be repeated three or four times, at intervals of a year. Yields, which were very variable, are also given of the rubber from dead vines of various species.—H. E. P.

Rubber; Chemistry of ——. *III. Theory of vulcanisation. II.* D. Spence. Z. Chem. Ind. Kolloide, 1911, 9, 300—306.

Further experiments on the extraction of sulphur from vulcanised rubber by acetone are described, the results of which are in agreement with the view previously expressed (this J., 1911, 816) that the sulphur in vulcanised rubber exists in three forms, viz., chemically combined, adsorbed, and free, the two last together constituting what is commonly termed "free sulphur." The difficulty of extracting the last portions of the adsorbed sulphur from rubber is due to the condition of equilibrium which is rapidly attained, whereupon further sulphur can be extracted only by a fresh quantity of acetone; the state of division of the rubber has comparatively little influence. Comparative experiments were made with rubber prepared from a mixing containing 13·14 per cent. of sulphur and vulcanised for 2 and 2½ hours respectively under a steam pressure of 40 lb. per sq. in. 10 grms. of each were extracted for successive periods of 30 mins. with 135 c.c. of acetone, and curves were constructed representing the percentage of sulphur extracted in each successive period. In the case of the sample vulcanised for 2 hours, there is a distinct break between the portion of the curve corresponding to the actual free sulphur, and the remainder, which is a typical adsorption curve. In the case of the other sample, there is no distinct break, and only the gradual change of the form of the curve indicates the presence of both free and adsorbed sulphur. The amounts of combined sulphur in the samples as determined by the usual method were 3·95 (2 hours vulcanisation) and 4·68 per cent. (2½ hours) respectively.—A. S.

Indiarubber production in 1911. S. Figgis and Co., London. Jan. 2, 1912. [T.R.]

The world's supply of rubber in 1911 amounted to about 76,000 tons (or 88,000 tons including guayule), nearly all of which was consumed: the production in 1910 was 70,000 tons. About 850,000 acres are now under rubber in the East, and about 80,000 acres in Mexico, Nicaragua, and Honduras. Exports from Brazil, Bolivia, and Peru were 39,500 tons in 1911, against 40,500 tons in 1910; about 9200 tons of guayule were exported from Mexico last year. Exports from Ceylon and India amounted to 2750 tons, from Malaya 11,400 tons, and from the West African coast about 15,000 tons.

Imports, etc., of all kinds of rubber into England were :—

	Imports.	Deliveries.	Stocks, Dec. 31.
	tons.	tons.	tons.
1909	24,563	24,225	1848
1910	32,659	29,980	5231
1911	33,964	34,054	3954

Imports of Parà (Manaos) rubber into England were 11,726 tons in 1911, 12,433 tons in 1910, and 10,179 tons in 1909; and of Peru (Cauchu) 3753 tons in 1911, 5577 tons in 1910, and 4630 tons in 1909. Of East India and Malay plantation rubber, 10,656 tons were imported into England in 1911, as compared with 6958 tons in 1910 and 3607 tons in 1909.

PATENTS.

India-rubber and other materials; Apparatus for testing the elasticity of ——. L. Schopper, Leipzig, Germany. Eng. Pat. 13,009, May 30, 1911.

The apparatus consists of two hammers or impact devices between which the test-piece of rubber is suspended. A blow is delivered by one of the hammers, and this blow is, in part, transmitted to the second hammer, producing a definite measurable movement of the latter. The elasticity of the sample is measured by the ratio of the amplitude of the striking-hammer to that of the other hammer. In the apparatus illustrated, the hammers are suspended, pendulum-fashion, from ball-bearings, and move through arcs of circles, being retained at the highest point of traverse by a trailing cam or equivalent device. Means are provided for accurately spacing the points of suspension of the hammers according to the thickness of the sample to be tested.—E. W. L.

Flexible composition or glue. Eng. Pat. 19,853. *See* XV.

XV.—LEATHER; BONE; HORN; GLUE.

Jellies; Investigations on the ultramicroscopic structure of —— *with the slit- and cardioid ultramicroscopes.* W. Bachmann. Z. anorg. Chem., 1911, 73, 125—172.

By means of the ultramicroscope the heterogeneous nature of gelatin jellies of 1—2 per cent. concentration is immediately revealed. Ultramicroscopic observation of the gelatinisation of solutions (optically homogeneous except for impurities such as dust particles, etc.) of this concentration, shows that six different phases are apparent :—(1) a diffuse (homogeneous) cone of light, linear polarised; (2) a glittering or twinkling motion, which is gradually resolved into (3) a multitude of submicrons showing translatory motion; (4) slackening of the Brownian motion of the optical impurities of the gelatin solution: (5) decrease of the translatory motion of the submicrons to an oscillatory motion around a mean equilibrium position; (6) differentiated jelly with quiescent "jelly elements" formed by aggregation of submicrons and amicrons. With increase of concentration the ultramicroscopic heterogeneity of the jellies becomes less and less distinct; jellies of 7—10 per cent. concentration appear homogeneous, but the strong polarisation of the diffuse light-cone indicates that they are actually heterogeneous and probably composed of extremely fine particles formed into larger "jelly elements" as in the jellies of lower concentration. The more concentrated the jelly, the closer together these "jelly elements" would be, and the smaller would be the difference in composition, and hence in refractive power between the two phases, so that at a certain concentration the two phases would be indistinguishable even with the ultramicroscope, and the jelly would appear homogeneous. In gelatin solutions (0·5 per cent.) of such low concentration as to be unable to form a jelly, flocks are gradually formed owing to the aggregation of isolated "jelly elements." or of submicrons. In all cases the observations point to a very much finer structure for gelatin jellies than that described by Bütschli. Jellies treated with alcohol or chromic acid showed under the microscope the honeycomb-structure of Bütschli, but the structure revealed by the ultramicroscope was a granular ("globulitic") one; and it was found that the alcohol (or chromic acid) caused coagulation and shinkage (dehydration), and that these are the cause of the honeycomb structure of Bütschli, the true structure of the jelly being much finer. Quite analogous results were obtained with agar-agar and silicic acid jellies (see also Zsigmondy, this J., 1911, 1056).—A. S.

Relation of chemical composition to calorific power in wood, peat, etc. Sherman and Amend. *See* IIA.

PATENTS.

Tanning liquors; Preparation of ——. J. Forster, Warrington. Eng. Pat. 6795, March 18, 1911.

The material to be leached is placed in perforated cages suspended in a series of pits through which the liquor flows, each cage being adjusted so that it may be inverted to discharge its contents into the cage of the next pit nearer to the inflow of the liquor.—D. J. L.

Tanning; Impts. in ——. J. Forster, Warrington. Eng. Pat. 6796, March 18, 1911.

The butts are passed progressively through a series of tan pits containing liquor, and arranged in ascending steps, the highest pit being supplied with the strongest liquor and each pit overflowing into the next lower pit. The butts are first suspended by their edges, later treated in a flat superimposed condition and finally are dusted whilst hanging saddlewise, flesh side upwards. The top pit of the series may be connected with the series of leaching pits described in Eng. Pat. 6795 (see preceding abstract).—D. J. L.

Skins; Process of hardening and waterproofing animal ——. K. Hartmann, Berlin. Eng. Pat. 16,810, July 21, 1911.

The skins, after removal of the hair and flesh by the usual methods, are hardened by immersion in a bath consisting of amyl acetate (two parts) and acetone (one part) for about 48 hours, and are then coated with a solution of celluloid in twice its weight of a solvent consisting of equal parts of amyl acetate and acetone. The solution may be applied by means of a brush. The skin is then placed for about 24 hours in a solution of white shellac (two parts) in 90 per cent. alcohol (one part).—E. W. L.

Glue; Flexible composition or ——. T. D. Kelly, Southend-on-Sea. Eng. Pat. 19,853, Aug. 25, 1910.

One hundred parts of peat of a gummy nature, or of seeds with woody husks such as linseed or cotton-seed, or of certain plants such as marsh mallow, are boiled in a 3 to 5 per cent. solution of lime or other alkali until of a thick creamy consistence, when the fibre may be strained off, and the cream well mixed with about 10 per cent. of its own bulk of petroleum. To make a substitute for rubber, a quantity (varying from $\frac{1}{3}$ to an equal volume) of the astringent liquor found near peat beds, together with from 1 to 50 per cent. (of the total bulk) of sulphur, or substances containing sulphur (*e.g.*, potassium sulphate), are added, the mixture heated and then placed in moulds and compressed to the desired shape. To make a flexible water- and fireproof cement or glue, 10 to 30 per cent. of either chalk, casein, or Portland cement is added to the creamy product, with or without petroleum. When chalk is used, a quantity of the astringent liquor is added.
—E. W. L.

Sulphur colouring matters [from quebracho, mangrove, etc.]. Eng. Pat. 28,862. *See* IV.

XVI.—SOILS; FERTILISERS.

Soil; Treatment of —— with a strong continuous electric current. J. König, J. Hasenbäumer and C. Hassler. Z. angew. Chem., 1911, 24, 2341—2348.

The authors (this J., 1911, 144) have described a method of valuing soils, by determining the electric conductivity, and have now extended it to the estimation of the absorbed or adsorbed, easily soluble mineral constituents. A layer of soil, under the influence of a strong continuous current behaves, in proportion to its colloidal content, as a semi-permeable diaphragm, and the following effects are produced: (1) Simple electrolysis of the soluble constituents, which may be more or less complicated by chemical decomposition; (2) transference of water to the cathode and (3) transference of suspended and colloid matters to the anode. 200 grms. of the air-dried soil are stirred up with distilled water and placed in a parchment dialyser supported inside a beaker so that a space, about 2·5 cm. deep, is left between the bottom of the beaker and the membrane; the anode is placed on the bottom of the beaker, whilst the cathode is placed in the inner vessel. The water inside and outside the dialyser is brought to the same level. A current of 220 volts is used, and the temperature in the anode space is not allowed to rise above about 50° C. On passing the current the colloids are flocculated whilst the humus acids pass through the membrane to the anode space. In order completely to remove all the material brought into solution, the water was changed several times, until no appreciable amount of current passed through the soil, and no rise of temperature occurred. Silica, potash, phosphoric acid, lime and magnesia were determined in the mixed anode and cathode liquids, the content of organic material was determined in both solutions separately by titration with $N/100$ permanganate in alkaline solution, and the acid anode solution tested for the presence of nitric acid. Six different soils were examined in this way. The liquid surrounding the anode had an acid, and that surrounding the cathode an alkaline reaction; after mixing the two liquids the reaction was in some cases neutral, and in others alkaline. The quantities of mineral matter dissolved under the influence of the electric current corresponded generally with the colloid content in the case of natural soils. With soils that had been treated with plant foodstuffs, it was found that only the easily soluble mineral materials or those combined with colloids, were dissolved under the action of the current. The authors have previously found that the easily soluble fertilising salts, or those combined with colloids, in a soil can be determined by steaming the soil under a pressure of 5 atmospheres, or by oxidising the soil with hydrogen peroxide, but the results thus obtained are lower than those obtained by the electrolytic process, if this is carried on till the soil is completely extracted, namely till no current passes. If, however, in the electrolytic process the water in the anode space is only changed once, and after the action of the current the soil is treated with cold 10 per cent. hydrochloric acid, much less is dissolved from the soil by the acid than before the action of the current. If the amounts of potash and phosphoric acid dissolved by the action of the current be added to those left behind, but soluble in hydrochloric acid, the sum is practically the same as that obtained by treating the original soil with hydrochloric acid. A comparison of all three processes is given, and for practical purposes a single treatment with the electric current is generally sufficient. In all three processes the humus-colloids exert a marked effect on the solubility of the fertilising material. In estimating the fertility of a soil, all three processes are valuable, since the plant foodstuffs shown by them stand in a definite relation to the amounts of foodstuffs taken up by plants.—W. C. H.

Arable soils; Determination of the colloids in ——. J. König, J. Hasenbäumer, and C. Hassler. Landw. Vers.-Stat., 1911, 75, 377—441. Chem. Zentr., 1911, 2, 1707—1708.

For the determination of the colloids in a soil by staining with a dye-solution, an aqueous solution of methyl violet is recommended. Further experiments have been made on the absorption of fertilising salts by soils (see this J., 1911, 144). A $N/50$ solution of dipotassium phosphate was used in the experiments, for the components of this salt are said to be absorbed by the soil in approximately equivalent proportions. The potassium is absorbed chiefly by colloidal clay substance, the phosphoric acid by the lime, iron oxide, and alumina. The potassium is not fixed very firmly, and can be removed almost or quite completely by steaming, oxidation with hydrogen peroxide, or the action of the electric current. The phosphoric acid is fixed chemically, mostly in the form of insoluble phosphates of calcium, etc. For the determination of absorbed or adsorbed ions in soils, a method based on the use of the electric current has been devised (see preceding abstract). A relation between the results of the staining test with methyl violet solution or the absorption of dipotassium phosphate and the actual yield of crop could only be established in the case of the surface soil and the subsoil from a given plot, but not in the case of different soils. Also, a comparison of the amount of plant foodstuffs dissolved by steaming, by oxidation with hydrogen peroxide, or by the action of the electric current and the amount assimilated by the plants showed that these agree satisfactorily in the case of potassium, if only the uppermost layer (20 cm.) of the soil be taken into consideration, but the results are not satisfactory in the case of phosphoric acid and lime.—A. S.

Ammonia nitrogen in limed and unlimed soils; Behaviour of ——. O. Lemmermann, E. Blanck, B. Heinitz, and I. von Wlodeck. Landw. Jahrbb., 1911, 41, 163—216. Chem. Zentr., 1911, 2, 1879—1880. (See also this J., 1911, 821.)

Experiments were made with different kinds of soil in pots, which, in most cases, were embedded in the ground in the open. With a light loamy sand soil, there was a loss of nitrogen from the soil after the application of 1 per cent. of calcium carbonate and possibly also a loss of ammonia from ammonium sulphate applied soon after the calcium carbonate. With smaller quantities of limestone, such as are used in practice, however, any considerable loss of nitrogen by liberation and volatilisation of ammonia is not to be feared. In the limed soils, in the 42 days over which the tests extended, the ammonia nitrogen was converted for the most part, but not entirely, into nitrate- and protein-nitrogen: on a lighter soil the conversion into nitrate appeared to predominate, whilst on a heavier soil the conversion into protein-nitrogen was greater, at least in the earlier stages. The loss of nitrogen diminished with increase in the water-absorbing power and amount of slime-material of the soil. The loss of nitrogen was also less when the ammonium sulphate was worked well into the soil and was very small or nil when the ammonium sulphate was mixed with superphosphate.
—A. S.

Carbon compounds of different organic substances; Decomposition of —— in the soil, especially under the influence of lime. O. Lemmermann, K. Aso, H. Fischer, and L. Fresenius. Landw. Jahrbb., 1911, **41**, 217—256. Chem. Zentr., 1911, **2**, 1880—1881.

CONTRARY to the statement of Kossowitsch and Tretjokow (J. exp Landw., 1902), the authors find that quicklime and calcium carbonate promote the decomposition of organic substances in the soil. No decrease in the amount of decomposition can be observed, when kainite and superphosphate are also added. A comparison of manuring with green plants and with stable manure respectively showed that the amount of decomposition of carbon compounds is greater with the former than with the latter, and is not increased by a combination of both kinds of manuring.—A. S.

Solubility determinations in agricultural chemistry. A. Rindell. Akad. Einladungsschrift, Helsingfors, 1910. Pp. 67.

A GENERAL statement concerning solubility, its importance in agricultural chemistry and the methods of determination. In Thomas meal the phosphoric acid is present apparently in a very insoluble form and yet the meal is an excellent fertiliser. Experiments with pure water after 55 days stirring at 25° C. using 10 grms. of substance per 1000 grms. of water show that with Thomas meal 0·1790 grm. of calcium oxide and 0·0316 grm. of phosphoric acid dissolve, whereas from raw phosphates the solution only takes up from 0·00075 to 0·0025 grm. of phosphoric acid, except in the case of Mexico phosphate, which is more soluble than Thomas meal. These phosphates will be perhaps slightly more soluble in soil solutions, but water is far preferable as solvent in such cases than the 2 per cent. citric acid usually employed, in which the soil constituents have too great a solubility. Stress is laid on the difficulties of finding solubility methods applicable to agricultural problems to which no theoretical objections can be raised, and the importance of introducing physical chemical methods into these conceptions is emphasised. —E. F. A.

Sodium chloride as fertiliser for sugar beets. Strohmer and Fallada. *See* XVII.

Waste product from tartars and lees of wine [*as a fertiliser*]. Carles. *See* XVIII.

PATENTS.

Dicalciumphosphate fertiliser. A. Bretteville, Notodden. Assignor to Norsk-Hydro-elektrisk Kvaelstofaftieselskab, Christiania, Norway. U.S. Pat. 1,011,909, Dec. 19, 1911.

PHOSPHATE is dissolved in nitric acid and precipitated with lime. The bulk of the liquid is separated and the precipitate dried so as to leave some of the calcium nitrate covering the phosphate.—G. W. McD.

Superphosphates; Apparatus for use in the treatment of products such as ——. J. Parent, Paris. Eng. Pat. 7994, March 30, 1911. Under Int. Conv., March 31, 1910.

SEE Fr. Pat. 427,949 of 1911; this J., 1911, 1225.—T.F.B.

Fertilisers from natural phosphates; Production of ——. ——. S. B. Newberry and H. N. Barrett, Bay Bridge, Ohio, U.S.A. Eng. Pat. 13,890, June 10, 1911.

SEE Fr. Pat. 430,850 of 1911; this J., 1911, 1400.—T.F.B.

Fertiliser. A. A. Forbes, North Vancouver, B.C. U.S. Pat. 1,012,251, Dec. 19, 1911.

SEE Eng. Pat. 19,706 of 1910; this J., 1911, 228.—T.F.B.

XVII.—SUGARS; STARCHES; GUMS.

Sugar beet; Variability of the weight and the sugar content of the —— and the mutual relationship of these two characteristics. K. Andrlík, V. Bartos, and J. Urban. Z. Zuckerind. Böhm., 1912, **36**, 193—210. (*Cf.* also this J., 1911, 298.)

THAT the weight and sugar content of the sugar beet vary considerably even under identical conditions of soil and weather is well known, but hitherto no systematic work has been done in this direction. From a lengthy series of experiments, the authors now come to the following general conclusions: (1) The weight of the root is one of the characteristics governed by the fluctuations of variability and conforms to the Quetelet-Galton law. (2) The extent of the variability of the weight of the roots is much greater than that of the sugar content, and may amount to over 100 per cent. of the average weight of the parent beet. (3) The variability of the weight of the root in the case of any particular stock is never the same, and in this respect variability caused by a normal and an abnormal consumption of nutrients is to be differentiated. (4) Roots of equal weight do not have the same sugar content, and conversely roots of equal sugar content do not necessarily have the same weight; within, however, the limits of variability, it has been found that to a certain weight of any individual there is a corresponding sugar content, and conversely to a certain sugar content there is a corresponding weight.—J. P. O.

Sodium chloride; Experiments with —— as fertiliser for sugar beets. F. Strohmer and O. Fallada. Österr.-Ungar. Zeitsch. Zuckerind., 1911, **40**, 425—441. Biedermann's Zentr., 1912, **41**, 40—45.

THE authors have already shown that fertilisation with common salt increases not only the yield per acre, but also the sugar content, and does not apparently affect the quality of the roots (this J., 1909, 948). Comparative field experiments have been made on a sandy loam soil, containing a sufficiency of assimilable lime, phosphoric acid, and potash, but deficient in nitrogen, with the object of determining if a mixture of common salt and ammonium sulphate might be used as a substitute for sodium nitrate. That this is so is shown by the following average results for (*a*) the weight of roots, and (*b*) the yield of sugar in metric centners per acre, obtained by the different methods of manuring employed; unmanured, (*a*) 370·5, (*b*) 69·6; common salt (93 lb. of soda, Na_2O, per acre), (*a*) 382·7, (*b*) 72·5; common salt and ammonium sulphate (93 lb. of soda and 42 lb. of nitrogen per acre) (*a*) 417·3, (*b*) 75·6; and sodium nitrate (93 lb. of soda and 42 lb. of nitrogen per acre), (*a*) 421·0, (*b*) 75·7.—J. P. O.

Sugar; Determination of —— [in the beet] by means of the alcoholic and aqueous digestion methods. S. Levitcki. Centr. Zuckerind., 1911, **20**, 357—358.

THROUGHOUT the past six campaigns a number of comparative experiments with methods of determining the sucrose content of the beet have been conducted by the author. In all of these, a very fine pulp prepared by means of the "Ideal" press was used, and the following average results were obtained:—

Campaign.	1904/5. and 1905/6.	1906/7.	1907/8.	1908/9.	1909/10.	1910/11.	Average.
Number of determinations	156	42	37	70	22	18	375
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Alcoholic extraction	—	15·32	17·63	16·12	18·03	17·15	16·56
Hot aqueous digestion	16·45	15·23	17·53	16·02	17·90	17·06	16·46
Hot alcoholic digestion	15·79	14·65	16·92	15·39	17·20	16·45	15·82

Comparing the results obtained by hot aqueous digestion with those found by the alcoholic extraction method, which is known to give the true sucrose content, it is seen that they always agree very closely, whereas those found by hot alcoholic digestion are from 0·06 to 0·83 per cent. lower, and vary appreciably from year to year. The author concludes that the alcoholic extraction and the aqueous digestion methods give practically the same results ; that the hot aqueous method may be considered to give the true sucrose content ; and that the alcoholic digestion method is quite untrustworthy.—J. P. O.

Scalding diffusion [*sugar*] ; *Report upon the testing of the "Elsdorf system" of* ——. A. Herzfeld. Deutsche Zuckerind., 1911, **37**, 9—14.

Under the auspices of the Institut für Zucker-Industrie an examination into the merits of the Elsdorf scalding diffusion process was carried out in November, 1911, in the Elsen factory, the run lasting seven days. In so far as it concerns the new process, the plant at the Elsen factory is as follows : From the slicers the chips are elevated to a hydraulic carrier, along which they are conveyed to the scalding trough, which is about 12 m. long, and is provided with a strong stirring appliance. Adjoining the trough is the juice separator, consisting of a grating, and under this is the reservoir in which the scalded juice, the expressed juice, the diffusion juice, and the first runnings from the scum filter-presses are all collected. From the separator the scalded chips fall into the fore-presses, in which they are freed from juice as completely as possible, next passing by suitable transporters to the diffusion battery. On being discharged from the battery, the exhausted chips are pressed in the usual way until they contain about 10 per cent. of dry substance. During the trial week, the analytical figures obtained for the different products were ; roots worked, 267·177 kilos. ; fresh slices, polarisation 16·3, dry substance 23·30 ; raw juice from the fore-presses, Brix 16·08, polarisation 14·06 ; pressed scalded chips, polarisation 14·05, dry substance 24·08 ; diffusion juice, Brix 11·27, polarisation 9·79 ; juice for defecation, Brix 14·74, polarisation 12·83 ; exhausted diffusion chips, polarisation 0·13, dry substance 7·71 ; diffusion waste water, polarisation 0·13, acidity 0·0033 ; pressed diffusion chips, polarisation 0·33, dry substance 9·48 ; chip press water, polarisation 0.16, acidity 0·0015. Attention is directed to the dry substance figure of the unpressed diffusion chips, since this seems to indicate that the chips by the scalding lose to some extent their capacity of swelling by absorption of water. The author states that the process worked smoothly throughout the trial week, and that it was possible to charge the contents of the diffusers with at least 33 per cent. more chips than in the old method.—J. P. O.

Sulphur dioxide ; Testing the —— *used for the saturation of syrups* [*in beet sugar manufacture*] *for sulphuric acid.* A. Herzfeld. Z. Ver. deut. Zuckerind., 1911, 917—922.

During the last campaign, the author observed in a certain beet sugar factory that there was a striking increase in the proportion of sulphates in the syrup as compared with the thin-juices, and the presence of sulphuric acid in the sulphurous acid used for sulphuring the syrups was therefore suspected. On testing the sulphur oven gases for sulphuric acid by the usual method of passing the gases through distilled water, and afterwards adding a little hydrochloric acid and barium chloride to the solution, it was found that the results were unreliable. Attention is called to the work of Titoff (Z. physik. Chem., 1903, **45**, 641), who showed that traces of iron or copper in the distilled water used may act as catalysts, oxidising the sulphur dioxide, while on the other hand stannic chloride, and polyhydric alcohols, such as mannitol, act as negative catalysts, inhibiting oxidation, even in the presence of salts of iron or copper. On passing sulphur dioxide free from sulphur trioxide through ordinary distilled water, obtained by condensation in a copper worm, the author always obtained positive results on testing for sulphuric acid, but on passing the same gas through a 55 per cent. solution of sucrose, negative results were obtained, even when traces of iron or copper were added. Invert sugar was likewise found to inhibit the oxidation of sulphur dioxide in the presence of catalysts. It is recommended that in testing sulphur oven gases in sugar factories, the gases should be passed for 10 to 15 minutes through a 40 to 50 per cent. solution of refined sugar, and a portion of this solution examined for sulphates by the addition of hydrochloric acid and barium chloride in the ordinary way.—J. P. O.

Juices, syrups, and molasses ; The direct and inversion polarisations of ——. H. Pellet. Bull. Assoc. Chim. Sucr., 1911, **29**, 363—375.

In order to avoid the influence of the basic lead acetate used for defecation upon the optically-active non-sugars in the double polarisation method of determining sucrose in beet factory products, the direct reading may be taken in a solution that is acid either with hydrochloric acid (Andrlik) or with sulphurous acid (Pellet), and it has been shown by the author and Ogilvie (this J., 1911, 62), that in the case of impure products, like molasses, both methods give the same result. With beet factory products of a high quotient of purity, however, as juices, syrups, and massecuites, the hydrochloric acid procedure has been observed by Cross and Taggart, to yield low results, owing to inversion setting in before the observation is made (*cf.* this J., 1912, 37). The author has therefore modified the method of taking the direct hydrochloric acid polarisation by saturating a portion of the acid with a mixture of normal and basic lead acetates, after which the inversion polarisation is carried out under the same conditions of acidity. It has been found that if to the 10 c.c. of hydrochloric acid and urea mixture, 15 c.c. of a mixture of equal volumes of normal lead acetate at 23° Bé. and basic lead acetate at 36 Bé. (French Codex) be added, then no sign of inversion is apparent for at least 15—17 minutes. In taking the direct reading according to the new modification, defecation of the product is carried out in the ordinary way ; 50 c.c. of the filtered defecated liquid are introduced into a 100 c.c. flask, the necessary amount of the solution of mixed acetates added, to bring the amount of lead salts already present to 15 c.c., 10 c.c. of hydrochloric acid and urea mixture (Andrlik) added, the liquid made up to the mark, well mixed, and filtered. It is assumed that but a small proportion of the basic lead acetate added for defecation becomes insoluble, so that if for example the product has been treated with 10 per cent. by volume of basic lead acetate, then to the 50 c.c. taken for the polarimetric reading is added 10·5 c.c. of the solution of mixed lead acetates. For the inversion reading 50 c.c. of the defecated product are placed in a 100 c.c. flask, the necessary amount of the solution of mixed acetates added, then 5 c.c. of pure hydrochloric acid (sp. gr., 1·18), and sufficient water to complete the volume to 80 c.c. after which inversion is carried out at 69° C., heating, however, being continued for 12 in place of 5 minutes, after reaching 69° C., the contents of the flask being finally made up to 100 c.c., and filtered. In accurate work it is necessary to take account of the influence of the volume of the lead chloride precipitate, which has been found to be 0·4 per cent., as the average of a number of determinations. Moreover, the constants 142·66 and 142·25 for concentrations of 13 and 6·5 per cent. respectively are no longer applicable, owing to the lesser amount of acid present, the new values having been found to be 141·65 and 141·50.—J. P. O.

Sucrose ; Gravimetric determination of —— *by oxidation with chromic acid.* A. Wechsler. Österr.-Ungar. Zeitsch. Zuckerind., 1911, **40**, 683—703.

It is claimed by the author that a practical method for the determination of sucrose in beet sugar factory products, equal in accuracy to direct polarisation, can be based upon the determination of the carbon dioxide evolved on oxidation in acid solution. An aqueous solution of the sugar product is oxidised with a suitable amount of a mixture of concentrated sulphuric acid, 500 c.c., chromic acid, 100 grms., and water, 300 c.c., in an apparatus resembling the Schrötter carbon dioxide apparatus, the evolved carbon dioxide being dried by means of sulphuric acid and calcium chloride. By taking the weight of the apparatus before and after oxidation, the amount of carbon dioxide corresponding to a known weight of the sample can be determined, and from this the sucrose content is calculated, it being assumed that under these conditions both terminal and intermediate groups of the sugar molecule are oxidised to carbon dioxide. On applying this method to pure sugar solutions, the results obtained were practically identical with those found by direct polarisation. Comparative determinations by the oxidation and polarimetric methods were also made with the solution resulting from the determination of sucrose in the beet by the Pellet hot aqueous digestion method, in which, however, clarification had been effected by basic lead nitrate (Herles' reagent). Here again almost identical figures are stated to have been obtained, and, since the oxidation mixture is capable of also reacting upon the organic matter other than sugar, it is concluded that the defecant had effected a complete separation of all organic non-sugars. It is further stated that the ratio $\frac{PC \times 100}{GC}$ in which PC is the carbon calculated from the polarisation figures, and GC the total carbon by the oxidation method, may serve as an indication of the proportion of sucrose to non-sugar in a factory product. In support of this statement a number of results are given showing that the increase or decrease in the new value is parallel with the increase or decrease in the quotient of purity, depending upon the product examined, whether raw or defecated juice, syrup, massecuite, or molasses. —J. P. O.

Chitine; Occurrence of —— *[in a sugar factory].* E. O. von Lippmann. Ber., 1911, **44**, 3716—3717.

On the surface of a vessel which had been left standing for several months, filled with dilute waste syrup in a sugar factory, there was observed a curious thin white film of tough, sticky and felt-like substance which could be lifted away in large pieces. After purification by means of water, in which it was insoluble, it was obtained on careful drying as a light grey amorphous powder, insoluble in alcohol, ether, sugar solutions, alkali, or dilute acids. On boiling with concentrated hydrochloric acid it dissolved without much difficulty, and from the solution crystals of glucosamine hydrochloride, $C_6H_{13}NO_5.HCl$, were obtained. The author concludes that the original substance is chitine, which forms the basis of the shells of *Crustacea*, and which occurs widely distributed among the higher and lower fungi. According to Browne (Louisiana Planter, 1905, 238) it is present to the extent of 10 per cent. of the dry substance in the scum on fermented colonial molasses, being formed by the growth of a *Citromyces*.—J. H. L.

Honey; Examination of some samples of genuine ——. G. L. Voerman and C. Bakker. Chem. Weekblad, 1911, [42]; Z. öffentl. Chem., 1911, **24**, 461—467.

The authors have examined 37 samples of genuine honey of Dutch origin and 8 samples from other countries. The specific gravity of the solution obtained by dissolving 1 part of sample in 2 parts of water was seldom less than 1·11 at 15° C., being considerably less (1·1055) in the case of one sample only; this (Dutch) sample was also distinguished by a high percentage of water, viz., 25·7, the water-content of the other samples ranging from 17·7 to 23·7 per cent. All the samples were lævo-rotatory; the rotatory power of the 10 per cent. solutions read in a 200-mm. tube at 20° C. ranged between $-1·5°$ and $-4°$ save in three cases where it amounted to $-0·31°$, $-6·27°$ and $-7·03°$ respectively. The sucrose-content amounted to 4·7 per cent. in the maximum, but since honey dextrin does not remain quite unchanged on treatment with hydrochloric acid, too much importance must not be attached to the values found for sucrose. The total sugar-content, calculated as invert sugar, was about 70 per cent. or more, in all cases; the acidity, calculated as formic acid, ranged between 0·05 and 0·15 per cent., and the ash-content ranged between 0·1 and 0·55 per cent.; generally the ash was of a green colour and contained manganese. Fiehe's test with resorcinol and hydrochloric acid for the presence of added invert sugar (this J., 1908, 1127) gave a negative result in every case. As might have been expected from the polarisation readings, Fiehe's test with alcohol and hydrochloric acid for the presence of starch syrup (this J., 1910, 106) was generally negative, though in the case of two Dutch samples, slight and very distinct turbidities respectively were obtained. Since, as was shown both by the polarisation and by the test of König and Karsch (this J., 1895, 773), these two samples were certainly free from starch syrup, it is evident that a positive result obtained with Fiehe's test for starch syrup requires confirmation by the polarisation or in some other way. Auzinger's test for diastase (this J., 1910, 291) gave a positive result with all the samples excepting two foreign ones, and here, the negative results were probably due to excessive heating of the samples. Finally, it is found that genuine honey, heated for 6 hours in a boiling water-bath (whereby it is rendered decidedly unpalatable), or for 3 hours at 105° C., only gives a transient and very slight rose colour when treated with resorcinol and hydrochloric acid according to Fiehe's method. Hence, any heating of a genuine honey that can lead to a positive result with the resorcinol-hydrochloric acid reaction must be very excessive, and this reaction, in conjunction with other tests, must be regarded as a very valuable aid in detecting the presence of added invert sugar.—L. E.

Patents.

Evaporating pan. H. Holmes, Clarence township, Mich. U.S. Pat. 1,012,550, Dec. 19, 1911.

The sap or other liquid to be evaporated passes from an elevated tank into a "boiling pipe" extending longitudinally through a furnace, and is then conducted into an "evaporating pipe" arranged above the furnace. The evaporating pipe is of serpentine form and has a funnel-shaped mouth provided with a strainer into which the liquid from the boiling pipe is discharged. A steam discharge pipe opens into the evaporating pipe near the upper end, while the lower end delivers the concentrated liquid to a syrup tank.—H. H.

Glucose-like product from cellulosic and ligneous materials; Method of making a ——. W. P. Cohoe, Toronto. Eng Pat. 23,573, Oct. 11, 1910.

See U.S. Pats. 985,725 and 985,726 of 1911; this J., 1911, 441.—T. F. B.

Refinery syrup; Processes for converting under atmospheric pressure and in a continuous manner —— *into fine grains or crystals.* P. Lagrange, Lille, France. Eng. Pat. 2022, Jan. 26, 1911.

See Fr. Pat. 425,199 of 1911; this J., 1911, 914.—T. F. B.

XVIII.—FERMENTATION INDUSTRIES.

Diastase. J. Buraczewski, L. Krauze, and A. Krzemecki. Anz. Akad. Wiss. Krakau 1911, **A**, 369—370. Chem. Zentr., 1911, 2, 1948—1949.

By the action of bromine or iodine on diastase (Merck's *Diastase absolut Ph. japon. III.*) suspended in methyl alcohol, the authors obtained substances containing respectively 6·23 per cent. of bromine or 9 per cent. of iodine. These were boiled with water, the solutions filtered from the greyish-white insoluble matter (apparently a halogen-derivative of a protein substance), and precipitated with a large quantity of alcohol, whereupon a product was obtained which reacted with a solution of iodine in potassium iodide in an exactly similar manner to starch; the original diastase gave no reaction with the iodine solution. This substance yielded dextrin-like products on hydrolysis with diastase or with dilute mineral acids; from the products of hydrolysis an osazone melting at 156°—157° C was obtained by means of phenylhydrazine. A solution giving a blue colouration with iodine solution can also be obtained by boiling diastase with very dilute (0·2 per cent.) mineral acids. The authors conclude that diastase is a relatively unstable compound of a protein and a carbohydrate. The araban which, according to Wróblewski, is always present in diastase, is regarded as a product of hydrolysis of the carbohydrate.—A. S.

Malt, wort and beer ; Acidity of ——. E. Prior. Allgem. Z. Bierbrau. u. Malzfabr., 1912, **40**, 2—5.

The author describes the variations of acidity of barley, malt and wort which take place in course of the manufacture of beer. The conclusions and the experiments on which they are based have, for the most part, been already published (see this J., 1892, 766 ; 1893, 380 ; 1894, 986 ; 1899, 61, 288.) The author points out that in modern malting practice, as compared with that of twenty years ago, germination of the barley is arrested at an earlier stage. The result of this is to produce malts of lower acidity, which during mashing are more sensitive towards the deleterious influence of alkali carbonates in the brewing water. The finished beers are also less acid and consequently less stable (cp. Moufang, Woch. Brau., 1909, **26**, 368 ; Schönfeld and Hirt, this J., 1911, 1274). The deficiency of acid in the malt is not the only factor contributing to instability of the beer. The malt acidity may be taken as an indication of the extent to which other transformations, important for the production of good malt, have occurred ; and the poorer quality of beers made from short grown malts is probably to be attributed to a deficiency of these other transformations the precise nature of which is as yet obscure.—J. H. L.

[*Beer*] *Carbonating and filtering process.* H. Abbot. J. Inst. Brew., 1911, **17**, 648—654.

The temperature at which beers intended for bottling are carbonated, determines largely the manner in which the gas is afterwards given off. If carbonation is carried out slowly at low temperatures (about 0° C.), the carbon dioxide appears to enter into some loose kind of combination with the constituents of the beer, and on opening the bottles it escapes slowly, as from well matured beers. When, on the other hand, the temperature of carbonation is higher, the beers obtained are likely to be "gassy." By conditioning for a long time at low temperatures and filtering bright, beers are obtained which keep well in bottle, but they are often deficient in palate-fulness, certain valuable constituents being lost. By using higher temperatures the palate-fulness is retained, but the beers are "gassy" and subject to deposit. In South Africa, it is the custom to condition in Pfaudler tanks by addition of "kräusen," the temperature being kept at 4°—7° C. and the pressure not being allowed to exceed about 5 lb. to the sq. in. Ripening is regarded as complete after 6—8 weeks in the winter and 4 weeks in the summer, and the beer is then forced through a filter into cask or bottle without further chilling. The quality is excellent but the gas comes out too fast and the head is not creamy and feathery, as in well matured beer. It is of the greatest importance in carbonating beer, that air should first be eliminated from the vessels, as otherwise the beers are likely to be deficient in head, and flat in flavour ; a very small proportion of air in the carbon dioxide makes a perceptible difference in the character of the beer. The best way to eliminate air is to fill the carbonating tank or drum completely, and then force back the beer to the desired level by a top pressure of carbon dioxide. The gas employed may be collected from the fermentation vats by having these enclosed at the top and strong enough to withstand a pressure of about 5 lb. to the sq. in. As soon as all the air has been displaced, the gas is pumped off into a storage cylinder. Precautions should be taken to prevent much rise in temperature during compression of this natural gas, as certain valuable volatile substances present in it may otherwise be altered or destroyed.—J. H. L.

Beer ; Influence of changes in the acid-content on the stability of ——. *II.* F. Schönfeld and W. Hirt. Woch. Brau., 1911, **28**, 617—618, 649—657 (See also this J., 1911, 1274).

The experiments recently described (*loc. cit.*) have been repeated with a larger number of beers (12 pale and 4 dark), the tests being carried out at room-temperature (20°—22° C.) and also at cellar-temperature (0° C.). At ordinary temperatures there was in the case of all the beers an optimum acidity, somewhat greater than the original acidity, at which the time elapsing before the appearance of cloudiness was a maximum. Thus, the average interval during which the twelve pale beers remained clear was 13 days ; after addition of 0·03, 0·06, 0·09, 0·15, 0·21 and 0·36 per cent. of lactic acid, cloudiness appeared after average periods of 20, 24·1, 23·6, 21·2, 17·6 and 11 days, in the respective cases. Addition of 0·018 per cent. of alkali to the original beers reduced the period of clarity to 7·8 days, and 0·36 per cent. to 5·8 days. In the case of the dark beers at room-temperature, the results were similar, but the optimum acidity corresponded to the addition of 0·09 per cent. of lactic acid instead of 0·06 per cent. ; and with larger additions the stability fell off less rapidly than with pale beers. The existence of a point of optimum acidity results from the intersection, so to say, of two tendencies, (1) with increasing acidity, a more and more rapid precipitation of resin-globules and albumin, (2) with diminishing acidity and increasing alkalinity, a more and more rapid and copious formation of cloudiness due to bacterial growth. Since, at lower temperatures, the growth of bacteria is retarded, the point of optimum acidity should then be displaced towards neutrality, or even beyond ; and actually it was found that at 0° C. the addition of the maximum quantity of alkali used (0·036 per cent.) did not shorten the period during which the beers remained clear, whilst with increasing acidity the cloudiness due to resin and albumin appeared somewhat more rapidly than at ordinary temperatures, especially in the case of pale beers. Some further experiments with larger quantities of alkali, at room temperature, showed that addition of 0·5 per cent. produces a very rapid and copious appearance of cloudiness, due chiefly to bacteria. Addition of 0·5—1 per cent. led to the separation of flocks of albumin with little living matter. Still larger quantities produced no precipitation but a pronounced darkening of colour. The substitution of tartaric or acetic acid in place of lactic acid gave substantially the same results, but rather larger quantities of acetic acid were required to produce the same effect as the latter. Experiments with pasteurised beer showed that addition of acid even in small quantities accelerates the formation of haze, as with ordinary beers at low temperatures, and probably for the same reason—absence of bacterial growth. Contrary to expectation, however, addition of alkali, even when followed by further pasteurisation at 65°—70° C., led to the formation of cloudiness consisting largely of bacteria. The authors conclude from this, that pasteurisation at 65°—70° C. does not completely destroy the bacteria in beer, but weakens the surviving ones to such a degree that they are unable to develop except under more favourable conditions such as those called forth by the addition of alkali.—J. H. L.

Aluminium ; Investigation of —— *with reference to its suitability for the construction of brewery plant.* A. C. Chapman. J. Inst. Brew., 1911, **17**, 660—678.

Much has been published concerning the durability of aluminium in contact with solutions of various substances (cp. Watson-Smith, this J., 1901, 475 ; Ditte, this J., 1899, 149), but the results obtained by many investigators are rendered uncertain by the omission of any statement as to the composition of the metal employed. The sensitiveness of commercial aluminium depends to a large extent on the nature and amount of the impurities present ; generally, the purer it is, the better does it resist corrosion. The metal employed by the author contained 0·22 per cent. of silicon, 0·22 per cent. of iron and 0·03 per cent. of sodium. Solutions of alkali chlorides corrode it rather rapidly, and it is therefore not suited for the construction of tanks in which brewing waters are treated with kainite or similar materials containing chlorine. Its sensitiveness towards alkalis also renders it an undesirable material for the construction of water-cisterns, although some waters would attack it much less rapidly than others. Worts and beers may remain in contact with it for days with perfect safety, the amount of corrosion being quite negligible. The author found that specimens of yeast which had not been in contact with aluminium contained distinct traces of it (less than 0·2 per cent. of the ash). Yeast which had been grown in wort containing aluminium salts contained no more than such traces, and its vitality was quite unimpaired. The author has previously shown

(J. Inst. Brew., 1909, 15, 36) that if fermentation is conducted in copper vats, the yeast near the sides of the vats, when examined microscopically, is found to be deteriorated owing to poisoning by copper salts. No such deterioration could be detected in the case of aluminium vessels. The haze produced in beers by contact with many metals, notably tin, is not produced by aluminium. The sensitiveness of the metal towards acid and alkaline cleansing agents constitutes a drawback to its use, but the surface of aluminium vessels can usually be cleaned thoroughly by mechanical means aided by hot water. Aluminium vessels which have been in use in a brewery for 18 months have given complete satisfaction. In one case, however, considerable corrosion occurred, which was traced to the presence of large quantities of salt in the water used for washing the vessel. The author concludes that while commercial aluminium appears well suited for the construction of many items of brewing plant, particularly of fermentation tuns and vessels intended for the treatment of chilled and filtered beers, its successful application depends not only on its appropriate chemical composition but also on the nature of the mechanical treatment to which it is subjected and the care exercised in its installation.—J. H. L.

Tartars and lees of wine; Waste product from —— [*as a fertiliser*]. P. Carles. Bull. Assoc. Chim. Sucr., 1911, **29**, 380—381.

It is pointed out that the exhausted residue from the extraction of tartars and lees forms a valuable manure, since it contains large proportions of carbohydrates capable of being transformed into humus, of nitrogenous matter, of potash, and of phosphates. The nitrogenous matter originates from dead yeast cells, the protein matter of the grapes, and of the finings used; the potash from the potassium hydrogen tartrate; and the phosphates from the animal charcoal employed for decolourisation. It is now general to allow this residue to undergo fermentation in heaps, whereby the nitrogen becomes readily assimilable, most of it indeed being transformed into ammonium salts. Analyses made by the author show that this fermented residue may contain: organic matter, 28—77 per cent.; total nitrogen, 4—5 per cent.; phosphoric acid, 0·25—5·29 per cent.; potash, 0·22—2·25 per cent. Owing to its origin, this manure is most suitable for wine soils, especially those poor in humus.—J. P. O.

Grape seeds. Paris. *See* XII.

PATENTS.

Alcohol; Process for denaturing ——. J. Kluge, Görlitz, Germany. Eng. Pat. 16,153, July 12, 1911.

About 2·5 per cent. of light oils, obtained by distilling coal-tar at a temperature of approximately 175° C., are added to the alcohol. Heavier oils, distilling at from 175° to 270° C. and freed from naphthalene, may also be employed; in this case, the addition of from 0·5 to 1 per cent. will be sufficient to render the alcohol unsuitable for human consumption. (See also Eng. Pat. 19,257 of 1909; this J., 1910, 196.)—W. P. S.

Distillers' wash; Processes for extracting useful products from ——. G. P. Guignard, Melun, and H. L. A. M. Watrigant, Lille, France. Eng. Pat. 12,737, May 26, 1911. Under Int. Conv., May 30, 1910.

See Fr. Pat. 427,560 of 1910; this J., 1911, 1134.—T. F. B.

Converting yeast into food. U.S. Pat. 1,012,147. *See* XIXa.

XIXa.—FOODS.

Phosphorus in Indian food stuffs. D. Hooper. J. and Proc., Asiatic Soc. of Bengal, 1911, 7, 313—322.

In view of the fact that lack of phosphorus in cleaned or milled rice is the predisposing cause of epidemic dropsy or beri-beri (H. Schaumann, Archiv f. Schiffs- und Tropenhygiene, 14, Beihefte 8), the author has determined the quantity of phosphorus present in numerous samples of Indian rice, as well as in other grains and food materials. The milling or polishing of the rice grain after the removal of the husk results in the loss of a layer which is rich in oil, protein and ash, and the food value of the grain is reduced. Experiments on fowls have shown that, whilst rice which yields 0·469 per cent. of phosphoric acid (P_2O_5) is a healthy diet rice containing only 0·2777 per cent. cause polyneuritis to develop within a few weeks. Samples of rice collected from districts where beri-beri existed contained from 0·26 to 0·47 per cent. of phosphoric acid; the well-polished rices containing the smaller quantities. The result of other analyses showed that unmilled rice contains on an average 0·65 per cent. of phosphoric acid, whilst milled rice contains about 0·38 per cent. The portion of the grain removed by the milling process was found to contain 3·36 per cent. of phosphoric acid. Indian wheat was found to contain an average of 0·69 per cent. of phosphoric acid, and wheat flour 0·21 per cent., these figures being similar to those shown by European wheats and flours (cf. this J., 1909, 808). The quantities of phosphoric acid found in other foodstuffs are recorded, and the following are selected from the lists given: barley, 0·94; pearl barley, 0·53; lentils, 0·75; cheese, 1·50; fish (boiled), 0·49; potato (boiled), 0·21; beans, 0·19; pineapple, 0·13; edible bird's nest, 0·06 per cent.—W. P. S.

Feeding stuffs; Determination of fat in —— *by the method of cold extraction.* C. Grimme. Chem. Rev. Fett Ind., 1912, 19, 1—5.

Comparative determinations of the fat in cottonseed meal with various cold solvents on the lines prescribed by Neumann (this J., 1911, 1181) gave the following mean results:—Ether (ordinary method of extraction), 7·45; chloroform, 8·58; carbon tetrachloride, 7·43; dichlorethylene, 8·13; trichlorethylene, 7·46; perchlorethylene, 7·79; tetrachlorethane, 7·71; and pentachlorethane, 9·62 per cent. Only in the case of carbon tetrachloride and trichlorethylene did the extracted fat agree in yield and in analytical values with the results obtained by the usual ether method. Complete extraction of the fat is not obtained with less than 100 c.c. of either cold solvent, but 45 minutes' extraction is sufficient with carbon tetrachloride and 30 minutes' extraction with trichlorethylene. Preliminary drying of the material is unnecessary. It is essential, however, that the shaking should follow the direction of the longitudinal axis of the flask. Below 10 per cent. of fat the weight of fat obtained on evaporating 50 c.c. of the extract may be accepted as sufficiently accurate, but an addition of 0·2 per cent. should be made for amounts between 10 and 15 per cent., and of 0·4 per cent. for amounts between 15 and 20 per cent. These corrections are based upon the average sp. gr. of fat = 0·93.—C. A. M.

Millet; Quantities of hydrocyanic acid evolved from different varieties of ——. J. Schröder and H. Dammann. Chem.-Zeit., 1911, 35, 1436—1437.

These experiments were carried out owing to the death of animals fed on millet, large amounts of which are used as fodder in sub-tropical countries. The plants are cut at beginning of flowering. The determination of hydrocyanic acid was carried out by cutting up the plant and macerating for 48 hours in water. The mass was then steam distilled and the hydrocyanic acid determined in the distillate by Denigès' process (Précis de chim. anal., 1907, p. 641). The following figures are typical of the percentage of hydrocyanic acid found. After 44 days' growth, 0·029 to 0·04 per cent.; after 99 days' growth, at the beginning of flowering, 0·006 to 0·004; after 119 days' growth, whilst in flower, 0·005; after 135 days' growth at the beginning of seeding, 0·001 to 0·004; and after 156 days' growth, whilst withering, 0·003 to 0·005 per cent. The amount of hydrocyanic acid thus diminishes with the growth of the plant, and the seeds yield none. In all cases manuring with sodium nitrate increases the amount of hydrocyanic acid.—G. W. McD.

Grape seeds. Paris. *See* XII.

Patents.

Frozen or chilled meat and other substances, either animal or vegetable; Preservation and storing of —— and apparatus therefor. Sir E. M. Nelson, W. P. Tyser, and J. Dicks, London. Eng. Pat. 28,704, Dec. 9, 1910.

In order to remove moisture from frozen meat, or other substances when these are placed in a cold storage chamber, a current of dry air at a temperature slightly above 32° F. is passed through the chamber; the temperature is afterwards lowered to the desired extent. The air is circulated by means of a fan first over pipes containing cold brine arranged at the sides of the chamber, then over pipes containing warm brine, placed under the perforated floor, and afterwards through the chamber. —W. P. S.

Flavouring preparation [from tea] and method of preparing the same. R. I. Bray, Scalby, F. J. F. Curtis, Leeds, and A. C. T. F. Waugh, Bradford. Eng. Pat. 9214, April 13, 1911.

Tea is submitted to steam-distillation until the distillate amounts to from two to three times the weight of the tea used. The distillate is then distilled, and the concentrated distillate (amounting to about one-fourth of the volume of the first distillate) thus obtained is extracted with successive quantities of an immiscible solvent such as chloroform, carbon bisulphide, ether, etc. The extracts are distilled at a low temperature, and the residue of essential oil of tea is mixed with a large quantity of a dry powdered residue obtained by the evaporation of an aqueous infusion of tea; the essential oil obtained from 500 parts by weight of tea may be mixed with from 5 to 10 parts by weight of the dry powder.—W. P. S.

Yeast; Process of converting —— into food. P. Nolf, Liege, Belgium. U.S. Pat. 1,012,147, Dec. 19, 1911.

The nitrogenous substances present in yeast are converted into "comestibles" by keeping the yeast at a temperature (between 45° and 60° C.) which will ensure autolysis, until the peptones have almost entirely disappeared; the treatment may be carried out in presence of oxygen. The bitter substances are removed from the product by treatment with "non-toxic salts."—T. F. B.

XIXb.—WATER PURIFICATION; SANITATION.

Water; Purification and softening of —— by permutite. A. Kolb. Chem.-Zeit., 1911, **35**, 1393—1395, 1410—1411, 1419—1420.

Permutite is an artificial zeolite (see this J., 1907, 711, 771, 1091, 1251), which has the property of removing certain constituents from water and of softening it. The constitution of the substance is $3SiO_2, Al_2O_3.(K_2O.Na_2O.CaO), 5H_2O$. Experiments were made, both by shaking and filtration, as to the interchange taking place between permutite and chlorides of calcium, magnesium and potassium, and it was found that the soda of the permutite was replaced by the bases of the salts added in molecular proportions. The permutite could be regenerated by treating the used substance with common salt. As well as the alkaline earth metals, iron and manganese could be removed similarly from solution. It is stated that with a filter formed of permutite, complete softening of water can be effected. The water must not be acid and must not contain suspended matter. A muddy water, in addition to blocking the pores of the filter, coats the grains of the filtering material with inert matter and prevents the chemical reaction taking place. The regeneration of the permutite by a solution of common salt is of industrial importance, as it enables the same filter to be used for an indefinite time. The richness of the treated water in sodium salts is not detrimental to a boiler-feed water.—J. H. J.

The dimethyl sulphate test for creosote oils and dips. Chapin. *See* III.

Patents.

Water for steam generators; Purifying and heating of feed ——. C. Hulsmeyer, Düsseldorf, Germany. Eng. Pat. 23,564, Oct. 11, 1910.

The feed water is heated to 150° C. in the boiler itself, being conducted into a receptacle which is arranged at the upper part of the boiler and provided with a number of spouts so that the water flows through and over a number of superposed trays before it reaches the bulk of the water in the boiler. During its passage over the trays the water is heated by the steam, and the deposited mineral substances may be blown off in the form of mud from the lowermost tray, or conducted to a part of the boiler enclosed by a partition plate and there blown off as required. Several forms of the apparatus, adapted for use in different forms of boilers, are described. (Reference is directed to Eng. Pat. 13,367 of 1906.)—W. P. S.

Sludge from sewage tanks; Discharge of ——. S. H. Adams, York. Eng. Pat. 28,631, Dec. 9, 1910.

A Dortmund or other sewage receiving tank is connected at its upper part with a smaller tank so that the liquid portion of the sewage may flow into the latter tank; when this is full, a siphon discharges a portion of the liquid, and the pressure caused by the higher level of the liquid in the main tank then forces the sludge upwards through a pipe into the lower part of the smaller tank or into a separate sludge tank, from which it is drawn off when necessary. As further quantities of liquid flow into the main tank and thence into the smaller tank, the siphon again comes into operation, and so on. A flap-valve is provided on the sludge pipe to prevent the sludge passing backwards into the main tank. Several forms of the apparatus are described.—W. P. S.

Product for use in making high-percentage stable emulsions Ger. Pat. 239,828. *See* XII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Brucine; The red substances obtained from ——. J. Buraczewski and Z. Zbijewski. Anz. Akad. Wiss. Krakau, 1911, A, 464—469. Chem. Zentr., 1911, 2, 1941—1942.

By the action of chlorine on brucine until evolution of hydrochloric acid begins, a reddish brown substance of the composition, $C_{22}H_{22}N_2O_4Cl_2$, $HCl+2H_2O$, is produced, which is easily soluble in water and alcohol. By the more prolonged action of chlorine a dark grey compound, $C_{21}H_{19}N_2O_4Cl_3$, $HCl+2H_2O$, is obtained, which dissolves easily in water to form a red solution; at 110° C., this compound slowly loses water and becomes almost black and nearly insoluble in water. By the action of bromine dissolved in carbon bisulphide on an alcoholic solution of brucine, a red product is obtained which appears to be a mixture of the two compounds, $C_{21}H_{22}N_2O_4Br+2H_2O$ and $C_{22}H_{24}N_2O_4Br$, $HBr+H_2O$. The action of dry chlorine on brucine may be used as a test for the latter, even in presence of other alkaloids. Even with very small quantities of brucine the reaction product gives a persistent red colouration on boiling with alcohol. (See also this J., 1909, 1102; 1910, 108.)—A. S.

Nicotine; Determination of —— in manufactured tobacco and in green tobacco leaves. R. Mellet. Schweiz. Woch. Chem. Pharm., 1911, **49**, 117. Ann. Chim. analyt., 1911, **16**, 233.

The weighed material, cut in small pieces, is damped with boiling water, and set aside for 24 hours in a closed flask. A considerable excess of freshly-made milk of lime is then added; the flask is again closed and set aside for a further 24 hours, with occasional agitation, after which the nicotine is distilled over in a current of steam. The distillate is neutralised with dilute sulphuric acid, and evaporated on the water-bath, protected from light.

The concentrated solution is transferred to a separator, rendered alkaline with a strong solution of potassium hydroxide, and shaken out with ether. The ether extract is evaporated on the water-bath until no more vapour of ammonia is given off, as indicated by Nessler's test-paper; then the rest of the ether is allowed to evaporate spontaneously. The oily residue thus left, which is nicotine, is dissolved in water and titrated with $N/10$ sulphuric acid solution.—J. O. B.

Copaiba. E. J. Parry. Chem. and Drug., 1912. **80**, 19.

According to Cocking (Chem. and Drug., 1910, II., 51), the optical rotation of the essential oil from genuine copaiba is always higher than that of the first 10 per cent. distilled from the oil; and this has been suggested as a test of the purity of copaiba oil. The author states that several specimens of genuine Maracaibo copaiba which he has recently examined gave an essential oil, the optical rotation of which was either the same as or lower than that of the first 10 per cent. distilled therefrom at 18—25 mm. pressure. It is pointed out that in any case, in order to obtain reliable results for the optical rotation, the essential oil must be separated from the resin by steam distillation, and the subsequent fractional distillation of the oil must be carried out under greatly reduced pressure.—A. S.

Essential oils; New Philippine ——. B. T. Brooks. Philipp. J. Sci., 1911, **6**, 333—351. (See this J., 1911, 1406, 1407.)

The essential oil from yellow champaca flowers (*Michelia champaca* L.) has the sp. gr. 0·904—0·9107 at 30°/30° C., $n_D = 1{\cdot}4640$—$1{\cdot}4688$ at 30° C., ester value 124—146, and ester value after acetylating 199. When distilled in a vacuum it polymerises. It contains isoeugenol, benzoic acid, benzyl alcohol, benzaldehyde, cineol and *p*-cresol methyl ether. The white flowers (*Michelia longifolia* Bl.) yield an oil with the following characters:—sp. gr. 0·897, ester value 180·0, $n_D = 1{\cdot}4470$ at 30° C. It contains linalool, methyleugenol, methylethylacetic acid probably in the form of the methyl or ethyl ester, and a phenolic substance possessing an odour closely resembling that of thymol. The yellow flowers contain a ketone melting at 165°—166° C., and yielding a hydrazone, $C_{16}H_{20}O_4 : N{\cdot}NH{\cdot}C_6H_5$, m.pt. 161° C. The leaves of *Toddalia Asiatica* (L.) Kurz (*T. aculeata* Pers.) yielded about 0·08 per cent. of oil on distillation. After freezing, about 18 per cent. of an unstable camphor-like product separated, m.pt. 96·5°—97° C. The characters of the oil are:—sp. gr. 0·9059 at 30°/30° C., $n_D = 1{\cdot}4620$ at 30° C. The leaves of *Limnophila* sp. of the *Scrophulariaceae* contain about 0·2 per cent. of an essential oil with an odour resembling that of rosemary. The oil has the sp. gr. 0·850. The oil from the leaves of *Citrus hystrix* DC. is only small in amount, 0·08 per cent. The characters are:—sp. gr. 0·9150 at 30°/30° C., $n_D = 1{\cdot}4650$ at 30° C., $a_D = -10{\cdot}50°$ at 30° C., saponification value 50·2. The cassie flower, *Acacia farnesiana* (L.) Willd., has been introduced into the Philippines and now grows wild. It would possibly pay for cultivation. A very fragrant oil was obtained from a species of *Andropogon*. It had the sp. gr. 0·8777 at 30°/30° C., and $n_D = 1{\cdot}4868$, and was optically inactive. It contained 72 per cent. of aldehydes (chiefly citral) and 12 per cent. of geraniol.—F. Shdn.

Essential oils; Constituents of ——. Constitution of active caryophyllene. Decomposition of active caryophyllene to monocyclic derivatives. F. W. Semmler and E. W. Mayer. Ber., 1911, **44**, 3657—3679. (See this J., 1910, 898 and 1911, 48.)

Commercial caryophyllene obtained from natural sources contains three isomerides, one optically inactive and two active. The inactive *a*-caryophyllene has been shown to be identical with humulene (this J., 1911, 766). The two active isomerides are readily converted the one into the other. They both yield the same hydrochloride, m.pt. 69° C., which can be converted into *d*-caryophyllene. When the ozonides of caryophyllene are decomposed, acid and neutral products are obtained. These finally yield products which possess the same trimethylated tetramethylene ring. Some of these substances yield dimethylsuccinic acid upon oxidation.—F. Shdn.

Ferric chloride reaction for salicylic acid, and determination of free salicylic acid in aspirin and other tablets. Linke. *See* XXIII.

4-Amino-3-hydroxyphenyl-1-arsinic acid and its reduction products. L. Benda. Ber., 1911, **44**, 3578—3582.

When *o*-nitroarsanilic acid is diazotised and the diazo solution treated with sodium acetate (to neutralise the free mineral acid), a hydroxyl group takes the place of the nitro-group and the resulting diazo compound now combines with R-salt only slowly in concentrated solution. It combines, however, with resorcinol or β-naphthol and when the latter combination is reduced with sodium hydroxide and hydrosulphite or with aluminium and sodium hydroxide, 4-amino-3-hydroxyphenylarsinic acid, $C_6H_3(NH_2)(OH)AsO_3H_2$, is produced. If, however, the reduction is carried further or the amino-hydroxyphenylarsinic acid is itself reduced, 4 : 4′-diamino-3 : 3′-dihydroxyarsenobenzene,

$$C_6H_3(NH_2)(OH)As : As(OH)(NH_2)C_6H_3,$$

is obtained, whilst 4-amino-3-hydroxyphenylarsenic oxide, $C_6H_3(NH_2)(OH)AsO$, occurs as an intermediate product. The therapeutic properties of these compounds will be described later.—J. C. C.

Arsenic in organic compounds; Detection and determination of —— [and characters of salvarsan]. G. Bressanin. Boll. Chim. Farm., 1911, **50**, 727—730. Chem. Zentr., 1911, 2. 1965.

Sodium cacodylate, arrhenal (disodium methyl arsenate), and atoxyl (sodium *p*-aminophenylarsinate) give characteristic coloured precipitates with a solution of potassium iodide in sulphuric acid of 45° B.; salvarsan (dihydroxydiaminoarsenobenzene) gives a precipitate only if it be first decomposed by heating with concentrated sulphuric acid (sp. gr. 1·84). For the determination of arsenic in the substances mentioned, 0·2—0·4 grm. is heated for 2 hours in a Jena flask with 10 c.c. of concentrated sulphuric acid, sulphur dioxide is expelled by a current of air, and the solution is poured into a 100 c.c. flask, the Jena flask being rinsed with sulphuric acid of 45° B., and the solution then diluted to the mark with acid of the same concentration. In an aliquot portion of the solution, the arsenic is then determined as described on page 93. In this way results are obtained agreeing with the theoretical values for sodium cacodylate with 29·6 per cent. of water, for arrhenal with 6 mols. of water, for atoxyl with 29·31 per cent. and for salvarsan with 8·6 per cent. of water.

Characters of salvarsan.—A light yellow microcrystalline powder, which decomposes at 175° C., and is soluble in water to a yellow, strongly acid solution. With cold silver nitrate solution it gives first a yellow colouration and then a gelatinous precipitate; on heating a black precipitate, soluble in dilute nitric acid, is obtained. With mercuric chloride it gives a light yellow precipitate, changing to a white powder on heating. With nickel salts it gives a green colouration, with cobalt salts a pink, with copper salts a blue, with lead salts and with magnesia mixture a white, and with picric acid a yellow precipitate. With ferrocyanide it gives a green precipitate, and on heating, hydrocyanic acid is evolved. With ferricyanide a brownish yellow precipitate is formed, and reduction to ferrocyanide takes place on heating. With potassium bichromate, it gives a brownish green precipitate in neutral solutions and a red colouration in presence of sulphuric acid.—A. S.

Methyl alcohol; Distillation of —— [in a current of air for formaldehyde production]. G. Birsten, H. Denneler and A. Heiduschka. Z. angew. Chem., 1911, **51**, 2429—2430.

In the production of formaldehyde from methyl alcohol by oxidation in air, the mixture of alcohol vapour and air is usually obtained by drawing air through the liquid alcohol at temperatures of about 50° C. The authors have found, from experiments carried out in a vacuum distillation apparatus in which the air current was produced by maintaining a reduced pressure in the receiver, that with a deficient air current, or with a low vacuum (690 mm.) in the distillation apparatus, even dilute solutions of methyl alcohol (16 per cent.) give vapours sufficiently rich in alcohol to be used for the production of formaldehyde. In such cases, however, the high temperature of distillation, which may exceed 80° C., may cause further oxidation of the formaldehyde formed, unless special precautions are taken. With a more rapid current of air, corresponding to a vacuum of 700 mm. in the apparatus, the liquid, whether containing 40 or 90 per cent. of methyl alcohol, was found to boil at 48°—52° C., and the proportion of alcohol to water in the vapour was in no case very different from that in the boiling liquid. This last point is important for the continuous production of vapours of a given composition.—J. H. L.

Mercury in mercurial preparations ; Volumetric determination of ——. W. B. Cowie. Pharm. J., 1911, **87**, 885—886.

The method proposed by Crewe (this J., 1908, 1040) for determining mercury in mercurial ointment by saponifying the fat and then weighing the separated mercury gives good results, and a more rapid, volumetric method can be based upon it, the mercury (or oxide of mercury) being dissolved in nitric acid and the solution titrated with thiocyanate according to Volhard's method. In the case of ointments with a paraffin base, the paraffin is removed by extraction with petroleum spirit, and the mercuric oxide dissolved in nitric acid. Some preparations such as *Hydrargyrum cum Cretâ* and *Pilula Hydrargyri* may be dissolved directly in nitric acid.—A. S.

Calcium ethylates. de Forcrand. Comptes rend., 1911, **153**. 1441—1444.

When metallic calcium or its hydride, nitride or carbide acts on ethyl alcohol, a crystalline compound, $(C_2H_5O)_2Ca,2C_2H_6O$, may be isolated. If this is enclosed at room temperature under a bell-jar in the presence of concentrated sulphuric acid, a gradual change in composition takes place, till at the end of two or three weeks the residue corresponds to $4C_2H_6O+3CaO$. From this point the process becomes extremely slow and a sample preserved since 1905 now has the composition, $C_2H_6O,3CaO,2H_2O$. The final product would presumably be entirely free from alcohol. The changes observed are probably due to the catalytic decomposition of the alcohol and the ethylate, in the presence of lime, with the elimination of ether and ethylene, which are absorbed by the sulphuric acid.
—W. H. P.

Determining calcium hypophosphite. Rupp and Kroll. *See* VII.

Patents.

Iodine ; Preparation or putting up of the ingredients necessary for making tincture or an aqueous solution of ——. J. Overton, Liverpool. Eng. Pat. 6562, March 15, 1911.

The dry ingredients necessary for making tincture or an aqueous solution of iodine, are mixed with boric acid or other substance capable of preventing deliquescence, and the mixture is hermetically sealed in suitable tubes in quantity sufficient for a single operation.—T. F. B.

Blood ; Process for the production of compounds from —— *or constituents of blood.* E. Scheitlin, Basle, Switzerland. Eng. Pat. 11,736, May 15, 1911. Under Int. Conv., May 14, 1910.

Compounds insoluble in water but soluble in dilute alkali after long standing, and suitable for internal use, may be obtained by the action of guaiacolsulphonic acid or other aromatic sulphonic acid on blood or a constituent of blood; *e.g.*, an aqueous solution of the sulphonic acid is added to fresh or defibrinated animal blood, with stirring, until the acid reaction on Congo Red no longer disappears; the product which separates is then washed with water and dried at a temperature below 100° C.—T. F. B.

Glycerophosphoric acid ; Manufacture of ——. A. Zimmermann, London. From Chem. Fabrik auf Actien, vorm. E. Schering, Berlin. Eng. Pat. 19,319, Aug. 29, 1911.

Glycerophosphoric acid is prepared by the action of nascent phosphoric acid on glycerin. Example: 100 kilos. of calcium phosphate (or 167 kilos. of secondary calcium phosphate) are mixed to a paste-like mass with 95 kilos. of concentrated sulphuric acid and 75 kilos. of glycerin (sp. gr. 1·25) or 68 kilos. when employing the secondary phosphate. The mixture is slowly heated in an agitating vessel to about 140° C. at a pressure of 20—40 mm. until samples show that a diminution of phosphoric acid can no longer be observed. The temperature is then allowed to fall to about 50° C., the mass is mixed with water, the calcium sulphate and excess of calcium phosphate are pressed out and the aqueous glycerophosphoric acid is treated in the known manner to produce different salts.—J. C. C.

Hydrogen peroxide and urea ; Manufacture of a stable preparation of ——. Chem. Fabr. vorm. Dr. H. Byk, Charlottenburg, Germany. Eng. Pat. 20,242, Sept. 12, 1911. Under Int. Conv., March 31, 1911.

The compound formed by adding excess of strong hydrogen peroxide to urea can be obtained in a more stable form by adding a small quantity of a substance which will unite with alkali to the solution before concentration : substances such as sodium hydrogen phosphate, sodium bitartrate, and boric acid may be used for the purpose. The compound may also be obtained in a stable condition by crystallisation from aqueous or hydrogen peroxide solutions ; thus, one mol. of urea may be dissolved in 1·5 mols. of hydrogen peroxide (30—40 per cent.) at a temperature of 50°—80° C., and the solution cooled.
—T. F. B.

Divinyl ; Process of producing ——. F. Hofmann and C. Coutelle, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,005,217, Oct. 10, 1911.

Tetramethylenediamine is completely alkylated and the quaternary ammonium base is suitably decomposed to form divinyl (erythrene). For example, if the alkylation is effected by means of methyl iodide, tetramethylene-hexamethyldiamine iodide, $I(CH_3)_3N.CH_2.CH_2.CH_2.CH_2N(CH_3)_3I$, is formed ; this is converted into the corresponding hydroxy compound, for instance by means of silver oxide : the hydroxy compound is readily decomposed, even by heating, into water, trimethylamine, and divinyl.—T. F. B.

Vanilla extract ; Method of making ——. J. K. Gowen, Newark, N.J. U.S. Pat. 1,010,043, Nov. 28, 1911.

Vanilla beans are macerated with water at a temperature not exceeding 165° F., the mixture is agitated, allowed to stand, and cooled to a temperature not below 80° F., whereupon alcohol is added and the mixture is gradually heated, agitated, cooled, and filtered under pressure.—T. F. B.

Halogen derivatives of hydrocarbons ; Process for the production of ——. J. Pfeifer and E. Szarvasy, Budapest. U.S. Pat. 1,012,149, Dec. 19, 1911.

Halogen derivatives of hydrocarbons are produced by submitting to the action of the silent electric discharge, a mixture of the hydrocarbon in the form of vapour and a halogen ; the reaction may take place in presence of a catalytic agent.—T. F. B.

Arsinic acids of the indole series ; Process for preparing ——. C. F. Boehringer und Söhne. Ger. Pat. 240,793, March 24, 1910.

By heating arsenic acid with indole or its derivatives, preferably in concentrated aqueous solution or in presence of an organic solvent, arsinic acid derivatives of indole are obtained ; the arsinic acid group appears to be united to the indole nucleus, in which it has displaced a hydrogen atom, and not to the benzene ring in the *p*-position to the nitrogen, as is the case with *p*-aminoarylarsinic acids The products possess valuable therapeutic properties. —T. F. B.

Flavouring preparation [*from tea*]. Eng. Pat. 9214. *See* XIXa.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Gelatin; Differences in reticulation of —— obtained by use of various chromates and bichromates. W. T. Wilkinson. Phot. J., 1911, **51**, 387—392.

In the collotype process the printing surface is obtained by spreading a 10 per cent. solution of gelatin mixed with a soluble bichromate over glass or metal at a rate of 5 minims per square inch, and drying at 100°—110° F. Although this film does not develop reticulation till exposed to light, the light does not influence the size and shape of the grain, which depends on the bichromate used. The bichromates also affect the physical condition of the gelatin; for example, the potassium salt hardens it, and if the drying temperature be at all high, the hardness is aggravated. The addition of ammonia gives a useful surface for printing. Resinous gum, mercury salt (as in the Sinop plate), or silver chloride reduce objectionable relief. It is recommended that the plate be prepared in three stages, being first "silicated," then coated with gelatin and finally sensitised by a five per cent. mixture of potassium and sodium bichromate, with sufficient ammonia to discharge the red colour of the solution. These plates require an exposure under the negative only one-tenth as long as those prepared in the ordinary way, and the bichromate is more easily washed out afterwards.—H. H S.

Photographic prints on copper. G. Reboul. Comptes rend., 1911, **153**, 1215—1217.

The sensitiveness to light of copper which has been submitted to the action of chlorine or bromine vapour, depends on the thickness of the halide layer: the thinner the layer, the more rapidly will it be blackened by light. When these images are kept in the dark, they disappear completely after times which vary according to the thickness of the layer of halide. This retrogression is not due to atmospheric oxidation, but to a re-halogenation of the subhalide, produced by the action of light, at the expense of the subjacent layers of halide. This explains why the thicker layers are more slowly blackened by light. The images of copper halide themselves cannot be fixed; the only means of preserving them is to convert them into silver or gold by means of silver or gold salts in presence of thiosulphate.—T. F. B.

Patent.

Colour photography on paper. E. T. Butler, Willesden. Eng. Pat. 1937, Jan. 25, 1911.

This invention relates to the production of colour photographs on paper by the combination of two "imbibed" images, produced by the pinatype process, with a blue image obtained by converting a silver image into ferric ferricyanide by the usual method, this blue image being uppermost. A P.O.P. image, fixed without toning, to produce an orange-yellow colour, may be used as a basis for the other three images.—T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Explosion of the contents of a nitrating centrifugal in the K.K. Powder Factory, near Ingolstadt. Chem.-Zeit., 1911, **35**, 1440.

During the unloading of a nitrating centrifugal and whilst some 7 kilos. of guncotton remained, the contents exploded so violently that one workman was killed, and another very seriously injured. The basket of the centrifugal was very much distorted, the spindle bent, and the whole of the earthenware drowning apparatus and pipes destroyed. The roof of the nitrating house was lifted and one of the sides bulged. It is suggested as a possible explanation of the cause of the decomposition that drops of condensed water from the cover of the centrifugal fell into the guncotton, or that pieces of wood or hardened lumps of cellulose led to local development of heat, which was not easily dissipated.—G. W. McD.

Nitrocellulose and powder; Change produced in —— by the action of heat. R. Fric. Comptes rend., 1912, **154**, 31—32.

The viscosity of acetone solutions of nitrocellulose and nitrocellulose powders was determined by noting the time required for 25 c.c. of the solution to flow through a 2 mm. capilliary tube 20 cm. long. The concentrations varied between 1 grm. in 30 c.c. and 0·8 grm. in 40 c.c. of solvent. The following comparative results are given (in seconds). Collodion cotton (69·3); after 7½ hours' heating at 80° C. (57·7). Guncotton (210); after 7½ hours' heating at 80° C. (99). French service black powder (36); after 5 hours' heating at 110° C. (21). French sporting powder (94·8); after 12 hours' heating at 110° C. (33·3).—G. W. McD.

Patents.

Nitro compounds; Art of manufacturing ——. G. E. Potts, Short Hills, N.J., Assignor to The Potts Powder Co., New York. U.S. Pat. 1,008,615, Nov. 14, 1911.

Nitro-compounds, such as nitroglycerin and nitrocellulose, are washed with water to remove as much acid as possible, then treated with a dilute solution of ferrous sulphate, chloride, or nitrate (*e.g.*, a one per cent. solution), again washed with water, and finally with a dilute (one per cent.) alkali solution. It is stated that the nitro compounds washed as above will stand the "heat-test" for much longer than when the washing with the ferrous solution is omitted.—T. F. B.

Explosive. G. M. Peters, Cincinnati, and M. F. Lindsley, Kings Mills, Ohio, Assignors to The King Powder Co. Cincinnati, Ohio. U.S. Pat. 1,011,238, Dec. 12, 1911.

Ammonium nitrate (30 parts), potassium chlorate (20), sodium nitrate (30), wood meal (10), and nitrobenzene (10 parts).—G. W. McD.

Explosive compound. G. G. King and M. F. Lindsley, Deerfield Township, Ohio. U.S. Pat. 1,012,368, Dec. 19, 1911.

Potassium nitrate (52·5 parts), charcoal (10), nitrocellulose (12·5), sulphur (7), nitrostarch (6·25), nitrosugar (6·25), nitrobenzene (4), and asphaltum (1 part). —G. W. McD.

Match composition ingredients; Process of producing ——. H. Staier, New York. U.S. Pat. 1,011,650, Dec. 12, 1911.

A substitute for yellow phosphorus is produced by heating a mixture of sulphur chloride (8 parts), amorphous phosphorus (10), and a metallic sulphide (2 parts), to 65° C., until the resulting reaction is complete. After washing and drying, the ingredient is ready for use.—G. W. McD.

XXIII.—ANALYTICAL PROCESSES.

Bromine; Detection of —— by means of fluorescein. H. Baubigny. Bull. Soc. Chim., 1912, **11**, 12—17.

Pribram (Z. physiol. chem., 1906, **49**, 457) has stated that the fluorescein test for bromine introduced by Baubigny (this J., 1898, 183) is not available for the detection of small quantities of bromine in animal tissues since the reaction is also given by chlorine and iodine. It is now stated in reply that chlorine does not give the test and that iodine should first be converted into iodate by heating with a little potassium permanganate as was made clear in the original description of the method. The use of fluorescein in the form of strips of impregnated paper, which are turned rose red by bromine owing to the formation of eosin, is upheld against the recent criticisms of Labat (Bull. Soc. Chim., 1911, **9**, 398).—E. F. A.

Arsenic and antimony; Detection, separation, and determination of ——. G. Bressanin. Boll. Chim. Farm., 1911, **50**, 691—694. Chem. Zentr., 1911, **2**, 1961—1965.

The author states that the method of Blattner and Brasseur (this J., 1904, 338) for the determination of small quantities of arsenic in hydrochloric and sulphuric acids does not give accurate results. In the case of concentrated hydrochloric acid, the loss of arsenic may amount to 2 per cent. Correct results are obtained with sulphuric acid of 45° B. even in the presence of hydrochloric acid, provided that the amount of the latter does not exceed one-third of that of the sulphuric acid. The washing of the arsenic tri-iodide with hydrochloric acid containing potassium iodide is not to be recommended, as iodine may be thereby liberated; and instead of the 5 c.c. prescribed by Blattner and Brasseur, the author uses 2·5 c.c. or less of the potassium iodide solution. For the determination of arsenic in hydrochloric acid, 1 part of the latter is mixed with 2 parts of sulphuric acid of 45° B., whilst in the case of sulphuric acid, if lead and tin be absent, the arsenic is precipitated as iodide without addition of hydrochloric acid. Commercial sulphuric acid is brought to a concentration corresponding to 45° B. and mixed with one-third of its quantity of hydrochloric acid before precipitating the arsenic; if nitrous compounds be present, these must be removed by addition of urea. For washing the precipitate, a mixture of 2 parts of sulphuric acid of 45° B. and 1 part of hydrochloric acid is used. In this modified form the method is said to give good results. Antimony tri-iodide is soluble in concentrated hydrochloric acid, and hence can be determined by this method only in sulphuric acid. For the determination of arsenic and antimony when present together, the substance is dissolved in sulphuric acid of 50° B., and in an aliquot portion of the solution, the arsenic and antimony are precipitated as iodides, and the precipitate titrated as described previously. In another aliquot portion of the solution, after addition of one-third of its quantity of hydrochloric acid, the arsenic alone is determined, and then the amount of antimony is obtained by difference.—A. S.

Salicylic acid; Permanence and delicacy of the ferric chloride reaction for ——, *and attempts to determine the free acid in aspirin and other tablets.* H. Linke. Apoth.-Zeit., 1911, **26**, 1083—1085.

When the dilution of salicylic acid in aqueous solution is greater than 1 in 50,000, the violet blue colouration produced by ferric chloride fades into a reddish violet colour in about two hours, finally turning brownish-yellow. The ferric chloride solution is prepared by diluting the *Liquor Ferri sesquichlorati* of the German Pharmacopœia with 25 volumes of water, a single drop being used in each test. With stronger solutions of salicylic acid, the colour is more or less permanent. If 25 c.c. of the solution of salicylic acid are put into a test-tube 20 mm. wide, the acid can be detected in a dilution of 1 in 900,000 by a distinct violet colouration after the addition of one drop of the dilute ferric chloride solution. The amount of free salicylic acid in tablets of aspirin or acetylsalicylic acid can be roughly determined by means of this reaction. The tablet is ground up with 25 c.c. of water, a drop of the ferric chloride solution added, the whole shaken and filtered into a test tube 20 mm. in width. The colour is then compared with that produced by solutions of salicylic acid of dilutions of from 1 : 50,000 to 1 : 200,000, tested in the same way. The amount of free salicylic acid found in several samples of aspirin tablets varied between 0·125 and 0·360 mgrm. —F. Shdn.

Determination of dust in blast-furnace gases. Johannsen. *See* IIa.

Examination of transformer oils. Breth. *See* IIa.

Determination of asphaltum in mineral oils, bitumens, etc. Schwarz. *See* IIa.

The dimethyl sulphate test for creosote oils and dips. Chapin. *See* III.

Determining calcium hypophosphite. Rupp and Kroll. *See* VII.

Separation of phosphomolybdates from silicomolybdates. Mélikoff. *See* VII.

Determining the penetration of salts in treated wood. *See* IX.

Colourimetric determination of manganese in iron and steel. Stanichitch. *See* X.

Analysis of ferro-uranium. Trautmann. *See* X.

Detection of mineral oils in fatty oils [*by means of aniline*]. Jablokoff. *See* XII.

Treatment of soil with a strong continuous electric current. König and others. *See* XVI.

Determination of sugar [*in the beet*] *by means of the alcoholic and aqueous digestion methods.* Levitcki. *See* XVII.

Testing the sulphur dioxide used for the saturation of [*beet sugar*] *syrups for sulphuric acid.* Herzfeld. *See* XVII.

Direct and inversion polarisations of juices, syrups, and molasses. Pellet. *See* XVII.

Gravimetric determination of sucrose by oxidation with chromic acid. Wechsler. *See* XVII.

Determination of fat in feeding stuffs by cold extraction. Grimme. *See* XIXa.

The red substances obtained from brucine. Buraczewski and Zbijewski. *See* XX.

Determination of nicotine in manufactured tobacco and in green tobacco leaves. Mellet. *See* XX.

Detection and determination of arsenic in organic compounds. Bressanin. *See* XX.

Volumetric determination of mercury in mercurial preparations. Cowie. *See* XX.

Patents.

Carbon dioxide or other gases; Apparatus for determining the quantity of —— *in furnace flue gases, producer gases and the like.* F. K. Woodroffe, Newton, Cheshire. Eng. Pat. 199, Jan. 4, 1911.

A charge of the gas to be tested is drawn into a hand pump through a multiple-way cock at the lower end of the pump barrel. The gas is then expelled from the pump through the cock into a bell immersed in potash and the gas which is not absorbed is drawn back into the pump. A capillary tube leading from the upper part of the pump barrel is now opened by a cock, and when the pump plunger is drawn to the end of its stroke, the reduced pressure due to a part of the gas having been absorbed is transmitted through the capillary tube to one limb of a U-tube containing liquid, and the change of level of the liquid is used for indicating the percentage of gas absorbed. In one example, a float in the open limb of the U-tube is connected with a pointer. In another example, the U-tube is replaced by a graduated tube connected with a movable pressure-equalising vessel. and the volume absorbed can be read directly. The pump has a movable stop for the plunger at the top end of the barrel, so that the plunger can be pulled right back to draw in the charge, and then a definite small quantity of the gas can be expelled into the atmosphere before the remainder is forced into the potash vessel.—A. T. L.

Coal mines; Apparatus for testing the atmosphere of ——. W. Deval, Erdington, Warwick. Eng. Pat. 2590, Feb. 1, 1911.

The sample of gas to be tested is collected, in the mine, in a gas bag. The test is carried out, at any desired temperature, in a water-jacketed cylinder. The cover, at one end of the cylinder, has two tubes, one with an inlet valve, and the other with an outlet valve, the latter being controlled by a spring. The bag containing the gas is attached to the inlet tube. The other open end of the cylinder is closed by a piston, moved by a toothed wheel working in a rachet. The piston is first brought flush with the closed end of the cylinder and on moving it back, by means of the toothed wheel, the sample of gas is drawn from the bag into the cylinder, until under atmospheric pressure. An electric spark is then passed into the gas. If it fails to explode, under these conditions, the gas is compressed, in successive tests, until the exploding point is reached. This is carried out by moving the piston forward, a graduated scale showing the extent of the compression. After the explosion, the hot gases escape under water by means of the outlet valve which is kept in position in its seating, up to a certain pressure, by the spring.—G. W. McD.

Laboratory utensil holder. A. L. Marsh, Assignor to Hoskins Manufacturing Co., Detroit, Mich. U.S. Pat. 1,012,391, Dec. 19, 1911.

The claim is for the use of an alloy of nickel (80 parts), chromium (18), and aluminium (2 parts), for the construction of an utensil holder specially adapted for metallurgical laboratory work.—G. W. McD.

Fat-extraction apparatus. H. L. Walter and C. E. Goodrich, Washington, D.C. U.S. Pat. 1,010,991, Dec. 5, 1911.

See this J., 1911, 1187.—E. W. L.

Books Received.

Handbuch der Mineralchemie. Herausgegeben von Hofrat. Prof. Dr. C. Doelter. Vier Bände. Mit vielen Abbildungen, Tabellen und Diagrammen. Bd. I. 4. Theodor Steinkopff's Verlag. Dresden. 1911. Price M. 6.50. (For Bd. I. 3, see this J., 1911, 1415.)

8vo volume, containing 160 pages of subject matter, with 15 illustrations. The subjects treated of are as follows, and by the following specialists :—I. Strontium carbonate and barium carbonate (H. Leitmeier). II. Alstonite, barytocalcite (St. Kreutz). III. Cadmium carbonate (H. Leitmeier). IV. Analytical methods for lead carbonate (M. Dittrich). V. Lead carbonate (Leitmeier). VI. Methods of manufacturing lead carbonates (O. Hönigschmid). VII. Lead chlorocarbonate (C. Doelter). VIII. Analytical methods for the carbonates of yttrium, lanthanum, cerium, and didymium (Dittrich). IX. Tengerite (Leitmeier). X. Lanthanite (Hj. Sjögren), etc. XI. Bismuth carbonates, and their analysis. (Dittrich and St. Kreutz). XII. Uranium carbonates, and their analysis. (Dittrich and Ritzel). XIII. Carbides (Hönigschmid). XIV. Silicates ; analysis (Dittrich). XV. Silicon (Doelter). XV. Synthesis of silicates (Doelter). XVI. Electrical laboratory-furnaces (Herold). XVII. Silicate fusions (Doelter).

Portland Cement. Its Composition, Raw Materials, Manufacture, Testing and Analysis. By Richard K. Meade. Second Edition. Chemical Publishing Co., Easton, Pa., U.S.A. 1911. Price $4.50. Williams and Norgate, 14, Henrietta Street, Covent Garden, London, W.C.

8vo volume, containing 501 pages of subject matter with 169 illustrations and numerous tables, followed by an alphabetical index. The subject matter is classified as follows :—I. Relation between mortar materials, and history of the development of the American Portland cement industry. II. Nature and composition of Portland cement. III. Raw materials. IV. Proportioning the raw materials. V. Quarrying, excavating, drying and mixing the raw materials. VI. Grinding them, and grinding machinery. VII. Burning. Kilns and process. VIII. Fuel and preparation of the same. IX. Cooling and grinding the clinker, storing and packing the cement, etc. X. Analysis of cement. XI. and XII. Analysis of cement mixtures and raw materials. XIII. Inspection of cement. XIV. Specific gravity. XV. Fineness. XVI. Time of setting. XVII. Tensile strength. XVIII. Soundness. XIX. Detection of adulteration in Portland cement. XX. Investigation of materials for manufacturing Portland cement.

Fertility and Fertilizer Hints. By J. Edward Halligan, Chemist in charge, Louisiana State Experiment Station. Chemical Publishing Co., Easton, Pa., U.S.A. 1911. Price $1.25. Williams and Norgate, 14, Henrietta Street, Covent Garden, London, W.C.

8vo volume, containing 143 pages of subject matter, with 12 illustrations, and an alphabetical index. The subject matter is arranged as follows :—I. Chemical elements needed by plants, and the composition of plants. II. Fertility of the soil. III. Maintaining soil fertility. IV. Farm manures. V. High-grade nitrogenous materials. VI. Low-grade nitrogenous materials and functions of nitrogen. VII. Phosphates. VIII. Superphosphates and effect of phosphoric acid. IX. Potash fertilizers. X. Miscellaneous fertilizer materials. XI. Lime, gypsum and green manures. XII. Commercial fertilizers. XIII. Valuation of fertilizers. XIV. Home mixtures.

A Brief Laboratory Guide for Qualitative Analysis By Arthur E. Hill, Ph.D. Associate Professor of Analytical Chemistry, New York University. Chemical Publishing Co., Easton, Pa., U.S.A. 1911. Price $1.00.

Small 8vo volume, containing 76 pages of matter, and an alphabetical index.

The Value of Quinine in Combating Malarial Fever. By S. S. Abrahamson. Netherlands-Indies Assoc. for the Promotion of the Interests of the Cinchona Planters. 1911. Price 3½d. each, postage incl., or £1 2s. 6d. per 100. To be retailed at not more than 6d. each.

8vo size, pamphlet form. Contains 21 pages of subject matter, a graphic interpolation table, and a map showing malarial regions.

Vorlesungen über Chemische Technologie. Von Dr. H. Wichelhaus, Professor und Director des technologischen Instituts der Universität, Berlin. Dritte umgearbeitete und vermehrte Auflage. Theodor Steinkopff's Verlag., Dresden. 1912. Price M.19. Bound, M.22.

Large 8vo volume, containing 865 pages of subject matter, with 200 illustrations, and indexes of names and subjects. The text is subdivided and classified as follows :—I. Sodium chloride. II. Sulphur and sulphur compounds. III. Hydrochloric acid and chlorine. IV. Sodium sulphate. V. Sodium carbonate (" soda "). VI. Sodium hydroxide (caustic soda). VII. Potash salts. VIII. Bromine. IX. Iodine. X. Oxygen. XI. Calcium compounds. Nitrogen and nitrogen compounds. XII. Ammonia. XIII. Nitre. XIV. Explosives. XV. Phosphorus. XVI. Aluminium. XVII. Iron. XVIII. Gold. Silicon. XIX. Glass. XX. Mortar and cement. XXI. Earthenware. XXII. Mineral colours (pigments). Carbon compounds. XXIII. Subterranean gas. Petroleum and earth wax. XXIV. Fats and oils. XXV. Carbohydrates (paper, starches, saccharose, etc.). XXVI. Alcohol. XXVII. Coal. XXVIII. Coal tar. XXIX. Essential oils and scents.

Onoranze Centenarie Internazionali ad Amedeo Avogadro. R. Accad. delle Scienze di Torino. Unione Tipografico-Editrice Torinese, Turin.

Quarto volume of 110 pages, containing an account of the celebrations of the 100th anniversary of the formulation of " Avogadro's law," held in Turin on Sept. 24th, 1911. The volume has as a frontispiece, a photograph of the statue of Avogadro erected in Turin last year.

Iron and Steel, 1910. H.C. 283. Wyman & Sons, Fetter Lane, E.C. Price 7d.

This is a Memorandum and Statistical Tables showing the production and consumption of iron ore and pig iron, and the production of steel, in the United Kingdom and the principal foreign countries in recent years, and the imports and exports of certain classes of iron and steel manufactures. See page 30.

Journal of the Society of Chemical Industry.

No. 3, Vol. XXXI. FEBRUARY 15, 1912. No. 3, Vol. XXXI.

Birmingham Section.

THE INFLUENCE OF MINERAL INGREDIENTS ON THE PROPERTIES OF RUBBER.

BY CLAYTON BEADLE AND H. P. STEVENS.

(This J., Dec. 30, 1911, pp. 1421—1425.)

Errata.

Page 1424, col. 1, line 15, *for* "Diagram II." *read* "Diagram III."

Page 1425, col. 1, lines 26 and 27, *for* "200 grms. per sq. inch" *read* "200 grms. per sq. millimetre."

Meeting held at Birmingham University on Thursday, December 14th, 1911.

MR. E. C. ROSSITER IN THE CHAIR.

NOTE ON THE PHENOL-SULPHONIC ACID METHOD OF DETERMINING NITRATES IN SEWAGE EFFLUENTS.

BY HARRY SILVESTER, B.SC., F.I.C.

In the analysis of potable waters and sewage effluents the estimation of the nitrates is one of the most important of the various determinations, and there is a wide choice as to the method that may be employed in making the analysis of the sample for this constituent. The literature on the subject is very extensive, and quite recently an elaborate study of the phenol-sulphonic acid process was contained in the "Chemical News," Sept. 22nd, 1911, and the three following weeks, and this was followed by a short note by Mr. A. E. Johnson, pointing out that the preparation of the phenol-sulphonic acid as described in his "Laboratory Companion," avoided the formation of the green tint, which was given as a frequent source of error and difficulty incidental to the process. The paper in the "Chemical News" by Messrs. Chamot and Pratt dealt with natural waters, and no particular reference was made to sewage effluents, for the analysis of which the process is frequently used. Working on potable waters and well purified effluents containing little organic matter, the method, following the directions contained in the "Laboratory Companion" gives good results, but when applied to effluents derived from sewage containing waste gas liquor and which may contain thiocyanates, etc., the results were frequently unreliable, samples which were proved to contain nitrates showing none by this test, or indicating amounts considerably below the truth. Mr. H. Crowther was the first to point out to the speaker, the probable failure of the method in the presence of thiocyanates. The reaction taking place between that constituent and the nitrates present being a well known one in industrial chemistry and constituting the basis of Raschen Brock's patent for the manufacture of cyanides from thiocyanates. In this process nitric acid reacts with a thiocyanate converting the latter into hydrocyanic acid, with the evolution of nitric oxide, and the oxidation of the sulphur to a sulphate thus :—

$$NaCNS+2HNO_3=HCN+2NO+NaHSO_4.$$

According to this equation one part of CNS per 100,000 in an effluent should prevent the detection and estimation of 0·5 part per 100,000 of nitrogen as nitrate. Under the conditions of the test the inhibiting power of the thiocyanate was not found to be so great, as the equation would suggest as is shown by the following table of results :

Parts of nitrogen as nitrate per 100,000 in the sample.	Parts of CNS per 100,000 .	Nitrogen as nitrate found by the phenol-sulphonic acid method.
1 part	23·2	No colour. Nil.
1 part	11·6	No colour. Nil.
1 part	5·8	Very faint yellow. Colour difficult to compare.
1 part	2·9	0·76 part per 100,000

A sewage effluent containing 2·06 parts per 100,000 of nitrogen as nitrate had various small additions of thiocyanate made to it, and the analysis was then made for nitrates by the phenol-sulphonic acid method in the ordinary way.

Effluent. Parts of nitrogen as nitrate per 100,000.	Parts of CNS (added) present per 100,000.	Nitrogen as nitrate found by test.
2·06	5·8	No colour. None.
2·06	2·9	1·3
Effluent from trickling filter containing 0·79	4·98	No colour. Nil.

Potable water nitrogen as nitrate per 100,000.	Parts per 100,000 of thiocyanate CNS added to the water.	Nitrogen as nitrate found by the phenol-sulphonic acid method.
0·403	1·45	0·07

I have found thiocyanates in waters oftener than was to be expected, and one frequent source of their presence in the streams in industrial districts is the drainings from gas lime tips which are found near the river banks. In wet weather the drainage from the gas lime is rich in thiocyanates.

For the determination of nitrogen as nitrate in effluents generally, including those containing thiocyanates, I have found the zinc-copper couple method to be the most uniformly reliable, and this is the process recommended by the chemists to the Royal Commission on Sewage Disposal in their Methods of Chemical Analysis, Fourth Report, Vol. IV. In using this method it is convenient to have an approximate idea of the amount of nitrate that is present in the water or effluent, and Dr. MacGowan recommends the pyrogallic acid method.

For a number of years I have used the diphenylamine test for detecting the presence of minute amounts of nitric acid in specially guaranteed pure sulphuric acid, and this test gives a ready means of ascertaining in a roughly quantitative manner the amount of nitric nitrogen in a water, sewage or sewage effluent. Taking 2 c.c. of the liquid to be tested, and adding a few drops of the diphenylamine reagent, followed by the cautious addition of a few c.c. (10 c.c.) of nitric free sulphuric acid, in the presence of nitrates a blue colour is produced, and from the depth of tint, a rough estimate of the amount can be formed. The test is a very delicate one, for when using 2 c.c. of a water containing only 0·14 parts per 100,000 of nitrogen as nitrate a pronounced blue was obtained. By taking a larger volume or concentrating a larger volume much smaller quantities of nitrates can be readily detected and approximately estimated by the diphenylamine test.

DISCUSSION.

Mr. F. R. O'SHAUGHNESSY said that his experience as to the inutility of the phenol-sulphonic acid method when applied to sewage effluents containing any but very small quantities of organic matter, coincided with that of Mr. Silvester, and he (Mr. O'Shaughnessy) had given up this method for routine purposes long ago. Even the zinc-copper couple method could not be applied indiscriminately; and if much nitrogenous organic matter were present (as in a sewage) it would yield ammonia on reduction and therefore give erroneous results. It was unusual to find oxidised nitrogen in crude sewage, but in Birmingham the conditions in that respect were quite exceptional, and it was the normal thing to find oxidised nitrogen (derived from trade sources) in Birmingham sewage. The accurate estimation of the oxidised nitrogen was a troublesome business. The method he adopted was rapid and, with care, fairly accurate. About 0·05 gram of diphenylamine dissolved in 10 c.c. of pure sulphuric acid furnished the reagent. A standard solution of potassium nitrate was prepared containing say 2 parts per 100,000 of nitric nitrogen. Portions of this solution say 0·2 c.c., 0·4 c.c., 0·6 c.c., etc., were measured into Nessler glasses, all made up to 1 c.c. with distilled water, and a convenient quantity, say, 1 c.c., of the sample was measured into another Nessler glass. Three drops of the reagent were added to all the Nessler glasses (these were shaken) and then 10 c.c. of pure sulphuric acid. A blue colour was produced, the intensity of which depended on the amount of oxidised nitrogen present, and by comparing the sample with the standards the amount of oxidised nitrogen could be estimated.

Mr. F. H. ALCOCK suggested that if the zinc-copper couple method were used for the sewage the probability would be that the sulphur present would be transformed into sulphuretted compounds. When the distillation was proceeded with he doubted if one would be able to nesslerize accurately owing to the effect the sulphuretted compounds would have upon the nessler reagent—and this often happened with bad potable water which contained such compounds. He did not therefore agree that the method would always be applicable to such waters. He would rather fall back on the method of Mr. O'Shaughnessy which had been demonstrated to him to be excellent in its results. He felt sure that after a little practice it could be made quantitative.

Mr. SILVESTER, in reply, pointed out that he seldom had to deal with nitrates in sewage. If there were nitrates in the sewage samples then it disappeared before it reached him. He thought that the zinc-copper couple method was the best process that could be used in relation to sewage effluents. With regard to the reference to thiocyanate and the evolution of the thiocyanate being nitrogen as ammonia, blank experiments showed that there was no error from that source. He had made many analyses by that method. Solutions were prepared containing a known amount of nitric nitrogen, and the results obtained were thoroughly satisfactory. In the presence of thiocyanate the method gave no trouble, but excellent results.

LIMITS OF ACCURACY IN COPPER AND BRASS ANALYSIS.

BY ERNEST A. LEWIS.

In opening a discussion on the limits of accuracy in analysis, I wish to emphasise the fact that I am referring to technical analysis and not what may be called research analysis. I only propose dealing with the subject in its relation to the copper and brass industry. All copper ores and a good many copper products, such as gun metal ingots, brass ingots, borings, and residues are now bought and sold on the assay value. The standard methods of assay in most works and mines are the electrolytic and the iodide assay. Test analyses of both which have been published, show an accuracy to the second place of decimas, but let two different chemists exchange assays of a commercial product or send portions of the same sample twice over under a different description to the same chemist, the two results may not agree within 0·2 per cent.

In technical chemistry there is a limit of accuracy which is allowable. The errors of analysis are (1) Experimental error; (2) Inherent errors in methods; (3) Errors in sampling. Experimental errors are purely personal ones, but in a works laboratory errors on the balance due to frequent weighings and unequal temperatures may cause variations of as much as 0·3 mgrm. in two weighings of a watch glass or a crucible, and to save time in a works laboratory the weight of a watch glass is often assumed to be the same. Platinum cones may vary 0·2 or 0·3 mgrm. between two weighings, all of which tends to increase the error. If one takes 0·5 grm. of copper, for instance, and electrolyses it, an error in weighing of only 0·2 mgrm. is 0·04 per cent., and copper analyses of this description are regularly reported to the third place of decimals. Of course by doubling the quantity taken the error is halved, but then comes the fact that analyses are wanted in a certain time. I mention this as an example of high-grade technical accuracy; the actual average error in works practice is more likely to be double what I have given.

The question of errors of method is too large to be adequately discussed here. I will mention the estimation of iron in tin alloys as an example of how a method may be totally wrong. It was not imagined until comparatively recently that a gun-metal analysis showing 0·2 per cent. iron by the method generally accepted as accurate might easily be 0·2 per cent. out, owing to the iron being precipitated with the tin oxide. This assay is now considerably complicated.

There are some metals which cannot be determined accurately in the commercially pure state directly: examples are tin, lead, zinc, and aluminium. They are always bought and sold on the purity after directly estimating the impurity present.

I regularly come across analyses adding up to 99·99 per cent. or 100·01 per cent., which are substantially accurate only. I recently saw several analyses of gun-metal, made from arsenical copper, scrap, and metal nuttings from washing brass ashes; they all added up to 100 per cent. within ± ·02 per cent., but no arsenic, oxygen, or sulphur was reported. The proportion of these elements present in this material would be at least 0·5 per cent.

Sampling errors can be avoided by adapting varying conditions of sampling to meet different cases. The sample representing the bulk should be in as fine a state as possible before it is sent to the analyst. The following table shows the limits of accuracy of analyses of material used in the copper and brass trade, which are the extreme errors allowable in technical work.

Metal.	Substance.	Error.	Amount taken for assay.
		per cent.	grms.
Copper ..	Electro-copper	±0·01	2·5
,, ..	Tough or B.S. copper	±0·05	1
,, ..	Pure brass alloys	±0·05	0·7
,, ..	Fine mixed borings	±0·5	10*
,, ..	Coarse ,, ,, ...	±1	10
,, ..	Copper scale	±0·25	10
,, ..	Rich residuals and ores	±0·5	10
,, ..	Poor ,, ,, ,, ...	±0·1	10
,, ..	Drillings from mixed ingots of brass alloys...........	±0·5	10
Tin	Brass (1% tin)	±0·01	5
,, ...	Gun metal (10% tin)	±0·5	1
,, ...	White metal (50% tin).....	±0·5	0·5
,, ...	White metal (80% tin).....	±1	0·5
Lead	Alloys (2% lead)	±0·05	5
,, ...	,, (30% lead)	±0·5	1
,, ...	,, (80% lead)	±1	1
Zinc	Brass	±0·05	0·7
,, ...	German silver	±0·2	0·7
,, ...	Zinc ashes and ores........	±0·5	10*
Iron	Brass and gun metal	±0·02	5
Nickel....	German silver	±0·5	0·7
,, ...	Pure nickel	±0·2	0·5†
Aluminium	10% aluminium bronze	±0·5	1
,,	Aluminium-zinc alloy	—	‡
Antimony	White metals..............	±0·5	0·5
Arsenic ..	Copper	±0·01	5
Phosphorus	Phosphor bronze...........	±0·02	5
,,	Phosphor copper...........	±0·5	1

* (aliquot part taken=0·5 grm.)
† 10 grms. (aliquot part taken).
‡ Always determined by difference.

I do not suggest that inaccurate, slovenly work should be encouraged, but it is utterly useless and misleading to report analyses past the second place of decimals, when the methods used are not accurate past the first place. If an analysis of a gun-metal, brass, or white metal can be relied upon to the first place of decimals it is quite sufficient for all practical purposes.

Technical methods of analysis must be reliable within the limits of accuracy required for various trade purposes, and this limit must be known to those who have to make use of the analysis.

Discussion.

The **Chairman** said in determining chlorine by the ordinary method, using standard silver nitrate and chromate as indicator, one must get within 0·1 c.c. of the correct titration to be within 0·5 per cent. of the correct result if a reasonable quantity of salt was used, *i.e.*, a quantity taking, say, 20 c.c. of silver. That meant that the end point of the titration should be determined to one drop of silver. The method of titrating salt solutions with silver nitrate by shaking in a bottle, using the formation of a turbidity of silver chloride as an indication of the end point and finishing the titration with 100th normal silver solution, gave results as accurate as the previous method. Yet the results by the two methods often differed by 0·5 per cent. Those differences when obtained were due to differences in the concentration of the solutions employed. It was therefore important, in order to obtain concordant results, to make the determinations at the correct concentration.

Dr. T. S. **Price** said that the accuracy obtained by the combined use of *N*/10 and *N*/100 solutions was often illusory; it all depended on the accuracy with which the volume of *N*/10 solution used was measured. The usual method was to run in a given volume from a burette, generally without allowing for adequate draining; the result was bound to be inaccurate, since any small error in the volume of *N*/10 solution used would completely vitiate the increased accuracy obtained in the final titration with the *N*/100 solution. The only accurate method for measuring the volume of *N*/10 solution used was to use a carefully calibrated pipette for delivering it.

With respect to the use of the term "accurate to within 0·01 per cent.," he wished to emphasise that it was very misleading. What was meant by Mr. Lewis was that the analytical results were within 0·01 of each other. If the amount, for example, of arsenic present were 0·50, this would mean only an accuracy of 2 per cent. It would be much better to use the phrase "accurate to so many parts per 1000," as suggested by Dr. Davidson.

Mr. Alex. **Tucker** said the author had not alluded to the personal experience of analysts in technical work, which they were sometimes called upon to do. For example, he had had results, relating to metals, questioned by a medical man in Honolulu, and also by men, very competent in food analyses, undertaking the assays of metalliferous materials with surprising results. Such a position was more likely than anything else to bring discredit upon analysts in the eyes of those who were not alive to the great importance of men dealing with their own particular subjects and being familiar with works practices.

Dr. W. B. **Davidson** urged that it was a mistake to suppose that the methods of the University were the most accurate in all cases. To his personal knowledge University methods were most inaccurate, simply because the best apparatus was not used. They did not know the really technical method of analysis. It was important that weights and volumetric measures should be standardised. It was unsafe to accept the pipette as being accurate. For sales and accurate work he standardised the pipette in the department with which he was concerned, and guaranteed accuracy to, say, 1 in 400 or 1 in 500. He thought the term "percentage" was ambiguous. In many tests he got an accuracy by the same method of about 1 in 500—which was beyond reproach. Some public analysts made a great mistake when they gave the figures to the second and third decimal place.

Mr. **Silvester** also commented on the tendency of some analysts to return figures to the third or fourth decimal place. He analysed a sample of zinc and returned the iron to the third place of decimals and sent the certificate, but it was returned, the client pointing out that he was in the habit of having the analysis to the fifth decimal place. He thought the other differences largely arose through the analysts working on different processes. In analysing manganese ores Pattinson's method gave results which agreed closely, not infrequently to 0·1 per cent.; but by the acetate method the figure might easily be 1 to 1½ per cent. higher unless a number of precautions were taken. The sample was often more to blame for differences than the analyst. Common sense must be exercised with a knowledge of technical matters as to the difference that was permissible.

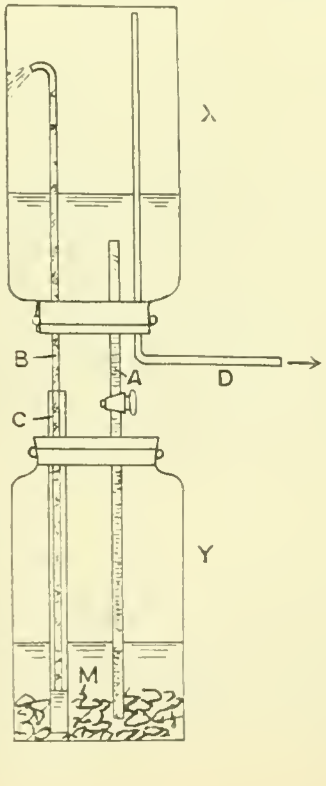
Dr. **Price** pointed out that before one could trust the accuracy of analytical operations it was very necessary that all weights and volumetric apparatus used should be carefully calibrated. Chemists were only too often inclined to take for granted the accuracy of their instruments. With respect to weighing, many of the differences of the order of a fraction of a milligram, referred to by Mr. Lewis, could be accounted for by variation in the amount of adsorbed moisture on the apparatus weighed.

Mr. **Lewis**, in reply, said the inaccurate analyses to which he had referred were made by men who were daily doing the same kind of work; they were men who called themselves experts. His attention was recently drawn to a sample of zinc-ashes. One man who was doing such analyses daily made the zinc assay 72 per cent.; while the public analyst, who did hundreds of such analyses, made it 76 per cent. The samples were identical, and each maintained that his result was accurate. A third analyst arrived at a figure of 74 per cent. In his opinion everything seemed to emphasise the necessity for the adoption of standard methods of analysis which would guarantee that on the same class of work one method would be employed.

DESCRIPTION OF EXTRACTION APPARATUS.

BY LEONARD P. WILSON, A.C.G.I.

The apparatus to be described is one which has been found useful for extraction and solvent purposes with non-volatile liquids; it is particularly applicable to laboratories in which want of power makes it impossible to perform



these operations in a shaking apparatus, or to experiments in which it is desirable to carry out the extraction at a constant or high temperature.

The effect of the solvent is promoted by constant circulation through or over the material upon which it is acting, and this circulation is produced by connecting the apparatus to a vacuum pump.

The apparatus consists of two vessels of any suitable material, wide mouthed glass bottles are useful for most purposes, one, X, being placed in an inverted position above the other, Y, and connected to it by two tubes, A and B, which pass through the stoppers or corks with which both vessels are fitted. One of these tubes, A, passes from the bottom of the lower vessel into the lower portion of the upper one, and is fitted with a stopcock between the two; the other tube, B, passes into the lower vessel through a third and wider tube, C, which reaches to the bottom of the bottle, Y, and whose upper end is left open to the air, the tube, B, reaches into the bottle, X, to the extent of two thirds of its height; a fourth tube, D, completes the apparatus, it passes into the upper part of the bottle, X, from any convenient position.

In order to use the apparatus the solid material to be extracted, M, is put into the bottle, Y, with about half of the liquid to be used, the other half of which is poured into the other bottle, X, which is then stoppered and fitted with its proper tubes, the stopcock is turned off, the bottle inverted and connected with the bottle, Y: the stopcock is then opened, D connected with the vacuum and circulation of the liquid commences. Air is sucked in at the upper end of the tube, C, and together with some of the liquid rises through B into the upper vessel whence the air is withdrawn, and the liquid passes through the tube, A, again into the vessel, Y. The temperature of the extraction may of course be regulated by immersing the lower vessel in a water or other bath.

London Section.

Meeting held at Burlington House, on Monday, December 4th, 1911.

MR. E. GRANT HOOPER IN THE CHAIR.

THE COMPOSITION OF BASSIA FATS.

BY RUSSELL G. PELLY, F.I.C.

Among the oil seeds which have been investigated recently in the Scientific and Technical Department of the Imperial Institute are the seeds of three species of *Bassia* viz.: *B. butyracea*, *B. latifolia* and *B. longifolia*, which are largely employed by natives in India for the preparation of fat for food and other purposes. As it was found that samples of native-prepared fat were liable to be adulterated the specimens of fat used in the investigation were prepared in the laboratory by extraction with light petroleum, from material forwarded to the Imperial Institute by J. H. Burkill, Esq., M.A., Officiating Reporter on Economic Products to the Government of India, and therefore of well-authenticated origin.

The kernels of the three species examined were found to contain the amounts of fat recorded in the following table:—

	Fat in Kernels. Per cent.
Bassia butyracea	61·2—66·9
Bassia longifolia	55·3—57·8
Bassia latifolia	33·0—46·0

The kernels of *Bassia butyracea* appear to be always richer in fat than those of either *B. longifolia* or *B. latifolia*, whilst the kernels of *B. latifolia* give the lowest yield (*cf.* Kesava-Menon, this Journal. 1910, **29**, 1429); it should, however, be mentioned that the very low yield, viz., 33 per cent., obtained for one sample is probably abnormal owing to the fact that some of the seeds were immature.

The specimens of fat used in the investigation furnished on examination figures which agreed with those recorded by previous investigators, with the exception of the saponification values, which are somewhat higher than usual:—

	Bassia butyracea.	*Bassia longifolia.*	*Bassia latifolia.*
Saponification value ..	200·0	195·3	195·3

It is evident that the fats of *B. longifolia* and *B. latifolia* are of similar character but that they differ widely from the fat of *B. butyracea*. Confirmation of this is afforded by the results of the investigation of the the fatty acids, which, stated briefly, are as follows: The fats of *Bassia longifolia* and *B. latifolia* consist of glycerides of stearic, palmitic and oleic acids, and in the case of *B. longifolia* of linoleic acid, whilst the fat of *B. butyracea* contains glycerides of palmitic and oleic acids only. The fat of *B. butyracea* is of firmer consistency and this fact, together with the superior yield of fat obtainable from the seeds should render the seeds of this species of greater value than those of *B. latifolia* and *longifolia* if it is found that supplies can be obtained for the European market.

Bassia butyracea.

The unsaturated acids, separated from the saturated acids by taking advantage of the greater solubility of the lead salts of the unsaturated acids in ether, had an iodine value of 92·8 per cent., and on oxidation by alkaline permanganate yielded only dihydroxy-stearic acid, m.p. 130°—131° C.

No linolenic hexabromide or linolic tetrabromide could be obtained on bromination of the acids at low temperature in the usual manner, although it was probable that a minute quantity of some less saturated acid than oleic acid was present as was indicated by the iodine value 92·8 per cent., which is somewhat higher than that of pure oleic acid, viz.: 90·1 per cent. Evidently the unsaturated acids consist almost entirely of oleic acid.

The saturated acids were found to have m.p. 62° C.*, neutralisation value 217, and iodine value 3·2 per cent., the latter figure being recorded in this case and also for the saturated acids of *B. longifolia* and *B. latifolia* merely for the purpose of indicating that the separation of the saturated acids from unsaturated acids had been incomplete and that therefore the figures for the melting point and neutralisation value approximate only to those of the pure acids.

From the melting point and neutralisation value recorded above it is obvious that the saturated acids consist of palmitic acid in an almost pure state. On fractional crystallisation from alcohol or by fractional precipitation of the magnesium salts, only palmitic acid, m.p. 62°—63° C., methyl ester, m.p. 29° C. could be obtained. From the above results and calculating from the iodine value of the fat, viz.: 39·6 per cent. it is obvious that the fat of *B. butyracea* (neglecting unsaponifiable matter) consists approximately of olein 46 per cent., and palmitin 54 per cent.

Bassia longifolia.

The unsaturated acids had an iodine value of 103 per cent. and on oxidation with alkaline permanganate yielded principally dihydroxy-stearic acid (m.p. 130°—131° C.) together with a small quantity of sativic acid, insoluble in ether, soluble in hot, but insoluble in cold water, m.p. 156° C. (*cf.* Fahrion, Zeit. f. angew, Chem. 1904, 1483; Krzizan, Chem. Rev., 1908, 8; 1909, 3.).

On bromination of the unsaturated acids in ether solution at low temperature a small quantity of a bromo-compound† insoluble in ether was obtained. This was insoluble in alcohol or benzene and did not melt below 200° C., and therefore cannot be linolenic hexabromide; the amount of substance obtained was too small for identification. Linolic tetrabromide (m.p. 114°—115° C.) was also isolated.

The unsaturated acid must therefore consist of oleic and linolic acids in the proportion of about six parts of the former to one part of the latter, calculated from the iodine value of the unsaturated acids, 103 per cent.

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* Open tube method, all other m.p. determinations by capillary tube method.

† Traces of a similar compound were also obtained from the fats of *B. butyracea* and *B. latifolia*.

The saturated acids had a neutralisation value of 200·3 and an iodine value of 12·3 per cent. On recrystallisation from alcohol a few times stearic acid was obtained in a fairly pure state (m.p. 69° C.), whilst from the neutralisation value of the saturated acids it would appear to be the predominant constituent of the saturated acids. By fractional precipitation of the magnesium salts and recrystallisation of the regenerated acids from alcohol, stearic acid, m.p. 70° C., methyl ester m.p. 37·5° C. was obtained. Palmitic acid was obtained from the intermediate fractions in an impure state (m.p. 57·5° C., methyl ester m.p. 27°—28° C.). The last fractions consisted of saturated acids contaminated with unsaturated acids; no saturated acids other than stearic and palmitic acids were obtained.

The acids present in the fat of *Bassia longifolia* are therefore linolic, oleic, stearic and palmitic acids, together with traces of volatile acids, and the approximate composition of the fat appears to be as follows:—Olein and linolin, together, 60 per cent. Stearin and palmitin, together, 40 per cent.

Bassia latifolia.

The unsaturated acids yielded only dihydroxy-stearic acid, m.p. 130° C. on oxidation; no sativic acid was obtained. On bromination no linolic tetrabromide could be separated and consequently the unsaturated acids appear to consist wholly of oleic acid; however, neither of these methods appears to be capable of detecting small quantities of linolic acid, and as only a small quantity of *Bassia latifolia* fat was available for examination it will be necessary to obtain a further quantity of material, and to repeat these experiments on a larger scale before definitely asserting the absence of linolic acid. This point is of some interest as the absence of linolic acid from the fat of *Bassia latifolia* would serve to differentiate it from that of *Bassia longifolia*, which otherwise it resembles.

The saturated acids had m.p. 53° C., neutralisation value 205, iodine value 12·7 per cent., and on re-crystallisation from alcohol yielded nearly half their weight of stearic acid in a fairly pure state (m.p. 67°—68° C., methyl ester m.p. 37°—38° C.). On fractional precipitation of the magnesium salts a small quantity of palmitic acid was obtained, m.p. 61° C. methyl ester m.p. 29°—30° C. No other saturated acids were detected. These results are at variance with those of Valenta (Anal. der Fette u. Wachsarten, Benedikt. u. Ulzer., 1908, p. 853) who states that the chief constituent of the solid acids of *B. latifolia* is palmitic acid; very likely the fat with which Valenta worked was not that of *B. latifolia* but *B. butyracea*, the solid acid of which consists entirely of palmitic acid. The fat of *B. latifolia* appears to consist approximately of olein 66 per cent., stearin and palmitin 34 per cent.

Discussion.

The Chairman asked Mr. Pelly if the refractive index in each case had been determined. In the two previous papers dealing with these fats the refractions had been given, and it would be useful to be able to compare the refractions of the several fats.

Mr. Kesava Menon asked whether Mr. Pelly could describe the different species of seeds he had examined, as of late there had been a great deal of confusion with regard to them, one seed being mistaken for the other. For instance, the seeds of *Bassia butyracea* were very much smaller and had more husks than the other varieties. The *Bassia latifolia* was the largest seed of all. The average weight of the seed was about 2 grms., whereas that of *butyracea* was about 1 grm., and that of *longifolia* was about 1·5 grms. He agreed with Mr. Pelly as to the amount of fat each seed gave; *butyracea*, according to his statement, yielded about 67 per cent. He (the speaker) had found about 65 per cent., and he should think that was about the average. He was surprised in looking at the tables of the various characteristics, to notice the high saponification values for the different fats. The saponification value of *Bassia butyracea* was more than 200, which was distinctly higher than the values recorded hitherto, viz., 190—195, and 195 for *Bassia longifolia* and *Bassia latifolia*, but previous workers have shown that the saponification value for the latter fat did not exceed 190. He thought 195 was a little too much. Then the determination of the amount of unsaponifiable matter was a very important factor in the analysis of these fats, because the *Bassia* fats contained as high as 2—2·5 per cent. of unsaponifiable matter which had a high iodine absorption. As a consequence the fats had a higher iodine value than the fatty acids freed from the unsaponifiable matter. What percentage of liquid acids, and of saturated acids, had the author found in the different fats? He had determined the liquid and solid acids in these fats, and had found the amount of unsaturated acid in *latifolia* was 59 per cent. and in *longifolia* about 20 per cent., the iodine numbers being 87 for *latifolia* and 81 for *longifolia*. The iodine value of 105 for the liquid acids was enormously high. He thought with good separation the iodine number might come up to 90. He also asked what was the melting point of liquid and solid acids, and also whether Mr. Pelly had found any stearic acid in the *longifolia* and *latifolia*. He (the speaker) had great reason to believe that these different fats did not contain any liquid acid more unsaturated than oleic acid.

Dr. S. Rideal said it seemed rather bold to generalise from a few samples. First of all, were they all the same species? and secondly, if they were, a different climate might account for variations in the chemical properties of the oil in the seeds of the same variety which might be greater than the difference in the kind and amount of oil found in the different species. At the present time there was a discussion as to whether rubber seeds gave drying or non-drying oil. It seemed that in some places they got a drying oil and in others a non-drying oil from the same species of *Hevea Braziliensis*; this difference could only be accounted for by climatic influences and changes brought about during the ripening of the seeds.

Mr. Pelly, in reply, said he had not determined the refractive indices. The unsaponifiable matter in the fats had been estimated in almost every case; it was not enough to make any appreciable difference in the analytical figures. He thought that botanical descriptions of the seeds need scarcely be given here, as they had been so often described before. The samples examined were collected by Forest Officers and their botanical origin might therefore be taken as correct. He had not actually recorded the amount of liquid acids and solid acids. They were estimated, although the separation was always incomplete. The solid acids from one sample had the iodine value of 12·3 per cent. That corresponded to about 14 per cent. of oleic acid. He had had a good deal of trouble in separating their lead salts. When the lead salts were precipitated from a boiling solution in the usual manner they came out hard, almost in the form of a resinous cake, and were extremely difficult to extract with ether. He had found it more convenient to precipitate the lead salts in the cold and to collect on a Buchner funnel, drying them *in vacuo*, and then extracting in a Soxhlet apparatus. He presumed Mr. Menon had estimated the stearic acid in the fats by Hehner and Mitchell's method, in which one treated a known amount of fatty acids with a solution of stearic acid in alcohol saturated at a certain temperature. Unless one was absolutely sure that stearic acid was there and had got it out of the fat, he thought that was an extremely risky method. Of course it did give an idea of the amount of stearic acid, and as far as he remembered from his calculations the amount of stearic acid approximated to that which Mr. Menon had mentioned in his paper. He said he had not the actual number of samples examined, but a number of samples of each species was examined and the figures given were quite average. They all fell within narrow limits, and he thought it might safely be assumed that these figures represented respectively the true analytical data of the pure fats of these three species of *Bassia*. He believed the different figures which previous observers had got were due to the fact that the natives did not take trouble in collecting to keep the different species separate, and also because many of the previous analyses referred to native prepared fat. Samples of native prepared fat had been examined in comparison with the present samples and they had entirely differed from fat obtained from the seeds in this country.

THE RAPID ESTIMATION OF CARBON MONOXIDE.

BY L. A. LEVY.

(This J., Dec. 30, 1911, pp. 1437—1440)

ERRATUM.

The block on page 1438 has been printed upside down.

Meeting held at Burlington House on Monday, January 8th, 1912.

MR. E. GRANT HOOPER IN THE CHAIR.

A RAPID VOLUMETRIC METHOD FOR THE ESTIMATION OF FREE SULPHUR.

BY C. DAVIS AND J. L. FOUCAR.

The following method was devised for the rapid estimation of free sulphur in material containing both free sulphur and substances other than sulphur soluble in carbon bisulphide or other solvents, such as are commonly used in the extraction test. The material which we particularly had in view is the spent oxide of gas works, which not infrequently contains a varying amount of such substances. The most usual method of estimation hitherto employed in such cases has been to completely oxidize the residue on evaporation of an aliquot portion of the extract to determine the resulting sulphuric acid as barium sulphate, and thence to calculate the total free sulphur present. This method takes a considerable time, although it is capable of giving accurate results, except in so far as sulphur containing substances other than sulphur may be extracted. The method proposed in lieu of this is the quantitative conversion of the sulphur into sodium thiocyanate by digestion with an alcoholic solution of sodium cyanide. The thiocyanate is titrated in the usual way. The actual procedure is as follows :—1 gram of the finely ground (60 mesh) sample (or its equivalent if previously dried) is dried in the water-bath for an hour (if not already dried) and then transferred to a 250 c.c. flask ; 1·5 grms. of sodium cyanide and 50 c.c. of absolute alcohol are added, and the contents are boiled under reflux for 2 hours. The alcohol is then completely removed by distillation, 100 c.c. of hot water added, and the solution washed into a 250 c.c. flask. The volume is made up to the mark—in the cold. To 25 c.c. of this solution 75 c.c. of water and 5 c.c. of saturated iron alum solution are added ; this is heated with constant stirring to 95° C., filtered into a 750 c.c. beaker, and washed free from thiocyanate. When cool, 5 c.c. of nitric acid are added, the solution made up, if necessary, to about 500 c.c. with water, and titrated with $N/20$ silver nitrate solution until the red colour of the ferric thiocyanate completely disappears, or an excess of silver nitrate may be added and the solution titrated back with $N/20$ thiocyanate. Should the sample contain thiocyanate, as is most likely in the case of spent oxide, a blank test should be conducted, the thiocyanate being extracted with water.

Should it be required to ascertain the amount of matter, other than sulphur, soluble in carbon bisulphide, it may clearly be determined by subtracting the sulphur-content, found as above, from the figure obtained in the usual way for the percentage soluble in carbon bisulphide.

The method is convenient, rapid, economical, and, within the limits of our experience, as exact as required, as is indicated by the following tests :—

Spent oxides.

By oxidation	73·12	74·37
By titration	72·74	74·08

	Flowers of sulphur.		*Sulphur crystals.*	
By oxidation	98·38		97·15	
(corrected for oxyacids of sulphur) .	98·23		97·15	
By titration	98·27 98·36	98·31	97·32 97·24	97·28

We desire to thank Colonel Wilton for permission to publish the details of the method, which we hope may prove to be of some use.

DISCUSSION.

Dr. H. G. COLMAN said that a method such as that described by the authors was very desirable for substances liable to contain tarry matter, such as gas-works spent oxide. At the same time, the tendency on the whole was for such spent oxide to be sent out less contaminated with tar than formerly.

Mr. FOUCAR, in reply to a question, said they had tested the alcohol extract, and they had not found oxyacids of sulphur present. It was necessary to use absolute alcohol, otherwise a certain amount of hydrolysis took place, and sulphides, sulphates, and other compounds were formed.

THE RELATIVE ADSORPTION OF DYES BY SAND AND NATURAL FIBRES.

BY W. P. DREAPER, F.I.C., AND W. A. DAVIS, B.SC.

We have before shown that the behaviour of a solution of Night Blue passing through a sand column is abnormal. (Internat. Cong. Appl. Chem., 1909, Sect. IVB., 7 ; see this J., 1909, 700), at which time we announced our intention of comparing the results then given with those obtained with different fibres. The abnormal effect produced with this dye on silk has already been noticed (Dreaper and Wilson, this J., 1909, 57).

Influence of the solvent used for Night Blue.—Experiments made with varying proportions of alcohol and water have given in a sand column the following results. It will be seen that as the ratio of the alcohol increases, the dyestuff retained by de-solution in the sand column diminishes, until at a certain concentration of alcohol, adsorption ceases.

Night Blue in sand column.

Weight of sand, 2 grms. ; Night Blue solution 0·1 grm. to one litre in all cases. Temperature, 15°—17°.

Water. per cent.	Alcohol. per cent.	c.c. passing colourless.
100	—	2·4
95	5	2·0
90	10	1·9
85	15	1·5
80	20	1·0
75	25	0·9
70	30	0·5
65	35	0·1
62	38	0·0

Experiment has shown that it is possible to substitute cotton or silk for sand in the de-solution column if care be taken to have the substances present in such a state that channels are not formed for the uneven flow of dye solution. This can be effected by cutting up the fibre into short pieces from 1—3 mm. long, and carefully packing them in the glass tube. Under these conditions cotton wool gave the following results :—

Night Blue and cotton.

Weight of cotton, 0·5 grm. Temperature, 15°—17°.

Ratio : alcohol to water.	c.c. of solution passing colourless through column.
0/100	25·1
5/95	21·5
10/90	18·2
15/85	15·0
20/80	13·2
25/75	10·0
30/70	5·6
40/60	0·3
45/55	0·0

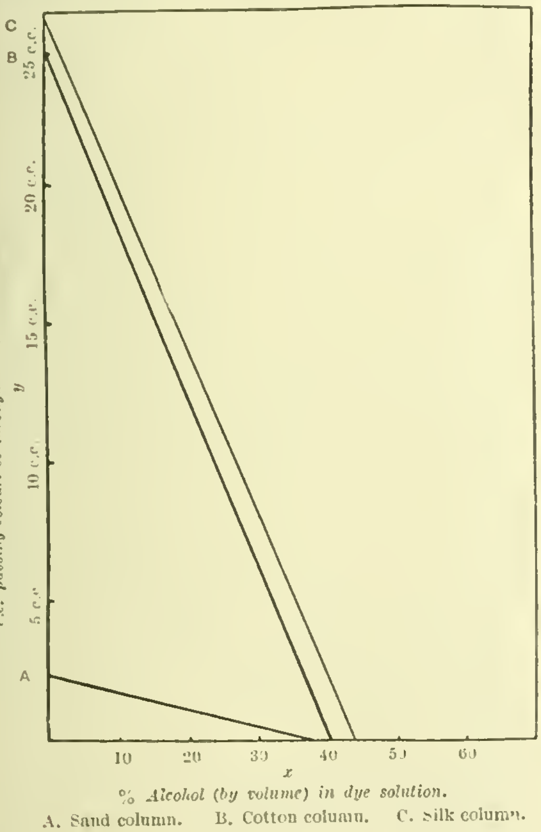
The following results were obtained with silk (fibroin) :—

Night Blue and silk.

Weight of silk, 0·5 grm. Temperature, 15—17°.

Ratio : alcohol to water.	c.c of solution passing colourless through column.
0/100	26·0
10/90	20·0
15/85	17·5
20/80	15·0
25/75	10·0
30/70	7·0
40/60	2·0
45/55	0·2

The results obtained may be expressed in simple arithmetical terms. The curves, A, B, and C (see Fig. 1.) obtained by plotting the percentage of alcohol in the dye solution (x) as abscissæ and the number of c.c. passing colourless through the column (y) as ordinate are straight lines. From these results we calculate for 100 grms. of the adsorbing material the following results :—



A. Sand column. B. Cotton column. C. Silk column.

For sand .... $y=120-0{\cdot}315x$ .... (1)
For cotton .... $y=5020-110x$ .... (2)
For silk .... $y=5210-110x$ .... (3)

If, when no alcohol is present the weight of dye adsorbed by sand be taken as 1, then the weight adsorbed by cotton will be 41·83 and by silk 43·40.

It is remarkable that under the conditions of adsorption in the column, cotton and silk give such similar factors with a dye which is not generally considered to be a "direct dye" for cotton in the absence of a mordant.

The fact that the curves practically meet at a common point shows that the action of alcohol of a strength of 40—45 per cent. is equal in all cases. This suggests that the solution state of the dye is an important factor.

The action is also a reversible one. That is to say, if de-solution takes place for an aqueous solution the proportion of alcohol which will prevent de-solution will also remove the dye from the silk, cotton, or sand.

In attempting to make a comparison between the action of the sand column and that of actual dyeing of the fibre under ordinary conditions, the estimation of the amount of dye fixed by the fibre is very difficult owing to the alteration of depth of shade in alcohol solutions and also of the shade obtained on the fibre itself in the case of silk. The difficulty is overcome in the column experiments as the actual depth of colour in the solution which passes is not material. It is a question of a colourless solution or a coloured one. The actual figures are given below when dyeing takes place under ordinary conditions. In the case of silk these indicate that in aqueous solutions the actual depth of shade produced on the fibre is not equivalent to the de-solution effect.

Night Blue and silk (ordinary dyeing action).

Time, 4 hours. Temperature, 15—17°. Ratio, silk to dye, 250/1. Ratio, silk to solution, 1/200.

Water.	Alcohol.	Dye left in solution by colour test.
per cent.	per cent.	per cent.
100	—	7
95	5	5
70	30	2
60	40	6
52	48	15
24	76	40

Thus the actual percentage of the dye on the fibre under these dyeing conditions cannot be accurately estimated by the depth of shade of either the dye solution, or the fibre. Actual titration of the dye, with picric acid or Naphthol Yellow S., is necessary. The effect of the presence of alcohol in the dye solutions as estimated by the change in shade or colour of the solution after removal of the fibre or of the fibre itself seems to indicate first an *increase* in the adsorption of dye ; then in the presence of a greater proportion of alcohol, the action is reversed and at a certain concentration (as in the case of the sand column) no de-solution or adsorption within the fibre occurs. The action of the silk and sand in the de-solution column are generally identical, but the actual reduction of the amount of dye adsorbed on increasing the strength of alcohol under ordinary dyeing conditions when estimated by the depth of shade on the fibre and in the solution is preceded by an opposite effect in neutral solution. This latter is probably due to a suppression of colour in alcohol solution rather than to actual adsorption differences.

In the case of cotton similar results are obtained and the actual de-solution of this dyestuff by cotton is beyond question. For example, if 1 grm. of cotton be left in 100 c.c. of 0·1 grm. to litre solution of Night Blue for 24 hours it will entirely absorb the dye. It is remarkable that cotton and silk are nearly identical in behaviour in the column experiments, whereas under actual dyeing conditions Night Blue is more readily taken up by silk than by cotton.

Nature of precipitated dyestuff.—In the case of cotton the dye is seemingly present as a basic salt for the following reasons. (1.) The dye adsorbed by cotton is entirely insoluble in boiling water. (2) It is a deep blue colour. (3) The solution passing through the sand or cotton column is acid to litmus paper. (4) When removed from the sand area with alcohol and evaporated to dryness it is insoluble in water at 100° or 15°. Night Blue is stated by Knecht to be a hydrochloride of tetramethyltolyltriaminodiphenylnaphthylcarbinol.

In the case of silk the dye substance may be present as the base itself, when dyeing takes place out of a neutral aqueous solution for the dyed fibre is of very light blue shade, instead of being a dark one, as is the case when dyed in 0·5 per cent. solution of acetic acid or from a solution containing 20—50 per cent. alcohol, which latter substance inhibits the normal action with the silk fibre and brings it more into line with the action of cotton.

Sand coated with paraffin wax.—The action of the sand column when the sand particles are coated with paraffin wax is of interest. The amount of wax present is so small that the surface may be taken as unaltered in area. The ordinary solution of Night Blue runs through the waxed sand column without de-solution occurring, the sand not being wetted. When, however, sodium chloride (5 grms. per litre) is present in the dye solution, de-solution takes place.

The influence of temperature and reagents such as acids in the place of alcohol are under consideration.

Discussion.

The **Chairman** asked the authors whether they were quite justified in using the term "adsorption" for all three of these results? In the case of the sand he thought they might admit that the action was one of adsorption; but in the case of the cotton and silk surely there was absorption, or in other words actual dyeing. He asked, was it not the fact that if the sand used in the particular experiment had been thoroughly well washed, most of the dyestuff which had been retained would have been removed, whilst the authors had mentioned in the paper that in the case of cotton and silk, the dye was not removed by boiling water.

Mr. F. **Evershed** asked what was the amount of dyestuff fixed by the fibre and by the sand respectively, stated as a percentage of the material. The authors' method of stating their results did not indicate this. He also asked whether the degree of fineness of the sand made a difference, and whether precipitated silica had been tried. Some years ago he had found that air-dried precipitated silica absorbed much more colour than if it were dried at a higher temperature. This, and similar observations with other materials, and the fact that air-dried wool and cotton and starch contain considerable quantities of water, suggested that the process of dyeing might in some degree depend on the state of hydration of the material.

Mr. C. **Beadle** said that the degree of hydration of cotton depended upon the percentage of alcohol in solution. It was possible to dehydrate cotton much beyond its atmospheric moisture by immersing it in strong alcohol and practically to dehydrate it altogether in absolute alcohol. Of course the hydration of cotton determined to a very large extent its power of absorbing dyeing matters.

Dr. J. C. **Philip** said that Mr. Dreaper had mentioned that the clear liquid obtained from the column of cotton fibre was acid to litmus. Was that the case also with the columns of sand and silk?

Mr. E. **Hatschek** did not see how there could be absorption without first having adsorption, which was an increased surface concentration. Also there was the point that with a certain strength of alcohol there was no absorption, and that seemed to him to prove that whatever might happen later, the phenomenon began as an adsorption phenomenon. He thought Mr. Dreaper had been extremely guarded in not giving any theory or suggestion in explanation of the phenomenon. He thought the whole experiment was one of the finest instances of almost purely electrical adsorption; and in that connection asked whether the surface tension of the solution had been determined. He (the speaker) had done it some time ago, and he found the decrease in surface tension was almost inappreciable. That of course removed the ordinary explanation of adsorption according to the Willard Gibbs theory. But there was a very considerable amount of work in a paper by Gee and Harrison, "On the electrical theory of dyeing," in which it appeared that Night Blue was one of the few positively charged colloidal substances. The majority of substances, *e.g.*, quartz, were negatively charged in contact with water. The most reasonable explanation was that this was a case of electrical adsorption; that was to say the positively charged Night Blue particles were adsorbed by the negatively charged sand particles. If the latter let a drop of clear water through immediately after a drop of concentrated Night Blue solution, it seemed to show very clearly that there was some saturation reached, and that very much more suddenly than with the ordinary surface tension adsorption. He thought Mr. Dreaper would also agree that it was purely a function of the surface. The same volume of finer sand had a larger surface, and consequently a larger charge, because the potential difference at the surface was the same whatever it was. (It was 0·03 volt according to Harrison's experiments.) With twice the surface there was twice the charge on it, and twice the amount of Night Blue was required to discharge it.

Another point mentioned by Mr. Dreaper was that the water which ran off was acid, while a basic dye went on the sand or fibre. That also agreed with what was known about the adsorption of dissociated substances, a subject on which some work had been done, but which called for much more. There were, for instance, the classical investigations of Van Bemmelen on the adsorption of potassium sulphate by his red colloidal manganese dioxide. There was always more potassium ion adsorbed than the corresponding SO_4 ion, *i.e.*, the solution after adsorption was acid. There were two obvious explanations why the adsorption ceased with alcohol of a certain concentration. One was, that the Night Blue at that concentration might be in true solution. The other was, that the charge of the sand particles against the liquid might become nil at that concentration of alcohol. The charge of those particles was found empirically—at present there was no mathematical theory of that law—to be dependent on the dielectric constant of the liquid; water, with its abnormally high constant of 80, gave a larger charge than other solvents. There were only a few liquids, such as formamide, first used by Walden, and sulphuric acid, which had a higher dielectric strength; that of the organic solvents, such as alcohol, was in the neighbourhood of 30. With the concentration of alcohol used, it was therefore possible that the charge on the sand and on the Night Blue might be considerably less than in water. Either of those explanations would account satisfactorily for the cessation of the adsorption. It appeared that silk and cotton took up about ten times more dye than sand. It was difficult to get any comparison of the surfaces; there might be adsorption and a certain amount of absorption running concurrently with it, especially if one looked on cotton and silk as having gel structure, as one was justified in doing. The point, that with all three the process stopped at the the same alcohol concentration, proved that it was purely a surface phenomenon.

Mr. W. C. **Hancock** said that the question of the adsorption of dyestuffs had been used in connection with determining the amount of colloid matter present in clays. In that case the comparison of the amount of dyestuff adsorbed was arrived at, in the work of H. E. Ashley, of the United States Survey, by comparing the strength of colour in the solution after contact with clay with that of the concentrated dye solution, originally used. He did not know whether Mr. Dreaper had applied that method in connection with the amount of dyestuff actually adsorbed by these fibres. With regard to the adsorption of the dyestuff by sand, it would be interesting to know whether the authors had tried the effect of igniting the sand first.

Mr. **Davis**, in reply, said that the sand experiments had been described at considerable length at the International Congress of Applied Chemistry in 1909, and the facts then dealt with covered a great many of the questions which had been raised. It was quite impossible to wash out the dye from the dyed sand column by water. The dyestuff in the sand column was apparently in the same condition as on a dyed fabric; it was absolutely fast. It was only possible to dissolve out the dye by the action of alcohol. By using from 40 up to 90 per cent. alcohol the whole of the dye was removed immediately, and the same was true with regard to acetic acid. The sand they dealt with was specially purified by boiling for several hours first of all with nitric acid, then with hydrochloric acid, then with a mixture of the two, and finally with chromic acid; afterwards it was washed thoroughly with distilled water many times and finally ignited. Those precautions were taken in order to remove the possibility of objection that some dye was taken up by organic particles or other substances present in the sand. When the sand was treated in that way it was found that the weight of dye absorbed per gram of sand was extremely constant so long as they dealt with sand of one degree of fineness, *i.e.*, sand which passed a 76-mesh sieve or a 120-mesh sieve. They worked with a very dilute solution, 0·1 gram of dye per litre. They had calculated the results in grams of dye adsorbed per gram of sand. In the case of Night Blue the constants in three experiments were 0·000147, 0·000148 and 0·000148. Results of that kind were obtained by taking very different weights of sand and passing through those sand columns very different volumes of solution. Probably it was one of the most sensitive methods of working that had yet been devised. There was an absolute division at the end point between the passage of colourless water and the discharge of strongly dyed solution, and the dyestuff passed down the sand column evenly and progressively. When dealing with solutions of dye containing salts such as sodium chloride and sodium sulphate, the dyestuff tended more and more to coagulate, so to speak, at the top of the sand column; but so long as they were dealing with solutions of dye in the absence of salts they got progressive and equal dyeing throughout the sand column and sudden transition from a colourless solution to a strongly coloured one. According to the degree of fineness of the sand they got very different constants per unit of sand. In the case of sand passing a 76-mesh the constant was 0·000148, whilst with sand which failed to pass this sieve the constant fell to 0·000080. As the sand particles became coarser it was found there was greater difficulty in getting concordant values for the constant, because the coarser sand particles were far less regular in their nature; they were dealing with more irregular figures.

A **Member** said that a smaller percentage was absorbed with coarser sand.

Mr. **Davis** said that was so, the absorption effect being considerably increased by decreasing the size. As Mr. Hatschek had pointed out, that was what would naturally be anticipated. He had already stated that they had used freshly ignited silver-sand, so that he did not think the question of moisture entered into the discussion. He was aware of the results obtained by Suida and others as to the action of dyes on colloidal silica and precipitated silica; but this was work of a different character. In the case of the experiments described in this paper they were dealing as far as could be seen, with non-colloidal material, and that came back to the question which had been raised by Mr. Hancock. He said he was aware of the recent work as to the possibility of differentiating colloidal material in soils and he believed the question originally came up in the United States in connection with road-making; it seemed, in the light of the results which they had obtained, that those experiments admitted of a different interpretation. It depended entirely on the relationship between the dye and the substances dealt with. They could get pure silicious material which was non-colloidal, but was dyed by certain selected dyes. That question became of considerable importance in connection with the possibility of the utilisation of the salts in soils for agriculture. Attempts had been made to differentiate between the useful portion of the soil as regards salt assimilation and the non-useful part, and a process based on the use of dyes had been suggested recently by König. This process, however, gave a measure not so much of the true *colloidal* matter, but of the active *surface*.

The **Chairman** said that Mr. Hancock's remarks had reference to the possibility of estimating the quantity of colloidal material in clay. If different clays were first passed through a sieve of a definite fineness, then the relative adsorption which they displayed might conceivably be a mode of determining the amount of colloidal matter present in each case.

Mr. **Hancock** said that he had some experiments on hand in which a clay had been elutriated into various portions in order to determine the amount of dyestuff adsorbed by the different portions. The paper he referred to was not written in connection with soil work, but with Ashley's work on colloid matter in clays, and its relation to plasticity.

Mr. **Davis** said the one he had in mind was as to the binding of road materials. Apparently it had been developed in two directions. That method might, of course, be very useful in getting at the relative value of materials, but he did not think it could be used to discriminate between actual colloidal substances and non-colloidal substances in view of the results with sand. The method was essentially a measure of total active surface.

As regards the electrical theory, as Mr. Hatschek had said, they had carefully steered clear of that point because in their own minds they were not satisfied as to its complete applicability. They went so far as to consider that the majority of the questions of dyeing were more physical than chemical, but it was very difficult at present to go beyond that. Although the ingenious hypotheses that had been put forward by Gee and Harrison explained a number of cases, they fell short in their estimation, in explaining a large number of the other facts.

Mr. **Dreaper**, in reply, said it was interesting to hear Mr. Hatschek's remarks on the subject of Night Blue. Mr. Hatschek had said that the relative surface value of a colloid like silk or cotton compared with sand was not an easy thing to determine. It was just possible that those figures would be of some value as indicating the relative surface action of the fibres and sand.

INGRAIN DYEING—INFLUENCE OF CERTAIN GROUPS ON THE RE-SOLUTION FACTOR.

BY W. P. DREAPER, F.I.C.

A quantitive investigation on more general lines than that previously recorded (see Dreaper, this J., **13**, 96; and Dreaper and Wilson, J. Soc. Dyers and Col., 1911, **27**, 170; see this J., 1911, 951) has been undertaken.

The results already obtained with primuline have now been extended to those obtained with reacting units of lower molecular weight, and different chemical constitution.

Relative action of amino and hydroxyl groups.—Silk as a typical animal fibre was treated with a 1 per cent. solution of β-naphthylamine hydrochloride for 30 minutes at 100°. After washing with water the fibre was immersed in a solution of nitrous acid in the usual manner, and subsequently introduced into a slightly alkaline solution of β-naphthol. The following results were obtained:—

β-naphthylamine (100°)—*β-naphthol* (10°).

Time of extraction.	Per cent. loss on re-solution.	
	In 0·5 per cent. sod. oleate at 100°.	In 80 per cent. alcohol at boil.
minutes.	per cent.	per cent.
2	87	97
5	90	98
10	96	99
20	97	—

When β-naphthylamine was substituted for β-naphthol the following results were obtained:—

β-naphyhtlamine (100°)—*β-naphthylamine* (10°.)

Time of extraction.	Per cent. loss on re-solution.	
	In 5 per cent. sod. oleate at 100°.	In 80 per cent. alcohol at boil.
minutes.	per cent.	per cent.
2	84	95
5	88	96
10	90	98
20	94	98

Thus the presence of an amino group as compared with a hydroxyl one in the second unit coupled with the diazo compound produces certain results, which agree generally with those previously obtained with primuline compounds. This difference would be more easily observed by using a 0·1 per cent. solution of sodium oleate, and alcohol containing a larger proportion of water.

Influence of sulphonic group.—When β-naphthylamine disulphonic acid (R. salt) is used for coupling the following results were obtained :—

β-naphthylamine hydrochloride and β-naphthylamine disulphonic acid (R salt).

Time of extraction.	Per cent. loss on re-solution. In 5 per cent. solution of sodium oleate at 100°.
minutes.	per cent.
2	90
5	92
10	96
20	98

The comparative effect of the presence of this group in the first solution or the developer respectively is seen in the following table, where the reacting units are β-naphthylamine (as hydrochloride) and α-naphthylamine sulphonic acid 1·5 respectively. In column (a) the results obtained when the fibre was treated at 100° with β-naphthylamine hydrochloride, and after diazotisation introduced into a solution of the 1·5 acid. In (b) this order was reversed, so that in the latter case a sulphonic acid group was present in the substance applied under dyeing conditions, and in the former it was only present at the time of and after coupling.

β-naphthylamine hydrochloride and α-naphthylamine sulphonic acid (1·5).

Time of extraction.	Per cent. loss into sod. oleate at 100°.	
	(a)	(b)
minutes.	per cent.	per cent.
2	85	70
5	87	75
15	92	90

The influence of a sulphonic acid group, present in the first substance applied to the fibre is specific. It materially increases the resistance of the final dyestuff against re-solution.

This effect is also seen when the reacting units are primuline and β-naphthylamine hydrochloride. Pure primuline (a) was applied to the fibre diazotised and combined with β-naphthylamine. In (b) this order was reversed, the fibre being boiled with a 1 per cent. solution of β-naphthylamine hydrochloride and then introduced into a solution containing freshly prepared diazo primuline. It was not found possible to diazotise the first substance *in situ* and then combine it with primuline.

Primuline and β-naphthylamine hydrochloride.

Time of extraction.	Per cent. loss on re-solution into 5 per cent. sol. oleate at 100°.	
	(a)	(b)
minutes.	per cent.	per cent.
2	1	50
5	2	70
10	3	75
15	4	82
20	5	89

The influence of the presence of a sulphonic acid group or of a dye molecule of high molecular weight, or some property exhibited by first substance when applied to the fibre under dyeing conditions is a definite one. It may greatly increase the resistance against re-solution. The effect produced is not modified to any great extent by the subsequent diazotising and coupling operations and the actual relationship between the dyestuff and fibre, whatever its nature, is not materially affected by these operations when the affinity is estimated by the re-solution results subsequently obtained.

The affinity which exists between the dyestuff and the fibre substance in the cases examined, is not seemingly influenced by the amino group, but may in some way be regarded as dependant upon the chemical constitution of the dyestuff. This affinity seems to react through the sulphonic group, although it might take place (in the case of primuline) through the methyl group. This is not likely, in face of the results obtained in the absence of such a group. The general evidence is not in favour of an association of a general but rather of a specific nature as between dyestuff and fibre substance. The presence of the HSO_3 group seems to modify the results obtained, while the effect of a NH_2 and OH group respectively in the developer is confirmed.

The resistance against subsequent re-solution is at its maximum when sulphonic group under ordinary dyeing conditions. But the presence of such a group has not the same effect, when present in the final dyestuff and introduced after diazotisation.

It is important to determine the effect of subsequent treatment of the azo dyestuffs produced *in situ*. The fibre dyed at 15° C. diazotised and developed was boiled for 30 minutes in a very dilute solution of acetic acid (0·05 per cent. solution), and the re-solution results compared with those obtained with the original sample. The following results were obtained :—

β-Naphthylamine (15°) *and α-naphthylamine sulphonic acid* (1·5).

Time of extraction.	Per cent. loss on re-solution in 2 per cent. solution sod. oleate.	
	(a) As dyed.	(b) Same treated with acetic acid at 100°.
minutes.	per cent.	per cent.
2	98	95

A greater difference was noticed in the case of primuline, as the following results will show :—

β-naphthylamine (15°)—*Primuline* (10°).

Time of extraction.	Loss into 0·2 per cent. sod. oleate solution at 100°.	
	(a) As dyed.	(b) After boiling in water for 20 minutes.
minutes.	per cent.	per cent.
2	40	16
5	75	40
10	90	60
20	95	85
30	98	92

The affinity which exists between the dyestuff and fibre when the above dyestuffs are formed *in situ* may thus be materially influenced by subsequent treatment in the direction of additional resistance against re-solution.

Variation in the colour of dyes produced in situ.—It was previously noticed (Dreaper, this J., **13**, 96) that material differences in shade of the final dye are obtained when a substance is the one applied to the fibre before diazotisation in comparison with its subsequent use, and this is also observed in the above cases. The relatively low resistance of the dye product *in situ* against re-solution, still further indicates that the ingrain method of dyeing does not necessarily give a high resistance against subsequent re-solution into the usual solvents.

This investigation is being continued.

Yorkshire Section.

Meeting held at Bradford on December 11th, 1911.

PROFESSOR W. M. GARDNER IN THE CHAIR.

TURKEY RED OIL—ITS COMPOSITION AND ANALYSIS.

F. W. RICHARDSON, F.I.C. AND WM. KEIGHLEY WALTON.

Our remarks refer to a commercial Turkey Red oil extensively used in finishing in the Bradford district. Modifications in the mode of manufacture, variations in the strength of the acid, differences of temperature and duration of reaction alter the nature of the product. It should therefore be clearly understood that our data do not refer to Turkey Red oils in general, but an oil typical of that class which dissolves in water, giving a clear solution, in fact to a well sulphated soluble oil.

Turkey Red oil is obtained by the action of strong sulphuric acid (66° B.) on castor oil at 30°—40° C.; the surplus acid is removed by washing with strong solutions of sodium sulphate or of common salt, and the product is then partially neutralised by means of caustic soda or ammonia or both. In the interest of clearness we deprecate the use of the terms "sulphonation" and "sulphonates" in regard to the action of sulphuric acid upon castor oil and the resulting products. Although "esterification" may be a permissible term we think the greatest simplification would be obtained by putting the changes which take place when sulphuric and acetic acids act upon ricinoleic acid in line with those resulting from the action of these acids upon the alkali hydroxides. "Sulphation" and "sulphated" are the correct terms to use in connection with this inquiry.

The following is a brief account of the methods used:—

(1) *Water.* (*A*).—The method of Stein, requiring the use of stearic acid and saturated salt solution, was found to be difficult of accomplishment and inaccurate in the results. The sulphated fatty matter retained water most persistently while the fatty layer remained contaminated with salt. Duplicate experiments gave 36·1 and 37·2 per cent. of water.

(*B*) *Method of Ubbelohde.*—49·215 grms. of the sample were put into a distilling flask with 30 c.c. of xylol which had been previously saturated with water, and the mixture was gently distilled into a narrow graduated tube graduated in 0·05 c.c. When the xylol had distilled over, a further addition was made with a subsequent distillation to bring over any small amount of water left in the oil. The volume of water found was 25·05 c.c., equivalent to 50·90 per cent.

(*C*.)—3·5525 grms. of the oil were placed in a large shallow platinum dish containing a glass rod. With frequent stirring the oil was heated to 100° C. until successive weighings 20 minutes apart differed by only 0·5 mgrm. The weight of dry solids amounted to 1·7465 grms., hence there was 50·84 per cent. of water. It is therefore evident that the much criticised method of direct dehydration at 100° C. is capable of giving as good results as the much more elaborate and tedious xylol process.

Total sulphuric anhydride.—Four grms. of the oil were boiled with dilute hydrochloric acid for ¾ hour. After filtration and thorough washing of the fatty matter with boiling water the sulphate in the filtrate was determined as barium sulphate. The percentage of total SO_3 found was 3·63 per cent.

Sulphuric anhydride as alkali sulphate.—A portion of the sample was dissolved in sulphuric ether in a separator and the solution was repeatedly shaken out with a saturated solution of pure sodium chloride. The united saline solutions were filtered, diluted and precipitated with barium chloride:

The percentage of sulphuric anhydride (as sodium sulphate) was 0·09 per cent.

5·9130 grams gave ·0165 gram $BaSO_4$ ·0856% SO_3
7·510 „ „ ·0190 „ „ ·0861 „

Sodium chloride.—All attempts to extract the chlorides by means of a saturated solution of pure sodium sulphate utterly failed, homogeneous mixtures being formed. A known weight was dehydrated and charred. The aqueous extract of the ash from 8·0 grms. of sample required 19·0 c.c. of *N*/10 sulphuric acid to produce neutrality to methyl orange. By *N*/10 silver nitrate we got 0·24 per cent. of sodium chloride. Our experiments show that if due attention is paid to the temperature there is no loss of sulphuric anhydride or chlorine.

Total soda.—We found Na_2O equal to 8·41 per cent. of sodium sulphate.

Unsaponifiable matter, determined in the usual manner, gave 0·17 per cent.

Neutral fat.—The method employed was that of Lewkowitsch (Vol. III, p. 159), and gave 5·22 per cent. Great difficulty was experienced in carrying out the process on account of the formation of ethereal emulsions, which became more permanent the nearer the reaction approached neutrality.

In a second experiment instead of 30 grms. only 6 grms. were used, with glycerine and ammonia in the same proportions as in the first experiment: in this case 0·326 grm. = 5·43 per cent. of neutral fat were found.

We believe that this result is nearer the truth than the former. Experiments showed that the presence of glycerine is not essential, and a large excess of ammonia is quite unnecessary. In subsequent extractions the glycerine was omitted, therefore the glycerol obtained from the neutral fat was not increased by the glycerine used in the process.

The neutral fat gave the following data:—

	The fat.	The fat acids. 92·17%
Saponification value	173·6	188·1
Mgrms. KOH for 1 grm.	—	298·55
Mean molecular weight		
Neutralisation value	—	185·8
Mean molecular weight	—	302·2
Average molecular weight	—	300·4
*Iodine number (Hübl)	77·73	84·42*
Yield of glycerol	13·22 & 13·32	—
Average of glycerol	13·22%	—
Acetyl value (KOH) in acetyl products	194·0	—
Acetyl value (KOH) in glyceride	224·2	—
Increase of weight on acetylisation	15·42%	—
Increase of weight on acetylisation less amount for phytosterol	15·56%	—
Saponification value of acetyl product:—		
on acetyl product itself	345·1	—
on glyceride	398·8	—
Butyro refractometer at 50° C.	62	50
Refractive index at 50° C.	1·4672	1·4593
Melting point	—	4 to 5° C.

* We have always compared the iodine numbers obtained in the analysis with a standard olive oil tested at the same time under the same conditions, otherwise the Hübl values are not sufficiently reliable, temperature and the degree of sensitiveness of the solutions producing rather wide differences.

(In the case of the neutral fat due allowance has been made for the 3·14 per cent. of unsaponifiable matter).

The data from the fat acids are in perfect agreement with those obtained from the mixed fat acids from castor oil, therefore the only question to be answered is that relative to the nature of the glycerides present.

Ricinoleins.	Glycerol. per cent.	KOH No.	Acetyl value.	Fat acids. per cent.	Increase of weight on acetylisation.
Mono.	24·74	150·9	338	80·10	33·87
Di.	14·11	172·1	216·4	91·40	19·30
Tri.	9·87	180·6	159·1	95·92	13·5
Neutral bodies less unsaponifiable	13·65	173·6	194·0	92·17	15·6

From the acetyl values of normal castor oils it is evident that they do not contain more than 93 per cent. of tri-ricinolein. (The calculation in Lewkowitsch's book. Vol. II., p. 326. 1909, is erroneous.) For the neutral bodies the acetyl value should therefore be increased from 194 to $\frac{194}{0{\cdot}93}$ = 208·6. In the absence of monoricinolein this would indicate the presence of about 86 per cent. of di-ricinolein and 14 per cent. of tri-ricinolein, or from the glycerol factor 89 per cent. and 11 per cent. respectively.

Bogajewsky suggests that the anhydrides of ricinoleic acid are also formed by the action of sulphuric acid on castor oil, but our data do not confirm this view. It is obvious that if any appreciable amount of anhydrides had been present in the neutral bodies we should have obtained a larger yield of fat acids whereas the 92·17 per cent. we have recovered indicate a mixture of 83 per cent. of di- and 17 per cent. of tri-ricinolein; in fair harmony with the data given by the glycerol and acetyl values. The same argument applies to the question of lactides, for if these bodies were present they would also increase the yield of fat acids, and would reduce the amount of glycerol recovered and the acetyl value.

Approximataly the neutral bodies from the sample of Turkey Red oil consist of :—

	Per cent.
Unsaponifiable (chiefly phytosterol)	3·14
Di-ricinolein	83·30
Tri-ricinolein	13·56
	100·00

Under the conditions of manufacture it is more reasonable to suppose that di-ricinolein would be formed in preference to mono-ricinolein; the low temperature and the vigorous agitation of the mass would allow of a steady transitional stage from the tri- to the di-glyceride. A larger amount of acid and a higher temperature and a more prolonged action would be required to convert the di- into the mono-glyceride.

The free fat acids.—The Turkey Red oil when dissolved in 70 per cent. alcohol gave an acidity to phenolphthalein corresponding to 32·68 c.c. of normal potassium hydroxide for 100 grms. of the sample. By direct extraction with ether 18·39 per cent. of fatty matter, containing the 5·43 per cent. of neutral bodies, was recovered. These 12·96 per cent. of acidic fats in ethereal solution gave an acidity to phenolphthalein equal to 34·78 c.c. of normal potash for 100 grms. of sample. Therefore partial hydrolysis must have taken place during the extraction and also during the washing of the ethereal extracts with water. We shall show that even cold water produces such an hydrolysis, and that the fatty bodies set free have a molecular weight of about 345.

With this factor and the increase of 2·1 $N/1$ for the acidity we find 0·72 per cent. of fat acids were produced by hydrolysis. This will give us 18·39 (5·43 neutral fats + 0·72 hydrolytic fat acids) = 12·24 per cent. of free fatty acids present in the original sample, absorbing 32·68 c.c. of normal potash = 149·95 acid value = 374·5 molecular weight.

A resolution of these fatty acids was attempted as follows :—Excess of ammonia was added and the unsaponifiable matters and neutral fats were removed by ether. The residual ammonia soap solution was neutralised. Additions of dilute sulphuric acid were made to cause partial decomposition of the ammonia soaps. In this way it was hoped that the relatively unstable ammonia soaps would be decomposed in the order of their molecular magnitude and some idea would be formed as to the extent polymerisation had taken place in the original oil. After each addition of acid the liberated fat acids were extracted by ether, and the ethereal solutions were well washed with water to remove dissolved soaps.

Fraction.	Mean molecular weight.	
	KOH	Depression of freezing point. Beckmann.
I.	446·4	445·2
II.	383·0	387·5
III.	—	357·1

The first fraction was re-fractionated by the above process and the highest molecular weight obtained was 548·5.

Juillard states that acids up to the penta acid are present in Turkey Red oil, but Scheurer Kestner maintains that these were produced in the process used, the hydrochloric acid liberated by the action of sulphuric acid upon the salt being chiefly responsible.

Our results indicate that the polymerisation cannot have exceeded that of the di-compound, *i.e.*, ricino-ricinoleic acid $HO.C_{17}H_{32}.CO.OC_{17}H_{32}.COOH$ = 578·53 mol. wt. We may therefore calculate the approximate composition of the free fatty acids in the sample as ricino-ricinoleic acid, 3·33 per cent.; ricinoleic acid, 8·91 per cent.

Fatty radicals (non-sulphated) as soaps.

We had to elaborate a special scheme to isolate the non-sulphated fatty acids. The amount of soda organically combined in 100 grms. of the sample = 112·12 c.c. of normal acid. The amount of soda in combination with the sulpho group = 44·18 c.c. $N/1$ acid. The original sample should therefore have an alkalinity to methyl orange of 112·12—44·18 = 67·94 c.c. normal; —COONa being alkaline and —(SO$_4$ Na) being neutral. We therefore propose to add an equivalent amount of acid, 67·94 c.c. of normal to 100 grms. of the sample to liberate the non-sulphated fat acids. The alkalinity to methyl orange = 64·69 c.c. of normal sulphuric acid for 100 grms. of the oil. The end point only came very gradually and a fluorescence appeared at the same time. Greater dilutions with water correspondingly decreased the amount of acid required, *e.g.*, 63·82 c.c. and 61·75 c.c. Finally titration in the presence of ether and alcohol required 67·64 c.c. of normal sulphuric acid. Therefore soda in combination with the sulpho group is neutral to methyl orange. An amount of acid equivalent to 67·64 c.c. of normal per 100 grms. of sample was slowly added with constant stirring and the liberated acids were extracted by ether. The ethereal extracts were well washed with water to remove any sulpho salts. Troublesome emulsions were formed, and the washing was only accomplished with much difficulty; nevertheless duplicate experiments were in close agreement :—29·18 per cent. and 29·19 per cent. respectively. This fatty matter was re-dissolved in ether and its acid value was found to be 131·0. Allowing for 5·43 per cent. of neutral fat we get fat acids 23·76 per cent. in which free fat acids amount to 12·24 per cent., a difference of 11·52 per cent., which represents not merely fat acids derived from non-sulphated soaps, but also a portion due to partial hydrolysis inevitably caused during the extraction process.

We have shown previously that this hydrolysis sets free acids equal to 5·89 c.c. of normal per 100 grms. of sample, using the same amount of water as that required in the extraction process. If the assumption of an equal amount of hydrolysis is correct we should have to deduct 1·77 per cent. of fat acids from 11·52 and state the true amount of fat acids from non-sulphated fatty matter, present as soap at 9·75 per cent.

By a process of calculation on the difference of the percentages of the various fats and fatty acids recovered, we arrive at a molecular weight of 300·0 for these non-sulphated fat acids, present as soap, therefore these acids are evidently all ricinoleic acid (mol. wt. 298) and represent 10·47 per cent. of sodium ricinoleate.

As the " total fat " was obtained by boiling with dilute hydrochloric acid and extraction with ether it includes decomposition products due to hydrolytic action.

Glyceryl estimations. (*A.*) A complete saponification and subsequent decomposition with sulphuric acid gave a filtrate yielding to the bichromate method 2·499 per cent. of total glycerol.

(*B.*) A portion of the oil extracted with a saturated aqueous solution of pure ammonium sulphate gave 0·823 per cent. of free glycerol.

(*C.*) A further quantity (10 grms.) was heated with water 200 c.c., and dilute sulphuric acid under a reflux condenser to hydrolyse the sulphonated bodies. In the filtrate we found 1·677 per cent. of glycerol which less

0·823 per cent. free glycerol gives 0·854 per cent. of glycerol present as easily hydrolysed esters.

(*D.*) In the "total fat" after saponification, 0·813 per cent. of glycerol calculated on 100 grms. of the original oil was found. As the "total fat" contains none of the glyceryl in an easily hydrolysed form, the glycerol recovered from the "total fat" represents only that due to stable glycerides.

(*E.*) In the neutral fats 0·718 per cent. of glycerol was represented, calculating upon 100 grms. of the original oil. The sample therefore contains :—

	Per cent.
Free glycerol	0·823
Glyceryl equal to glycerol in easily hydrolysable esters	0·854
Glyceryl in stable glycerides	0·813
	2·490

In order to arrive at some clear idea of the composition of the "total fat" obtained in our experiments, a very intricate series of calculations must be carefully followed.

A quantity of the total fat was neutralised to phenolphthalein and after addition of more alkali the neutral bodies were extracted by ether; these amounted to 7·178 per cent. on the original oil. Deducting the weight of this portion the acid value was equal to 327·4 mean molecular weight for the acid bodies in the total fat. A confirmatory test was made by recovering the fat acids, after removing neutral bodies, and taking the acid value directly. This value was equal to 327·7 mean molecular weight.

Knowing the molecular weights of the non-sulphonated fatty matter we are now in a position to calculate by a differential process the molecular complexity of the fat acids derived from the sulphated fats by hydrolysis.

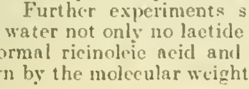
Of the total fat 40·4 per cent., 7·18 per cent. = neutral bodies; 33·22 per cent. = fat acids.

Fat acids.		Molecular weight.		
per cent.				
12·24	×	374·5	=	4583·88
9·75	×	300·0	=	2925·00
11·23	×	X by difference		3387·28
33·22		327·8		10986·16

from which we get X = 301·6.

Therefore the sulphated compounds on boiling with dilute acid yield (1) glycerol; (2) a neutral body, and (3) normal ricinoleic acid.

To ascertain the nature of the neutral body we made another recovery of "total fat," purposely prolonging the length of boiling to increase the amount of neutral bodies, and found 8·836 per cent. of total neutral bodies, calculated on the original oil. Of this 5·43 per cent. was due to the original neutral fat previously determined, we therefore have produced 8·836—5·430 = 3·406 per cent. of some neutral body by hydrolysis. Having ascertained the following values: (1) saponification; (2) acetyl; (3) acid values of the original neutral fats and the neutral fats and the neutral bodies obtained by hydrolysis the additional product gave: Acid value, nil; acetyl value, nil; saponification value, 204·9; molecular weight by depression of freezing point, 553·5. These data show that the additional neutral body consists of a double molecule of ricinoleic acid, which has lost the two hydroxyls of the chain, and has formed a cyclic compound, no doubt a lactide of the composition :—



$$C_{17}H_{32}\begin{matrix}\diagup CO.O \diagdown \\ \diagdown O.CO \diagup\end{matrix}C_{17}H_{32}$$

Molecular wt. 560·51
Saponification value, 200·4.

Our experiments and calculations prove that the sulphonated fatty matter on hydrolysis with a dilute mineral acid yields glycerol, a lactide, and normal ricinoleic acid. Further experiments showed that on hydrolysis with water not only no lactide was produced but a mixture of normal ricinoleic acid and ricino-ricinoleic acid, as is shown by the molecular weight of 348. (Beckmann 350.)

Adolf Grün and H. Wetterkamp (J. Chem. Soc., 1909, Abs. Vol. I, p. 8) state that their results do not agree with those of Wagner. Our results corroborate those of these authors who found that aqueous solutions of ricinoleic-sulphuric acid yield ricinoleic ricinoleate. Grün and Wetterkamp also found a neutral body on acid hydrolysis and conjectured that this was a lactide. Our results absolutely confirm this view.

The sulphated fatty matter. The heating of fatty acids with dilute mineral acids is calculated to produce polymerisation, but the fat acids obtained from our sample of Turkey Red oil after hydrolysis with acids had a molecular weight of 301·6. From this it may be inferred that no sulphated polymerides of ricinoleic acid are present in the oil. Since glycerol is produced on hydrolysis we can only assume that a part of the organically combined sulphuric anhydride exists in a sulphated glyceride of ricinoleic acid.

Acetylisation experiments were made to throw further light on the composition of this glyceride. 7·304 grms. of the oil were mixed with water and diluted sulphuric acid and the mixture was boiled for ¾ hour. The fat acids were collected on a filter and were washed with water till free from acidity. 2·951 grms. = 40·40 per cent. were thus obtained. This fat after acetylisation gave 3·209 grms. of acetylated product = 43·93 per cent. = 8·75 per cent. of increase on weight of fat. Ricinoleic acid should theoretically give an increase of 14·41 per cent. Lewkowitsch finds the anhydride of the acetyl derivative is formed, therefore we suggest that all acetyl values should be calculated on one gram of the oil or fat, and not on one gram of the acetylated product, in order to obviate the uncertainty of varying degrees of anhydrisation, especially in the case of fatty acids.

Grün (J.C.S., 1909, Vol. I. Abs., 875) shows that other discrepancies may be due to the formation of internal anhydrides. This author finds that when ricinoleic acid is treated with acetic anhydride it yields not acetylricinoleic acid, but acetylricinoleylricinoleic acid, $C_2H_3O.C_{17}H_{32}.CO.OC_{17}H_{32}.COOH$.

The 3·209 grms. of acetylated product on saponification and after the prescribed treatment gave :—

Acetyl value on 1 gram. of	Original oil	52·975
	Total fat	131·120
	Acetyl product	120·57

(*B*). We tried with success a rather bold experiment and acetylated the original oil, the excess of acetic anhydride disposing of the water present; duplicate experiments were in close agreement.

Acetyl value on 1 gram. of	Original oil	65·01
	Total fat	160·7
	Acetyl product	140·7

(*B*). A third estimation conducted in the same manner as in the last experiment and reserving all the washings from the acetyl compound, washings containing all the glycerol from that existing in a free state and as loosely combined glyceryl. 0·821 per cent. of glycerol was thus found by the acetin method, practically the same result as that found to exist in a free state, by the bichromate method. This last acetyl experiment shows that although the sulphated glyceride is easily hydrolysed and decomposed with liberation of glycerol when boiled with dilute mineral acids, yet the acetylated glyceride is not hydrolysed and no glycerol is liberated by boiling with dilute acetic acid.

From experiments (*a*) and (*b*) the loss, *i.e.*, the difference of 12·035 of acetyl values of the original oil is due to the formation of glycerol during the process of recovery of the total fat and to the production of a small amount of lactide.

Under the conditions of experiment we know that 1·748 per cent. of lactide is formed and as 596·548 of ricinoleic acid = 560·5 of lactide, therefore 1·748 of lactide would represent a loss of 1·86 per cent. of ricinoleic acid. The acetyl value of ricinoleic acid $\frac{56\cdot158}{298\cdot274} = 0\cdot18828$.

This loss of 1·86 per cent. of ricinoleic acid would account for a difference of 0·35 grms. per cent. of caustic potash on the original oil. 1·2035—·3500 0·8538 grm. of caustic potash, corresponding to the acetyl groups replacing the hydroxyl groups in the easily hydrolysed sulphated glyceride, therefore the easily hydrolysed sulpho-glyceride is either a mono- or di-glyceride, and cannot be a triglyceride. 0·8535 grm. of caustic potash calculated into terms of glycerol = 1·399 of glycerol as diglyceride = 0·699 as monoglyceride.

Allowing for the free glycerol, the glycerol obtained on hydrolysing the soluble oil = 0·854 per cent. Therefore the easily hydrolysed sulphated glyceride exists as a monoglyceride. the small difference of 0·15 per cent. being in all probability due to some small experimental error, which would be enormously magnified in the above calculations.

The 0·854 per cent. of glycerol should therefore be calculated as the product of a mono-glyceride of the constitution, $(HO)_2C_3H_5.C_{17}H_{32}CO.O.SO_4H$; *i.e.*, the monoglyceride of ricinoleic acid sulphate, of which 452·39 would equal 92·064 per cent. of glycerol. therefore 0·854 of glycerol = 4·196 of the glyceride. Expressed as the equivalent of ricinoleic acid sulphate, $C_{17}H_{32}(HSO_4)CO.OH$. (= 376—342) = 3·509 per cent. The organically combined sulphuric anhydride was found to equal 3·537 per cent. = 16·71 per cent. of ricinoleic acid sulphate. 16·71—3·51 = 13·20 per cent. ricinoleic acid sulphate. Calculating these into their sodium salts we get :—

$$(HO)_2C_3H_5.C_{17}H_{32}.CO.O.SO_4Na = 4{\cdot}40 \text{ per cent.}$$

The monoglyceride of ricinoleic sodium sulphate and the sodium salt of ricinoleic acid sodium sulphate,

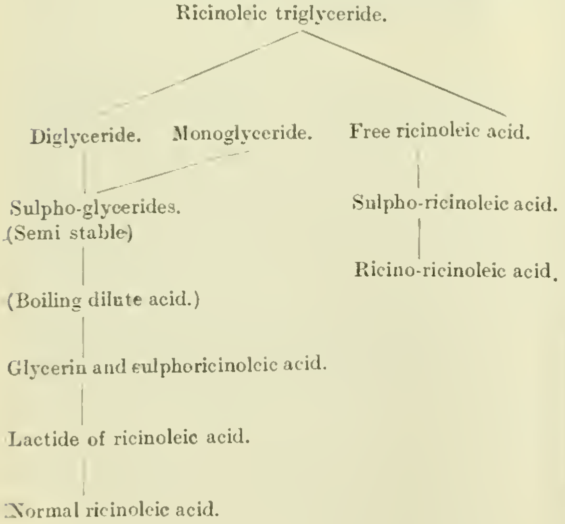
$$C_{17}H_{32}(SO_4Na)CO.ONa = 14{\cdot}735 \text{ per cent.}$$

So far we are enabled to assume the following :—

Approximate analysis of the Turkey Red oil.

		per cent.
Sulphated fats as sodium salts.	Sodium salt of ricinoleic acid sodium sulphate	14·73
	The monoglyceride of ricinoleic sodium sulphate	4·40
Free fat acids.	Ricinoricinoleic acid	3·33
	Ricinoleic acid	8·91
	Sodium ricinoleate	10·47
Neutral fats.	Unsaponifiable matter (phytosterol)	0·17
	Diricinolein	4·21
	Triricinolein	1·05
	Glycerol	0·82
	Sodium chloride	0·24
	Sodium sulphate	0·16
	Water	50·90
		99·39

Tentatively we suggest the following scheme, representing the general changes which occur when castor oil is submitted to the action of strong sulphuric acid, and when some of the products are boiled with dilute acids :—



DISCUSSION.

Mr. A. **Wilkinson** asked if the use of strong sulphuric acid would reduce or completely eliminate the amount of non-sulphated bodies left after treatment by the ordinary method. Would a product obtained thus be useful for particular classes of goods.

Prof. W. M. **Gardner** asked what oils in addition to castor oil had been found in other samples tested, and also whether there was not danger of lactide formation if the method indicated by the authors for the estimation of water were used.

Mr. F. **Wilkinson** asked if mineral oil was ever found present and if the Turkey Red oil analysed was acid or alkaline in its reaction.

Mr. G. A. **Bracewell** referred to the difficulty of obtaining satisfactory or rapid separation in the estimation of neutral oil. Ammonia and excess of glycerin were added, giving troublesome emulsions. Addition of alcohol only made matters worse. The omission of the glycerin he found in no way detrimental to the results. He had wondered if the addition of a small quantity of neutral tallow (say 2 per cent.) would be admissible. That would make the castor oil miscible, and petroleum ether could then be used in the extraction.

Dr. L. L. **Lloyd** asked whether ammonia was present in the sample, since if absent, and the sample completely neutralised by soda, the oil, although termed "Turkey Red oil," could not be used for the dyeing of mordant colours, as it would not become polymerised on stoving, and would therefore not be fixed on the cotton; such a substance would, however, on account of its neutrality, be a valuable softening agent for textiles. In the analysis of fats and distilled greases very rich in cholesterol and other compounds that tended to produce an almost permanent emulsion, he had found the extraction by means of pure benzene to give extremely good and rapid results. The separation was carried out by placing the separating funnel, after well shaking with benzene, in an oven at about 70° C. In order readily to dissolve soaps, that were sparingly soluble in water, 30 per cent. alcohol (by volume) was used; benzene dissolved in this dilute alcohol in only small quantities. The benzene extract should be washed with 30 per cent. alcohol under the same conditions as the extraction was carried out. The benzene might then be distilled or preferably removed by a current of steam and the residue taken up with ordinary ether. Benzene was a far better solvent than petrol for many fatty compounds and since one could separate while hot much time was saved.

Mr. W. **Keighley Walton** said the oil owed its properties to sulphated glycerides, and not to sulphated acids. The object was to obtain a product soluble, easily hydrolysed and containing as high a percentage of sulphated glyceride as possible. Fuming sulphuric acid would split up the glyceride completely. The reaction of the oil depended on the indicator used. No free sulphuric acid was present as it was all washed out by brine and sodium sulphate solution, finishing with ammonia. To litmus the product would be alkaline. Soaps were alkaline to methyl orange. He did not think Mr Bracewell's suggestion could be adopted, since it complicated matters by introducing a further unknown factor.

Mr. F. W. **Richardson**, in reply, said the object of sulphonating was to obtain a soluble product, but the presence of some non-sulphated bodies was not harmful. Spontaneous combustion in woollen goods might be caused by using fuming sulphuric acid in preparing the oil, and he could see no way in which it was advantageous. He had not found Turkey Red oil made from other oils than castor. Other oils would give stearo-lactones. There was no danger of lactide formation in the method for estimating water since no acid was present to cause this. Mineral oil was not found in these oils.

Journal and Patent Literature.

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I.—GENERAL PLANT; MACHINERY.

Heat, Flow of —— through contact surfaces. C. Hering. Met. and Chem. Eng., 1912, 10, 40—44.

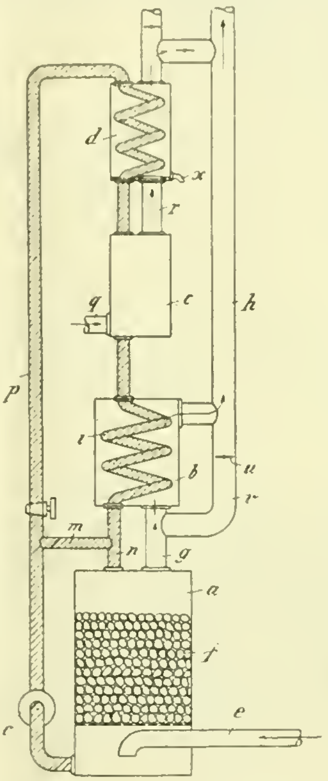
The thermal ohm being defined as the unit of resistance which allows a flow of heat equivalent to one watt for a temperature fall of 1° C., a table has been compiled giving the flow of heat between surfaces in contact in the following cases: solid to gas (or vacuum), metal to water, water to metal to air, gas to metal to water, gas to metal to gas, the sources from which the data were obtained being also given. No data were available in the cases of solid to solid, and gas to metal. The table includes the kilowatts per sq. ft., the watts per sq. in., the thermal ohms per sq. in., and the watts per sq. cm. It is pointed out that the thermal ohm cannot be a true resistance since the ratio of the temperature fall to the watts is not constant but increases as the temperature rises. The following reduction factors are given: 1 watt = 0·238882 small calories per second, 1 kilowatt = 56·8776 B.T.U. per minute, 1 watt per sq. ft., per C.° = 1·90 B.T.U. per hour, per sq. ft., per F.°—A. H. C.

Fire extinction [petroleum, tar, etc.] by frothy mixtures. Engineering, Jan. 12, 1912, 52—53. (See also this J., 1911, 1042.)

The use of frothy mixtures for fire extinction has recently been tested at Wilhelmsburg, near Harburg, in the presence of officials representing the Prussian Fire Brigade (see *Preuss. Feuerwehr-Beirat, Drucksache Nr.* 4. 1911). A solution of caustic soda, containing froth-forming ingredients and a solution containing alum, etc., are mixed together by means of carbon dioxide so as to yield a foam consisting of bubbles filled with carbon dioxide, which is directed on to the surface of the burning petroleum, etc. It is stated that 2 litres (3½ pints) of the mixed liquids when directed on to light petroleum spirit gave 13 litres (nearly 3 gallons) of foam, the volume of which diminished by 5 per cent. in 5 mins., 14 per cent. in 10 mins., 47 per cent. in 30 mins., and 76 per cent. in 60 mins. In one set of tests, the plant used comprised two reservoirs each of 5 cb. m. (175 cb. ft.) capacity, from which the solutions were delivered to the mixer by two duplex feed pumps at the rate of about 160 litres (35 galls.) per minute. The foam was discharged from the mixer through a pipe of 80 mm. (3 in.) diam., which branched into two pipes of 52 mm. (2 in.) diam. Fifteen tons of crude petroleum benzine were set on fire in a brickwork tank of 10 m. (33 ft.) diam., and after the fire had burned for 5 mins. in a strong wind, the foam was applied under a pressure of 2 atmospheres. The fire was soon stifled except for isolated jets of flame near the edge of the tank, and was completely extinguished in 6 mins.; 10 mins. afterwards, on sweeping away the layer of foam, the benzine could immediately be relighted. About 1800 litres (400 galls.) of the mixed liquids were consumed. The results showed that it was advantageous to apply the foam under a low pressure, so that it could spread quietly over the surface of the burning liquid. In another test, 1800 kilos. (1¾ tons) of tar and four empty tar barrels were placed in a "tar-field" of 1300 sq. ft. area, and set on fire by the aid of 150 kilos. of spirit. After the fire had burned for 4 mins., foam was applied under a pressure of 3·5 atmospheres through a 13 mm. (½ in.) nozzle on a 32 mm. (1¼ in.) hose from a Perkeo tilting ejector, consisting of a tub of 150 litres (33 galls.) capacity mounted on wheels so that it could be tilted in order to mix the liquids. The fire was extinguished in 1 min. 35 secs.—A. S.

Patents.

Dry heated air; Production of ——. W. H. Derriman, London. From Siemens und Halske, Berlin. Eng. Pat. 13,613, June 7, 1911.



The drying is performed by means of sulphuric acid, the circulating pipes for which are shown shaded in the diagram, the air pipes being in outline. The air enters by the pipe, *e*, and passes through the drying chamber, *a*, over sulphuric acid on the packing, *f*; the acid is circulated by the pump, *o*, part, directly back to the drying chamber by the pipes, *m*, and *n*, the remainder passing by the pipe, *p*, through the preheater, *d*, to the regenerator, *c*: here the hot acid coming in contact with a current of air entering at *q*, parts with water and sulphuric acid vapour, these being carried forward with the air through the pipe, *r*, and condensed in the preheater, *d*, the liquid escaping by the pipe, *x*; the vapour tension of a mixture of sulphuric acid and water being considerably less than that of water alone, this air may be allowed to pass direct into the dry-air conduit, *h*. From the regenerator, *c*, the acid passes through the coil, *i*, in the heat equaliser, *b*, on its way to the drying chamber where it heats the outgoing dry air entering from the pipe, *g*. The pipe, *v*, with the valve, *u*, serves to by-pass a portion of the dry air direct into the conduit, *h*, if desired.—B. G. McL.

Drying by heating in vacuo [Controlling devices]. T. J. and E. Rorke and H. S. Benson, Barnes, Surrey, and J. Thame, London. Eng. Pat. 22,046, Sept. 22, 1910.

The patent relates to electrical controlling devices operated as follows:—The temperature in an electrically heated vacuum drying oven is regulated by a thermostat in which the expansion of a liquid, by making contacts in its containing tube, electro-magnetically switches off or on one or more of the heating units: two thermostats may be employed, one controlling the main heating circuits, the other adding or eliminating auxiliary circuits; or the thermostat may change the heaters from being in series to being in parallel. For controlling the degree of drying of a solid, a weighed portion of the material acts as the regulator or indicator; this is placed in the dryer in a receptacle at one end of a balance beam controlled by a spring, and when the material has lost weight to a predetermined extent, the circuit is closed to a suitable visible or audible indicator. The beam may be replaced by a hanging spring, or a hydrometer floating in a suitable liquid, *e.g.*, glycerin, may be employed. The degree of evaporation of a liquid is similarly controlled by the use of a hydrometer. By employing a series of contacts fixed in the manometer tube which indicates the degree of exhaustion of the chamber, resistances may be introduced or cut out from the circuit driving the exhauster-motor, the vacuum maintained being dependent on the speed of the motor.—B. G. McL.

Dryer. P. Fatus. Fr. Pat. 432,456, July 18, 1911.

Hot air is caused to impinge on the under side of a travelling band, on which the material to be dried rests. The hot air issues from a series of jets or ports spaced apart, and which are bent in the direction in which the band travels. The aperture of the jets can be regulated, and the impact of the air causes an undulatory movement of the band which hastens the drying. —W. H. C.

Desiccating apparatus; Method of heating ——. E. Hahn. Fr. Pat. 433,064, Aug. 8, 1911.

Three separate sets of heating coils are used. Steam is passed through the first, the hot condensed water from the first set of pipes is passed through the second, and the hot saturated air from the drying chamber, mixed with the vapour escaping from the condensed water from the other coils, is driven by a fan through the third coil. —W. H. C.

Dryers. Lambert Frères and A. Papin. Fr. Pat. 433,103, Aug. 8, 1911.

A thorough circulation of the air or other drying medium is attained by constructing the drying chamber of such a form that, combined with an internal set of blades or propellers, it acts as an ordinary centrifugal fan, working in a closed circuit.—W. H. C.

Interchange of heat; Apparatus for the ——. W. J. Still, Southall, Middlesex, and Stills Tube Syndicate, Ltd., London. Eng. Pat. 27,772, Nov. 29, 1910.

In apparatus in which a transference of heat is brought about by a fluid passing at right angles across a battery of tubes through which another fluid is passing, it is claimed that greater efficiency of transmission of heat is effected by causing the fluid to impinge directly on the tubes and to pass in comparatively thin layers round them. The baffles employed for this purpose may be of metal or refractory material and may occupy the space between two tubes in the same row, deflecting the gases on to the tubes in the next set by projecting flanges, or may be so constructed that when placed between four tubes, two in each row, the same object is attained.—B. G. McL.

Heat interchanging apparatus; Tubular ——. J. T. Sandberg, Göteborg, Sweden. Eng. Pat. 15,890, July 8, 1911.

In tubular heaters or condensers, the tube plate at either or at each end is not connected directly with the shell, but is provided with upturned edges forming a socket, which embraces a spigot-like projection from the cover. The joint between the spigot and socket is made by piston packing rings. The cover is provided with two apertures, one connected with the interior, and the other with the space surrounding the tubes.—W. H. C.

Centrifugal separator. J. J. Berrigan, Orange, N.J., Assignor to F. J. Arend, New York, and J. Bernstrom, Stockholm. U.S. Pat. 1,013,113, Jan. 2, 1912.

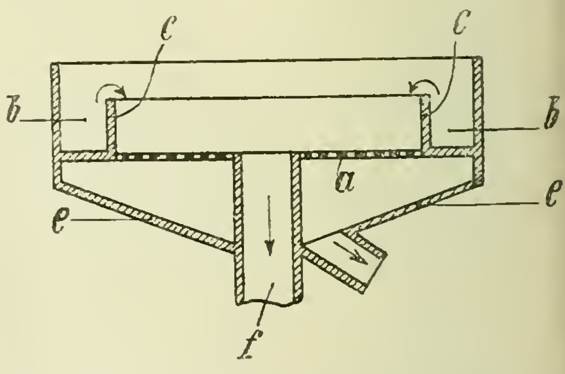
The driving mechanism of the apparatus is substantially arranged as shown in the diagram accompanying U.S. Pat. 994,631 (this J., 1911, 1038, Fig. I.). The rotating drum is provided internally with a number of perforated conveyors, each of which consists of a cylindrical part of somewhat smaller diameter than the drum and a conical part, the narrow end of which is within the cylindrical part of the next conveyor; behind each of the conical parts of these conveyors are solid conical baffles fixed to the rotating drum. The material to be treated is fed centrally by a worm conveyor on to the inner surface of the first conveyor; the liquid passes through and is carried by the baffle to a peripheral opening in the rotating drum, the solid material being conveyed towards the narrow end of the cone where, passing between the edge of this and the axle, it is thrown on to the inner surface of the next conveyor and again similarly treated, the liquid being removed as before. The solid material finally leaves the drum by a separate peripheral opening. Each conveyor is capable of being rotated independently at any desired speed relative to the speed of the drum. (See also this J., 1906, 1081; 1910, 1093; and 1911, 1039.)—B. G. McL.

Separating machines. F. M. Cole and M F. Tallmage, Buffalo, U.S.A. Eng. Pat. 18,066, Aug. 9, 1911.

The separating roll has a covering of cord wound spirally upon it and is rotated so that its surface moves upwardly away from a stream of the material to be separated. This flows parallel to the roll, along a "valley," formed by the roll itself and a flexible, spring-controlled bar, which is in contact with the roll along its entire length.—W. H. C.

Separating solid constituents from liquids; Straining or sieving apparatus for ——. Amme, Giesecke und Konegen Akt.-Ges. Brunswick, Germany. Eng. Pat. 24,544, Nov. 4, 1911. Under Int. Conv., Nov. 4, 1910.

The liquid containing the solid matter in suspension enters the annular channel, *b*, and flows over the partition, *c*, on to the filter surface, *a*, towards the centre. The clear liquid passes through into the chamber, *e*, from which it is discharged, and the deposited solids are swept by brushes (not shown) into the central shoot, *f*.—W. H. C.



Steam generation, feed water heating, and the heating of liquids in general; Means and apparatus for ——. W. A. Bone and J. W. Wilson, Leeds, and C. D. McCourt, London. Eng. Pat. 2404, Jan. 31, 1911.

Instead of forcing a mixture of gas and air into the tubes packed with granular refractory material, as described in Eng. Pat. 4362 of 1910 (this J., 1911, 406), a fan is used to draw the gas and air into the combustion tubes, which pass through the boiler. In order to get a greater efficiency and to prevent damage to the fan, a feed water heater provided with similarly packed tubes, is interposed between the boiler and the fan.—W. H. C.

Filters. E. A. Andrews, Birmingham, and A. E. Owen, Darlaston. Eng. Pat. 5310, Mar. 3, 1911.

When flushing out the filter for cleaning purposes, the water from the supply tank passes through a conical pipe provided with holes. Air is drawn in through these holes and is forced through the filtering medium along with the water.—W. H. C.

Filtering material for alkaline and acid liquids. S. Bornett. Ger. Pat. 241,710, Aug. 7, 1909.

The claim is for the use of "carbon-stones" as filtering material for acid and alkaline liquids. These "carbon-stones," which have hitherto only been used for lining blast-furnaces, are prepared by grinding coke of low ash content, mixing it with about 20 per cent. of tar, compressing the mass in moulds, and then heating with exclusion of air. It is stated that they can be used for the filtration of boiling concentrated solutions of caustic potash or soda.—A. S.

Temperature of fluids; Apparatus for regulating the —— H. Darwin, C. C. Mason, and The Cambridge Scientific Instrument Co., Ltd., Cambridge. Eng. Pat. 12,047, May 18, 1911.

The power-operated regulating device, automatically controlled by a thermometer in the fluid the temperature of which is to be regulated, is provided with electromagnets by means of which the device may be given more than one speed. One of the speeds is regulated automatically by the thermometer for small variations of temperature, and the others are utilised for correcting larger variations. When a large variation is expected to occur, a self-energising electro-magnet is put into action by momentarily closing a contact, and this magnet causes the regulating device to regulate for a predetermined period in one direction until it is stopped by a previously set regulator.—W. H. C.

Measuring gaseous fluids; Automatic recording apparatus for ——. C. F. Simon, Stolberg, Germany. Eng. Pat. 14,218, June 15, 1911. Addition to Eng. Pat. 19,169 of 1909, dated Nov. 2, 1908.

In working the apparatus described in the chief patent (this J., 1910, 1144), it was found that if sufficient clearance were allowed between the cylinders to prevent sticking, then an error was introduced, as the alteration in the size of the aperture due to the clearance space was not taken into account. This is overcome by employing only one cylinder, which is stationary, with vertical slots on each side. The variation in the width of the slots according to the fluctuations of pressure is effected by means of a spring-controlled slide, and the variation in the vertical height of the slots is effected as the result of varying weights of gaseous fluid passing by a closely fitting piston, working within the cylinder. The leakage space between the slide and the cylinder is of constant width and varies in height at the same rate as the main opening. The wire carrying the recording pen passes over a compensating cam-disc.—W. H. C.

Grinding mills. F. L. Daggett, Boston, Mass., U.S.A. Eng. Pat. 16,941, July 24, 1911.

The mill consists of an outer fixed and an inner rotating grinding surface. The grinding surfaces have cylindrical zones at the inlet end of the mill, and frustro-conical zones extending from the cylindrical zones to the outlet end.
—W. H. C.

Concentrating liquids; Apparatus for ——. P. Kestner, Lille, France, Assignor to Kestner Evaporator Co., Philadelphia, Pa. U.S. Pat. 1,013,091, Dec. 26, 1911.

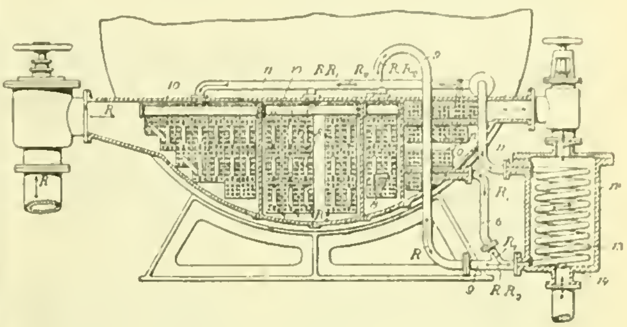
The heated liquid to be evaporated passes first into an expansion chamber where vapour is given off, and from the bottom of this chamber it flows to the bottom of the vertical evaporator tubes which are surrounded by a heating jacket. The vapour from the upper part of the expansion chamber is conducted by a separate pipe and discharged into the lower ends of the vertical evaporator tubes by jets which project some distance vertically into the vertical tubes.—W. H. C.

Evaporating apparatus. E. A. Barbet. Fr. Pat. 432,570, Oct. 6, 1910.

The claim is for a separator serving as a reservoir and spray catcher which is used in conjunction with a tubular evaporator. The latter is curved to allow the tubes to be increased in length so as to give a greater heating surface, without involving such an increase of liquid pressure as to prevent the formation of bubbles of vapour
—W. H. C.

Evaporating apparatus; Device for increasing the heating surface and diminishing the consumption of steam in ——. R. Kottek. Ger. Pat. 240,787, May 11, 1910.

In place of the usual bolts in the intermediate spaces of the groups of tubes heated by the return steam, tubes are arranged, and these are connected by means of knee-bends, 8, with coils, the lower ends of which open into the respective chambers, whilst the upper ends communicate by means of tubes, 10, 11, with a coil, 13, contained in a casing, 12, through which the fresh steam passes. This coil is supplied with fresh steam by an injector, 14, and by means of the tubes, 6, 9, with the whole of the return steam from the different compartments of the evaporator. In this way circulation of the steam is obtained, the return steam (R, R_1, R_2) being renewed and heated by fresh steam and used again.—A. S.



Furnaces or kilns: Apparatus for heating ——. W. R. Dunn, Easton, Pa. U.S. Pat. 1,013,379, Jan. 2, 1912.

The powdered fuel is fed from the bottom of a storage hopper by means of a horizontal worm-conveyor into a funnel-shaped vessel, the lower end of which opens directly into a horizontal ejector tube, whence it is carried along into the burner nozzle by means of compressed air. The burner nozzle consists of a cylindrical chamber surrounding the end of the ejector tube and on which it fits loosely, this chamber being tapered to a narrower cylindrical tube which projects into the furnace: a lateral pipe is attached to this chamber for the introduction of an auxiliary supply of hot air drawn from the clinker pit. The aperture in the furnace wall through which the burner passes is cylindrical for the outer portion and then expands conically into the furnace, and means are provided whereby the burner nozzle may be inserted to varying distances along the cylindrical part of this aperture.
—B. G. McL.

Rotary kilns. L. Bahler. Fr. Pat. 432,757, July 29, 1911.

The interior of the rotary kiln is provided with longitudinal partitions attached to an axial shaft. As the kiln rotates, these partitions move round, but their motion is limited by catches fastened to the shell of the kiln, so that a to and fro movement is imparted to them.—W. H. C.

Distillation of liquids immiscible or incompletely miscible with water; Process for the fractional ——. K. Kubierschky. Ger. Pat. 241,667, Dec. 7, 1909.

The distillation is effected by means of direct steam, and in order to recover the distillation residue in an anhydrous condition, this is heated indirectly by steam in a separate chamber below the distilling column, the steam thus evolved being passed again into the distilling column, whilst the residue is drawn off in an anhydrous condition.—A. S

Cooling plates for rectifying columns for volatile products; System of ——. E. A. Barbet. Fr. Pat. 432,569, Oct. 6, 1910.

The column is divided into sections, D, D^1, D^2, D^3 (see Fig. 1), each of which is cooled by a system of pipes, shown in Fig. 2. The water flows from the reservoir, A, through the pipe, B, M, enters the coils through the branches, *b*, and returns to the tank, A, by the branches, *c*, and the pipe, C, N. The tank, A, has a coil, S, through which cold water is circulated. The arrangement forms a thermosiphon, the cold water flowing down B, M, and the warm water returning by N, C. These pipes are provided with thermometers, T, T′, and the regulation is effected by the tap, B.—W. H. C.

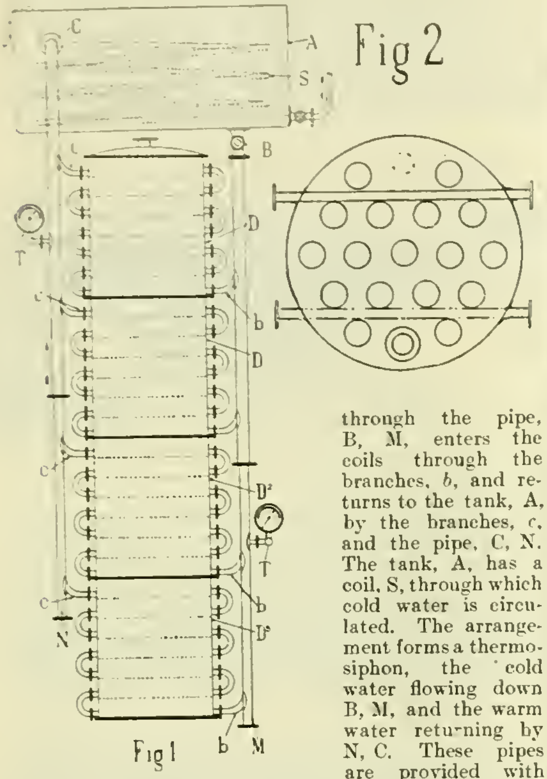


Fig 2

Fig 1

Recovery arrangement for machines and apparatus working with inflammable liquids. Maschinenbau-Ges. Martini und Hüneke m.b.H. Fr. Pat. 433,251, Aug. 16, 1911. Under Int. Conv., Sept. 10, 1910.

The machine or apparatus is enclosed in a vapour-tight casing and a current of non-oxidising gas is circulated through the apparatus by a fan. The gas leaves the apparatus saturated with the vapour of the inflammable liquid and passes through a condenser and separator, where the vapour is condensed and the condensed liquid separated. It is afterwards returned to the casing by the fan, which is provided with an automatic regulating device for regulating its speed so that the pressure within the apparatus is kept constant.—W. H. C.

Gases; Purification of —— from dust, condensable vapours, etc. E. Wagener. Ger. Pat. 241,042, July 27, 1910.

The gas and washing liquid are passed through a helical conduit, and this conduit and the casing surrounding it, are made to taper in the direction of flow, so that the mixing of the gas and liquid gradually becomes more and more complete, until finally a kind of emulsion is formed, which ensures a very intimate contact of the washing liquid with the gas.—A. S.

Separation and dehydration of vegetable, animal, or mineral substances by electro-osmosis. B. Schwerin. Ger. Pat. 241,177, Jan. 26, 1911. Addition to Ger. Pat. 181,841, May 2, 1906 (see Eng. Pat. 10,024 of 1907; this J., 1907, 955).

According to an earlier addition to the chief patent (see Ger. Pat. 233,281; this J., 1911, 605), electrolytes were added to the mixture before subjecting it to the action of an electric current. When the suspended particles are of an electrically inert character, they may travel to one or other of the electrodes after the addition of an electrolyte, but they do not adhere firmly, and the dehydration is very imperfect. According to the present patent particles of such a character are rendered electrically active by allowing them to adsorb colloidal substances (humic acid, silicic acid, aluminium hydroxide) of pronounced electropositive or electro-negative character.—A. S.

Mixing of pasty masses or liquids permeated by crystals; Apparatus for ——. G. Roock. Ger. Pat. 241,918, Aug. 14, 1910.

Bell-shaped vessels are placed in the liquid, and the latter is moved up and down inside these vessels by means of compressed air and of a vacuum. The vessels, and also stirring arms disposed inside them, are rotated around a vertical axis. The compressed air may be supplied to the stirring arms as well as to the interior of the vessels. —A. S.

Distribution of liquids [in absorption towers, etc.]; Apparatus for the even ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 29,902, Dec. 23, 1910.

See Fr. Pat. 421,952 of 1910; this J., 1911, 526.—T. F. B.

Evaporation boilers. P. Piccard, Geneva, Switzerland. Eng. Pat. 13,005, May 30, 1911. Under Int. Conv., June 10, 1910.

See Ger. Pat. 238,739 of 1910; this J., 1911, 1301.—T. F. B.

Evaporation apparatus. Soc. d'Exploitation de Procédés Evaporatoires Système Prache et Bouillon, Paris. Eng. Pat. 14,492, June 19, 1911. Under Int. Conv., June 30, 1910.

See Fr. Pat. 428,851 of 1910; this J., 1911, 1240.—T. F. B.

Filter-press; Automatic ——. E. H. Alvord, Seattle. Assignor to H. H. Taber, Tacoma, Wash. Reissue No. 13,351, dated Jan. 9, 1912, of U.S. Pat. 894,966, Aug. 4, 1908.

See this J., 1908, 886.—T. F. B.

Filtering liquids; Process for ——. S. Bornett. Fr. Pat. 433,211, Aug. 12, 1911.

See Ger. Pat. 241,710 of 1909; preceding.—W. H. C.

Dry-pan [grinding mill]. R. C. Penfield, New York. Reissue No. 13,356, dated Jan. 9, 1912, of U.S. Pat. 974,180, Nov. 1, 1910.

See Eng. Pat. 24,660 of 1910; this J., 1911, 805.—T. F. B.

Casks, barrels, or the like, Process for tightening —— B. Diamand, Idaweiche, Germany. U.S. Pat. 1,013,137, Jan. 2, 1912.

See Eng. Pat. 5206 of 1909; this J., 1909, 1239.—T. F. B.

Vaporizing the volatile constituents of liquids; Method of and apparatus for ——. C. H. Köhn, Leipzig-Lindenau, Assignor to E. Munster, Leipzig, Germany. U.S. Pat. 1,013,881, Jan. 9, 1912.

See Fr. Pat. 417,209 of 1910; this J., 1911, 15.—T. F. B.

Gases and vapours under pressure; Apparatus for measuring ——. Chem. Fabr. Rhenania. First Addition, dated June 20, 1911, to Fr. Pat. 417,296, June 20, 1910.

See Eng. Pat. 14,218 of 1911; preceding.—T. F. B.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal in storage; Deterioration and spontaneous heating of ——. H. C. Porter and F. K. Ovitz. J. Ind. Eng. Chem., 1912, 4, 5—8.

An account of an investigation carried out by the U.S. Bureau of Mines on the deterioration of coal on storage.

With New River coal, largely used by the U.S. Navy, there was a loss of less than 1 per cent. in calorific value (calculated to "coal substance free of moisture, sulphur, and corrected ash") when a 300 lb. sample was exposed in the open for 1 year. There was practically no loss in samples submerged in sea water or in fresh water. Pocahontas run of mine coal, a steaming and coking coal, which is the principal fuel used in the Panama Canal work, lost less than 0·4 per cent. in calorific value by exposure for 1 year. Pittsburg coal, a rich coking and gas coal, suffered no loss in calorific value by exposure for six months. Wyoming coal, a sub-bituminous coal or black "lignite," lost 5·3 per cent. of its calorific value in 2¾ years and as much as 3·5 per cent. during the first three months' exposure. Storage under water prevents loss of calorific value and as it also prevents spontaneous combustion, may be advantageously adopted in some cases, but there is the great disadvantage that some kinds of coal retain a large proportion of water after draining, and fuel would be consumed in the evaporation of this water. The authors also discuss the question of the spontaneous combustion of coal (compare Threlfall, this J., 1909, 759) and the following recommendations are put forward: (1) Coal should not be piled more than 12 feet deep, nor so that any point in the interior will be more than 10 ft. from an air-cooled surface. (2) If possible, only lumps should be stored. (3) Handling of the coal should be reduced to a minimum in order to avoid production of dust. (4) Lumps and fines should be distributed on the pile as evenly as possible, care being taken that lumps do not roll down and form air passages at the bottom. (5) The coal should be re-handled and screened after 2 months. (6) External sources of heat should not be allowed near the pile. (7) The coal, after mining, should be "seasoned" for 6 weeks before storing in piles. (8) Alternate wetting and drying of the coal should be avoided. (9) Admission of air to the interior of the pile through interstices or porous foundations should be avoided. (10) Ventilation by pipes should not be attempted.—A. S.

Coal-dust; Experiments on liquid mixtures for laying ——. W. M. Thornton. Trans. N. Eng. Inst. Min. Eng., 1911, **62**, [1], 14—34.

The object of the experiments was to prepare a liquid mixture capable of fixing, at a reasonable cost, the fine coal dust left on dusty surfaces, after most of it had been removed by mechanical means. Figures representing the wetting power (for coal dust) of a number of liquids are given. It was not found possible to obtain a mixture composed entirely of non-combustible materials which would satisfactorily wet and bind fine coal dust, but good results were obtained in the laboratory with a mixture composed of 10 parts of a 5 per cent. solution of water glass, 1 part of a 5 per cent. solution of a liquid rosin soap, and 1 part of commercial carbolic acid. With this mixture the dust is readily wetted and a thin layer sets like hard distemper; the effect of the small proportions of combustible materials (soap and carbolic acid) is considered to be more than neutralised by the water glass. Some tests in a colliery, using a tub sprayer, failed to give satisfactory results with respect to the binding of the dust, and it appears probable that in order effectively to fix the fine dust left on timbers, etc., after sweeping or brushing, hand spraying would have to be employed.—A. S.

Carbonisation of coal. V. B. Lewes. J. Roy. Soc. Arts, 1911–12, **60**, 135—145, 172—180, 188—197, 216—226.

(1) *The composition of coal.*—In the author's view, coal consists of an agglomerate of the solid degradation products of vegetable decay together with such of the original bodies as have resisted to a greater extent the actions to which they have been subjected. Among the latter bodies the resin constituents are very important, as it seems probable that the proportion of these constituents in the original vegetation determines in large measure the nature of the coal produced. Thus, where the proportion of resins is small, the humus, which is the first decomposition product of the woody matter, undergoes complete degradation and an anthracite would be formed, but where the proportion of resin is greater, the mass ultimately becomes cemented together by the resin as the humus decomposes, and at last a residue of the humus is protected from further rapid change and a bituminous coal results. If the percentage of resin has been very high, as in the drifted deposit of spores of lycopodia, and the temperature becomes high, the resin bodies may become semi-liquid and mingle with surrounding earthy deposits, forming such substances as Boghead cannel, or may be distilled into the underlying clay, yielding some forms of shale. The hydrocarbons produced by the effects of heat and pressure on the resins also act as binding agents, so that bituminous coal may be regarded as composed of a basis of humus bodies and their degradation products down to carbon, cemented together by hydrocarbons and resins. The terms "humus" and "resin" bodies are used to denote classes of bodies of this character rather than distinctive compounds, humus bodies all containing a percentage of hydrogen from 5 per cent. downwards, and resin bodies containing above 5 per cent. of hydrogen. The methods and results of determinations of the composition of coal by analysis, *e.g.*, extraction by solvents, and by distillation are discussed. It is pointed out that in the case of extraction by pyridine, the very large soluble portion, which, in some cases, may actually exceed in amount the volatile portion as determined by distillation, may be due to the formation of compounds of pyridine with the soluble constituents. As regards methods of classification of the different coals, the author prefers Gruner's classification based upon their coking properties (Ann. des Mines, s. 7, 1873, iv., 182; Percy's Metallurgy, Fuel, etc., 1875, p. 302). He regards the evidence as conclusive that pitch is not a primary constituent of coal. The resin bodies in coal account for the effect of weathering when coal is exposed to air, being converted into humus bodies in the process.

(2) *The methods employed in the destructive distillation of coal.*—The author deals historically with the various processes which have been used. With regard to gas manufacture it is pointed out that the modern tendency to obtain a maximum volume of gas, *e.g.*, 13,000 cub. ft. per ton of coal, by means of high temperatures, to the detriment of the lighting value of the gas and of the quality of the tar, is likely to be modified:—(1) By the introduction of carbonisation in bulk in vertical retorts, and (2) By packing the old horizontal retorts full of coal instead of only partly filling them, whereby an almost equal yield of gas of better quality and a better quality of tar are obtained. As regards coke manufacture, it is estimated that the various methods of coking give approximate yields as follows, for a good coking coal containing 87 per cent. of carbon:—

Carbonised	in	heaps	61 per cent.
,,	,,	beehive ovens	64 ,,
,,	,,	Appolt and Coppée ovens	68 ,,
,,	,,	modern recovery ovens	68–77 ,,

In spite of the large economies effected by the modern recovery coke ovens, less than one-third of the coal used for coking is carbonised in such ovens, owing to the fact that they are not suitable for working with the "fat" gas coals of the North of England, which froth and swell during carbonisation. Hence the beehive oven continues to be used for these "fat" coals notwithstanding its disadvantages on the grounds of economy and pollution of the atmosphere. The following statement shows the approximate results of carbonisation of a ton of coal for gas and coke making respectively, under the best conditions:—

	Coke.	Gas.
Gas making	13 cwt. of inferior coke, less 2·6 for heating.	12,500 cub. ft. of 15 candle-power gas.
Coke making	14·2 cwt. of superior coke	9,500 cub. ft. of 10 candle-power gas, less 4,500 for heating.

(3) *The thermal conditions existing during the carbonisation of coal.*—The thermal value of coal only agrees with that calculated theoretically from the composition in the case of anthracite or similar coals, whereas in coals containing more than 3 per cent. of oxygen the thermal value is in excess, so that such coals are endothermic. Making allowance for this fact the heat required to carbonise an

average English coal containing about 32 per cent. of volatile matter and 7 to 8 per cent. of oxygen, under favourable regenerative conditions, is set out as follows :—

Used in retort	1. Decomposition and distillation	21·4	per cent.	54·1
	2. Escaping in gas vapours	13·8	,,	
	3. In hot coke	18·9	,,	
Used in setting	1. Flue gases	25·2	per cent.	45·9
	2. Radiation and convection ...	19·9	,,	
	3. Ash	0·8	,,	

The author discusses the rate of heat transference through the walls of retorts, and the temperatures existing at different parts of the charge. In the case of retorts filled with coal, the heat advances slowly into the mass, so that the centre of the charge becomes a tube surrounded by a pasty mass, and the gases escape through this tube without becoming overheated in the crown of the retort, the effect being to improve both gas and coke, as the former escapes at a lower temperature, whilst the latter is enriched by the residue of the tar which condenses in the central core during the earlier portion of the distillation. When the central core becomes choked with condensed tar, the gas forces its way through the outer layers of highly heated coke and is partly decomposed thereby. The gas produced at different periods of the distillation, is thus of different quality, and similar considerations apply in any type of retort, to the gases produced near the mouth of the retort, as compared with the gases from the far end thereof. The gas and tar obtained are a mixture of the results of everything from low temperature distillation for a short period to high temperature distillation for a long period. From these considerations the author concludes that in the destructive distillation of coal for the manufacture of gas, there is no one factor of uniformity in any part of the process, and that attempts to trace the course taken in the decomposition of such a complex body as coal under such conditions, are not likely to meet with success.

(4) *The possible improvements in carbonisation.*—The experience gained in the manufacture of "coalite" has thrown much light upon the nature of the primary distillation products of coal as distinct from the secondary products formed by the decomposition of the primary products at higher temperatures. The distillation at from 400° to 500° C. of a gas coal containing from 30 to 33 per cent. of volatile matter yields 68 to 70 per cent. of low-temperature coke containing 10 to 14 per cent. of volatile matter and a volume of gas varying from 3,000 to 5,000 cub. ft. The gas approximates to the following composition :—hydrogen 27·5, methane 48·0, other saturated hydrocarbons 10·1, unsaturated hydrocarbons 3·0, carbon monoxide 7·3, carbon dioxide 2·5, nitrogen 1·6, hydrogen sulphide 1·8. The low-temperature tar is as distinctive as the gas. It has the sp. gr. about 1·075, is very liquid, contains an abundance of light solvent oils, very little aromatic hydrocarbons and phenol, but large quantities of cresol, no naphthalene, and very little anthracene, whilst the free carbon is as a rule below 2 per cent. The low percentage of benzene is made up for by the presence of paraffins such as hexane, heptane, and octane, and also naphthenes or hexahydrobenzenes. These primary products of distillation undergo analytic and synthetic actions on heating to higher temperatures, yielding gas and tar similar to those produced in the ordinary process of manufacture. When a good Durham coal is carbonised under ordinary conditions to give 11,000 cub. ft. of gas per ton, 45 per cent. of the volume of gas may be regarded as low-temperature gas of 22 candle-power, 42 per cent. (of 2½ to 3 candle-power) as derived from the pitch residues left in the low-temperature coke and distilled at a high temperature, and the remaining 13 per cent. (of 10 candle-power) as derived from the various secondary actions and tar, the resulting mixed gas being of 14 or 15 candle-power.

In the new methods of carbonisation giving 13,000 cub. ft. of gas, the improvement is entirely due to the free escape, without over-heating, of the products from the first two-thirds of the coal carbonised, whilst the extra volume of gas is obtained from the complete degradation of the products from the remaining third. The author discusses results obtained with the different types of retorts and concludes that the most economical system to adopt is to continue the present horizontal retorts, using full charges, until scrapping of the plant becomes necessary, and then to instal a continuous vertical retort system. The importance of obtaining a good quality of coke in gas retorts as well as a large volume of gas, is emphasised. The author considers that in order to effect improvement, retorts must be designed to give a large clearance space above the charge, so that the primary products of distillation may be subjected to radiant heat whilst being kept out of contact with heated retort surfaces as much as possible. It is suggested that the best form of retort would be a vertical one with (1) a space at the top, (2) semi-intermittent feed and coke removal, (3) a cooling chamber for the coke, (4) secondary air regeneration, and (5) heat concentration at the point where the coal falls on the surface of the coke, the temperature falling to about 800° C. above and below. From 6 to 8 per cent. of the volatile matter should be left in the coke, and from 9.500 to 10.000 cub. ft. of gas capable of dilution with 5.000 cub. ft. of water gas produced.—H. H.

Water-gas ; Application of blue —— to industrial purposes. A. Meade. J. Gas Lighting, 1912, 117, 83—84.

THE author points out that the industrial use of water-gas has made more progress on the Continent than in this country. The most important property of blue water-gas is its very high flame temperature. With preheated air, a temperature above the melting point of platinum is reached and under ordinary conditions the hottest part of the flame is between 2800° and 3000° F. Burnt at a pressure of ½ lb. per sq. in., with air at 2½ lb., in a fireclay-faced burner, it is largely used for pipe welding. For heating purposes it is not necessary to purify it from hydrogen sulphide, but for lighting and power purposes this is necessary. Blue water-gas contains so much hydrogen that it is not very suitable for gas engines, as it cannot be highly compressed. For incandescence lighting, with suitable arrangements, the results are equal or superior to those obtained with ordinary coal gas. It is also finding application for the preparation of hydrogen by liquefying or freezing out the other constituents, and is being used by cement manufacturers to heat their rotary furnaces.—W. H. C.

Petroleum ; Formation of the chief constituents of ——. C. Engler. Petroleum, 1912, 7, 399—403.

AN extension of the author's theory of the production of petroleum from organic remains (see this J., 1908, 932). The residual fatty substances (including waxes, resins, etc.) left after decomposition (putrefaction) of the protein, cellulose, etc., are considered to be gradually converted into anabitumen, soluble in benzene, carbon bisulphide and other organic solvents, which then undergoes further changes into other forms of bitumen (polybitumen, katabitumen, ecgonobitumen or crude petroleum, oxybitumen or asphaltum), (see also Chem.-Zeit., 1912, **36**, 65—66, 82—84). The results of recent work by the author, in conjunction with Routala and Halmai (see this J., 1910, 10, 338) are then adduced in order to explain the formation of the different types of natural petroleum from a common source.—A. S.

Transformer oil ; Characteristics of a ——. A. Berninger. Mitt. K. K. Techn. Gewerbe-Museums in Wien, 1911, 21, 211—217.

A TRANSFORMER oil, consisting of a mixture of mineral oil and rape oil, was examined by the methods previously described (this J., 1911, 696). It gave the following results :—Viscosity at 14° C., 21·92° and at 50° C., 3·37° (Engler) ; flash-point (open test), 192° C. (corr.) ; ignition temperature, 224° C., and acidity (as SO_3), 0·016 per cent. In the tests of the dielectric potential, sparking took place in the unheated oil at an effective tension of 12,900 volts (25° C.) in 14 to 18 seconds, whilst, after once being heated the oil did not allow passage of the spark below 16,400 volts at 22·6° C, and, after a second heating, below 41,000 volts at 22·6° C. in approximately the same time. The oil after about 150 discharges, was considerably darker, but did not show any material alterations in its viscosity and ignition temperature. Experiments with this and other unheated transformer oils showed that the resistance per 1 c.c. varied between 40° and 100° C. in accordance with the equation

$$(t-a)\ (W-b) = C,$$

where a represents, in the mean, 20·2° C.; b, 138,000 megohms, $C=13{\cdot}23{\cdot}10^6$; t, the temperature of the oil in ° C.; and W, the resistance in megohms per c.c. The dielectric potential at 25° C. and at 5 mm. distance between the electrodes was determined at different high tensions with this oil, and the results were plotted in a curve in which the ordinates represented the effective tensions in kilo-volts and the abscissæ the different times required for sparking. The shape of the curve indicated that the limiting voltage below which no sparking would take place even after a prolonged period, was 11,050 volts. (See also this J., 1912, 62).—C. A. M.

Petroleum; Examination of mixtures containing ——. J. H. Coste, E. T. Shelbourn, and E. R. Andrews. Analyst, 1912, 37, 8—12.

In view of the decision of the Privy Council in 1907 that the Petroleum Acts of 1871 to 1881 shall apply to all mixtures which contain "petroleum" and have a flash point of less than 73° F. in Abel's apparatus, and of the fact that other substances besides petroleum products with a flash-point below 73° F. are used in the preparation of paint solvents, enamels, etc., it is necessary to make a systematic examination before asserting that a sample showing a low flash-point necessarily contains petroleum within the meaning of the Acts. If the mixture is wholly miscible with water it cannot contain any notable quantity of the low-flashing petroleum hydrocarbons. All soluble constituents (alcohol, acetone, ether, etc.) may be removed by washing with water (*cf.* Nash, this J., 1912, 33), after which the sample should be dried with calcium chloride and its flash-point again determined; whilst viscous liquids containing fixed oils may be distilled alone or in a current of steam. After this treatment only hydrocarbons, their chlorine derivatives, amyl alcohol or acetate, and carbon bisulphide are likely to be present. The hydrocarbons may contain terpenes, paraffin, and cycloparaffins, and aromatic hydrocarbons. Terpenes may be separated by Armstrong's method (this J., 1882, 480; 1910, 438; 1911, 698), which also removes the amyl compounds if present; but in the latter case the acid must be separated before the distillation with steam. The presence of chlorine derivatives in the residual liquid may be ascertained by diluting 1 c.c. thereof with 2 c.c. of alcohol in a porcelain capsule, which is placed in a beaker covered with a clock glass, on the under side of which is suspended a drop of silver nitrate solution. The appearance of silver chloride in the drop, on igniting the mixture in the capsule, indicates the presence of a chlorine derivative. Unless carbon bisulphide or substances such as nitrobenzene are present, a sp. gr. above 0·9 will indicate the presence of chlorine compounds (trichlorethylene, sp. gr. 1·4702 at 17·5° C.; tetrachlorethane, sp. gr. 1·6013 at 17° C.; carbon tetrachloride, sp. gr. 1·6095 at 12·3°/4° C.). Conversely a sp. gr. below 1·47 suggests the addition of lighter substances to chlorine compounds. As a rule, any mixture which flashes below 73° F. after being freed from alcohol, ether, and acetone, must contain "petroleum." The presence of chlorine compounds raises the flash-point of other liquids. In the case of a mixture of aromatic and aliphatic hydrocarbons and chlorine derivatives of the latter, the aromatic hydrocarbons may be separated by careful nitration, followed by fractional distillation or sulphonation; but if terpenes have been found a deduction of from 5 to 10 per cent. should be made from the amount of aromatic hydrocarbons, on account of the cymene formed when turpentines are polymerised. The paraffins and cycloparaffins in admixture with chlorine compounds may be determined approximately from the physical properties of the mixture and its probable constituents.—C. A. M.

Asphaltum; Examination of ——. H. Loebell. Chem.-Zeit., 1912, 36, 4—5; 22—23.

The physical characteristics of a sample of asphaltum are shown by a number of examples to be of greater importance than the question whether it is a natural or a petroleum product. Thus in the case of an asphaltum tested in Berlin, the bitumen was found to be of natural origin, but it was so brittle that it could be powdered with a glass rod. An asphaltic material containing about 78 per cent. of such bitumen would be quite unusable, whatever its origin, until it had been mixed with a "flux." The nature of the mineral constituents also has an influence upon the behaviour of asphaltum, and may afford a means of judging between two different samples. Marcusson and Eickmann (Chem.-Zeit., 1908, 965) devised the following modification of Richardson's method of distinguishing between natural and petroleum asphaltum (The Modern Pavement, p. 509):—Ten grms. of the bitumen are dissolved in 15 c.c. of benzene, and the solution poured into 200 c.c. of petroleum spirit (b. pt. 80° C.) to precipitate asphaltenes. The liquid is separated from the precipitate, shaken with three successive portions of 15 c.c. of concentrated sulphuric acid to remove colouring matters, washed with alkali and water until free from acid, and distilled. In the case of natural asphaltum the residue was stated to be fluid at 20° C., whereas petroleum products yielded a viscous residue containing particles resembling vaseline. In a critical examination of this method, the author cites examples which show that in the case of mixtures of natural and petroleum asphaltum the proportion of oily constituents will depend, in the main, not upon the quantity, but upon the nature of the petroleum product. According to Marcusson, natural asphaltum may contain from 3 to 34 per cent., and petroleum asphaltum from 26 to 58 per cent. of oily constituents, so that mixtures may be prepared containing any given proportion of petroleum asphaltum without raising the amount of oily constituents above the upper limit for the natural product. The nature of the oily constituents may also be inconclusive. Thus a sample of asphaltum examined by the author yielded 34 per cent. of a reddish-brown oil, which was fluid at 20° C., and contained no vaseline or paraffin wax particles. This indicated a natural product, whereas the amount of paraffin wax (1·9 per cent.) suggested a petroleum asphaltum, whilst the sulphur (1·8 per cent.) approached the lower limit for a natural asphaltum. Since, therefore, the oily constituents may afford such doubtful evidence, their separation must be regarded as superfluous, the more so since the determination of the paraffin wax is usually the decisive factor. With regard to the paraffin wax (see this J., 1902, 690: 1911, 528) it is pointed out that the presence of a considerable quantity indicates a petroleum asphaltum, but that a small proportion does not necessarily prove the absence of a petroleum product. Thus many of the petroleum residues from Bustenari contain at most 1 per cent., and usually less than 0·5 per cent. of paraffin wax, whilst certain Austrian products contain none at all, and American petroleum residues with only 0·5 per cent. of wax are being imported into Germany in large quantities. On the other hand, natural asphaltum containing considerably over 1 per cent. of paraffin wax has recently been discovered in Switzerland. —C. A. M.

Paraffin wax analysis; Application of the formolite reaction in ——. F. Sommer. Petroleum, 1912, 7, 409—410.

The author has found that the oily or liquid constituents of paraffin wax consist largely of unsaturated hydrocarbons, and that these are the cause of the tendency to become yellow shown by many samples of paraffin. The content of these unsaturated hydrocarbons can be determined by means of the formolite reaction (see this J., 1904, 1082; 1911, 201) in the following way:—20 grms. of the paraffin are melted, treated with 20 c.c. of concentrated sulphuric acid, and 20 c.c. of formaldehyde added gradually, with agitation. The mixture is heated on the water bath for 20 mins., with occasional agitation, cooled, the cake of paraffin removed, and the residual solution diluted with water, and extracted with chloroform.

The chloroform solution is evaporated and the residual formolite dried at 105° C. and weighed. In 10 samples, formolite numbers ranging from 0·02 to 1·55 per cent. were obtained, and on exposing portions of the same samples of paraffin to diffused sunlight, the tendency to become yellow was found to be greater the higher the formolite number.—A. S.

Petroleum production and exports of the United States. Oil, Paint, and Drug Rep., Jan. 22, 1912. [T.R.]

THE production of petroleum in 1911, according to the preliminary report of the United States Geological Survey, increased slightly over the figures of 1910; moreover, the industry assumed a steadier condition, owing to the absence of the very disturbing incidents of 1910, such as the bringing in of the Lakeview gusher and other great wells in California. The following table gives a comparison of the final figures for 1910 and the estimated output for 1911 :—

	1910. Barrels.	1911. Barrels.
Appalachian field	31,985,515	28,000,000
California	73,010,560	81,000,000
Kansas and Oklahoma	53,157,386	56,000,000
Louisiana	6,841,395	10,000,000
Texas	8,899,266	9,000,000
Miscellaneous	35,661,926	33,000,000
Total	209,556,040	217,000,000

The exports of various kinds of mineral oils during 1910 and 1911 is shown in the following table :—

	1910.		1911.	
	Quantity galls.	Value.	Quantity galls.	Value.
Illuminating oil	932,443,617	$55,053,884	1,096,226,564	$60,083,738
Lubricating oil	158,866,676	20,044,921	177,387,371	22,332,326
Naphthas	79,059,528	6,481,686	110,741,439	9,249,204
Crude	119,630,159	3,572,252	122,791,300	3,861,599
Residuum	107,095,460	3,414,376	115,498,246	3,409,928
Totals	1,397,095,440	$88,567,119	1,622,644,920	$98,036,795

Fire extinction [petroleum, tar, etc.] by frothy mixtures. *See* I.

PATENTS.

Briquettes; Manufacture of smokeless fuel ——. S. O. Cowper-Coles, London. Eng. Pat. 2003, Jan. 26, 1911.

THE briquettes are made from anthracitic coal containing about 8 per cent. of volatile matter, mixed with bituminous coal containing about 32 per cent. of volatile matter. The mixture, containing about 16 per cent. of volatile matter, is briquetted, using tar and pitch as binder, and the briquettes are heated to 500° C. for two hours. —A. T. L.

[Fuel] Briquette. C. T. Malcolmson, Chicago, Ill. U.S. Pat. 1,012,676, Dec. 26, 1911.

BRIQUETTES are made from anthracite coal with a binder consisting of pulverised pitch mixed with bituminous coking coal. The materials are heated until the pitch liquefies, and are then cooled to a suitable temperature for briquetting.—A. T. L.

Agglomerant for fuel briquettes; Smokeless and odourless ——. E. M. Heckel. Second Addition, dated July 7, 1911, to Fr. Pat. 402,247, April 20, 1909. (Compare this J., 1912, 20).

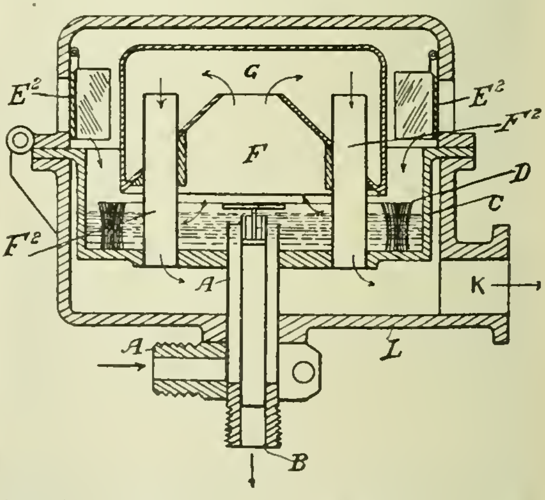
FUEL briquettes are agglomerated by means of about 1 per cent. of a starchy material treated with aluminium sulphate, alum, or the sulphates of zinc, copper, iron, magnesium or manganese, instead of by chromium salts as in the principal patent.—H. H.

Coke ovens; Vertical ——. A. O. Jones, Whitley Bay, Northumberland. Eng. Pats. 30,374, Dec. 31, 1910, and 948, Jan. 13, 1911.

THE patent relates to apparatus of the kind described in Eng. Pat. 19,812 of 1909 for discharging coke through a removable sole-plate closing the bottom of the retorts, comprising a wheeled truck carrying an hydraulic plunger for supporting the sole-plate while the fastenings are released, and for lowering the sole-plate. According to this invention, an hydraulic accumulator is provided on the truck for storing the energy given up by the lowering of the sole-plate, so as to provide power for replacing the sole-plate and for moving the lowered sole-plate laterally in order to discharge the coke into a truck. The sole-plate is lowered so as to rest on a second truck carried by the first, and this second truck is then moved along the first by hydraulic or other power and discharges the coke into the forward end of a coke-trolley. An automatic coupling connects the coke-trolley with the first truck until the second truck has been moved as described, when the coupling becomes disengaged.—A. T. L.

Gaseous fuel; Production of ——. A. W. Southey, London. Eng. Pat. 29,501, Dec. 19, 1910.

GASEOUS fuel for internal-combustion engines is produced from liquid hydrocarbons by burning a portion thereof in such a way as to convert the greater part into a fixed gas enriched with the vapourised hydrocarbons. The apparatus (see fig.) comprises a closed chamber, L, containing a shallow tray, C, supplied with hydrocarbon by a pipe, A, and provided with an overflow pipe, B. A baffle, F, G, in the space above the liquid carries down-pipes, F^2, which lead the gases to an outlet, K. In operation, air is drawn in through large valves, E^2, by the suction of the engine, and passes beneath the baffle and burns with the oil at an asbestos wick, D. The combustion



products, together with fixed and condensable gases from the heated liquid are drawn through the tubes, F^2, and outlet, K, to the engine. The air inlets are larger than the gas outlet in order that the pressure in the apparatus may not fall below atmospheric.—A. T. L.

Gas; Generation of —— from liquid fuel. A. W. Southey, London. Eng. Pat. 2954, Feb. 6, 1911.

In apparatus of the kind described in Eng. Pats. 26,749 of 1909 and 29,501 of 1910 (see preceding abstract), the liquid fuel is heated prior to combustion by passing the flame and combustion products around or beneath the fuel trough or through tubes passing through the liquid. —A. T. L.

Gas poor in oxygen; Preparation of —— under pressure. H. von Eicken. Fr. Pat. 432,912, June 28, 1911 Under Int. Conv., "June 29, 1911."

A single-cylinder internal combustion engine is combined with a gas compressor which compresses the exhaust gases. The cylinder of the compressor is of the same size as, and arranged parallel to, that of the engine, and both engine and compressor work upon the same crank shaft, the cranks being disposed at 180° to give a balanced effect. The exhaust gases from the engine pass through a cooling chamber into a storage chamber from which the compressor draws the gas and compresses it.—H. H.

Producer-gas; Making —— from liquid hydrocarbons. H. A. Grine, Los Angeles, Cal., Assignor to F. C. Nelles, Los Angeles, Cal., and G. R. Harrison, San Diego, Cal. U.S. Pat. 1,013,013, Dec. 26, 1911.

The producer comprises a primary chamber in which partial combustion of the liquid fuel takes place, and a secondary chamber in which the products of combustion pass through a bed of carbonaceous material to the interior of which air is also admitted. The liquid fuel is admitted at the top of the primary chamber near one end and runs in cascade form down the stepped end-wall, horizontal air inlets being formed in each step of the cascade. The secondary chamber, which communicates at the top with the top of the primary chamber, is packed with rows of hollow tiles forming perforated air flues. The interstices between the rows become packed with carbonaceous deposit from the partially burnt oil, through which the gases have to pass.—A. T. L.

Water-gas; Conversion of carbon monoxide in —— into methane. L. Vignon. Second Addition, dated Sept. 26, 1910, to Fr. Pat. 416,699, Aug. 12, 1909 (see this J., 1910, 1366; 1911, 75).

Instead of passing water-gas through a heated mass of quicklime and slaked lime as in the principal patent and the first patent of addition, the quicklime and slaked lime are mixed with the combustible in the gas producer itself in the form of briquettes. Air and steam are admitted alternately, when the following reactions take place:—

(1) $CaO+C+O_2=CaO+CO_2$;
(2) $4C+3CaO+6H_2O=CH_4+3CaCO_3+4H_2$;
(3) $C+CaO+2H_2O=CaCO_3+2H_2$.

The reactions (2) or (3) predominate according to the temperature, which may be regulated by the duration of the air blast and the speed of the current of steam.—H. H.

Gas producers; Generation of steam for —— by direct contact of heated escaping gases with water. Bender und Främbs G. m. b. H. Fr. Pat. 432,950, Aug. 3, 1911.

A small portion of the gases escaping from a gas producer is drawn off through a by-pass, burnt, the products of combustion passed over trays containing water, and the mixture of burnt gases and steam thus produced forced by a fan into the producer.—H. H.

Asphaltum and the recovery of lighter products; Method of and apparatus for treating asphaltic oils for the production of ——. F. H. Dunham, Santa Paula, Cal. U.S. Pat. 1,013,283, Jan. 2, 1912.

A charge of the asphaltic oil is heated to a temperature between 400° and 600° F. in a vessel by heat applied directly to the bottom of the vessel. Asphaltic solution is removed from the bottom of the charge and vapours arising from the solution are condensed outside the vessel, and the unvaporised portion of the solution is returned to the top of the charge in the vessel. Any vapours arising in the vessel are removed, and finally the unvaporised asphaltic solution is withdrawn. The apparatus comprises an extractor vessel, the bottom of which is heated, and outside of which is a condenser casing which is provided inside with a spiral pan. Means are provided for drawing liquid from the bottom of the extractor and delivering it to the top of the pan, for discharging the products of condensation from the condenser, and for returning uncondensed products from the latter to the extractor, and also for discharging vaporised products from the condenser.—W. C. H.

Light petroleum; Production of ——. C. R. Burke Fr. Pat. 432,762, July 29, 1911.

Heavy petroleum is distilled at a low pressure and condensed at a pressure of from 700 grms. to 35 kilos. per sq. cm., a combined suction and force pump between the still and the condenser being employed to effect the required changes of pressure. Natural gas may be passed into the still.—H. H.

Retorts; Construction of —— to improve the quality of the coke. S. Phillips. Fr. Pat. 432,495, July 24 1911. Under Int. Conv., Aug. 4, 1910.

See Eng. Pat. 18,406 of 1910; this J., 1911, 882.—T. F. B.

Gas producers. E. Dor-Delattre, Dorplein-Budel, Holland. Eng. Pat. 14,774, June 21, 1911.

See Fr. Pat. 431,327 of 1911; this J., 1911, 1367.—T. F. B.

Gas; Apparatus for testing ——. Drägerwerk H. und B. Dräger, Lübeck, Germany. Eng. Pat. 24,654, Nov. 6 1911. Under Int. Conv., Nov. 5, 1910.

See Ger. Pat. 236,730 of 1910; this J., 1911, 1141.—T. F. B.

Hydrocarbon emulsion. R. Wallbaum, Charlottenburg, Germany. U.S. Pat. 1,014,103, Jan. 9, 1912.

See Fr. Pat. 423,291 of 1910; this J., 1911, 675.—T. F. B.

Steam generation, feed water heating, and the heating of liquids in general. Eng. Pat. 2404. *See* I.

Extraction of hydrogen sulphide from gases containing it alone or mixed with ammonia. Fr. Pat. 432,590. *See* VII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

Destructive distillation; Method of ——. W. B. McLaughlin, New York, Assignor to The McLaughlin Development Co. U.S. Pat. 1,012,684, Dec. 26, 1911.

The material is distilled in a chamber surrounded by a heating coil through which superheated steam is passed. Every turn of the steam coil also passes through a furnace chamber, so that the distilling chamber is heated uniformly.—A. T. L.

Electric lamps; Regenerating burnt-out carbon and metal filament ——. S. Bloch, Charlottenburg, Germany. Eng. Pat. 16,230, July 13, 1911.

New filaments are mounted in the lamps by means of cemented joints, and the joints are dried and the deposit removed from the bulb at the same time by mounting the lamps in a closed chamber with the caps projecting to the outside, and either heating the chamber to 270°—320° C. or sending a current of hot air through the lamps.

In the former case, the heating may be effected whilst the lamps are connected with the vacuum pump.—A. T. L.

Electric incandescence lamps; Preparation of refractory metallic bodies used in the manufacture of ——. Cie. Franç. pour l'Exploit. des Proc. Thomson-Houston. Fr. Pat. 433,131, Aug. 10, 1911.

To prevent crystallisation in filaments or incandescence bodies made of tungsten, molybdenum, tantalum, titanium, zirconium, thorium, etc., when used with alternating current, or when subjected to prolonged heating, small quantities of certain substances such as the oxides of the rare earth metals are added to the refractory metal. For example, tungsten filaments are made from relatively large grains of reduced tungsten, mixed with 5 to 10 per cent. of the oxides of thorium, zirconium, yttrium, erbium, didymium, or ytterbium. Alternatively, the thorium, etc., may be added before the tungsten oxide is reduced. —A. T. L.

Electric arc lamps; Iron-aluminium electrode for ——. Banque du Radium. Fr. Pat. 433,261. Oct. 22, 1910.

A positive electrode consisting of an aluminium core with an envelope of iron is used with a negative electrode of carbon in order to produce light rich in ultra-violet rays. —A. T. L.

Light: Product for transforming —— *[into light of different wave length]*. P. C. Hewitt. Fr. Pat. 432,483, July 22, 1911. Under Int. Conv., July 23, 1910.

Reflectors or screens for use with light deficient in rays of certain wave-lengths, in order to obtain a reflected or transmitted beam of light having rays of the desired wave-length, are made by means of a varnish containing a fluorescent dyestuff and cellulose acetate together with glycerin or gum. For example, the varnish may consist of 70 parts of cellulose acetate, 10 parts of glycerin, and 20 parts of acetic acid, dissolved in pure acetone to form a 12 per cent. solution, with a quantity of rhodamine equal to 3 per cent. of the weight of cellulose acetate and glycerin. The varnish is spread on a suitable supporting surface, either transparent or light-diffusing, and the acetone and acetic acid are allowed to evaporate. If desired the dried varnish may be removed from the support and used alone.—A. T. L.

Carbonisation; Processes of ——. F. W. Burstall. First Addition, dated June 28, 1911, to Fr. Pat. 431,581, June 24, 1911.

See Eng. Pat. 18,148 of 1910; this J., 1911, 410.—T. F. B.

Gases obtained by distillation or carbonisation of coal or other carbonaceous material; Process and apparatus for treating ——. G. Wilton. Fr. Pat. 432,759, July 29, 1911. Under Int. Conv., Sept. 30, 1910.

See Eng. Pat. 18,176 of 1910; this J., 1911, 1444.—T. F. B.

Incandescent filament. D. Hand, Newark, Assignor to General Electric Co., New York. U.S. Pat. 1,013,599, Jan. 2. 1912.

See Eng. Pat. 5416 of 1908; this J., 1908, 1197.—T. F. B.

III.—TAR AND TAR PRODUCTS.

Fire extinction [petroleum, tar, etc.] by frothy mixtures. *See* I.

[Fractional distillation] Separation of mixtures of substances having nearly identical boiling points and of mixtures of constant boiling point. Golodetz. *See* XX.

Decomposition of trinitrotoluene on heating. Verola. *See* XXII.

Some properties of picric acid, trinitrotoluene and trinitrobenzene. Dautriche. *See* XXII.

Patents.

Naphthanthraquinones; Halogen derivatives of —— *and process for producing them.* F. Ullmann. Fr. Pat. 433,076, Aug. 8, 1911. Under Int. Conv., Oct. 15, 1910.

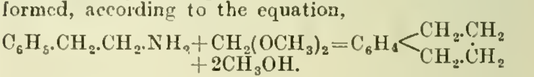
Naphthanthraquinonesulphonic acids in which the sulphonic acid group is in the portion of the naphthalene nucleus furthest removed from the carbonyl group, are readily converted into halogen-naphthanthraquinones on treatment with halogens or substances producing halogens, preferably in presence of a solvent or diluent. *Example.* A boiling aqueous solution of the potassium salt of the naphtanthraquinonesulphonic acid obtained by sulphonating naphthanthraquinone, is treated with hydrochloric acid and sodium chlorate, whereby a chloronaphthanthraquinone is precipitated in the form of yellow crystals, of m. pt. 231° C., readily soluble in acetic acid and in benzene, but soluble with difficulty in alcohol. —T. F. B.

Anthraquinone series; Process for preparing condensation products of the ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pats. 241,837 and 241,838, July 23 and 26, 1910.

(1.) Aminoanthraquinones or their derivatives are combined with halogencarbanilides of the general formula, Hl.R.NH.CO.NH.R.Hl, where Hl represents a halogen and R a substituted or unsubstituted aromatic radicle. (2.) Aminoanthraquinones are condensed with halogen compounds of the type, $Hl.R.NH.CO.(CH_2)_n.CO.NH.R.Hl$, Hl and R representing a halogen and an aromatic radicle, respectively, and n being 0, 1, 2, 3, etc.—T. F. B.

Tetrahydro-isoquinoline and its derivatives; Process for preparing ——. A. Pictet. Ger. Pat. 241,425, April 9, 1911.

When phenylethylamine or one of its derivatives is condensed with methylal in presence of concentrated mineral acids, tetrahydro-isoquinoline or a derivative thereof is formed, according to the equation,



$$C_6H_5.CH_2.CH_2.NH_2+CH_2(OCH_3)_2=C_6H_4\begin{matrix}<\end{matrix}\begin{matrix}CH_2.CH_2\\CH_2.CH_2\end{matrix}+2CH_3OH.$$

—T. F. B.

Para-chloro-meta-cresol; Manufacture of ——. A. Liebrecht, Frankfort on Maine, Germany. Eng. Pat. 7633, March 27, 1911.

See Ger. Pat. 233,118 of 1910; this J., 1911, 611.—T. F. B.

IV.—COLOURING MATTERS AND DYES.

Identification of dyestuffs on textile fibres by the spectrophotometric method. Porai-Koschitz and Auschkap. *See* VI.

Identification of after-chrome blacks on the fibre. Walker. *See* VI.

Composition of Prussian blue. Woringer. *See* VII.

Patents.

Indigo; Reduction of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 29,918, Dec. 23, 1910.

The reduction of indigo to its leuco derivative is facilitated by adding a small amount of Induline Scarlet either to the alkaline vat or to the dyestuff itself.—J. C. C.

Aminoanthraquinonecarboxylic acids, their substitution products, and dyestuffs derived therefrom ; Process for producing ——. Badische Anilin und Soda Fabrik. First Addition, dated June 30, 1911, to Fr. Pat. 425,859, Jan. 19, 1911. Under Int. Conv., Jan. 19, 1911 (see this J., 1911, 947).

Aryl-1-thio-anthraquinone-2-carboxylic acids are obtained by treating with arylmercaptans or their derivatives, anthraquinone-2-carboxylic acids in which the 1-position is occupied by a negative substituent. When these new acids are treated with condensing agents such as aluminium chloride, sulphuric acid, etc., they are converted into compounds which dye fast yellow, orange, and red shades from the vat. The same colouring matters may be obtained by converting the aryl-1-thio-anthraquinone-2-carboxylic acids into their halogenides and heating these alone or, preferably, in presence of an indifferent solvent.—T. F. B.

Anthraquinone series ; Process for preparing condensation products of the ——. Badische Anilin und Soda Fabrik. Ger. Pat. 241,786, Feb. 28, 1911. Addition to Ger. Pat. 240,520, Sept. 30, 1910 (see Fr. Pat. 428,338 ; this J., 1911, 1153).

The vat dyeing products produced by the process described in the principal patent may also be obtained by condensing ω-dihalogenmethylanthraquinones or their derivatives with anthraquinone-hydrazines.—T. F. B.

Vat-dyeing condensation products of the anthraquinone series ; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 241,805, Feb. 24, 1911.

Aldehydes or ω-dihalogenmethyl derivatives of the anthraquinone series are condensed with urea or thiourea ; the reaction is preferably carried out by heating the components to 120°—150° C. in presence of pyridine, quinoline, or other suitable solvent, until no further formation of the dyestuff takes place.—T. F. B.

Sulphide dyestuffs. Badische Anilin und Soda Fabrik, Fr. Pat. 433,323, Aug. 16, 1911. Under Int. Conv., July 4, 1911.

2 : 7-Dinitro- or 4 : 5-dinitro- or dinitrodibromophenanthrenequinone when heated with sodium sulphide and sulphur furnish sulphide dyestuffs producing khaki to brown shades when dyed on cotton from a hydrosulphite vat.—J. C. C.

Azo dyestuffs from αγ-diketohydro-indene and its derivatives ; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 241,630, Feb. 12, 1911.

αγ-Diketohydro-indene-β-carboxylic acid or a derivative is combined with a diazo compound, and the product is treated with a saponifying agent, which results in the elimination of the carboxylic group. The dyestuffs are stated to be fast (compare following abstract).—T. F. B.

Azo dyestuffs suitable for use in dyeing and in making lakes ; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 241,723, Nov. 11, 1910.

Dyestuffs obtained by combining diazo or diazo-azo compounds containing one or more nitro or sulphonic groups, or both, with αγ-diketohydro-indenes, are suitable for dyeing animal fibres and also for the production of lakes and pigments. Their shades vary from greenish-yellow to reddish-orange. The dyestuffs containing sulphonic groups give level shades on wool, fast to light, whilst those containing a hydroxl group in the o-position to the azo-group, give red to red-brown shades after chroming. The lakes are soluble in water, spirit, and oil, and are of good fastness to light.—T. F. B.

Azo dyestuff ; New ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 316, Jan. 5, 1911. Addition to Eng. Pat. 4768, Feb. 26, 1909 (this J., 1910, 207 ; 1909, 1191).

The new dyestuff is prepared according to the process described in the chief patent, by combining with 2-benzoylamino-5-naphthol-7-sulphonic acid the diazotised monoazo dyestuff prepared from diazotised 3-chloro-2-toluidine-5-sulphonic acid and aniline. It dyes cotton a red shade fast to light.—J. C. C.

Azo dyestuffs ; Manufacture of new ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 11,085, May 8, 1911.

The diazo compounds of o-aminophenol-4-sulphonic acid or of its substitution products are combined with *m*-aminobenzidine. The dyestuffs obtained give brown shades on wool which after being chromed are fast to potting.—J. C. C.

Anthraquinone derivatives ; Manufacture of ——. Farbenfabriken vorm. F. Bayer und Co. Second Addition, dated June 14, 1911. (Under Int. Conv. July 8, 1910), to Fr. Pat. 362,140, Jan. 3, 1906 (this J., 1906, 752).

Vat dyestuffs similar to those described in the chief patent are obtained from anthraquinonyl derivatives of the type, $A.NH.C_6H_4.X.C_6H_4.NH.A$, where A=anthraquinone or its derivatives and X=O, S or NH. Example : A mixture of 10 kilos. of dibromophenyl ether, 17 kilos. of α-aminoanthraquinone, 20 kilos. of sodium acetate (anhydrous), 1 kilo. of copper chloride and 170 kilos. of nitrobenzene is boiled for 8 hours while stirring. The precipitate is collected, washed with nitrobenzene, alcohol and warm water. The dyestuff produced gives a reddish brown vat with alkaline hydrosulphite from which cotton is dyed in bluish red shades.—J. C. C.

Azo dyestuffs of the anthraquinone series ; Manufacture of ——. Farbwerke vorm. Meister, Lucius, und Brüning, Hoechst-on-the-Maine, Germany. Eng. Pat. 21,727, Oct. 2, 1911. Under Int. Conv., Oct. 6, 1910.

A diazo derivative of an aminoanthraquinonesulphonic acid is combined with an aceto-acetic arylamide. Example : 64 kilos. of sodium 2-aminoanthraquinone-3-sulphonate are made into a thick paste with concentrated hydrochloric acid, diluted with water and cooled. A solution of 12 kilos. of sodium nitrite in 50 litres of water is now added and the product is run into a solution of 30 kilos. of aceto-acetic anilide in 400 litres of alcohol (95 per cent.) made alkaline with sodium carbonate. The mixture is heated for a short time, filtered, and the precipitate washed. The yellow dyestuff thus obtained may be rubbed to a paste and used directly. It gives a pure, fast yellow on wool and silk.—J. C. C.

Disazo dyestuffs ; Manufacture of violet black to greenish black basic ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Hoechst-on-the-Maine, Germany. Eng. Pat. 22,069, Oct. 6, 1911.

Trimethylammoniumphenylazo-*m*-toluidine chloride hydrochloride is diazotised and combined with 1 : 8- or 1 : 5-diaminonaphthalene in acid solution. The dyestuff obtained with the 1 : 8-diaminonaphthalene dyes artificial silk in bluish violet black shades, whilst that with the 1 : 5-compound gives deep black tints.—J. C. C.

Indophenols and new sulphide dyestuffs derived from them ; Manufacture of new ——. Act.-Ges. für Anilinfabrikation. Fr. Pat. 432,440, July 21, 1911. Under Int. Conv., March 18 and June 16, 1911.

The new indophenols are prepared by oxidising perimidine (see Annalen, 1909, 365, 83) or its derivatives with aminophenols or by condensing them with quinonechlorimide. Similarly indophenols are produced by condensing dihydrothioperimidone-2 with quinonechlorimide, or from the azimino-derivative of 1 : 8-naphthylenediamine and dichlorquinonechlorimide. Examples are given illustrating the joint oxidation of 2-methylperimidine and 2 : 6-dichloro-*p*-aminophenol by means of sodium bichromate, of the condensation of perimidine hydrochloride and of dihydrothioperimidone-2 with quinonechlorimide, and of the azimino-derivative of 1 : 8-naphthylenediamine with dichloroquinonechlorimide. By boiling these indophenols with aqueous alcoholic sulphur and sodium sulphide in the usual manner, sulphide dyestuffs are obtained.—J. C. C.

Vat dyestuffs, Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 4609, Feb. 23, 1911.

SEE Ger. Pat. 236,407 of 1910; this J., 1911, 1047.—T. F. B.

Vat dyestuffs of the anthracene series; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 432,449, July 21, 1911. Under Int. Conv., July 29, 1910.

SEE Ger. Pat. 239,544 of 1910; this J., 1911, 1372.—T. F. B.

[Anthracene] dye. W. Berchelmann, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,014,204, Jan. 9, 1912.

SEE Addition of Dec. 16, 1910, to Fr. Pat. 403,205 of 1909: this J., 1911, 738.—T. F. B.

Trisazo dyestuffs: Process for the production of tertiary ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 12,126, May 19, 1911. Under Int. Conv., May 21, 1910.

SEE Fr. Pat. 430,527 of 1911; this J., 1911, 1306.—T. F. B.

Azo dyestuffs; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 432,729, July 28, 1911. Under Int. Conv., Aug. 8 and Dec. 1, 1910.

SEE Eng. Pat. 21,199 of 1910; this J., 1911, 1371.—T. F. B.

Disazo dyestuff; Process for producing a ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 432,783, July 31, 1911. Under Int. Conv., Aug. 10, 1910.

SEE Eng. Pat. 21,200 of 1910; this J., 1911, 1108.—T. F. B.

Azo dyestuffs; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 433,015, Aug. 5, 1911. Under Int. Conv., Aug. 13, 1910.

SEE Eng. Pat. 21,473 of 1910; this J., 1911, 1109.—T. F. B.

Azo dyestuffs; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 433,049, Aug. 7, 1911. Under Int. Conv., Aug. 13, 1910.

SEE Eng. Pat. 21,202 of 1910; this J., 1911, 1108.—T. F. B.

Sulphide dyestuffs dyeing cotton directly; Process for producing green ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 433,088, Aug. 8, 1911. Under Int. Conv., Aug. 25, 1910.

SEE Eng. Pat. 30,104 of 1910; this J., 1912, 66.—T. F. B.

Vat dyestuffs of the anthraquinone series; Manufacture of ——. A. G. Bloxam, London. From Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 7297, March 23, 1911.

SEE Fr. Pat. 427,479 of 1911; this J., 1911, 1111.—T. F. B.

[Azo] colouring matters; Manufacture of black ——. Read Holliday and Sons, Ltd., J. Turner, and H. Dean, Huddersfield. Eng. Pat. 8068, March 31, 1911.

SEE Fr. Pat. 430,289 of 1911; this J., 1911, 1306.—T. F. B.

Compounds and colouring matters of the anthracene series; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 8704, April 7, 1911.

SEE Ger. Pat. 236,857 of 1910; this J., 1911, 1048.—T. F. B.

Monoazo dyestuffs; Dark blue and red ——. M. Böniger, Assignor to Chem. Fabr. vorm. Sandoz, Basle, Switzerland. U.S. Pats. 1,014,039 and 1,014,114, Jan. 9, 1912.

SEE Fr. Pat. 425,837 of 1911; this J., 1911, 947.—T. F. B.

Vat [thioindigo] dyestuffs; Process for making violet-blue ——. Farbwerke vorm. Meister, Lucius, und Bruning. Fr. Pat. 432,791, Oct. 11, 1910.

SEE Eng. Pat. 24,569 of 1910; this J., 1911, 1305.—T. F. B.

3-6-Diamino-acridine and its alkyl derivatives; Process for producing ——. L. Cassella und Co. Fr. Pat. 433,079, Oct. 18, 1910.

SEE Ger. Pat. 230,412 and U.S. Pat. 1,005,176: this J. 1911, 352 and 1306.—T. F. B.

Manufacture of lakes. Eng. Pat. 18,379. *See* XIII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Wool; Sulphur combined [as sulphite] in ——. H. Strunk and H. Priess. Z. physiol. Chem., 1912, **76**, 136—144.

To determine whether wool, in its normal condition, contained an appreciable quantity of sulphur combined in a sulphite form, the authors digested samples of raw wool, carefully de-greased and cleaned, with concentrated phosphoric acid for a protracted period in the absence of air. The mixture was subsequently distilled in a current of carbon dioxide, and the evolved sulphur dioxide was determined. The authors found that a minute quantity of sulphur dioxide was obtained in this manner, corresponding to less than 1/1000th part of the total sulphur contained in the wool, from which the conclusion, that part of the sulphur of the keratin molecule was combined with oxygen as a sulpho-group, was untenable. They further found that wool had the power of absorbing and combining with an extraordinarily large amount of hydrogen sulphide, and they suggest that the variations in the sulphur content of different wools may perhaps be attributed to this property. The hydrogen sulphide, thus chemically combined with the wool fibre, was found to be readily oxidisible to sulphurous and sulphuric acids, a fact which might easily account for the presence of small quantities of sulphurous acid in the wool of live sheep.
—O. R.

Tulle; Artificial ——. Comp. Franç. des Applications de la Cellulose. A. M. Auty. J. Soc. Dyers and Col., 1912, **28**, 16—17.

A CUPRO-AMMONIACAL solution of cellulose, made in the form of a stiff paste, is delivered into a reservoir, the inclined side of which forms a scraper delivering the paste into the hollows of an engraved cylinder revolving against the scraper. The cylinder passes through a coagulating solution, the cellulose (hydrate) being then drawn off as a continuous fabric over a suitable roller. By means of special washing contrivances and dryers, the roller is cleansed before receiving another quantity of paste. The tulle is afterwards washed, dyed, dried and finished. Many designs which are said to be technically impossible in weaving may be obtained by this process of moulding.
—B. N.

Crop plants for paper-making. C. J. Brand. U.S. Dept. Agric., Bureau of Plant Industry, Circular No. 82, Aug. 31, 1911, 1—19.

THE Bureau of Plant Industry is conducting experiments with crop by-products and specially cultivated plants for paper making. The most important crop waste under present conditions is ordinary Indian-corn stalks, of which 30 million tons are available annually in the "corn belt" of the States. A ton of cornstalks, when extracted with water, yields 200—300 lb. of dissolved solids, apparently of high nutritive value, and experiments are in hand for feeding stock with the concentrated extract. In addition, the dried stalks yield 12—18 per cent. of long fibre of high quality, and 15—30 per cent. of "pith pulp," of less value but capable of utilisation in special directions. Cost estimates are incomplete, but it is

robable that the farmer could not afford to deliver the aw material at less than 20s. per ton air-dry weight. Broom corn" stalks offer better prospects, both as egards yield and quality, than ordinary corn stalks, but the roduction is relatively small, being estimated at 450,000 ons. The proportion of pith in the stalk of the "broom orn" is not so large, and the pulp may be used to the xtent of 50 per cent. in the composition of high class ook papers without any separation of the pith cells, hereas in the case of ordinary corn stalks a special eparation of a portion of the pith cells is absolutely necesary. One of the most promising raw materials of this lass is rice straw, the production of which in the States s estimated at 1½ million tons: its present value for edding purposes runs from 16s. to 18s. per ton. A yield f 35 per cent. of pulp is to be expected, suitable for excellent ualities of book papers, like "broom corn" pulp, without ny separation, provided it is suitably blended. The roduction of rice straw is more concentrated in area than hat of corn or "broom corn." Cotton-hull fibre has lready established itself as an industrial raw material f considerable value. Cotton stalks and bagasse do not appear likely to yield satisfactory substitutes for wood pulp. Flax straw is produced to the extent of about 3 million tons, of which not more than 300,000 tons are at present utilised, chiefly for the manufacture of a rough grade of tow. It is a promising material, but much still remains to be done to perfect its development as a raw material for paper making. Of the crops which could be grown primarily from the point of view of paper making, hemp is perhaps the most attractive. It should be "dew retted" to avoid impoverishing the soil: it is calculated that 1 acre should yield 2½—3 tons of retted stalks, yielding 40—45 per cent. of pulp, at a cost up to the retting stage of about 57s. per acre. Another possible crop is *Eulalia japonica*, which yields a fibre resembling that of esparto. The circular is printed on five different kinds of paper manufactured from the materials under discussion.
—J. F. B.

Soda wood pulp; Manufacture of ——. C. G. Schwalbe. Papierfabrikant, 1911, 9, 1522.

The digestion of wood by the soda process gives a somewhat lower yield of cellulose than with the bisulphite process, but the results of the former are improved by the modification known as the sulphate-soda process, the main objection then being the offensive odours produced. Christiansen has made a study of the digestion of wood with caustic soda at different concentrations and temperatures. It was found that neutralisation of the alkali ceased after a certain time, *e.g.*, after 4—4½ hours, and that only after a further period of digestion, *e.g.*, half an hour, was a further continued consumption of alkali observed. The higher the temperature of digestion, the sooner this halting point is attained, and this point appears to coincide with a sufficient isolation of the fibres. Satisfactory digestions are not obtained at concentrations below 4 per cent. of sodium hydroxide. The solution of the lignin appears to begin at a temperature of 160° C. and is effected most advantageously at 170° C., which temperature should be reached as rapidly as possible and must not be maintained longer than necessary. For testing the progress of digestion a portion of the lye is withdrawn, neutralised by sulphuric acid and boiled; when the precipitate thus formed no longer shows signs of diminishing in the course of digestion the above mentioned halting point has been reached. Rinman has introduced a new modification of the soda process in which common salt is added to the caustic digestion liquor; the salt is equally as effective as sodium sulphate in preserving the fibre and thus improving the yield, and possesses the advantage of giving odourless products. Moreover, in Rinman's process the exhausted lyes, after suitable concentration, are saturated with carbon dioxide, whereby the dissolved humus matters are precipitated in a condition suitable for filtration, whilst the humic acid is removed in the subsequent causticising process. By the regeneration of the soda by the furnace, one of the most offensive parts of the sulphate process, is dispensed with. Valuable by-products, methyl alcohol, acetone and charcoal are also recovered by the destructive distillation of the dried filter-press residues.—J. F. B.

Sulphite wood pulp waste lyes. New use for —— [*for preventing foot and mouth disease*]. A. Stutzer. Wochenbl. Papierfab., 1911, 42, 4956.

The foot and mouth disease is one of which the propagation is stimulated by an alkaline condition of the stalls and bedding; as a preventive the spraying with a dilute mineral acid has met with a fair amount of success. But the handling of these acids, prior to dilution, by farm labourers presents a certain amount of risk, so the author suggests that the waste lyes from sulphite wood-pulp mills might be tried with good effect. The lyes should be transported either in barrels or absorbed in sawdust. In the former case the farmer should make a heap of dry sand or earth and pour the lye in the centre, subsequently mixing well. The material impregnated with the sulphite lye should be spread daily over the stalls and yards inhabited by the animals; treatment should be commenced before the disease has actually broken out.
—J. F. B.

Writing papers; Magnesium sulphate as a substitute for aluminium sulphate in sizing ——. P. Klemm. Wochenbl. Papierfab., 1911, 42, 4954—4956. (See also this J., 1911, 352.)

The author has studied the action of a solution of aluminium sulphate on magnesium resinate; the tendency in this reaction is to form magnesium sulphate, which dissolves, and to leave a residue of free resin acids. If the quantity of aluminium sulphate be restricted, it parts with two-thirds of its sulphuric acid forming the basic sulphate, Al_2O_2,SO_4; this, however, being insoluble, remains in the precipitate and can take no further part in attacking the magnesium resinate. If the quantity of aluminium sulphate be increased so that the liquid just retains an acid reaction when the decomposition of the magnesium resinate is complete (a condition essential for the production of an ink-resisting writing paper), a basic aluminium sulphate, $Al_2O,2SO_4$ is produced corresponding to the displacement of only one-third of the total sulphuric acid of the aluminium sulphate. Thus in order to obtain hard sizing, it is necessary to use aluminium sulphate to the extent of 3 times the equivalent of the magnesium oxide in the resinate. But this is precisely what is required for hard-sizing by the direct precipitation of sodium resinate with aluminium sulphate; the magnesium resinate is merely an intermediate product, which has not only had no beneficial effect, but which has actually done harm in producing a coarse precipitation of the size instead of a fine one. It is by no means uncommon to find paper-mill waters containing sufficient calcium and magnesium salts to precipitate the whole of the size in the form of resinates, and sizing in such cases is notoriously difficult. The presence of resinates of the alkaline earths tends to prevent the proper amalgamation of the particles of rosin under the action of the hot drying cylinders. The author points out that his remarks in the present instance are confined to the question of sizing ink-resisting writing papers and that the question of magnesium resinate in the sizing of printing papers requires separate discussion.—J. F. B.

Paper-sizing; Notes on ——. Papierfabrikant, 1912, 10, 73.

In the case of writing papers and papers for coating, where hard sizing is required, the best results are obtained with a size containing much free rosin at a concentration of 1 to 1·2 per cent.; if used at 2 per cent. strength the quantity of size required to do the same work is very considerably increased. The size should not be added to the stuff in the beater whilst either size or stuff is warm; the contents of beaters which have to stand over the week-end should not be sized until the Monday. Rosin sizing is particularly difficult with "free-beaten" stuff, and can be assisted in such cases by gelatin or casein. In making a coating-paper with 70 per cent. of mechanical wood and 30 per cent. of sulphite pulp, it was found to be impossible to obtain the necessary hardness of sizing unless particular care were taken to use only finely ground "greasy" mechanical pulp prepared from fresh wood. With such wood it is possible to produce satisfactory printing papers without any size at all, merely adding aluminium sulphate. Cheap varieties of rosin, if properly prepared, are quite satisfactory for printing papers and often more efficient than the better qualities. For preparing the size an emulsifying machine eliminates the danger of trouble from clots of undissolved rosin in the paper and on the wire; it is preferable to store the diluted size emulsion for a few days before using. China clay considerably increases the difficulty and cost of sizing papers, particularly those of thin substance; in many cases also the composition of the water causes an excessive consumption of rosin in the production of hard-sized papers.—J. F. B.

Paper; Influence of supercalendering on the properties of ——. Pauli. Papierfabrikant, 1912, 10, 76—77.

THE treatment on the supercalender is intended primarily to smooth the surface of the paper, but incidentally it tends also to affect the thickness, "handle," colour, structure, transparency, and sizing. As regards surface, much depends on the manipulation on the paper-machine, and if the paper comes to the calender with a pronounced felt or wire-mark, satisfactory glazing is almost impossible. Another factor of prime importance is the damping, which must be uniform and suitably adjusted in quantity to the glaze desired. The thickness of the paper is always materially reduced by glazing, but this reduction may be kept within limits by restricting the damping and the pressure of the calender, effecting a compromise between the degree of finish and the reduction of bulk. Excessive or uneven damping and pressure modify the colour of the paper, producing "greyness" if excessive and variations in shade if irregular. The structure or "look-through" of the paper may generally be improved by the judicious use of the supercalender, but care is required in the case of laid and watermarked papers not to overdo the damping and glazing so as to obliterate the lines. The closing of the surface and structure of the paper which is produced by supercalendering naturally tends to increase the transparency; this fault may often be avoided by moderate treatment twice or three times, instead of a single heavy treatment. On the other hand, for imitation parchment papers, maximum transparency is a desirable feature and heavy damping, up to 18 per cent. of moisture, and heavy calendering are required. Under certain circumstances supercalendering may injure the sizing of the paper. This is particularly the case when, owing either to excessive damping in the first instance or to insufficient heating of the steel calender bowls whilst glazing, the paper leaves the calender with too much moisture. For instance, paper leaving the calender with 1—2 per cent. of moisture was well sized, but the same paper when allowed to come away with 4—5 per cent. was weakly sized; subsequent hot drying of the latter paper somewhat improved it.—J. F. B.

Wood dextrins [from filter paper]; Chemistry of ——. C. A. Yllner. Z. angew. Chem., 1912, 25, 103—107.

FORTY grams of Swedish filter paper were dissolved gradually in 100 grms. of 80 per cent. sulphuric acid, with precautions to prevent rise of temperature, and after 12 hours, the viscous solution was poured into 1 litre of water and neutralised with chalk. The precipitated calcium sulphate was removed and the clear solution fermented with yeast; after three days the alcohol was distilled off. Fermentation, which was due to dextrose, set in soon after adding the yeast and ceased after 1 day: in four experiments 1·8, 1·3, 2·1, and 1·2 grms. respectively of alcohol were obtained from 40 grms. of paper. After removing the yeast, the solution was concentrated to 250 c.c., purified with animal charcoal, and boiled for 15 minutes with an equal volume of alcohol under a reflux condenser. The precipitate, probably a hydrated derivative of cellulose, was separated, and from the filtrate dextrins were separated by fractional precipitation with alcohol. It was found that by dissolving the precipitates in water and re-precipitating with alcohol several times, products of tolerably constant rotatory power and cupric-reducing power could be obtained. Contrary to the statement of Hönig and Schubert (Monats. Chem., 1885, 708; 1887, 424), the author found that the cupric-reducing power increased with increase in the rotatory power for example a product with a rotatory power of $[\alpha]_D = +25$ had a cupric-reducing power equivalent to a little mor than 0·1 grm. of cuprous oxide per grm., whilst for a produc of rotatory power $[\alpha]_D = +50°$, the reducing power wa equivalent to nearly 0·2 grm. of cuprous oxide. On heating with 10 per cent. hydrochloric acid on the water bath the dextrins were converted into dextrose, but the conversion was never complete, the highest yield obtained being about 85 per cent. on the weight of the dextrin the average yields were about 50 per cent. after 20 mins., 70 per cent. after 40 mins., and 80 per cent. after 1 hour, after which the hydrolysis was almost inappreciable.—A. S.

PATENTS.

Sacks and tissues employed for manufacturing them; Process for preserving ——. M. Boucherie, Paris. Eng. Pat. 2604, Feb. 1, 1911. Under Int. Conv., Mar. 12, 1910.

SACKS and fabrics are first heated and then impregnated with a preservative compound according to the process described for impregnating timber in Fr. Pat. 401,746 of 1908 (this J., 1909, 1132). Acids, bases, salts, alcohols, essences, heavy or creosote oils, and fatty bodies may be employed separately or combined. The sacks are inserted in a cylinder and impregnated by sudden forcible efforts and the excess of impregnating liquid is extracted by means of a vacuum, air or water at a high temperature, steam or any of these agencies combined. If necessary, the extraction of the liquid may be completed by mechanical pressure.—J. F. B.

Fabrics; Drying devices in conjunction with stentering and like machines for treatment of ——. Bradford Dyers Assoc., Ltd. A. T. Metcalf and H. V. Nunn, Bradford. Eng. Pat. 8756, Apr. 8, 1911.

IN drying and stentering machines for fabrics, arrangements are described providing means for moving all the hot air nozzles outwards and inwards whenever the stenter chains are similarly adjusted to take fabrics of different widths.—J. F. B.

Washing and drying linen goods, textile substances, feathers, woollens and the like; Process and apparatus for ——. K. J. Breh. Fr. Pat. 433,004, Aug. 5, 1911. Under Int. Conv., Aug. 6, 1910.

THE articles to be treated are put into a rotary drum provided with a perforated false bottom, mounted on a vertical axis and surrounded by an envelope which has an air-tight cover. Jets of scouring liquor are forced up into the drum through the perforations and down into it from above. Other jets arranged at different levels on the inner wall of the envelope first impinge on vanes projecting radially from the wall of the drum (thus causing it to rotate) and then enter the drum through large openings in its periphery. The apparatus is furnished with a pump for circulating the liquors and rinsing waters and also with a ventilating shaft in which a turbine ventilator is arranged for drying the goods whilst in the drum. Wire netting is fastened round the drum to prevent small articles from being thrown out of it through the openings in its periphery.—P. F. C.

Products [Sulphur derivatives of hydrocarbons] suitable as coatings, loadings, films, threads, binding agents and elastic or plastic masses; Manufacture of ——. L. Lilienfeld, Vienna. Eng. Pat. 26,928, Nov. 19, 1910.

METHODS are described for the manufacture, and the technical utilisation of the plastic properties of the sulphur derivatives of hydrocarbons (except terpenes) and alcohols, as well as their anhydrides, polymerides and other derivatives. Useful products of this order are obtained by the action of alkali hydrosulphides, sulphides and thiocarbonates upon the halogen derivatives of glycerin, *e.g.*, the chlorhydrins and epichlorhydrins. They are viscous fluids which readily undergo condensation and polymerisation under the action of heat, yielding inert, insoluble. amorphous bodies which can be applied either alone or in junction with other plastic colloids for the purposes umerated in the title. The sulphur derivatives may ier be prepared separately or be generated *in situ*, incorporating the materials with the product in which y are to be utilised. A special claim relates to the duction of plastic sulphur derivatives in conjunction h cellulose products by incorporating an alkyl halide ., a chlorhydrin) with "viscose" (cellulose xanthoate), which contains the sulphides necessary to comte the reaction when the product is heated. Examples: mixture of a thioglycerin and an oxytrimethylene lphide (dichlorhydrin derivative), or the latter body ne, is heated to 100°—110° C. until a substance similar caoutchouc is obtained; or the same reaction may be ected with the admixture of caoutchouc itself. The ioglycerin and oxytrimethylene sulphide may be mixed th all kinds of plastic masses, *e.g.*, cellulose, cellulose ters, glue, starch, etc., and in the fluid condition they rve as insoluble permanent softening agents, whilst if nverted by heating *in situ* into their polymerides, they t as elastic binding agents favourably modifying the operties of the original colloid.—J. F. B.

llulose acetate or acetyl-cellulose; Treatment of —— to render it flame-proof or non-flammable. F. Seaton-Snowdon and D. A. Young, London. Eng. Pat. 28,848, Dec. 12, 1910.

ELLULOSE acetate, after purification by washing, is eeped in a solution of boric acid or a suitable borate and ied. The proportion of boric acid may be 2·5 per cent. the weight of cellulose acetate, and the steeping is fected preferably at a temperature of about 100° F. he borated cellulose acetate is soluble in the usual media, nd may be used for the manufacture of films, etc. If esired, other flame-proofing compounds, such as sodium ngstate or ammonium phosphate, may be used in conjunction with the boric acid, or the boric acid or borate ay be added to the solvent employed for the cellulose cetate.—J. F. B.

ellulose acetate and plastic materials therefrom; Manufacture of ——. Soc. L'Oyonnaxienne. Fr. Pat. 432,751, July 29, 1911.

ELLULOSE is acetylated by means of acetic anhydride roduced in the course of the reaction itself by the action pon acetic acid of phosgene, generated by the action of ulphuric anhydride upon carbon tetrachloride. Example:—10 parts of cellulose, 200 parts of acetic acid, 5 parts of "oleum" of 130 per cent. strength, and 100 arts of carbon tetrachloride are heated together at a emperature of 65° C. under a reflux condenser. Acetylation of the cellulose is complete in about an hour, and the esidual reagents are then distilled off under a pressure of 0 mm. Finally the cellulose acetate is precipitated by water, washed and recovered.—J. F. B.

Artificial threads; Apparatus for treating [twisting] ——. T. W. Fox, Eccles, and W. Myers, Gatley. Eng. Pat. 1022, Jan. 14, 1911.

The apparatus is constructed for the purpose of unwinding the artificial threads from bobbins, twisting them and collecting them in hanks on reels, whilst the threads undergo a treatment with liquids in their passage from the bobbins to the reels. The bobbins are placed on rotating bobbin carriers, each spindle being driven by a friction pulley and capable of being disengaged by a foot-operated catch without interfering with the rest of the machine. Shields are provided for preventing the splashing of liquid from the rotating bobbins. The threads pass upwards in contact with guide-rolls which revolve in troughs of water, acid or other liquid with which the threads are to be treated, and are finally reeled upon independent "swifts" to form hanks of twisted yarn. —J. F. B.

Paper, cardboard and the like sheets; Method of applying a layer of gelatin to ——. R. Ludwig, Leipzig, Germany. Eng. Pat. 17,851, Aug. 5, 1911.

The sheet of paper or card is uniformly coated with gelatin either by hand or by a roller machine; the coated sheet, when dry, is placed in a water-bath and then pressed in contact with a glass plate and left to dry until it peels off of its own accord.—J. F. B.

Paper, Materials for sizing ——. F. H. Kalbfleisch. Fr. Pat. 431,714, July 28, 1911.

Ordinary aluminium sulphate cake cannot advantageously be manufactured at a higher concentration than about 16 per cent. of aluminium oxide. It is stated that magnesium sulphate also has a useful action in precipitating rosin size, and a mixture of aluminium and magnesium sulphates can be manufactured in a commercial and transportable form, containing 22 per cent. of mixed oxides. Such a mixture is preferably manufactured by evaporating a solution of aluminium sulphate to a syrup containing about 16 per cent. of aluminium oxide and then adding the requisite quantity of dehydrated magnesium sulphate. —J. F. B.

Papers; Process and apparatus for removing ink from printed waste ——. O. C. Winestock, F. W. Fabyan and E. G. Childs. Fr. Pat. 432,744, July 29, 1911.

The apparatus consists of a vertical cylindrical vessel with undulated walls, with a number, *e.g.*, three, vertical shafts revolving inside and provided with stirring-arms; in addition to the arms, each shaft carries a helix which works the stuff down to the bottom of the vessel, thus effecting a thorough mixing. The waste papers are charged into the vessel together with water containing a reagent capable of loosening the printing ink, *e.g.*, 30—50 grms. of ammonium carbonate or 50 grms. of potash soap per 50 litres of water, preferably hot. The paper is reduced to pulp by the action of the stirrers and the ink is separated by the centrifugal action, being finally eliminated by washing the pulp. The latter may be improved by heating with a dilute solution of oxalic acid.—J. F. B.

Methyl alcohol from the residual products from the manufacture of [sulphate] cellulose; Production of ——. H. O. V. Bergström. Fr. Pat. 433,168, Aug. 11, 1911. Under Int. Conv., Aug. 13, 1910.

The vapours escaping from the digesters in which wood, etc., is being treated by the sulphate process, are made to pass through a body of liquid already obtained by the condensation of such vapours; the vapours escaping from this liquid are then condensed, and the dilute methyl alcohol thus produced is either concentrated in a continuous rectifying column with simultaneous treatment with suitable purifying agents (acids, alkalis, oxidising agents, etc.), or it is concentrated in an intermittent column still before or after treatment with the purifying agents.—T. F. B.

Sulphite-cellulose waste lyes intended for the manufacture of cattle foods and fertilisers; Purification and concentration of ——. M. Müller. Ger. Pat. 241,282, June 14, 1910.

The waste lye, after treatment with sodium sulphate and separation of the precipitated calcium sulphate, is passed into the last element of a multiple-effect evaporator where, under a high vacuum, it is subjected to film evaporation in the known manner, the liquid ascending externally heated tubes in the form of a thin film on the inner surface. The lye is in this way freed from sulphurous acid which is carried away by the steam. The mixture of steam and sulphurous acid is led over lime, which absorbs the acid, on its way to the condenser. The further evaporation of the lye, after expulsion of the sulphurous acid, is effected in any suitable manner.—A. S.

Artificial thread; Manufacture of ——. J. C. Hartogs, Amsterdam. Eng. Pat. 16,720, July 20, 1911. Under Int. Conv., Aug. 18, 1910.

See Ger. Pat. 237,744 of 1910; this J., 1911, 1249.—T.F.B.

Cellulose: Treatment of ——. H. Peters and H. W. Cullum. Fr. Pat. 432.747, July 29, 1911.

See U.S. Pats. 1,008,489 and 1,008,557 of 1911; this J., 1911, 1447.—T. F. B.

Cellulose: Manufacture of nitrated ——. A. M. Hart. Fr. Pat. 433,012. Aug. 5, 1911. Under Int. Conv., Aug. 6, 1910.

See Eng. Pat 18,606 of 1910; this J., 1911, 1446.—T.F B.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Enzymes of malt and their employment in the textile industry. M. Hamburg. J. Soc. Dyers and Col., 1912, **28**, 7—14.

Of the malt enzymes of interest to the textile industry, recent investigation has shown that diastase contains two enzymes capable of attacking starch. Fraenkel and Hamburg (this J., 1906, 945) have separated, by dialysis, an enzyme which both liquefies and saccharifies starch from one which only liquefies it, and have further proved that diastase is not an albumin. Pollak's modification of Eggloffstein's method (this J., 1903, 763) of determining the amount of diastase present in a preparation is recommended. At 75° C., at least 6 or 7 times as much starch in the form of a 30 to 40 per cent. starch paste will be liquefied in 5 to 10 minutes as is converted into maltose by the above test, so that the method gives some idea of the liquefying power (see this J., 1903, 1370). "Diastafor" is recommended for use in textile industries as a uniform product. For sizing yarns, farina converted by diastase easily penetrates the fibre, and for heavy sizes, the weighting material penetrates with it. In dyeing silk, increased strength and elasticity is given to the material. Diastafor is extensively used before bleaching operations for the removal of the sizing, the subsequent boiling operations in alkalis being considerably shortened. This ensures greater preservation of the fibre, and imparts a fuller handle to the goods. It is also used for degumming, as at low temperatures the colour is not attacked. For this purpose also it is used for discharging when a half-bleach is required, or before mercerising. It is also used for the production of uniform finishes: diastafor-starch finishes penetrate the fibre evenly, and prevent the colour from being saddened, thus producing very satisfactory results with regard to brightness, weight, handle, etc., of the goods.—B. N.

Turkey Red. F. Kornfeld. Chem.-Zeit., 1912, **36**, 29—30, 42—44, 58—59. (See also this J., 1885, 587; 1886, 525.)

The author discusses the formation and composition of Turkey Red. His results show that the constitution of the best and fastest lake, as fixed on the fibre, is represented by the following formula:—

$C_{14}H_6O_4Ca.Al_2\left(\begin{matrix}CO_2.C_{16}H_{31}.CH\\CO_2.C_{15}H_{31}.CH\end{matrix}>O\right)_3$. Tannin and tin salts used in the process are not regarded as contributing an integral portion of the lake; tin and tannin may however, be linked to the unsatisfied aluminium bonds. The existence of unsatisfied aluminium bonds is held to be proved by the fact that the calcium in the above lake can be doubled without altering the general character of the lake, the resulting product being quite as fast though possessing a less vivid tone. The author's results are not in agreement with Werner's theory of mordant dyestuffs (this J, 1908, 439, 892). The dyeing of yarn is also discussed; the author has for several years used calcium saccharate instead of chalk to avoid precipitation in the dye-bath when dyeing cops (see this J., 1901, 893; 1910, 484, 137[illegible]). Reference is made to the new vat dyestuffs, but the possibility of such dyestuffs competing commercially with alizarin is regarded as improbable in the near future at any rate. Alizarin has been detected by the author in the shell of the crab and the reddening taking place on boiling is stated to be due to the formation of Turkey Red, the essential ingredients of the lake being all present.—A. Sbld.

Alkalis in the indigo vat: The influence of —— *on th absorption of the dye by the cotton fibre.* E. Knecht an V. G. Nair. J. Soc. Dyers and Col., 1912, **28**, 28—33.

The authors have made experiments on the influenc of alkali by dyeing cotton yarn with a solution of indigo containing one equivalent of caustic soda, in amount just sufficient to form the mono-sodium compound, and also in solutions in which the caustic soda was increased to two, three or four equivalents, the indigotin on the fibre being estimated in each case. The conclusions arrived at are that: (1) the absorption of indigo white by the cotton fibre decreases as the alkalinity of the bath is increased, the greatest absorption being obtained when the caustic soda is only sufficient to form the mono-sodium salt of indigo white; (2) the indigo white absorbed can be removed from the fibre to a large extent by prolonged washing with cold air-free water; (3) absorption decreases with rise of temperature. The experiments were carried out in a suitable apparatus in which an atmosphere of hydrogen could be maintained.—B. N.

Mohair curl plushes; Finishing and dyeing of ——. J. Rosenberg. Färber-Zeit., 1912, **23**, 2—4.

In order to raise the pile, the fabric, which usually has a ground weave of dyed cotton, is either steamed for half an hour or is first passed through a cutting machine with a steaming arrangement attached to it and then sent over a fine steel raising cylinder. The cloth is then evenly covered with a suitable size and introduced into the curling machine, where, by means of levers, the workman can adjust the rapidly rotating brushes so as to produce any desired pattern. After brushing, the material is provided at each end with a wrapper and rolled carefully on to a perforated cylinder. The roll is then boiled for three or four hours, next steamed at a pressure of one atmosphere for twenty minutes and unrolled when cool. The mohair of the plush is afterwards dyed at the boil with acid dyestuffs on a winch-machine with the pile kept upwards to prevent marking or fraying. The fabric is subsequently well rinsed to prevent heat creases, then washed, dried, simultaneously sheared and steamed and finally pressed on a rotary press. Recipes are given for dyeing various shades and for preparing a suitable size.—P. F. C.

Light-fastness [of dyed textiles]; The effect of certain softeners on ——. J. R. Hannay. J. Soc. Dyers and Col., 1912, **28**, 20—24.

The experiments have been carried out on mercerised and unmercerised material dyed with equal weights of Benzo Fast Red 8 BL, Thional Green 3 B, dark and light shades, a mixture of Katigen Green 2 G and Chloramine Yellow M, Algol Blue 3 G, and standard indigo, and in the case of the mercerised material also with a diminished quantity of dyestuff so as to obtain the same shade as with the unmercerised material. The material was finished with solutions of various softeners. The mercerised material on exposure to light was less affected than dyed ordinary cotton, and the nature of the fatty acid in the softener exercised a greater influence on the final result than the nature of the alkali. The influence of castor oil in producing fading was very marked, soluble oil (Turkey Red oil) and "monopole soap" producing the maximum effect, and "soda oleine" the least. Rape and cocoanut oils should also be avoided in softeners. The ideal fatty matter is stearic acid as far as light-fastness is concerned, but does not soften sufficiently for most finishes. Ammonium stearate and Irish moss gives a full clothy finish. Olive, arachis and maize oils offer the most promising substitutes for castor oil, the first-named being probably the best. The experiments showed that materials used for filling do not affect the fastness to light. —B. N.

Dyestuffs; Identification of —— *on textile fibres by the spectrophotometric method.* A. Poraï-Koschitz and J. Auschkap. Rev. Gen. Mat. Col., 1912, **16**, 1—11.

By means of a specially constructed apparatus, the authors carried out spectrophotometric analyses of the light reflected from fabrics dyed with different dyestuffs in order to determine : (*a*) the intensity of the light in the different parts of the reflection spectra, and (*b*) the positions of maximum absorption. By plotting the results for each dyed sample, characteristic absorption curves were obtained. The authors draw the following conclusions from the results of their experiments. (1) For each combination of dyestuff and fibre the absorption curve is independent of the concentration of the dyestuff. (2) Different fibres have different effects on the optical properties of dyed shades, though in this respect wool and silk behave very similarly. (3) Dyeings obtained with substantive dyestuffs on cotton approach most closely, as regards their absorption spectra, to neutral solutions of the corresponding dyestuffs. A number of experimental results are recorded in tables and curves.—P. F. C.

Blacks , Identification on the fibre of the after-chrome ——. J. A. Walker. J. Soc. Dyers and Col., 1912, **28**, 14—16.

A list of reactions with several after-chrome blacks is given, using the following reagents : (1) cold concentrated sulphuric acid, the fibre being steeped for five minutes ; (2) boiling for five minutes with a 7½ per cent. solution of sulphuric acid ; (3) steeping for five minutes in concentrated nitric acid ; (4) boiling in stannous chloride solution until the colour is reduced, a portion of the fibre after washing being boiled with 0·1 per cent. solution of potassium or sodium bichromate. The stannous chloride solution consists of equal weights of the crystallised salt, hydrochloric acid and water. The colour of the fibre and of the solution are noted, and in the cases of the concentrated acids, the colour of the solution after diluting ; these results are given in a tabulated form for several dyestuffs.—B. N.

Patents.

Bleaching vegetable fibres, pulps and the like. C. A. Meygret. Fr. Pat. 432,552, July 25, 1911.

The fibre or pulp is first subjected to an alkaline treatment, then washed and afterwards submitted to the action of one of the following reagents—hydrochloric acid, nitric acid, a mixture of nitric and hydrochloric acids, alcohol, acetone or one of its derivatives, or wood spirit. The excess of liquor is next removed and the material is successively treated with ozone, chlorine and dilute acid. It is then washed, immersed in a solution of sodium thiosulphate, washed again and finally dried.—P. F. C.

Hosiery ; Mercerisation of ——. B. Müller. Fr. Pat. 433,115, Aug. 9, 1911.

The hose are drawn over formes which are suspended from a moving endless band. This band carries the goods between vertically arranged sprinklers for impregnating them with the mercerising liquor and subsequently washing them. The washing is carried out on the cumulative principle in order to recover the lye.—P. F. C.

Indigo-vat ; Preparations suitable for the ——. Farbwerke vorm. Meister, Lucius, und Brüning, Hoechst a/Main, Germany. Eng. Pat. 17,437, July 31, 1911. Under Int. Conv., Aug. 1, 1910.

This is a modification of the process described in Eng. Pats. 18,761 and 20,324 of 1910 (this J., 1911, 1047 and 1110), which consists in incorporating with indigo one of the acids mentioned in the above patents as suitable for the manufacture of colloid-like indigo, with or without the addition of such substances as clay, starch, etc., mentioned in Eng. Pat. 4647 of 1905 (this J., 1906, 174). This indigo-preparation yields in the vat, finely-subdivided, easily-reducible indigo.—B. N.

Dyeings on the fibre ; Production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 433,313, Aug. 7, 1911. Under Int. Conv., Mar. 27, 1911.

By combining diazo, diazo-azo or tetrazo compounds of the benzene or naphthalene series with 3-amino-1-phenols or 3-amino-1-phenylglycines or with those of their derivatives which are unsubstituted in at least two of the positions 2, 4 and 6, dyestuffs are obtained which are specially suitable for developing on the fibre. Example : 10 kilos. of the dyestuff prepared by combining diazobenzene with *m*-aminophenol are dissolved in warm water and after adding 10 litres of caustic soda of 40° B. and 20 litres of Turkey red oil, the solution is diluted to 1000 litres. Bleached cotton cloth is padded in this liquor at the ordinary temperature, then dried, and developed with a solution of diazotised *p*-nitraniline. A bright reddish brown is obtained which is fast to light and washing and gives a good white when discharged with rongalite. —P. F. C.

Reserving vegetable fibres before dyeing ; Process for ——. Soc. Anon. Benigno Crespi. Ger. Pat. 240,871, Nov. 16, 1910.

Cotton yarn may be reserved against dyeing by treatment with boiled linseed oil or other drying oil, with or without addition of a metallic salt.—T. F. B.

Printing fabrics ; Process for ——. C. Winternitz and P. Zaeslé. Fr. Pat. 432,809, July 19, 1911.

Ozonised starch is used as a thickening agent in the preparation of printing colours.—P. F. C.

Printing ; Process for ——. L. Tochtermann. Ger. Pat. 241,521, July 12, 1910.

Unprepared goods are printed with dyestuffs such as indanthrenes, Ciba colours, Helindone dyes, sulphide or thioindigo dyestuffs (which can be fixed by means of hydrosulphite and alkalis, or with alkalis or sodium sulphide), together with an excess of alkali, and then steamed and printed with tannin colours.—T. F. B.

Norgine insoluble in water and in alkalis ; Process for preparing ——. Chem. Fabr. Grünau, Landshoff und Meyer A.-G., and R. May. Ger. Pat. 240,832, Feb. 14, 1911.

A variety of norgine which is insoluble in water and in alkalis, may be obtained by treatment of soluble norgine with formaldehyde vapour or by boiling it for a short time with an aqueous solution of formaldehyde and evaporating the product to dryness on the water-bath. The products obtained in this way differ materially from those produced by precipitating norgine from its aqueous solutions with acids or with soluble salts of metals of high atomic weight or of magnesium.—T. F. B.

Fabrics, threads, and other materials ; Process for waterproofing ——. A. M. Hart. Fr. Pat. 433,013, Aug. 5, 1911. Under Int. Conv., Aug. 6, 1910.

See Eng. Pat. 18,607 of 1910 ; this J., 1911, 1448.—T. F. B.

Products [Sulphur derivatives of hydrocarbons] suitable as coatings, loadings, films, threads, and elastic or plastic masses, etc. Eng. Pat. 26,928. *See* V.

VII.—ACIDS ; ALKALIS ; SALTS ; NON-METALLIC ELEMENTS.

Pyrites ; Risk of danger to a cargo steamer by ——. H. Mastbaum. Chem.-Zeit., 1912, 36, 30—31.

A description of a case in which part of a consignment of extracted pyrites was loaded into the ship during rainy weather, and later, owing to the ship's motion, became converted into a pasty mass which endangered the equilibrium of the vessel. When the cargo was being unloaded, pools of a greenish liquid containing 12·24 grms. of ferrous and 8·72 grms. of ferric sulphate and 5·79 grms. of free sulphuric acid per 100 c.c. were observed. It is stated that at Lisbon only one single similar case had occurred. Danger due to movement of the cargo and to corrosion could be prevented by simple means, but the author suggests that it might prove profitable to dry the extracted pyrites further by pressing, draining, or centrifuging; with pyrites similar to the consignment in question, if the water-content (8—10 per cent.) were further reduced one-half, 120—160 kilos. of copper would be recovered per 1000 metric tons.—A. S.

Hydrochloric acid from chlorine; Production of ——. O. Nagel. Chem.-Zeit., 1912, 36, 54.

A MIXTURE of steam and chlorine is passed through a column of glowing coke which is maintained at about 1000° C. by substituting a blast of air for the mixed gases at regular intervals. The reaction takes place in accordance with the equation: $Cl_2 + H_2O + C = 2HCl + CO$, and fairly pure carbon monoxide is obtained as a by-product (compare Eng. Pat. 25,073 of 1894; this J., 1895, 272). In the United States considerable quantities of electrolytic chlorine are available and, owing to lack of Leblanc alkali works, there is always a good demand for hydrochloric acid. —F. SODN.

Ferrous salts; Dimethylglyoxime as a sensitive reagent for ——. P. Slawik. Chem.-Zeit., 1912, 36, 54.

WHEN an alcoholic solution of dimethylglyoxime is added to a solution of a ferrous salt, in the presence of tartaric acid, and the mixture is saturated with ammonia, an intense red colouration is at once produced. Ferric salts are not affected by the reagent.—F. SODN.

Bisilicates and titanates; Fusion experiments with ——. S. Smolensky. Z. anorg. Chem., 1912, 73, 293—303.

MIXTURES of calcium silicate ($CaSiO_3$) and calcium titanate ($CaTiO_3$), containing from 0 up to 73·2 mols. per cent. of the latter, when allowed to solidify from the fused state, form a continuous series of mixed crystals, and these separate on further cooling into the two constituents. From fused mixtures of the corresponding manganese compounds, containing less than 22·3 mols. per cent. of titanate (the eutectic concentration) manganese silicate crystallises on cooling, and above this concentration a solid solution of silicate and titanate, which decomposes on further cooling, is obtained. The melting point of manganese titanate is given as 1404° C. and that of the eutectic as 1120° C. An equilibrium diagram is given for each system, and the conclusions arrived at by the thermal method have been confirmed by microscopic examination. The mineral, titanite, has been prepared in the form of fine blue crystals, melting at 1221° C. and exhibiting all the optical characters of the natural mineral.—F. SODN.

Niobic and tantalic acids; Hydrosols of —— and the separation of niobium and tantalum by the method of Weiss and Landecker. O. Hauser and A. Lewite. Z. angew. Chem., 1912, 25, 100—103.

THE method of Weiss and Landecker (this J., 1909, 1169) consists, briefly, in fusing a mixture of niobic and tantalic acids with sodium carbonate and potassium nitrate, treating the product with water, filtering from the sparingly soluble sodium hexatantalate, and treating the solution with carbon dioxide to precipitate the small quantity of tantalum which passes with the niobium into the solution. Foote and Langley (this J., 1911, 51) have examined the method and state that it is quite unreliable. The authors, however, find that if the fusion be effected with sodium carbonate alone and certain other conditions be complied with, good results can be obtained. It is pointed out that the tantalate and niobate present in the solution obtained by treating the fusion with water, are largely hydrolysed, and on introducing carbon dioxide the hydrolysis rapidly becomes complete. The tantalum and niobium are then present in the solution entirely in the form of colloidal tantalic and niobic acids, and the precipitation of the former is due to the fact that it is coagulated by carbonic acid much more rapidly than colloidal niobic acid is. The authors prepared hydrosols of the two acids by fusing niobium and tantalum pentoxides with alkali in a silver crucible, dissolving in water, and dialysing. The sols are relatively stable especially in presence of a small quantity of alkali; they are both electro-negative, so that there is no special tendency for one to carry down the other on precipitation; titanic acid hydrosol on the other hand is electropositive according to Lottermoser, and this accounts for the tenacity with which it is retained by the gels of titanic and niobic acids. Recognition of the fact that the precipitation by carbon dioxide in Weiss and Landecker's process is a colloid-chemical phenomenon allows of defining the requisite conditions for obtaining accurate results. No anions, such as sulphate-, chloride-, sulphite-, or nitrate-ions, which are capable of coagulating the sols should be present. The coagulated or precipitated tantalic acid should be filtered off as soon as possible, before coagulation of the niobic acid sets in. The solution should not be too concentrated, as the sols are stable only in tolerably dilute solutions.—A. S.

Magnesium nitride; Conditions of formation of —— from air. C. Matignon and Lassieur. Comptes rend., 1912, 154, 63—65. Chem.-Zeit., 1912, 36, 30.

IT has been pointed out (compare Erdmann and Moser, Ber., 1901, 34, 390) that when a porous mass of magnesium powder is heated in air, magnesium oxide is formed at the surface and magnesium nitride in the interior of the mass. Experiments made by the authors have now shown that magnesium powder absorbs oxygen much more rapidly than it does nitrogen, and that the absorption begins at a lower temperature (600° C. at atmospheric pressure) in the former than in the latter case (670° C.). At 670° C. the absorption of oxygen is at least 1000 times more rapid than that of nitrogen. It is apparent therefore that when magnesium powder is heated in air, the oxygen is first absorbed, with formation of magnesium oxide in the surface layer of the mass, after which the residual nitrogen penetrates further and forms magnesium nitride in the interior. The absorption of nitrogen is not facilitated by previous amalgamation of the magnesium.—A. S.

Magnesium silicide; Preparation of —— and its decomposition by acids. A. Besson. Comptes rend., 1912, 154, 116—119.

MAGNESIUM silicide is readily prepared in quantity by well ramming an intimate mixture of thoroughly dried quartz powder (200 pts.) and magnesium powder (100 pts.) into an iron crucible and starting the reaction by igniting a little magnesium powder on the surface of the mixture, the crucible being then covered. A bluish-black regulus of magnesium silicide is obtained, and by the action of dilute hydrochloric acid, a mixture of hydrogen and hydrogen silicides, containing 6—7 per cent. of the latter. The exact concentration depends on the conditions, but a greater concentration than that indicated above was not obtained by varying the nature or strength of the attacking acid; moreover, the gas evolved by the action of acids on calcium silicide was likewise found to be poor in hydrogen silicide. By collecting the dried gases in a vessel containing air, and sufficient carbon dioxide to prevent spontaneous ignition, a flocculent white deposit, which will burn like tinder, is obtained. The composition of this substance, which appears to be a mixture of products resulting from the incomplete oxidation of the silicon hydrides, corresponds to a formula between $H_4Si_2O_3$ and $H_4Si_2O_4$. When heated *in vacuo*, it is converted into a white sub-oxide of silicon, water being evolved.—F. SODN.

Rare earths; Fractional crystallisation of the picrates of the ——. L. M. Dennis and C. W. Bennett. J. Amer. Chem. Soc., 1912, 34, 7—10.

A NEUTRAL, aqueous solution of the picrates of the rare earths of the yttrium, erbium and didymium groups was subjected to fractional crystallisation in the usual manner, a series of 25 final fractions being obtained from the 263 crystallisations made. The absorption spectra of the final fractions were plotted, the atomic weight of each fraction being also determined by precipitating the earths as oxalates and ascertaining the $R_2O_3 : 3C_2O_5$ ratio. Commencing with an original material of atomic weight 116, a concentration of praseodymium and neodymium was obtained in the first fractions, the proportion of these elements rapidly decreasing after the sixth but increasing again unaccountably in the tenth and nineteenth fractions. Although entirely absent in the first six fractions, a sudden concentration of erbium and holmium occurred in the eighth fraction. The authors consider the process suitable for effecting a rapid concentration of praseodymium and neodymium practically free from erbium and holmium, and *vice versa*. —W. E. F. P.

Hydrogen peroxide; Derivatives of ——. J. D'Ans and W. Friederich. Z. anorg. Chem., 1912, **73**, 325—359.

Sodium reacts with an ethereal solution of pure hydrogen peroxide, displacing an equivalent quantity of hydrogen and forming sodium hydroperoxide, NaO_2H, ½ H_2O_2, part of the hydrogen peroxide being at the same time decomposed catalytically. Sodium hydroperoxide is also obtained by the interaction of sodium peroxide or natryl hydrate (NaO_2H) (Tafel, this J., 1894, 1195) and hydrogen peroxide dissolved in ether, also by the action of hydrogen peroxide on sodium alcoholate, and by evaporating a solution of sodium hydroxide containing hydrogen peroxide and subsequently dehydrating the product. Natryl hydrate is converted into sodium hydroperoxide by dissolving in alcohol, and these compounds are regarded as differing from each other only by the hydrogen peroxide of crystallisation present in the latter; this is obtained purest, and therefore most stable, when prepared from metallic sodium. When potassium reacts with an ethereal solution of hydrogen peroxide, part of the metal displaces hydrogen and part is directly oxidised. In this process the compound, $KO_2H.1{\cdot}5H_2O_2$, is formed, whereas by the interaction of potassium alcoholate and an alcoholic solution of hydrogen peroxide, the compound, $KO_2H.\frac{1}{2}H_2O_2$, is obtained. Calcium reacts with an ethereal solution of hydrogen peroxide to give a mixture of products. The formation of perphosphoric acid from phosphoric oxide and hydrogen peroxide (this J., 1910, 693) has been confirmed, and it has been found that pernitric acid is similarly produced when nitric anhydride is employed. Caro's acid, prepared from hydrogen peroxide and chlorosulphonic acid (this J., 1910, 877), has been shown by molecular weight determination in aqueous solution, to be monobasic; it may also be obtained, in theoretical yield, by the action of hydrogen peroxide on persulphuric acid. Acetyl chloride gives with pure hydrogen peroxide, peracetic acid, $CH_3CO.O_2H$, or diacetylperoxide, $(CH_3CO)_2O_2$, according to the proportions used; peracetic acid, like diacetylperoxide, is very explosive.—F. Sodn.

Rapid determination of sulphur in roasted blende. Nitchie. *See* X.

Patents.

Oleum [fuming sulphuric acid]; Process of making ——. T. L. Briggs, Flushing, N.Y., and H. F. Merriam, Summit, N.J., Assignors to General Chem. Co., New York. U.S. Pat. 1,013,638, Jan. 2, 1912.

A mixture of sulphuric anhydride and air is brought into contact with finely divided sulphuric acid (97—99·5 per cent. strength) which is made to move in a direction opposite to that of the mixture, the latter preferably passing upwards and meeting the acid in a descending film. The temperature of the apparatus is so regulated (*e.g.*, by cooling the exterior), that the sulphuric anhydride is practically all absorbed, and "a substantially clear exit" is produced.—F. Sodn.

(1) *Sulphuric acid; Process of concentrating* ——. (2) *Process and apparatus for the production of sulphuric acid free from arsenic and iron, by the lead chamber process.* Gräflich von Landsberg-Velen und Gemen'sche Chem. Fabrik, Berg- und Hüttenwerke, Ges. m. b. H. Fr. Pats. 432,873 and 432,874, Aug. 2, 1911. Under Int. Conv., Aug. 13, 1910.

(1) The acid is first concentrated, at 150°—160° C., to about 61° B., and is then introduced, in a finely divided state, into a tower or other appropriate apparatus in which a partial vacuum is maintained and in which the temperature may be regulated by the admission of heated air. (2) Arsenious acid contained in the gases employed is oxidised to the non volatile arsenic acid, and this is removed by washing the gases with acid, before allowing them to enter the chambers. In order to remove dust, the gases may first be passed through a mechanical filter composed of granular material, which is contained in one of two contiguous vertical chambers communicating below and sloping at the bottom, on opposite sides, so as to form a common central exit, towards which the material naturally slides, to be withdrawn, and replenished from above, at will; the gases pass down the unfilled chamber and enter the mass of filtering material at the bottom and to one side. From the filter the gases pass through one or more Glover towers and then through a series of washing towers to the chambers, the rinsing acid supplied to the washing towers (originally as free as possible from arsenic) being sent finally to the first Glover tower, in which denitration is effected.—F. Sodn.

Sulphuric acid lead chambers; Device for increasing the yield of ——. O. Niedenführ, geb. Chotko. Ger. Pat. 241,894, Dec. 3, 1910.

Partitions of iron or the like, covered with lead, are so mounted in the chambers that they can be readily removed or interchanged, thus dividing the chamber into compartments which can be connected with, or separated from, one another as desired.—A. S.

Nitric acid; Process of manufacture of highly concentrated ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 432,990, Aug. 4, 1911. Under Int. Conv., March 17, 1911.

Dilute nitric acid (of 60—62 per cent. strength for instance) is treated with nitrogen peroxide and then with oxygen, the apparatus being preferably arranged on the countercurrent principle. Oxygen may be allowed to enter alone at the end of the system and nitrogen peroxide introduced at an intermediate point, the latter being best effected by means of a current of oxygen, which is made to pass through the liquid peroxide. A slight excess of oxygen is employed in the process.—F. Sodn.

Nitric acid; Continuous production of —— *from nitrate and sulphuric acid.* H. Schellhaass. Ger. Pat. 241,711, April 8, 1911.

The nitrate and the sulphuric acid are heated and introduced separately in a finely-divided state into the reaction chamber (tower) in such a manner that they become intimately mixed whilst suspended in their finely divided condition and are thus enabled to interact completely. It is stated that the process can be worked so as to obtain either bisulphate or sulphate and to yield distillates of equal or different concentration.—A. S.

Lead oxide; Apparatus for the manufacture of ——. W. Eckford, Rhyl, Flint. Eng. Pat. 30,355, Dec. 31, 1910.

The lead melting vessel is provided with a well, below the bottom of the main vessel, to contain the molten metal, and the well is extended laterally beyond the circumference of the main vessel so as to form a feeding and overflow pocket. The latter is arranged so that its upper edge is at the working level of the lead, and is provided with depending walls carried below the level of the molten metal, thus forming a feed-pipe through which the vessel may be charged without interruption of the process. By means of the pocket, the working level may be observed and maintained, and overloading automatically prevented. The slope of the feed-pipe is such that it automatically grips and retains the pigs of lead in position as they are fed into the apparatus. Two separate passage-ways may be arranged in the feed-pipe, one for the air-supply pipe, and one for the pigs of lead. The walls of the well are extended across the main vessel, in order to prevent the rotation of the molten metal. (See also Eng. Pat. 30,354 of 1910; this J., 1912, 71.)—B. N.

Nitrogen compounds of silicon and aluminium; Manufacture of ——. O. Serpek, Paris. Eng. Pat 25,141, Nov. 11, 1911.

Bauxite, kaolin, clay, or any other substance containing mixtures or compounds of silica and alumina, is heated with carbon in a current of nitrogen, first to 1300°—1500° C. for a sufficient time to convert almost all the silicon into nitride, and then to 1600°—1800° C. for the formation of aluminium nitride, as described in Eng. Pat. 7507 of 1909 (this J., 1910, 277). In the first stage of the process the nitrogen must contain no oxygen, either free or combined, but in the second stage, producer gas containing no free oxygen or carbon dioxide may be utilised (see Eng. Pat. 13,086 of 1910; this J., 1911, 421).—O. R.

Alumina; Process of producing ——. E. D. Kendall, Elizabeth, N.J., Assignor to E. N. Dickerson, Stovall, N.C. U.S. Pat. 1,013,022, Dec. 26, 1911.

Clay is heated with a caustic alkali solution under pressure, milk of lime is added to the liquor, and the mixture is again heated under pressure. The alkali aluminate solution which is formed, is filtered and alumina is precipitated from it by means of carbon dioxide at ordinary temperature. —O. R.

Silicon carbide. F. J. Tone, Assignor to The Carborundum Co., Niagara Falls, N.Y. U.S. Pat. 1,013,700, Jan. 2, 1912.

Shaped pieces of carbon having a portion of their surface covered with dense silicon carbide, are made by heating similarly shaped pieces of carbonaceous material in proximity to vapours of a substance containing silicon, the temperature being sufficiently high to bring about the combination of the silicon and carbon *in situ*, but below that at which the resulting compound would be destroyed —F. Sodn.

Sulphurous acid; Installation for the liquefaction of ——. M. Moulin and R. Vandoni. Fr. Pat. 432,431, Oct. 4, 1910.

Sulphur dioxide is recovered in the liquid form from dilute sulphurous gases, without previous concentration and in apparatus of comparatively small bulk, by compression and cooling, the latter being effected by utilising the expansion of the admixed residual gases. The installation consists of a sulphur burner, working preferably under pressure, a series of compressors and heat interchangers, a liquefier, and expansion apparatus. The gas from the burner, containing 10—12 per cent. of sulphur dioxide, is conducted through a heat interchanger and cooling apparatus, and is then compressed to about 30 kilos., after which it is further cooled to about 0° C., and passed to the liquefier, the residual gases from which, after expansion to about 5·5 kilos. pressure, are at a temperature of — 70° C. and are used for cooling the tubes of the liquefier and in the heat interchangers. —F. Sodn.

Hydrogen sulphide; Extraction of —— from gases, containing it alone or mixed with ammonia, by means of metallic salt solutions. W. Feld. Fr. Pat. 432,590, June 17, 1911. Under Int. Conv., Feb. 3, 1911.

In the extraction of hydrogen sulphide from gaseous mixtures by passing them through a solution of a thionate of a metal, *e.g.*, iron, of which the sulphide is soluble in sulphurous acid, with regeneration of the thionate (see Eng. Pat. 3061 of 1909; this J., 1910, 352; also this J., 1910, 754), claims are made for: (1), employing excess of sulphurous acid to prevent the formation of iron bisulphide; (2), adding free sulphur before or after the treatment with sulphurous acid in cases where the amount of hydrogen sulphide in the gas is small as compared with that of the ammonia; (3), treating the regenerated thionate solution with a base, such as ammonia, or a reducing body, such as hydrogen sulphide or an alkali sulphide, to remove the excess of sulphurous acid and reduce the polythionates to thiosulphates; (4), treating the solution with an oxidising agent, in cases where the hydrogen sulphide present in the gas is in excess of the ammonia, to convert the thiosulphates and polythionates into sulphates; and (5), in process (4), the preliminary separation of the precipitated metallic sulphide prior to the oxidation of the solution.—H. H.

Carbonic acid; Vertical retort furnace intended specially for the burning of carbonate of calcium (limestones) and carbonate of magnesium (giobertite), with a view to the production of ——. The Magnesite Co., Ges. m. b. H. Fr. Pat. 432,648, Oct. 7, 1910.

The retort is surrounded by a wall of refractory material, which is attached solidly to the retort by radial slabs, but is not connected with the external masonry. A kind of outer retort is thus formed, within which the combustion gases rise around the retort proper. The retort wall and the outer wall, which are comparatively thin, are made of a mixture of corubin (the slag derived from the working of metals by the alumino-thermic process) and firebrick. —F. Sodn.

Crystals of inorganic salts; Production of large, pure ——. H. Osten. Ger. Pat. 241,315, July 6, 1910. Addition to Ger. Pat. 238,548, Oct. 12, 1909.

The mother liquors obtained when working the process described in the chief patent (see this J., 1911, 1313), are treated with a metallic halide or a halogen acid and then with excess of a soluble sulphide, and filtered if necessary, before being again submitted to crystallisation.—A. S.

Saturator for ammonium sulphate. H. Koppers. Ger. Pat. 241,338, Jan. 5, 1911.

The saturator is closed at the top by a distributing chamber provided with a heating device, and from the bottom of which a number of gas-inlet tubes, disposed symmetrically, depend into the saturator. In the saturator chamber a separate acid inlet tube is provided for each gas-inlet tube, and adjacent thereto.—A. S.

Oxides of iron; Preparation of pure —— by "blowing" impure molten iron. W. Günther. Ger. Pat. 241,341, Aug. 21, 1909.

The molten iron is first "blown" until the easily oxidisable impurities (sulphur, phosphorus, carbon, silicon, zinc, manganese, etc.) are removed, and the blowing is then continued for the production of pure oxides of iron, being stopped before notable oxidation of the remaining impurities (copper, tin, nickel, etc.), which are oxidised less readily than iron, takes place.—A. S.

Borax; Preparation of anhydrous ——. Chem. Fabr. Grünau, Landshoff und Meyer, A.-G., and P. Brand. Ger. Pat. 241,893, March 3, 1911.

Crystallised borax is heated at a temperature below its melting point until it is so far dehydrated that it will not melt in its water of crystallisation when heated to a higher temperature, at which the dehydration is completed. By working in this way, complete dehydration can be effected at 350°—400° C., and the metal containing vessel is not attacked.—A. S.

Alkali hydrosulphite; Preparation of solid ——. H. Schulze. Ger. Pat. 241,991, Sept. 8, 1910. Addition to Ger. Pat. 237,449, Sept. 18, 1909.

The process described in the chief patent (this J., 1911, 1161) is modified by using a solution containing a salt of a heavy metal in addition to magnesium hydrosulphite, and adding a quantity of sodium or potassium chloride equivalent to the salt of the heavy metal and one-half of the magnesium hydrosulphite. On allowing to stand, a double salt of the heavy metal separates first, and then on further standing and cooling, commercially pure alkali hydrosulphite separates.—A. S.

Alkali and alkaline-earth nitrates; Preparation of —— from nitric acid and chlorides. Le Nitrogène Soc. Anon. Ger. Pat. 242,014, July 3, 1910.

The claims are for the use of nitric acid of less than 35 per cent. concentration and for carrying out the reaction at a temperature not exceeding 80° C. or at a pressure of less than 300 mm. of mercury; the vapours evolved, with or without addition of air or oxygen, are led through one or several chambers containing the solid chloride. It is stated that under the prescribed conditions, the reaction: $HNO_3 + 3HCl = NOCl + Cl_2 + 2H_2O$, takes place only to a negligible extent.—A. S.

Calcium sulphate from brine and similar solutions; Separation of ——. E. Passburg. Ger. Pat. 242,071, July 1, 1910.

The solution is heated to a temperature at which it is supersaturated with respect to calcium sulphate, and is then rapidly transferred to a depositing vessel, before separation of calcium sulphate on the heating surface can take place. In carrying out the process, the solution is forced rapidly by means of a pump, through a system of heating tubes, into the depositing chamber, in which separation of the calcium sulphate is promoted by known means.—A. S.

Gaseous element [nitrogen or hydrogen] from a fluid containing oxygen; Separation of a ——. W. G. Heys, Manchester. From The Nitrogen Co., Ossining, N.Y., U.S.A. Eng. Pat. 17,666, Aug. 3, 1911.

A fluid, such as air or steam, containing oxygen as one of its constituents, is made to react with a molten or heated metal having a strong affinity for oxygen, which is thus absorbed. After collecting the residual nitrogen or hydrogen, the metallic oxide produced is made to dissolve or disseminate in a liquid, in which it is brought into contact with a suitable reducing agent, the reduced metal being continuously returned for re-oxidation in the process. The metal, in the case of air preferably lead, is suitably contained in a cast iron pot, lined with refractory material, and having an air-tight cover. Air, or other gas to be treated, is blown through the metal and collects in a bell of refractory material which depends from the cover into the molten layer overlying the metal. This upper layer consists, for example, of sodium chloride (100 pts.), sodium carbonate (100 pts.), and potassium chloride (75 pts.), and serves as a vehicle for transporting the lead oxide from the central part of the vessel, through which the nitrogen is ascending, to the sides of the pot, where, in the compartment formed between the outer walls of the bell and the lining, the oxide comes into contact with suspended or floating coal (or with a current of reducing gas) and is reduced, forming carbon dioxide, which is withdrawn, and metallic lead which settles down into the bath and is re-used. The unabsorbed gas (nitrogen) passes out from the upper part of the bell, through a pipe of relatively large diameter which surrounds the inlet pipe.—F. Sodn.

Nitrous products lost in the manufacture of sulphuric acid by the lead chamber process; Process for the recovery of the ——. A. Taraud and P. Truchot, Paris. Eng. Pat. 9461, April 18, 1911. Under Int. Conv., April 18, 1910.

See Fr. Pat. 425,913 of 1910; this J., 1911, 1012.—T. F. B.

Chlorosulphonic acid; Process of making ——. A. Klages and H. Vollberg, Salbke, Germany. U.S. Pat. 1,013,181, Jan. 2, 1912.

See Eng. Pat. 16,518 of 1910; this J., 1910, 1203.—T. F. B.

Ammonia from gases; Process of recovering ——. H. Koppers, Essen, Germany. U.S. Pat. 1,013,404, Jan. 2, 1912.

See Eng. Pat. 13,327 of 1910; this J., 1911, 249.—T. F. B.

Ammonia from nitrolim; Process for making ——. Alby United Carbide Factories, Ltd. Fr. Pat. 433,306, Aug. 3, 1911. Under Int. Conv., Sept. 12, 1910.

See Eng. Pat. 18,207 of 1911; this J., 1911, 1252.—T. F. B.

Zinc sulphide and thiosulphates: Process of producing pure ——. P. Pipereaut and A. Vila, Paris. U.S. Pat. 1,013,511, Jan. 2, 1912.

See Fr. Pat. 394,441 of 1908; this J., 1909, 243.—T. F. B.

Silicon carbide; Manufacture of ——. F. J. Tone, Assignor to The Carborundum Co., Niagara Falls, N.Y. U.S. Pat. 1,013,701, Jan. 2, 1912.

See Fr. Pat. 415,087 of 1910; this J., 1910, 1306.—T. F. B.

Hydrogen peroxide from impure persulphuric acid solutions; Process of making ——. L. Löwenstein, Vienna. U.S. Pat. 1,013,791, Jan. 2, 1912.

See Fr. Pat. 422,460 of 1910; this J., 1911, 685.—T. F. B.

Nitrates [from nitrites]; Process of making ——. C. Bosch and W. Wild, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,013,984, Jan. 9, 1912.

See Fr. Pat. 411,674 of 1910; this J., 1910, 949.—T. F. B.

Potassium salts, phosphoric acid, potassium phosphate, and other products from seaweeds or similar organic substances; Process for extracting ——. W. S. Firman, Administrator of H. S. Firman. Fr. Pat. 432,595, July 3, 1911.

See U.S. Pat. 1,010,403 of 1911; this J., 1912, 28.—T.F.B.

Oxides of nitrogen; Process and apparatus for obtaining ——. Nitrogen, Ltd. Fr. Pat. 432,810, July 21, 1911. Under Int. Conv., Nov. 26, 1910, and Feb. 20, 1911.

See Eng. Pats. 27,558 of 1910 and 4268 of 1911; this J., 1911, 1211.—T. F. B.

Filtering material for alkaline and acid liquids. Ger. Pat. 241,710. *See* I.

VIII.—GLASS; CERAMICS.

Arsenic in glass. S. R. Scholes. J. Ind. Eng. Chem. 1912, 4, 16—17.

Conflicting opinions have been expressed as to the possibility of the arsenic used in glass-making remaining in the finished glass. The author analysed samples of a soda-baryta glass of fairly high alkali-content and a potash-lead glass used for cut-glass ware. The charges of raw materials for these glasses contained 0·3—0·5 and 0·45 per cent. (reckoned on the amount of glass produced) respectively of arsenious oxide, and it was found that the greater part of the arsenic remained in the finished glass, being present almost entirely in the quinquevalent condition.—A. S.

Siloxide, a valuable substitute for quartz glass. F. Thomas. Chem.-Zeit., 1912, 36, 25—27.

The author has examined specimens of "siloxide," a name given to products prepared by fusing silica with small proportions of refractory acidic oxides such as zirconia or titania, (see Fr. Pat. 432,786; following), with the purpose of obtaining materials more resistant to the action of metallic oxides, especially alkalis, than quartz glass, and having a lesser tendency than the latter to suffer devitrification on heating (compare this J., 1911, 210, 748). Specimens of Z-siloxide or zirconium-glass and T-siloxide or titanium-glass were examined, and these, whilst not exhibiting the beautiful silky lustre of quartz glass ("vitreosil") possessed distinct advantages over the latter with respect to strength, thermal properties (resistance to devitrification), and resistance to the action of alkalis. In the case of the zirconium-glass the best material with respect to strength contained 1 per cent. of zirconia, whilst that containing 0·5 per cent. had the best thermal properties. Zirconium-glass has a softening point not much different from that of quartz glass, but it resists deformation better at high temperatures owing to its greater viscosity. The titanium-glasses (0·1—2 per cent. of titanium) have a somewhat lower resistance to compression than quartz glass, but resist transverse fracture better than the latter, and are superior even to zirconium-glass with respect to thermal properties.—A. S.

Fusion experiments with bisilicates and titanates. Smolensky. *See* VII.

Patents.

Quartz ware ; Manufacture of ——. F. W Burckhardt, Biebrich-on-Rhine, Germany. Eng. Pat. 1362, Jan. 18, 1911.

To obtain a uniform, plastic "bloom" by melting a silicious substance in an electric resistance furnace, the raw materials, such as quartz and sand, are used in different degrees of fineness. The material nearest the core of the furnace is heated to its vaporising point, so as to form an annular vapour space around the core, from which the vapour gradually penetrates the mass of raw material, and thus the finer particles of the mass are quickly melted and serve to bind the coarser particles. The raw material may be arranged round the core in concentric rings, differing from one another in fineness and colour, and separated from one another by cylinders made of paper, or other combustible substance, with the result that the individual layers are discernible in the finished product, with varying effects.—O. R.

Glass-furnace. S. B. Goff, Camden, N.J. U.S. Pat. 1,013,486, Jan. 2, 1912.

The melting furnace is surrounded by a casing, forming a hot air space provided with an air inlet. Fuel is supplied from a tank, through pipes which encircle the heating zone of the furnace, to the burners in the furnace which are also supplied, by means of a blower which discharges into the hot-air space with hot air conducted from the hot-air space through a pipe which also encircles the heating zone of the furnace. Means are provided for heating the fuel tank. The melting furnace is connected by a duct with a cupola-shaped furnace, forming a glass pot in its lower portion, and provided with "glory-holes" above the pot. Around and above the upper part of the cupola-furnace is a conical hood with an outlet at its upper end and shields hinged at the edge of the hood and extending over the "glory-holes." An annular water-chamber with an inlet and outlet is arranged on the top of the cupola furnace, and has a central duct communicating with the furnace. Above the water chamber is an air-chamber provided with a central duct which communicates with the former duct, and spiral vanes are arranged between the sides of the air-chamber and the hood to form spiral passages round the chamber.—W. C. H.

Glass ; A new —— and process for its manufacture. F. Wolf-Burckhardt and W. Borchers. Fr. Pat. 432,786, July 31, 1911. Under Int. Conv., Feb. 20, 1911.

The new glass, called titanium glass, is made by fusing pure anhydrous silica, as found in nature, with oxides of elements of the silicon-carbon group, preferably titanic acid or zirconium oxide, or with a mixture of these two. The new glass is formed by the solution of these refractory oxides of an acid character in silicic acid ; from chemical and thermal points of view it is very resistant. It is more easily worked than pure quartz glass, and can be worked by the ordinary methods employed in glass manufacture. (See also Thomas, preceding.)—W. C. H.

Silicious clay, kaolin or other clays, Process capable of removing iron contained in ——. F. Schulz, jun., Akt-Ges. and H. Gruber. Fr. Pat. 432,866, Aug. 1, 1911.

The raw clay material is worked up with water, small amounts of mineral acids are added, and finally a small quantity of hydrosulphurous acid or of a hydrosulphite at the ordinary temperature.—W. C. H.

Ceramic masses ; Filter-press for the dehydration of ——. H. Stegmeyer. Ger. Pat. 241,668, April 21, 1909.

A worm consisting of two concentric parts working in opposite directions, rotates in the annular space between two fixed concentric filter-cylinders. For instance the worm may have a left-handed thread on its exterior and a right-handed thread on its inner side. The ceramic mass can then be circulated continuously until sufficiently dehydrated.—A. S.

Clay ; Preparation of —— for dry or semi-dry pressing. J. Peters. Ger. Pat. 242,025, Dec. 6, 1910.

The clay is dried and ground as usual and is then moistened, previous to pressing, by means of the vapours evolved during the drying of a fresh quantity of clay.—A. S.

Lithographic stones ; Process for the manufacture of artificial ——. Lithographische Kunststeinfabrik G. m. b. H. München. Fr. Pat. 433,092, Aug. 8, 1911. Under Int. Conv., Sept. 10, 1910.

Air is removed during all the stages of manufacturing the stones from the time when the raw material is in the form of a dry powder, and then a paste, until the exhausted tank is opened and the cloth which protects the mass from water during the hydraulic pressing is taken off. The mass of material is cooled during the mixing process and any spontaneous heating prevented which would cause the air bubbles to expand ; the cooling is maintained not only during the mixing with magnesium chloride but also during the hardening of the stone.—W. C. H.

Clay, kaolin, and ceramic masses ; Process of treating ——. G. Keppeler, Darmstadt, and A. Spangenberg, Merzig on Saar, Germany. U.S. Pat. 1,013,603, Jan. 2, 1912.

See Fr. Pat. 387,803 of 1908 ; this J., 1908, 857.—T. F. B.

Enamelling objects of cast iron and particularly kitchen utensils ; Process for ——. L. V. Colin, Guise, France. Eng. Pat. 17,270, July 28, 1911.

See Fr. Pat. 411,630 of 1909 ; this J., 1910, 651.—T. F. B.

Silicon carbide. U.S. Pat. 1,013,700. *See* VII.

IX.—BUILDING MATERIALS.

Mortar ; Destruction of ——. A. H. White. Tonind.-Zeit., 1911, 35, 1737–1739, 1767–1768, 1807–1809, 1819–1821.

An account is given of a large number of observations by different observers of the alterations in volume of pure cement and mortars under various conditions, viz., exposed to water and to air, subjected to alternate wetting and drying, with and without embedded iron rods, etc. Neat cement, hardened under water, after one year shows an expansion of 0·07 to 0·15 per cent., and that there is practically no alteration up to four years. In the dry condition, after 3 years exposure to water, there is a contraction of 0·13 to 0·15 per cent., and on subsequent wetting, an expansion again of 0·13 to 0·17 per cent. Test-pieces of neat cement, hardened in air, contract after 3 months, 0·14 to 0·28, and after 1 year, 0·18 to 0·34 per cent., but there is no essential difference up to 4 years. Test-pieces of cement mortar 1 : 3, hardened under water, expand, chiefly during the first weeks, 0·01 to 0·05 ; but when hardened in air, they contract chiefly during the first 3 months, 0·06 to 0·09 per cent. In the moistened condition they expand 0·04 to 0·09 per cent., and in the dried condition, contract within the same limits. Test pieces of neat cement, and mortar 1 : 3 connected together, expanded and contracted jointly but in different ratios, and to different amounts : the difference in expansion fluctuated up to 0·15 per cent. Natural Portland cement showed twice as large a variation in volume as the artificial product. Alterations in volume by varying moisture content do not cease even after some years, for variations of 0·05 to 0·06 per cent. have been observed in test pieces taken from certain cement passages which had been in use for 20 years. Although these figures appear very insignificant, they would represent an appreciable amount in a wall, say 100 feet long, if free to move, and if not free to move, very considerable internal strains would be developed. Concrete hardened in a damp place, and kept moist all through its mass, expands slightly, but the pressure developed is not strong enough to cause damage. Concrete hardened in air and kept dry, contracts about twice as much as moist concrete expands. This greater force is dangerous not only on account of its magnitude, but because it shows itself at

the weakest place in the concrete, and introduces an error of unknown size into the calculation of reinforced concrete beams, and is responsible for cracks on the surface of indoor cement steps, though fortunately the worst effects are seen in the first three months. Cement footpaths, layers of plaster, etc., exposed to the weather, contract when dry, and expand when moistened. The alteration in volume is greatest with mixtures rich in cement, so that a difference in expansion between the upper and lower layers of a path may cause them to split apart, or cause a "fat" rough cast to peel off from bricks. In moist climates irregular expansions may become apparent even up to 20 years, and the worst effects may not occur for many years. Wide expansion joints are absolutely necessary in paths. Fat rough-cast surfaces become non-resistant through expansion and contraction, and the only safety seems to lie in the use of "lean" mixtures in which the alteration in volume is negligible. A plaster layer is not suitable for protecting iron network, for if "fat" enough to resist water it develops cracks, and if "lean" enough to avoid cracking it lets water through. In a dry climate cement paths and plaster layers contract to a greater extent than they expand, and consequently are more durable, and on account of the diminished wear and tear, plaster can be used to protect iron network.
—W. C. H.

Ferro-concrete ; Recent experiments on the fireproof qualities of ——. R. Saliger. Tonind.-Zeit., 1912, **36**, 66—68.

The necessity for uniform methods of testing the fireproof qualities of building materials is emphasised, such as those devised by the British Fire Prevention Committee or the German Commission on Ferro-concrete. In small test-pieces cement mortar and concrete are not strongly fire-resisting, so that scientifically controlled tests on experimental huts, such as those made at Berlin in 1910 are valuable. Details of the construction of the huts are given and the main results obtained. The conflagration lasted 140 minutes and the highest temperature reached was about 1000—1200° C., but fell to about 750° C., when the fire was extinguished with hydrants. Plaster on the walls peeled off at something below 100° C. At higher temperatures cracks developed in the walls and roofs and were much wider on the corners of the buildings, and in many places the concrete flaked off from the iron. Gravel concrete side walls bulged inwards about 10 cm., but rubble concrete walls only about 7 cm. Walls in which the iron was embedded to a depth of 0·5 cm. did not behave very differently from those in which it was embedded 2 cm., but the concrete was partially destroyed behind the iron. On the whole, rubble concrete was superior to gravel concrete. Concrete reinforced with iron rods lost 10 to 15 per cent. of its strength. After the fire, gravel concrete blocks, which had been placed in the huts, had lost 65 per cent., and rubble concrete blocks 59 per cent. of their strength. The conclusions confirm those of other observers. The modulus of elasticity of concrete decreases considerably under uniform heating, and causes large changes in shape, bulging, etc. As concrete conducts heat badly, and heat only penetrates slightly, only the surfaces of large bodies are destroyed. Refractory, porous aggregates are better than dense material such as quartz; and porous concrete, with a large amount of mixing water is better than a dense product. Old concrete resists fire better than new, and the most suitable mixing proportions are from 1 : 4 to 1 : 6, as either very fat, or very lean concrete is not advantageous. The coating on the iron should amount to 2—3 cm., but a mortar plaster of more than 5 to 7 cm. is valueless. Ferro-concrete buildings, as distinct from actual refractory constructions, are fireproof, and if properly planned and built are indestructible by conflagrations. Ferro-concrete roofs, beams and pillars, in a fire can carry much greater loads, without allowing the fire to pass to other floors.
—W. C. H.

Plaster of Paris ; Properties of ——. A. S. Seliger. Tonind.-Zeit., 1912, **36**, 68.

The chief drawback to plaster of Paris as a building material is lack of uniformity. The author has examined 10 sacks of plaster, for fineness of grinding (determination of the residue left on a 900-mesh sieve), the time of casting, and time of moulding. In the tests the first varied between 1 and 14 per cent., and indicates that the grinding is not carried out carefully. The time of casting ranged from 5 to 8 minutes, and of moulding from 15 to 26, but neither of these ranges is as great as that shown in the residues obtained on sifting. The experiments show lack of uniformity in the product, though individual tests made on the contents of any one sack agreed well with one another.—W. C. H.

Patents.

Mortars ; Compounded ——. S. Ferrand. Fr. Pat. 433,298, July 22, 1911.

In order to secure a uniform product the sand and lime or cement are mixed beforehand in exact proportions to give a mortar that will satisfy the requirements of public contracts for bridges, etc. The materials are thoroughly mixed mechanically so that the lime or cement is uniformly distributed through the mass of sand and surrounds all the grains. The sand is previously pounded and heated to remove all the moisture, and when cold is sifted to collect all the grains of any one size that is most suitable for a particular kind of work, such as pugging for heavy masonry, reinforced concrete construction, etc. The lime and cement are also sifted to remove any light or hard burnt portions. Mortars prepared accurately in this way, in a state of powder, ready for hydration and immediate use are claimed as new products, and also compounded mortars in the preparation of which there is included sodium carbonate or sea salt, to prevent cracking due to frost in fresh mortars, or magnesium oxychloride, to increase the coefficient of hydraulicity and the hardness of the mortar.—W. C. H.

Coating mortars ; Process for improving the permeability by air of dry ——. C. A. Kapferer. Fr. Pat. 433,321, Aug. 12, 1911.

Mortars composed of lime and granular material, such as sand, are rendered more easily permeable by air by adding oil or some fatty substance to one of the constituents of the mortar, or to the finished mortar. The fatty substances may be mixed with the lime during slaking, or in the slaked condition either before or during grinding. Or, the paste of slaked lime may be dried and sprinkled, whilst it is still hot, with a solution of the oil or grease in alcohol or acetone, some starch being added at the same time, and ground after the solvent has evaporated. Some milk of lime or other feebly alkaline liquid is added to the oily or greasy substances, and thoroughly agitated by mechanical means, and the emulsion obtained may be used to slake the lime, or the emulsion may be heated to drive off the excess water and then added to the mortar. Oxidisable oily or greasy substances may be treated with one of the finely divided constituents of the mortar, and the mixture exposed to the air ; after resinification it is used, in the ground condition, for preparing the mortar. The greasy substances may be added to porous, partially decomposed, mineral materials and the dry mortar made by mixing these with other materials. The porosity is improved by scratching the surface of the layer of coating which has been applied and smoothed.
—W. C. H.

X.—METALS ; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron-carbon system ; The ——. A. Smits. Z. Elektrochem., 1912, **18**, 51—54.

The author puts forward arguments in favour of the view that cementite, in the iron-carbon system, is always metastable. He considers that the liquid phase contains iron, carbon, and iron carbide in equilibrium. With slow cooling, graphite separates when the saturation point is reached, but with quick cooling, under-cooling takes place, resulting in supersaturation of both graphite and cementite. The supersaturation being relatively greater in the case of the cementite, this material separates. The author also considers that the solid phase martensite consists of graphite, cementite, and iron in equilibrium, and that the separation of cementite instead of graphite when malleable cast iron is heated to 1030° C. and then quickly cooled is to be ascribed to similar under-cooling. To follow the stable equilibrium between martensite and graphite to the eutectoid point would require such slow cooling that a thermal estimation of the temperature of the stable eutectoid point is quite impossible, but a positive result may possibly be obtained in the future by the dilatometric method.—T. St.

Tetracalcium phosphate; Constitution of —— and its behaviour with carburised and pure iron. E. Steinweg. Metallurgie, 1912, **9**, 28—40.

Finkener proved that tricalcium phosphate is decomposed by pure iron at high temperatures, phosphorus entering the iron. The phosphate in Thomas slag is a tetracalcium salt, which melts at about 1850° C. In the fluid state, the silica in Thomas slag is combined as $2CaO,SiO_2$; while on cooling, the compound, $5CaO.P_2O_5.SiO_2$, crystallises out, lime being liberated. Detailed results are given of an extensive series of experiments on the fusion of Thomas slags from various sources with pure iron, and also with iron free from silicon, but containing 3·84 per cent. of carbon. It was found that silica, and also alumina, decompose tetracalcium phosphate, forming a less basic phosphate, which latter is reduced by carbon, phosphorus entering the iron, if any be present. In presence of ferric oxide, the tetracalcium phosphate is decomposed: a calcium ferrite is formed, together with a reducible less basic calcium phosphate. In the absence of silica, alumina, and ferric oxide, the tetracalcium phosphate of a Thomas slag is not reduced by carburised iron. The re-entry of phosphorus into steel after blowing a charge can therefore only be caused by silica, alumina, or ferric oxide. This is confirmed by the fact that it is specially noticeable in hot blows, giving a chemically active slag.

The author concludes that the re-entry of phosphorus into steel probably takes place in the ladle, where it is due to the action of the silica and alumina of the lining, and not in the converter or open-hearth furnace on the addition of the recarburising medium, as is generally thought. —R. W. N.

Nickel- and manganese-steels; Magnetic properties of ——. S. Hilpert, E. Colver-Glauert, and W. Mathesius. Stahl und Eisen, 1912, **32**, 96—104. (See also this J., 1911, 625.)

The magnetic properties of heat-treated steels were measured at ordinary temperatures. Nine steels were examined, four containing 5·90 to 31·11 per cent. of nickel with less than 1 per cent. of manganese, and five free from nickel, but containing 4·58 to 20·80 per cent. of manganese. In every case except the steel with 31 per cent. of nickel, sudden cooling from 1200° C. produced a more magnetic steel than either a similar treatment at lower temperatures, or, in most cases, than slow cooling. By heat-treatment and systematic magnetic measurements it is shown that above 1050° C. highly magnetic compounds are formed, which it was found impossible, however, to obtain in a pure state at ordinary temperatures by sudden chilling. The magnetic properties depend on the heat-treatment previously received, the relation not being capable of such a simple explanation as that furnished by the usually accepted transformation theory. In all cases except that of the specimen containing 31 per cent. of nickel, the magnetic properties are increased by annealing at 400° to 450° C., both with suddenly and with slowly cooled steel. This is not an "ageing" phenomenon but a new condition only produced by heating. Specimens suddenly cooled from a given temperature show different properties according whether this point was reached by raising or by lowering the temperature: there is a marked hysteresis. No distinctive microscopic structure could be detected for magnetic or non-magnetic steels. In steel with 31·2 per cent. of nickel, the characteristic properties of iron disappear completely. Previous heat-treatment affects its properties only slightly. Steel with 20 per cent. of manganese is non-magnetic, and remains so whatever heat-treatment is applied. The authors have plotted the results obtained in a series of diagrams.—R. W. N.

Chromium: Determination of ——, and its separation from vanadium in steels. J. R. Cain. J. Ind. Eng. Chem., 1912, **4**, 17—19.

After discussing defects in the usual methods for the determination of chromium in chrome-vanadium steels, the author proposes a method based on the fact that chromium (and vanadium) can be completely precipitated in a few minutes by boiling the nearly neutral (ferrous) solution with barium carbonate (or cadmium carbonate, zinc oxide, or magnesia), the chromium and vanadium being subsequently separated by precipitating the former as lead chromate (see Noyes and Bray, Technolog. Quart., 1908, **21**, 14). A quantity of drillings of the steel, corresponding to not more than 0·06—0·07 grm. of chromium, is dissolved in hydrochloric acid (10 c.c. of acid of sp. gr. 1·2 per grm. of steel) in a covered 300 c.c. Erlenmeyer flask, the solution is diluted to 100—150 c.c. with hot water, nearly neutralised with a saturated sodium carbonate solution, and a slight excess of a barium carbonate "emulsion" added. The flask is covered and the contents boiled vigorously for 10—15 mins., with further small additions of barium carbonate at intervals, but not using more than 1—2 grms. excess of the latter. After allowing to settle, the precipitate is filtered off, washed twice with hot water, the paper and precipitate incinerated, and then fused for 20 mins. with 2 grms. of sodium carbonate and 0·25 grm. of potassium nitrate. The fusion is removed from the crucible by means of boiling water, the solution filtered, treated with 1—2 c.c. of hydrogen peroxide, and boiled for 5—10 mins. After cooling, the solution is well shaken with a slight excess of nitric acid (1 : 1) in a separating funnel, the carbon dioxide being allowed to escape by inverting the funnel and opening the stop-cock. The solution is then transferred to a flask, just neutralised with sodium hydroxide, and treated with 2 c.c. of nitric acid (1 : 1) for each 100 c.c. of solution. The chromium is now precipitated by addition of 20 c.c. of a 20 per cent. solution of lead nitrate, the precipitate being collected on asbestos, washed three or four times with cold water, decomposed with hot hydrochloric acid (1 : 4), and the chromium determined by titration with N/10 ferrous sulphate solution. The results of check analyses are given showing the accuracy of the method. (See also this J., 1911, 958.)—A. S.

Cyaniding by continuous decantation in Clear County, Colorado. H. C. Parmelee. Met. and Chem. Eng., 1912, **10**, 27—31.

At the works of the Hudson Reduction Co., Idaho Springs, Colorado, silicious sulphides of iron, sometimes containing lead and copper, and with a silver gold ratio of 15 : 1, are being successfully treated by amalgamation, concentration, and cyanidation. The addition of the cyanide process has not altered the former percentage of recovery by amalgamation and concentration but has converted a tailing loss into an additional saving, an old twenty stamp amalgamation concentration mill being remodelled so as to include cyanidation by concentration in Dorr slime thickeners. Full details of the whole process are given, and illustrated by a complete flow sheet. Recently an electrolytic oxygen cell has been placed in the fifth compartment of the zinc box where the barren solution will flow through it on its return to the mill, a current being used of 30 amps. at 100 volts flowing between 111 plates 3·5 by 3 in. in area, alternate plates being connected to each pole of the current. Since its introduction the permanganate consumption has steadily fallen and a curve is given showing the former high irregular consumption and the present low and much more regular consumption.—A. H. C.

Pyritic smelting. G. A. Guess. Eng. and Min. J., 1912, **93**, 113—117.

Pyritic smelting is defined as the production of a slag containing ferrous silicate from an ore in which all the iron is present as sulphide. The equation of the fundamental reaction is:

$$xFeS + ySiO_2 + 3xO = xFeO,ySiO_2 + xSO_2$$

One lb. of oxygen will oxidise approximately 1·84 lb. of pyrites to slag in presence of silica, or it will burn approximately 0·45 lb. of ordinary coke. Therefore as regards air consumption, 1 lb. of coke will take the place of 4 lb. of pyrites. When in a pyritic furnace the amount of coke is reduced, the tonnage increases until a new balance is attained. While the combustion of coke generates heat only, the combustion of pyrites also results in the formation of slag, which bears with it from the furnace approximately 30 per cent. of the heat so formed. When insufficient silica is present, the activity per cb. ft. of charge is diminished, and the temperature of the furnace is lowered. The slag is then more silicious than is normally the case, and a lower grade of matte is consequently formed. The remedy is to increase the amount of silica in the charge. Alterations in the silica content of the charge are the principal means available for changing the ratio of concentration, or condition of the furnace. It may, with suitable ores, be possible to vary at will the ratio of concentration from 4 to 1 up to 15 to 1 or more. The most economical conditions under which to work are determined from the speed of the furnaces under these varying conditions and the amount of copper in the slag. Increase of activity per cb. ft. of charge is brought about by increasing the silica, and indicates high concentration ratio. Increase of activity per minute, indicating faster smelting, is solely dependent on the volume of air per minute. Free oxygen appears to be always present in pyritic furnace gases. Oxygen efficiency, or the ratio of used oxygen to the total entering the furnace, rises with the ratio of concentration; this is also found to be true in converter work. The silica in the charge should be uncombined, as far as possible, as the presence of silicates lowers efficiency.—R. W. N.

Sulphur in roasted blende; Rapid method for the determination of ——. C. C. Nitchie. J. Ind. Eng. Chem., 1912, **4**, 30—32.

The following method has been in use for a year and has proved quite satisfactory as a means of controlling the roasting of blende. From each car load of ore drawn from the kiln, two samples are taken at different places by a spear sampler, and these are reduced with a riffle to a 50-grm. sample, which is ground in a Buck mortar by a few turns of the muller. A representative 1 grm. sample of the ground ore is then placed in a combustion boat which is introduced into a combustion tube of fused silica heated to about 1000° C. in an electric tube furnace. A moderately rapid current of air free from carbon dioxide is now drawn through the tube and through a Murray potash bulb containing a measured quantity (7—10 c.c.) of standardised sodium hydroxide solution (1 c.c. = 5 mgrms. of sulphur) diluted to a suitable volume. All of the sulphides and the sulphates of zinc and lead are decomposed, and the sulphur dioxide and trioxide evolved are absorbed by the alkali. Zinc oxide fume also passes over but is not absorbed to any appreciable extent by the alkali solution. When the zinc oxide fume has completely disappeared from the large bulb of the absorption apparatus (after about 6 minutes), the air current is stopped and the alkali solution is titrated with standard acid of equivalent strength, using phenolphthalein as indicator. The result obtained in this way gives what the author calls the "false sulphur," *i.e.*, the sulphur which under proper conditions might have been removed in the roasting. By adding to this value, $\frac{32}{56}$ of the percentage of lime (corresponding to the sulphur present as calcium sulphate), the total sulphur is obtained, and the figures agree well with those furnished by direct gravimetric determination. In practice a correction based upon the average lime content of a given grade of ore is sufficiently accurate for the purpose of works control.—A. S.

Copper; Influence of oxygen on ——, containing arsenic or antimony. R. H. Greaves. Inst. of Metals, Jan., 1912. [Advance proof.]

With the object of determining the influence of oxygen upon certain of the mechanical and physical properties of copper containing up to 0·5 per cent. of arsenic or antimony, comparative tests were made in which the metals were cold-rolled down to a thickness of 0·02 in. or drawn into fine wire. In the case of arsenical copper, it was found that, with increasing arsenic content, more and more oxygen was taken up by the metal without impairing its malleability or ductility; the quantity of oxygen so absorbed increased from about 0·05 to 0·02 per cent. as the arsenic increased from 0 to 0·2 per cent., and then more slowly to about 0·28 with 0·5 per cent. of arsenic, above which point the malleability decreased and the metal eventually became "cold-short." Similar results were obtained with antimonial copper, but in this case the presence of about 0·1 per cent. of oxygen was found to effect a distinct improvement in the malleability of the metal. The results of the tensile tests showed that when the oxygen content of either metal was increased from 0·15 to 0·4 per cent. a rapid diminution in the elongation was produced; but the effect upon the maximum stress was not marked. Measurements with the Shore scleroscope indicated that the hardness of the metal was scarcely affected by the addition of oxygen until the amount present exceeded 0·3 per cent., with 0·4 of arsenic (or less with antimony), when the hardness increased rapidly; the first addition of arsenic or antimony was found to decrease the hardness of copper containing oxygen. The quantitative effect of oxygen upon the electrical conductivity of arsenical or antimonial copper was not determined, but the addition of oxygen was found to decrease the conductivity of the former and increase that of the latter metal. The various methods of determining oxygen in copper are discussed in an appendix in which the author shows that the process involving reduction in hydrogen and weighing the water produced is both convenient and accurate.—W. E. F. P.

Copper-zinc alloys. The critical point at 470° C. *in ——.* H. C. H. Carpenter. Inst. of Metals, Jan., 1912. [Advance proof.] (See also this J., 1911, 133.)

The so-called β-constituent in copper-zinc alloys is to be regarded below 470° C. as an extremely minute and uniform complex of α- and γ-particles. A sample of pure β-alloy cast as nearly as possible in the β-area of the Shepherd diagram shows a remarkable structural stability. Even six weeks annealing at 445° C. does not produce any appreciable coalescence of the particles to crystalline units, which can be recognised microscopically. With alloys cast just outside the β-area, which contain crystallites of the α- or γ-phase in the presence of the main bulk of β, this stability is easily destroyed. The great stability of the isolated β-constituent is explained by supposing that the resolution on cooling takes place throughout the entire alloy at the same time, so that the α and γ are separated in the amorphous form intimately mixed. In an alloy containing 4 per cent. of aluminium the structural stability of the β-phase has been so much reduced that two days annealing at 445° C. is sufficient to produce a typical lamella inversion similar to that shown by pearlite. It is therefore definitely concluded that below 470° C. the β-constituent in copper-zinc alloys is really the two-phase system $\alpha + \gamma$.—W. H. P.

Brass. Influence of lead and tin on the microstructure of ——. F. Johnson. Inst. of Metals, Jan., 1912. [Advance proof.]

Tin is only slightly soluble in the α-phase of a cast alloy containing 70 parts of copper to 30 of zinc. Rolling and annealing help it to pass into solution. In the β-phase which is contained in alloys like Muntz metal and Admiralty brass, tin is readily soluble even in the cast condition. The "reticulations" caused by the presence of tin in a brass containing two parts of copper to one of zinc are due to the deposition of $SnCu_4$ from the β-constituent which is not present in sufficient quantity to dissolve it completely. Such "reticulations" have no structural relations with any lead which may be present, the latter always occurring in the free state. The author points out that it is advisable in practice to anneal thoroughly all castings from which the brittle $SnCu_4$ could separate, before mechanical treatment, so that the conditions for its solution are made as favourable as possible. For the same reason it is advisable to cool articles made of such brass very slowly after annealing. —W. H. P.

[*Zinc*] *Alloys; Behaviour of certain ——, when heated in vacuo.* T. Turner. Inst. of Metals, Jan., 1912. [Advance proof.]

The author has found that zinc and other metals are entirely removed from brass and other copper-zinc alloys when the latter are heated in a vacuum. In the case of brass, the separation of the zinc is quantitative provided the temperature does not exceed 1200° C. and the heating is not too prolonged; by subjecting a sample of "poisoned" brass to this treatment, all the zinc, lead and arsenic and a little of the tin were removed at 1200° C. Zinc volatilises easily at 375° C. in a vacuum; zinc was also readily volatilised from 60/40 and 70/30 brass at temperatures of 520° and 550° C. respectively. In an experiment upon 180 grms. of 70/30 brass which was melted in a crucible and allowed to cool in an exhausted desiccator, the percentage of zinc in the alloy was sensibly reduced, although the charge could not have remained liquid for more than three minutes. On heating zinc with copper *in vacuo*, the metals not being in contact, the copper rapidly turned yellow at 380° C., the zinc being still solid. When "hard" zinc (the residue from galvanising baths, containing about 5 per cent. of iron) was heated to 500° C. in a vacuum, the zinc was completely volatilised, the whole of the iron remaining in the residue. The application of this principle to the refining of crude copper, brass scrap, hard zinc, etc., is suggested.—W. E. F. P.

Corrosion; Contributions to the history of ——. (1). *The corrosion of condenser tubes by contact with electro-negative substances.* A. Philip. Inst. of Metals, Jan., 1912. [Advance proof.]

There is comparative freedom from corrosion of the condenser tubes in use in the Royal Navy, and this immunity is ascribed to the satisfactory composition of the tubes (70 per cent. of copper, 29 of zinc and 1 of tin) and the consistent employment, in the installations throughout the Service, of protector bars, slabs, etc., of steel, iron, zinc or aluminium. To be effective, such protecting metal must be in direct electrically-conducting connection with the tubes. Of the failures now observed, the author considers that less than 10 per cent. are caused by localised corrosion, the remainder being due to causes which have been long understood. According to present practice the tubes are placed horizontally and, in almost every instance of localised corrosion, each tube has been found to be pitted along the lower part of the interior surface. This circumstance is regarded as indicating that corrosion of this kind is caused by local galvanic action set up by the deposition, from the cooling water, of particles of coke, carbon or ferric oxide or of other conducting electro-negative material. Such local action is increased if the condenser, when not in use, is allowed to remain full of sea water, since the suspended particles are thus enabled to settle out in the tubes; by discharging the sea water, on the other hand, a possible source of danger is introduced since the lower portion of each tube would thereby be longest exposed to the joint action of sea water and air. The author considers that, in either case, the causes of localised corrosion could be minimised or altogether removed by the employment, if feasible, of condensers having vertical or strongly inclined tubes and by drawing the cooling water from such positions as will give the least chance of ashes from the ash-ejector, etc., being carried into the tubes.—W. E. F. P.

Tungsten and molybdenum; Some applications of wrought ——. W. D. Coolidge. J. Ind. Eng. Chem., 1912, 4, 2—4.

The recent production of ductile and malleable tungsten and molybdenum (this J., 1910, 825) has rendered possible the use of these metals for purposes for which previously they were quite unsuitable. The employment of drawn tungsten and molybdenum wires in the manufacture of electric incandescence lamps has been mentioned previously (this J., 1912, 20), and the author describes several other possible applications. As a winding for electric furnaces, tungsten and molybdenum wires are cheaper and far superior to platinum (see this J., 1911, 1264), and when used upon an alundum (fused alumina) body, higher temperatures can be attained than with platinum. Owing to their high melting point, heat conductivity (about twice that of platinum) and hardness, tungsten and molybdenum appear eminently suitable for electrical contact-devices, and their employment for this purpose is being tested in several directions. Tungsten is superior to platinum as a material for the targets in Röntgen (X-ray) tubes. Owing to its high melting point (3000° C. as compared with 1755° C. for platinum), it can be placed directly at the focus of the cathode rays, and radiographs of sharper definition can be obtained with much shorter exposure than with platinum. A further use for wrought tungsten which is being investigated is in the manufacture of projectiles. Its specific gravity (19·3) is higher than that of lead (11·5), and its hardness and high tensile strength will ensure a high penetrating power.—A. S.

Vanadium; Pure ——. O. Ruff and W. Martin. Z. angew. Chem., 1912, 25, 49—56.

The authors' starting point was the difficultly fusible vanadium trioxide: the pentoxide, on account of its readier fusibility, was found to be unsuitable. The alumino-thermic method, when carbon was substituted for a portion of the theoretically necessary aluminium, yielded a product containing from 95 to 99 per cent. of vanadium. Equally good results were obtained by making rods of the trioxide mixed with sugar charcoal, and heating them, first to sintering in Ruff's electrical vacuum resistance furnace, then to fusion in an arc furnace; or by melting down in zirconia crucibles at a temperature of about 2000° C. a mixture of vanadium carbide and trioxide. The carbide was obtained by fusing in a carbon crucible in the Ruff furnace at 2800° C. a suitable mixture of trioxide and carbon. Pure vanadium melts at 1715° C.; the sp. gr. at 18·7° C. of the fused metal is 5·688; the heat of combustion of 1 grm. (to V_2O_5) is 2456 calories. The melted metal readily dissolves either the trioxide or the carbide; and these mixtures melt at higher temperatures than the metal. The trioxide melts at 2000° C.; the carbide at 2750° C.—J. T. D.

Alloys; Properties of ——, at high temperatures. G. D. Bengough. Inst. of Metals, January, 1912. [Advance proof.]

The author has determined, through ranges of temperature up to their melting points, the influence of temperature on the breaking tensile stress and elongation of pure metals (copper, aluminium), alloys consisting of a single simple solid solution (copper-nickel, 70 : 30 brass), and alloys consisting of two solid solutions or other phases (Muntz metal, low-copper brass). In all cases the tensile strength diminishes as the temperature rises, but there is usually a change of direction in the curve representing this, most marked in the pure metals (copper 650°C., aluminium 395° C.). Above these temperatures the metals resemble very viscous fluids, having little strength, being very ductile, and greatly influenced in their tensile strength by the duration of the application of stress. Stress, too, causes them to emit a cry like the cry of tin—which metal is probably at the ordinary temperature above this "point of recuperation." No thermal critical points exist at these temperatures, and the suggestion is made that in a pure metal the crystals are normally held together by Beilby's "amorphous material," stronger than themselves, in a more or less continuous sheet or cellwork, and that above the "temperature of recuperation" this is no longer able to exist, and the crystals come in contact with one another. Fracture now takes place, no longer through the crystals, but along the crystal faces. If a metal be worked at a temperature above the point of recuperation, "amorphous material" if formed cannot exist permanently, and no effect is produced on the mechanical properties of the metal: this is "hot work." Cold work, on the other hand, carried out wholly or partly below this temperature, produces "amorphous material," and strengthens the metal. The difference in strength between rolled and cast material is shown by diagrams, and is seen to vanish at the temperature of recuperation. The elongation curves show these "mechanical critical points" more markedly than the maximum stress curves; but in the case of alloys these curves are greatly affected by variations in temperature, size of specimen, etc., and are often difficult to interpret. In pure metals, the elongation may increase, diminish, or remain almost constant, up to the point of recuperation, but there it greatly increases, and remains high till close to the melting-point. In the case of alloys, the forms of the curves are very various, and it is not yet possible to generalise about them.—J. T. D.

Alloys; Nomenclature of ——. W. Rosenhain. Inst. of Metals, Jan., 1912. [Advance proof.]

ATTENTION is called to the confusion which exists in the nomenclature of alloys, particularly in the use of the terms "brass" and "bronze" which are frequently used in contradiction. A suggested system of classification is given in which the class name "brass" includes all alloys whose principal constituents are copper and zinc, and "bronze" those containing copper and tin, and when other metals are present each particular alloy is distinguished by an addition to the class name, for instance, so-called manganese bronze would be known as manganese brass, and "Aich metal" as "iron brass."—A. H. C.

The bismuthate method for manganese. Demorest. *See* XXIII.

Mineral and metal production of the United States in 1911. Eng. and Min. J., Jan. 6, 1911. [T.R.]

THE following figures relate to the mineral and metal production of the United States in 1911, as compared with 1910:—

		1910.	1911.
Mineral and chemical substances:—			
Ammonium sulphate	tons of 2,000 lb.	116,000	127,000
Arsenic	lb.	2,652,000	6,162,000
Coal, anthracite	tons of 2,000 lb.	82,670,235	86,896,065
Coal, bituminous	,,	411,126,408	396,296,823
Coke	,,	36,056,059	29,338,214
Copper sulphate	lb.	26,356,788	33,454,000
Iron ore	tons of 2,240 lb.	53,267,397	41,815,471
Petroleum	brls. of 42 U.S. galls.*	210,588,308	209,931,884
Tungsten ore	tons of 2,000 lb.	2,130	1,125
Zinc oxide	,,	78,000	65,000
Metals:—			
Copper (*a*)	lb.	1,086,219,983	1,101,291,290
Ferromanganese	tons of 2,240 lb.	221,431	175,595
Gold (*b*)	dols.	96,269,100	96,233,528
Iron	tons of 2,240 lb.	27,074,114	23,647,451
Lead (*c*)	tons of 2,000 lb.	392,704	402,281
Nickel (*e*)	lb.	25,359,541	26,716,643
Quicksilver	flasks of 75 lb. net	22,418	21,500
Silver (*b*)	tr. oz.	57,137,900	57,796,117
Zinc (*d*)	tons of 2,000 lb.	277,065	292,700

* U.S. gallon = 0·833 Imperial gallon.

(*a*) Production from ore originating in the United States. (*b*) The statistics for 1910 are the final and those for 1911 are the preliminary statistics reported by the director of the Mint. (*c*) Production of refined lead from ore and scrap originating in the United States; antimonial lead is included. (*d*) Total production of smelters, except those treating dross and junk exclusively: includes spelter derived from imported ore. (*e*) Imports for first 11 months of each year; this nickel is smelted in the United States for the production of metal, oxide, and salts.

PATENTS.

Iron or steel; Treatment of —— for the prevention of oxidation or rust. H. L. Heathcote and Rudge Whitworth, Ltd., Coventry. Eng. Pat. 29,504, Dec. 19, 1910.

IN the treatment of iron or steel articles by immersion in a boiling solution of hydric phosphate of iron, the bath is prevented from becoming undesirably acid by the periodical addition of an alkali hydroxide or carbonate in predetermined quantity. It is claimed that, by the use of such neutralising agent (instead of iron filings or precipitated iron phosphate), the initial preparation of the bath and its maintenance in working condition are greatly facilitated.—W. E. F. P.

Metals, alloys and steels; Treatment of melted ——. L. Baradue-Muller, Paris. Eng. Pat. 30,198, Dec. 29 1910.

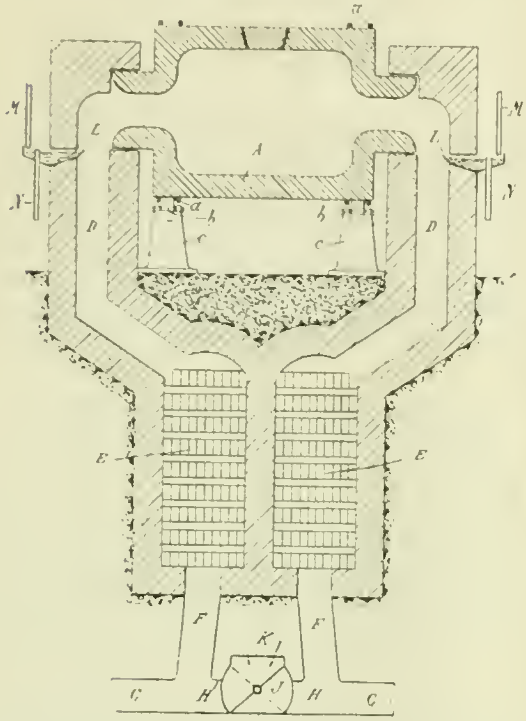
THE molten material, contained in the casting ladle, is placed in a closed chamber connected with pumps of high power capable of rapidly producing a partial vacuum; after which the exhaustion of the chamber is continued, by means of water, air or steam ejectors, until the pressure inside the chamber is equivalent to about 1 mm. of mercury. This condition is maintained for a few seconds, after which air is gradually admitted to the chamber and the molten metal is conveyed to the casting pit. To increase the speed with which the exhaustion of the chamber is effected, the gases drawn from the latter are rapidly cooled before entering the suction apparatus.
—W. E. F. P.

[*Iron*]. *Oxides; Process for the economic reduction of* ——, *by carbon and carbon monoxide.* Soc. Electro-métallurgique Française. Fr. Pat. 432,721, Oct. 10, 1910.

THE reduction is effected in a long, inclined, cylindrical, rotatory furnace, the lower end of which is connected with the interior of a horizontal electric furnace by means of a short vertical pipe through which hot reduced ore is continuously discharged. The metallic oxide (*e.g.* iron ore), in granular form but without addition of carbon, is fed into the upper end of the cylinder, a current of carbon monoxide being supplied from the opposite end. The charge is heated by the combustion of a portion of this gas, for which purpose a regulated quantity of heated air is admitted through openings in the cylinder at a point about midway of its length; below this point the ore, now partly reduced, is mixed with a proportion of granular carbon (introduced through openings in the cylinder) which serves the double purpose of completing the reduction and converting the carbon dioxide present into carbon monoxide. The final melting and subsequent purification of the metal is effected in the electric furnace.
—W. E. F. P.

Steel and other metals; Furnace system for the fusion of ——. A. Festa. Fr. Pat. 433,125, Aug. 9, 1911.

A CYLINDRICAL furnace, A (see fig.), open at both ends and provided with suitable supports, *b*, *c*, and guides *a*, is rotated about a horizontal axis, the open ends being connected with the conduits, D, by which the hot gases are conducted to or from the regenerators, E. The pipes, F, leading from the regenerators, open into a common



flue, G, in which the air-intake, K, is situated at a point between the two pipes, F, the direction of the air current being determined by means of the valve, J. The furnace is fired with oil contained in the receptacles, L, in which a constant level is maintained by means of the inlet and outlet pipes, M and N respectively. The whole system is enclosed in masonry lined with silica brick, the firing of the furnace being effected from each end alternately.
—W. E. F. P.

Iron and manganese ores: Purification of —— from arsenic, antimony, copper, lead, zinc, sulphur, etc. C. A. Brackelsberg. Ger. Pat. 241,321, Dec. 10, 1910.

The ore, whilst at a red or white heat, is treated with hydrochloric acid gas. The arsenic, antimony, copper, lead, zinc, iron, and sulphur compounds, etc., in presence of sufficient quantities of ferric and manganic oxides, are decomposed by the hydrogen chloride, with formation of metallic chlorides, ferrous and manganous oxides, steam, and sulphur dioxide. The ferrous and manganous chlorides react with the oxides of zinc, lead, copper, arsenic, etc., to form ferrous and manganous oxides and chlorides of the metals mentioned, and these chlorides are volatilised and recovered by condensation.—A. S.

Oxide ores and metallurgical products, especially iron ore, manganese ore, burnt pyrites, and flue dust; Process for the agglomeration of ——. Metallbank und Metallurgische Ges. A.-G. Ger. Pat. 241,464, Feb. 25, 1910. Addition to Ger. Pat. 210,742, Oct. 28, 1905.

According to the chief patent the finely divided ore was mixed with fuel, with the addition of water if desirable, and then heated in a current of air, the heat developed by the combustion of the fuel serving to sinter the greater part of the ore. In the case of certain kinds of burnt pyrites and blast-furnace flue dust, it has now been found that a larger proportion of the ore is sintered, and a more satisfactory product obtained, if the mixture before heating, be impregnated with a saline solution, for instance a solution of ferric sulphate.—A. S.

Melting furnace. G. J. Stock, Darlington. Eng. Pat. 24,329, Oct. 20, 1910.

A long, inclined, cylindrical hearth or melting chamber is connected at its lower end with an enclosed receiver for the molten metal liquated from the charge. The apparatus is fired (with gas, oil or coal-dust) from the upper part of the receiver, the air and fuel tuyères being so arranged that the flame sweeps twice across the surface of the molten metal before entering the cylindrical body of the furnace.—W. E. F. P.

Furnaces for smelting metals or the like. F. W. Winner, Wiesbaden, Germany. Eng. Pat. 10,939, May 5, 1911. Under Int. Conv., May 7, 1910.

With the object of increasing the efficiency of a crucible furnace by utilising that portion of the heat passing immediately beneath the furnace arch or roof, the latter is provided with openings from which additional crucibles are suspended. These crucibles are provided with supporting heads or flanges and the furnace arch is suitably reinforced.—W. E. F. P.

Roasting furnaces; Process for ensuring the regular distribution of air in the interior of ——, and rendering the gaseous products harmless. H. Kipper and C. Dax. Fr. Pat. 433,016, Aug. 5, 1911.

In a roasting furnace of the kiln type, the air is admitted through a distributing cone, centrally disposed in the lower part of the furnace and provided with a system of internal passages through which heated air is drawn from a chamber beneath. The gaseous products are drawn from the top of the furnace through a series of dust-collecting chambers before being allowed to escape.
—W. E. F. P.

Furnaces; Mechanical roasting ——. Helsingborgs Kopparverks Aktiebolag. Fr. Pat. 433,246, Aug. 16, 1911. Under Int. Conv., Aug. 18, 1910.

In a roasting furnace in which the ore is propelled, by means of horizontally rotating rabble arms, from the uppermost to the lowest of a series of superposed chambers, the rabble arms are removable and supported internally by carriers attached to a central shaft. The latter is provided with a number of downwardly inclined sockets adapted to receive the carriers which, when once placed, are retained in position by their own weight. The free end of each carrier is provided with a projection adapted to fit into a tube upon which a rabble arm is horizontally supported during its introduction or withdrawal through either of the lateral openings in the furnace. The hollow rabble arm is thus caused to slide into position over the carrier, the upper part of which is provided with an angular projection or shoulder adapted to engage with a corresponding portion of the interior of the rabble arm. Provision is also made for the circulation of a cooling medium through the interior of the rabbling system.—W. E. F. P.

Filter-presses for use in connection with hydro-metallurgical processes. C. W. Merril, California, U.S.A. Eng. Pats. 2802, Feb. 3, 3102, Feb. 7, and 7601, Mar. 27, 1911.

The filter-press—the construction of which is illustrated by a series of 36 drawings—comprises a series of filter plates and one or more containers, each of the latter being provided with a removable, non-metallic duct or pipe connecting the bottom of the container with a feed channel situated at a higher level. The filtrate is discharged from the press, through openings at the top or bottom of alternate filter plates, into closed or open delivery channels as required.—W. E. F. P.

Antimony; Process for electrolytic production of metallic ——, from antimony ores or compounds. R. C. V. Whitfield, Middlesbrough-on-Tees. Eng. Pat. 9968, April 25, 1911.

A solution of antimony trichloride, obtained by heating the ore (stibnite) with hydrochloric acid, is subjected to electrolysis (the anodes consisting of iron and the cathodes of copper, carbon or other suitable material) for the production of metallic antimony and a solution of ferrous chloride. The latter is oxidised, by means of nitric acid or a current of air, the resulting ferric chloride being used for effecting the solution of a further quantity of ore. —W. E. F. P.

Sodium by electrolysis; Furnaces for the production of metallic ——. E. Scheitlin, Basel, Switzerland. Eng. Pat. 18,804, Aug. 21, 1911. Under Int. Conv., Aug. 20, 1910.

The receptacle containing the melt, the walls of which act as the anode, is made circular in form, with two concentric cylindrical anode faces located one within the other. The cathode, consisting of several U-shaped arms branched off from a common contact pin, is located in the annular space forming the bath between the anode faces. An insulated current-conducting member in the form of a rod fits into the inner cylindrical anode, and at its upper extremity is formed into a cup, in which is placed a current-conducting liquid making electrical connection with the common contact pin of the cathode, so that the latter may be rotated during the process.—B. N.

Zinc; Electroplating with ——. A. A. Lemètre, Paris. U.S. Pat. 1,012,665, Dec. 26, 1911.

The electrolytic bath contains approximately 12 kilos. of zinc sulphate, 3 kilos. of ammonium chloride, 2 kilos. of sodium sulphate, 1 kilo. of sulphuric acid and 100 litres of water. A zinc plate is used as anode, and the current is passed through the liquid, either cold or at a temperature not exceeding 30° C., whereby an adherent deposit of metallic zinc is obtained.—B. N.

Zinc; Process for the extraction of crude —— *from materials containing zinc, with the aid of carbides.* A. van de Casteele and Comp. des Métaux et Prod. Chim. d'Overpelt. Fr. Pat. 432,849, Aug. 1, 1911.

The metal is extracted by distillation in the ordinary manner, the carbon necessary for the reduction being partly replaced by an alkaline-earth carbide.—W. E. F. P.

Ores: Process for the reduction of ——. W. Koehler, Cleveland, Ohio. U.S. Pat. 1,013,498, Jan. 2, 1912.

The ores are subjected, in the presence of a reducing agent and moisture, to the action of a halogen acid at a temperature sufficient to effect the liberation of the metalloids as such or as volatile compounds.—W. E. F. P.

Pyrites briquette and process of making same. J. S. Robeson, Camden, N.J. U.S. Pat. 1,013,614, Jan. 2, 1912.

In the preparation of "pyrites smalls" for desulphurisation, the material is moistened with the concentrated sulphite liquor resulting from the manufacture of cellulose pulp and made into briquettes.—W. E. F. P.

Electro-metallurgical products; Process of treatment of ——. The Carborundum Co. Fr. Pat. 432,503, July 24, 1911.

Electro-metallurgical products, designed for use as abrasive or refractory materials (see U.S. Pat. 906,172; this J., 1909, 26), are heated with the haloid of an alkali or alkaline-earth metal, such as sodium chloride, in order to remove impurities, especially carbides or silicides of iron, aluminium and titanium. By heating under oxidising conditions the products of the reactions between the impurities and the sodium chloride are removed, and the products then agglutinated. In the same way impure crystalline alumina may be heated in the presence of oxygen with the salt of an alkali metal, such as sodium chloride.—W. C. H.

Magnetic materials; Method of making ——. R. A. Hadfield, Sheffield. U.S. Pat. 1,014,218, Jan. 9, 1912.

See Eng. Pat. 22,130 of 1905; this J., 1906, 592.—T. F. B.

Iron; Method of copperising ——. W. G. Clark, Geelong, Victoria. U.S. Pat. 1,014,451, Jan. 9, 1912.

See Eng. Pat. 13,145 of 1909; this J., 1910, 359.—T. F. B.

Pig-iron; Process for refining —— *to convert it into a pure product for use in making iron and steel.* A. Boucher. Fr. Pat. 432,906, Oct. 15, 1910.

See Eng. Pat. 28,746 of 1910; this J., 1911, 752.—T. F. B.

Ores containing sulphides; Process and apparatus for washing ——. O. Malkemus, Benolpe, and C. Pletsch, Attendorn, Germany. Eng. Pat. 15,292, June 30, 1911. Under Int. Conv., Aug. 10, 1910.

See Fr. Pat. 429,296 of 1911; this J., 1911, 1220.—T. F. B.

Welding copper or nickel and copper or nickel alloy; Method of ——. W. Schieber, Vienna, Assignor to Berndorfer Metallwaaren-Fabr. A. Krupp, Berndorf, Austria-Hungary. U.S. Pat. 1,013,620, Jan. 2, 1912.

See Fr. Pat. 423,131 of 1910; this J., 1911, 631.—T.F.B.

Copper from its ores; Process of recovering ——. H. K. Hess, Philadelphia. Assignor to American Copper Extracting and Refining Co., Arizona. U.S. Pat. 1,014,061, Jan. 9, 1912.

See Fr. Pat. 391,017 of 1908; this J., 1908, 1117. T. F. B.

Precipitating and recovering from solutions valuable products, especially metals; Process and apparatus for ——. C. W. Merrill. Fr. Pat. 433,273, June 15, 1911.

See U.S. Pats. 1,006,865 and 1,006,866 of 1911; this J., 1911, 1320.—T. F. B.

Sodium; Furnace for the electrolytic manufacture of ——. E. Scheitlin. Fr. Pat. 433,395, Aug. 19, 1911. Under Int. Conv., Aug. 20, 1910.

See Eng. Pat. 18,804 of 1911; preceding.—T. F. B.

XI. ELECTRO-CHEMISTRY.

Characteristics of a transformer oil. Berninger. *See* IIa.

Patents.

Furnaces; Electric ——. Rochling'sche Eisen und Stahlwerke G. m. b. H. and W. Rodenhauser, Völklingen-on-Saar, Germany. Eng. Pat. 10,231, April 27, 1911. Under Int. Conv., Dec. 13, 1910.

The furnace is oblong in shape, with end walls that are semicircular as viewed in horizontal section, and inclined to slope away from the base as viewed in vertical section. The end walls, acting as electrodes, are composite in character, each consisting of an outer metal pole piece, lined with a refractory second class conductor, such as dolomite or magnesite. Iron bars or strips are embedded in the refractory material, in planes perpendicular to the direction in which the main current flows, and the current is first passed through these in order to heat the furnace and render the refractory material conductive, the current being then supplied to the outer metal pole pieces. The charge may be heated by induced currents, by arranging the core and primary windings of a transformer below the oblong base of the furnace.—B. N.

Furnace; Electric ——. F. Louvrier, Mexico. U.S. Pat. 1,013,189, Jan. 2, 1912.

The furnace is provided with an electrode at its base forming an electrically-conducting floor, and two series of electrodes are arranged in its opposite sides. Three circuit wires are arranged, so that, by means of circuit closers, one wire may be connected with the floor of the furnace, and the other two wires with the two series of electrodes through one or more of the contacts.—B. N.

Furnace; Electric ——. M. Appel, Baltimore, Md. U.S. Pat. 1,013,359, Jan. 2, 1912.

The furnace, of the induction type, is mounted so that it is capable of oscillation, and is provided with a number of metal baths, electrically interconnected at their surfaces by channels of relatively small cross-sectional area. These channels are so disposed that, by tilting the furnace, the cross-sectional area of the conductors in the channels may be varied. The furnace has oppositely-disposed electrodes in contact with the metal of the bath, and also connected with a conductor forming a closed secondary circuit with a primary winding in inductive relation to this. —B. N.

Furnace for production of endothermic reactions of gases by means of the electric arc. Salpetersäure Ind.-Ges. G. m. b. H. Fr. Pat. 433,112, Aug. 9, 1911. Under Int. Conv., March 31, 1911.

The lower electrode of the furnace, in the form of a rod, is surrounded by and insulated from two annular tuyères, arranged on the same axis as the electrode. The air is emitted from the inner tuyère in the form of a cylinder, and from the outer tuyère in the form of a cone. The shape of the furnace is such that the air in the outer stream is led along the walls of the vessel in a diverging direction, but on reaching the upper part of the vessel is changed to a converging direction essentially perpendicular to the axis of the furnace, and finally leaves the apparatus in a direction parallel to the axis of the furnace. These two distinct layers of gas are different in concentration, and two or more cooled annular outlets are arranged on the same axis, so as to carry off separately the gases of different concentration.—B. N.

Storage-battery separator. W. Taylor, Assignor to The Electric Storage Battery Co., Philadelphia, Pa. U.S. Pats. 1,012,751 and 1,012,752, Dec. 26, 1911.

(1) The separator is made from treated and dried wood of the species *Sequoia sempervirens.* (2) The separator consists of dry wood of the species *Taxodium distichum* belonging to the family *Taxodineæ.*—B. N.

trodes, with the metallic veins in the electrodes themselves. The metallic veins in the electrodes open into tapped cavities or grooves, and may also be terminated by enlarged parts or plates.—B. N.

Galvanic batteries. A. Heil, Frankfort on Maine, Germany. Eng. Pat. 473, Jan. 7, 1911. Under Int. Conv., March 14, 1910. Addition to Eng. Pat. 207 of 1911, dated Jan. 4, 1910.

See Fr. Pat. 419,770 of 1910; this J., 1911, 221.—T. F. B.

Furnaces; Electric radiation ——. E. C. R. Marks, London. From Gebr. Siemens und Co., Lichtenberg, Germany. Eng. Pat. 11,932, May 17, 1911.

See Fr. Pat. 431,243 of 1911; this J., 1911, 1394.—T. F. B.

Separation and dehydration of vegetable, animal, or mineral substances by electro-osmosis. Ger. Pat. 241,177. *See* I.

Purifying water. U.S. Pats. 1,012,808 and 1,012,809. *See* XIXb.

XII.—FATS; OILS; WAXES.

Linseed oil; Pure ——. E. J. Sheppard. J. Ind. Eng. Chem., 1912, 4, 14—16.

Samples of linseed of different origin were screened and carefully hand-picked, and specimens of oil were prepared by pressing both from the picked seed and the original sample. Portions of the picked seed were also analysed, the results being shown in the following table, together with the amounts of impurities in the original samples.

Kind of seed.	Picked seed.				Original seed.	
	Oil, per cent.	Sp. gr. at 15·5°/15·5° C.	Weight of one seed, in mgrms.*	Oleaginous impurities, per cent.	Non-oleaginous impurities, per cent.	Oil in total impurities, per cent.
1. American	39·67	1·1388	4·61	1·50	1·69	10·0
2. American	39·40	—	4·53	1·01	1·05	—
3. La Plata	36·98	1·1415	5·58	0·58	5·64	14·1
4. Calcutta†	40·82	1·1326	5·41	4·85	5·03	14·9
5. Bombay	41·23	1·1182	7·88	0·81	2·80	—
6. S. Russia (Kertch)	39·11	1·1375	5·74	5·05	1·71	—
7. N. Russia (Riga)	36·95	1·1458	4·19	3·31	1·97	—

* Average of 4000 full-sized seeds.

† In 11 more recent samples, the total impurities amounted to 6·9 per cent., with an oil content of 15·1 per cent.

On comparing the oils from the original samples and from the picked seed, no considerable differences in character could be detected, the most noticeable difference being in the case of Calcutta seed, where the oil from the picked seed had the iodine value (Hanus) 180·5, and that from the original sample, 179·3. The dark green colour of La Plata oil is due to the non-oleaginous impurities of the seeds, but the green colour of Riga oil is due to a colouring matter present in the linseed itself. No change in the character of the oil is produced by keeping the seeds for 2½ years in a closed container.—A. S.

Electrodes; Method of manufacturing ——. H. Rodman, Pittsburgh, Pa., Assignor to The Electric Storage Battery Co., Philadelphia, Pa. U.S. Pat. 1,013,445, Jan. 2, 1912.

Planté pole plates, for use as storage battery electrodes, are formed by pressing or moulding a barium-lead alloy into suitable shapes, a portion of the lead being then converted into active material, and a portion of the barium into an insoluble inert substance incorporated within the active material.—B. N.

Electrode; Carbon ——. Planiawerke A.-G. für Kohlenfabrikation. Fr. Pat. 433,204, Aug. 12, 1911. Under Int. Conv., Oct. 6, 1910.

In order to avoid losses of material in electric furnaces, in which carbon electrodes are employed, the remainder of an old electrode is united with the new one by means of carbon union pieces, and to compensate for the intervening resistance at the point of union, the union pieces are provided each with one or more metallic veins. The latter are terminated at their two extremities by enlargements or plates, and these are disposed in such a way that they make contact, after reunion of the elec-

Linseed oil; U.S. Navy specifications for boiled ——. Oil, Paint, and Drug Rep., Jan. 8, 1912. [T.R.]

The following specifications for boiled linseed oil have been issued by the U.S. Navy Department, November 20, 1911, superseding "Specifications 24-O-4," issued March, 1903, April, 1905, and April 8, 1908, and "52-O-2," issued November 10, 1909:—

1. Must be absolutely pure boiled oil of the best quality, made wholly by heating pure linseed oil to over 350° F., with oxides of lead and manganese for a sufficient length of time to secure a proper combination of the constituents and be properly clarified by settling or other suitable treatment.

2. Evidence of the presence of any matter not resulting solely from the combination of the linseed oil with the oxides of lead and manganese shall be considered grounds for rejection.

3. To be acceptable the oil must show on examination :—Unsaponifiable matter Not more than 1·5 per cent. Lead oxide (PbO)—Not less than 0·20 per cent. Manganese oxide—Not less than 0·01 per cent. Iodine no. (Hanus)—Not less than 170. Specific gravity at 60 F.—Not less than 0·938.

4. The oil shall give no appreciable loss at 212° F., in a current of hydrogen, and the oil flowed over glass and allowed to drain in a vertical position must dry free from tackiness in 12 hours at 70° F.

5. To be purchased by the commercial gallon; to be inspected by weight, and the number of gallons to be determined at the rate of 7½ lb. of oil to the gallon.

6. Before acceptance the oil will be inspected. Samples of each lot will be taken at random, the samples well mixed together in a clean vessel, and the sample for test taken from this mixture. Should the mixture be found to contain any impurities or adulterations the whole delivery of oil it represents will be rejected.

7. To be delivered in shipping cans and cases which shall conform to the latest specifications for the same issued by the Navy Department, or, if specifically stated in the contract, in strong, tight, well-made white oak casks, hooped with eight iron hoops; the chime hoops to be about 1¾ inches wide; the bilge hoops to be about 1½ inches wide; each cask to have a capacity of about 50 gallons.

8. Barrels to be marked with gross and net weight, and their weights will be verified by the inspecting officers as may be deemed necessary.

9. The quantity of oil delivered in 5-gallon shipping cans will be determined by taking the gross weight of 10 per cent. of the total number of cans, selected at random, from which the average gross weight of the delivery will be determined. A sufficient number of these cans will be emptied to determine the average tare, and the net weight of the oil will be taken from the figures thus obtained.

10. Each delivery will be considered a lot by itself, and each lot will be inspected and accepted or rejected as it passes or fails to pass the test required. No second test of any lot rejected will be permitted.

Fatty oils; Index of refraction of the mixed acids of ——. W. B. Smith. J. Ind. Eng. Chem., 1912, 4, 36—38.

From an examination of published data, together with some of his own experimental results, the author shows that the ratio between the refractive index of a fatty oil and that of the fatty acids separated therefrom depends upon the percentage of fatty acids in the glycerides and is nearly independent of the total refraction and of the iodine value (content of unsaturated acids). The refractive index of a fatty oil multiplied by 0·9938 gives a figure approximately equal to the refractive index of the insoluble fatty acids of the oil; in the case of solid fats, the corresponding factor varies between 0·992 and 0·994, according to the composition of the fat. The values 1·4991, 1·422, and 1·441 given in text-books (compare also Thoerner, this J., 1895. 43) for the refractive indices at 60° C. of the insoluble fatty acids of rape oil, cacao butter, and olive oil respectively are incorrect; the values obtained by the author at 40° C. are 1·4572, 1·4475, and 1·4528.—A. S.

Castille thistle seed oil. F. P. Lavalle. Ann. Soc. Argentina, 1911, **71**, 225—247. Chem. Zentr., 1912, 1, 269.

The seeds of the Castille thistle (*Cynara cardunculus*) contain 15—18 per cent. of a yellow non-drying oil of pleasant odour and taste. It has a sp. gr. 0·923 at 15° C.; acid value, 3·8; saponification value, 187·7; Hehner value. 83·1; Maumené number, 58·5° C.; oleorefractometer reading, + 25°; refractive index (Wollny-Zeiss), 1·4733 at 25° C., iodine value, 97·8; m.pt. of fatty acids, 11°—17° C. The flowers of the plant on extraction with ether yield a solid fat of agreeable odour, melting at 44° C. and solidifying at 39° C., the fatty acids from which melt at 48° C., and solidify at 42° C.—A. S.

Pancreas lipase. A. Hamsik. Z. physiol. Chem., 1911, 71, 238—251.

Dry pancreas powder, prepared by treating pigs' pancreas with alcohol and ether, was suspended in glycerin (1 grm. to 100 c.c.), the mixture was filtered repeatedly through paper, and the clear liquid then passed through a Chamberland filter. The first portion of the filtrate possessed relatively little enzymic activity, but the later portions were nearly as active both in hydrolysing and in synthesising power, as the original suspension. Clear active extracts could not be prepared with aqueous glycerin (33 per cent. solution). Experiments are described showing that under suitable conditions, palmitin and stearin can be synthesised to an appreciable extent by the action of pancreas powder (or a glycerin extract thereof) on palmitic acid or stearic acid and glycerin (compare Taylor, this J., 1906, 1157). Neutral salts have an unfavourable effect on the activity of pancreas lipase, but in presence of a suitable proportion of soap, this unfavourable effect may be prevented or even changed to a favourable effect.—A. S.

Influence of rice bran upon the manurial value of phosphoric acid contained in oil-cakes. Kida. *See* XVI.

Detection of cocoanut oil in butter and lard. Polenske. *See* XIXa.

Shrewsbury and Knapp's process of determining cocoanut oil [in butter]. Shrewsbury and Knapp. *See* XIXa.

Examination of dynamite glycerin. Hofwimmer. *See* XXII.

Patents.

Oleaginous seeds; Process for treating ——. P. Schneider. Fr. Pat. 432,787, July 31, 1911.

The seeds, prior to their expression, are given several rapid treatments with superheated steam so that they shall contain the degree of moisture most suitable for obtaining the highest yield of oil of good quality. Or, a strong jet of superheated steam may be applied to the seeds before crushing, with the object of destroying superficial germs, to the action of which the bitter flavour of the oil from certain seeds is attributed. A small addition of salt before the steaming prevents the quality of the oil being injured by any excess of water.—C. A. M.

Hydroxy fatty acids and their glycerides; Manufacture of —. K. E. Markel and J. Crosfield and Sons, Ltd. Fr. Pat. 433,294, July 18, 1911. Under Int. Conv., June 6, 1911.

In the reduction process described in Eng. Pat. 1515 of 1903 (this J., 1904, 26), the temperature of the reaction was stated to have no influence upon the final results. In the case of hydroxylated fatty acids or their glycerides, however, the decomposition of the hydroxyl groups may be prevented and saturated hydroxylated products obtained by keeping the temperature as low as possible, and preferably just above the melting point of the desired product. Thus when castor oil with an iodine value of 83·6 and acetyl value of 154·4 was agitated for several hours at 86° to 89° C. in an atmosphere of hydrogen in the presence of a finely divided catalytic agent containing nickel (see Eng. Pat. 30,282 of 1910; this J., 1911, 1461) a product with an iodine value of 2·4, an acetyl value of 155·6, and m. pt. 76·2° C. was obtained. Other metals in a state of fine division may be used in place of nickel in this process of manufacturing saturated hydroxylated fatty acids and glycerides.—C. A. M.

Wool fat and mineral oil; Process for preparing a solid fat from partly saponified ——. H. Joske. Ger. Pat. 241,565, Aug. 27, 1908.

Lanoline is heated for a prolonged time at 55°—60° C., and mixed with a 25 to 30 per cent. solution of potassium carbonate, with further heating; 10 per cent. of petroleum is then incorporated with this mixture at the ordinary temperature. The product is especially suitable as an emollient of the skin.—T. F. B.

Rosin soap; Process of manufacturing ——. J. Aktchourine, dit Aktschourin. Fr. Pat. 432,998, Aug. 5, 1911.

Wood shavings or analogous material are treated with a dilute alkaline solution at a temperature below 100° C. and under a pressure of several atmospheres, and the resulting mixture of rosin soap and rosin emulsion is separated from the residual woody fibre by any suitable method.—C. A. M.

Cooling margarine and like substances. Eng. Pat. 20,292. *See* XIXa.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Brazil copal. S. Machenbaum. Arch. Pharm., 1912, **250**, 6—12.

Brazil copal occurs in irregular fragments of a yellowish or reddish colour. It shows signs of melting at 127° C. and becomes clear at 160° C. The direct acid value is 123·2, the indirect value being 128·56. The cold saponification value after 24 hours is 136·26 and the hot saponification value 144·24. The copal was extracted with ether and the extract treated with solutions of carbonates to obtain resin acids. An acid, $C_{24}H_{40}O_3$, was obtained by means of ammonium carbonate and an acid, $C_{22}H_{38}O_2$, by means of sodium carbonate. The ether extract also contained a resene and an essential oil. After treatment with ether, the copal was extracted with a mixture of alcohol and ether. This extract contained an acid, $C_{16}H_{30}O_2$, isolated by means of sodium hydroxide solution, and a resene. About 58 per cent. of the copal is soluble in ether and about 30 per cent. soluble in the mixture of alcohol and ether. The ash amounts to 4 per cent.—F. Shdn.

Columbia copal. S. Machenbaum. Arch. Pharm., 1912, **250**, 13—19.

The colour of Columbia copal which occurs in moderately large pieces, is not uniform, some pieces being light, others dark in appearance. The powder smells slightly of turpentine. It shows signs of melting at 120° C. and becomes clear at 155° C. The direct acid value is 105·0 and the indirect acid value, 106·12. The cold saponification value is 106·80 after 24 hours, and the hot saponification value 110·60. The copal was examined in the same way as Brazil copal (see preceding abstract). The portion soluble in ether amounted to about 56 per cent. Treatment of this extract with ammonium carbonate solution led to the isolation of an acid, $C_{22}H_{40}O_3$, whilst by subsequent treatment with sodium carbonate solution an acid, $C_{20}H_{40}O_2$, was obtained. The extract also contained a resene and an essential oil. The copal was then extracted with a mixture of alcohol and ether. Two acids, $C_{14}H_{24}O_2$, and $C_9H_{20}O_3$, were separated from this extract by means of sodium hydroxide solution. The extract contained a resene, and amounted to about 30 per cent. of the copal. The copal yields 2 per cent. of ash. —F. Shdn.

Chicle gum; The so-called ——. J. E. Q. Bosz and N. H. Cohen. Arch. Pharm., 1912, **250**, 52—62.

The larger portion of Chicle gum, which is obtained in Mexico and Central America from *Achras Sapota* finds its way to the United States where it is used for the manufacture of chewing gum. The authors have repeated the work of Schereschewski (this J., 1905, 898). *α*-Chiclalban consists of almost pure *α*-amyrin acetate. *β*-Chiclalban is a mixture of lupeol and *α*- and *β*-amyrin combined with caproic, acetic, and cinnamic acids. It appears probable that γ-chiclalban is identical with cerotinone. Chiclafluavil is a mixture of all the constituents of the Chicle gum.—F. Shdn.

Examination of mixtures containing petroleum. Coste and others. *See* IIa.

Red lead; U.S. Navy specifications for dry ——. Oil, Paint, and Drug Rep., Jan. 8, 1912. [T.R.]

The following specifications for dry red lead have been issued by the U.S. Navy Department, November 20, 1911, superseding "specifications 24L2," issued July, 1904, and July 16, 1906, and "52L2," issued March 1, 1909:—

1. The dry pigment must be of the best quality, free from all adulterants, and contain at least 94 per cent. of true red lead (Pb_3O_4)—equivalent to 32·8 per cent. of lead peroxide, the balance to be practically pure lead monoxide. It must contain less than 0·1 per cent. of metallic lead, and to be of such fineness that not more than 0·5 per cent. remains after washing with water through a No. 21 silk bolting cloth sieve. It must be of good bright colour and be equal to the standard sample in freedom from vitrified particles and in other respects.

2. When mixed with pure linseed oil, turpentine substitute, and Japan drier, as per standard formula, viz:—Red lead, dry, 20 pounds; raw linseed oil, 5 pints; turpentine substitute, 2 gills; Japan drier, 2 gills; and applied to a smooth vertical iron surface, it must dry solidly without running, streaking or sagging.

3. When purchased in metal packages it must be boxed in quantities of 100 lb. each; the cases to be made of ⅞-inch new pine or spruce, planed on both sides. Tin pails or cans of 12½, 25, and 50 lb. must be provided with bails.

4. Each can must be marked with the name of the material, the trade-mark, if any, and the name of the manufacturer.

5. To be delivered in commercial packages. Net weight only will be paid for.

Patents.

Ink [for stencil duplication]. W. G. Fuerth, Assignor to Equilibrator Co., Newark, N.J. U.S. Pat. 1,013,544, Jan. 2, 1912.

A stencil ink is made from approximately equal proportions of fatty or vegetable oil (*e.g.*, a blown oil) and of "acetated" glycerin, to which are added a binding agent, an earthy filling material, a colouring matter, and a drier. Thus it may consist of "acetated" glycerin (40 per cent. by weight), rape seed oil (40 per cent.), dextrin (10 per cent.), zinc oxide (2 per cent.), and barium sulphate (8 per cent.), with a suitable pigment.—C. A. M.

Lakes; Manufacture of ——. Wülfing, Dahl, und Co., Act.-Ges. Farbenfabr., Barmen, Germany. Eng. Pat. 18,379, Aug. 14, 1911. Under Int. Conv., Aug. 16, 1910.

The azo dyestuffs obtained by combining diazotised aniline or *o*-toluidine with 1-naphthol-4-sulphonic acid are converted into orange red lakes by precipitation with heavy spar and calcium or barium chlorides.—J. C. C.

Lakes [from azo dyestuffs]; Manufacture of ——. Wülfing, Dahl, und Co., Akt.-Ges., Barmen, and E. Ulrichs, Elberfeld, Germany. Eng. Pat. 12,345, May 22, 1911.

See Fr. Pat. 431,420 of 1911; this J., 1911, 1397.—T. F. B.

Lakes [from azo dyestuffs], Manufacture of ——. E. Ulrichs, Elberfeld, Assignor to Wülfing, Dahl, und Co., Barmen, Germany. U.S. Pat. 1,014,539, Jan. 9, 1912.

See Fr. Pat. 431,420 of 1911; this J., 1911, 1397.—T. F. B.

Azo dyestuffs suitable for use in dyeing and in making lakes. Ger. Pat. 241,723. *See* IV.

Products [sulphur derivatives of hydrocarbons] suitable as coatings, loadings, films, threads, and elastic or plastic masses, etc. Eng. Pat. 26,928. *See* V.

Apparatus for the manufacture of lead oxide. Eng. Pat. 30,355. *See* VII.

Manufacturing rosin soap. Fr. Pat. 432,998. *See* XII.

XIV.—INDIA-RUBBER ; GUTTA-PERCHA.

Raw rubber ; Method for determining the amount of insoluble particles in ——. C. Beadle and H. P. Stevens. Analyst, 1912, 37, 13—16.

One grm. of the finely divided rubber is heated very gradually with 5 to 10 c.c. of nitrobenzene, petroleum spirit of high boiling point, or phenetol, preferably the last. The temperature should be kept for 30 minutes at 100° C. and then slowly raised to 140° C. and maintained at that point for 1 to 1½ hours, until the gelatinous mass suddenly liquefies. The contents of the tube are then cooled and poured into about 100 c.c. of benzene, and the liquid subsequently decanted from the insoluble deposit. The latter is washed twice by decantation with benzene and the washing completed upon a filter. Or in some cases it is best to remove the soluble matter completely by repeated decantation with naphtha, to evaporate the last traces of solvent, and to weigh the residue. The following results were thus obtained :—

	Hard cure Para unwashed as received.	Hard cure Para washed and dried.	Negro head.	Plantation crepe	Castilloa.	Castilloa creped.	Wild rubber A.	Wild rubber B.	Gutta.
	grms.	grms.	grms.	grms.	grms.	grms.	grms.	grms.	grms.
Total sediment	1·50	0·38	0·48	0·29	6·80	5·90	6·88	6·46	0·80
Ash from sediment . . .	0·66	0·20	0·26	0·05	3·78	1·10	2·85	1·06	0·40
Organic matter (by difference)	0·84	0·16	0·22	0·24	3·02	4·80	4·03	5·40	0·40

This method affords a check upon the completeness of the washing of the rubber. Thus in the case of two samples of scrap crepe the amounts of sediment (A, 1·7 ; and B, 2·5 per cent.) were reduced by re-washing to 0·7 and 1·4 per cent. respectively. The samples then yielded 0·7 and 0·35 per cent. of ash respectively. The insoluble impurities in A were chiefly sand and grit, and in B were mainly bark débris. Hence it is seen that the amount of ash does not necessarily indicate the amount of insoluble impurities in a sample of rubber. An advantage of this process is that it does not render the proteins of the rubber insoluble as is the case when benzene is used. Moreover, solvents of sufficiently high boiling point, such as phenetol, cause depolymerisation (by reason of the temperature obtained), so that the liquid becomes less viscous and allows rapid subsidence of the insoluble matter.—C. A. M.

Patents.

Caoutchouc substances ; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 1124, Jan. 16, 1911.

Certain organic substances, such as starch, urea, albumin, blood serum, glycerin, etc., possess the property of promoting the polymerisation of butadiene or its substitution products or homologues. For example, a whitish solid caoutchouc substance is obtained by allowing a mixture of 100 parts of butadiene and 1 to 2 parts of wheat starch to stand in a closed vessel for some months (compare Eng. Pat. 15,254 of 1910 and Fr. Pats. 417,768, 419,316, and 422,945 ; this J., 1910, 1215 ; 1911, 38, 226, 637).—T. F. B.

India-rubber ; Machines for washing, macerating, crepeing and similarly treating ——. R. Bridge, Castleton, Lancs. Eng. Pat. 8095, Mar. 31, 1911.

In three-roller rubber-washing machines, the main (top-front) roller is provided with fixed bearings, whilst the other two rollers have adjustable bearings. By means of an operative shaft and worm, clutch, spur and bevel or chain gear, the rollers can be adjusted separately or simultaneously, as to alignment of nip. Water jets are provided at the front and rear of the second nip and above the first nip.—E. W. L.

India-rubber ; [Apparatus for] Extraction [deresinification] of ——. W. Hiestrich, Nachf., Hamburg, Germany. Eng. Pat. 10,216, Apr. 27, 1911. Under Int. Conv., July 23, 1910.

The apparatus consists of a trough through which run, longitudinally, three parallel horizontal shafts, all revolving in the same direction and carrying knives which are arranged in such a way as to disintegrate the rubber by a scissor-like action. The "scissors" come into action in groups so as to reduce the power consumed within convenient limits. Sieves are provided at the ends of the shafts to prevent particles of rubber from being forced into the bearings. Liquid-discharge valves are provided for the removal of the solvent and extracted resins. The contents of the vessel can be heated during extraction by means of a steam-jacket on the lower part of the trough. The crude rubber is introduced into the extraction vessel without previous washing, and water is introduced with the extracting solvent ; subsequent washing of the rubber is unnecessary.—E. W. L.

Products [Sulphur derivatives of hydrocarbons] suitable as coatings, loadings, films, threads, and elastic or plastic masses, etc. Eng. Pat. 26,928. *See* V.

Producing isoprene from terpenic hydrocarbons. Addition to Fr. Pat. 425,885. *See* XX.

Producing hydrocarbons containing more than one double linkage [isoprene, etc.]. Fr. Pat. 433,322. *See* XX.

XV.—LEATHER ; BONE ; HORN ; GLUE.

Patents.

Tannic extract liquors, particularly quebracho extract liquors ; Process for clarifying ——. A. Redlich. Fr. Pat. 432,439, July 21, 1911.

See Eng. Pat. 16,527 of 1911 ; this J., 1911, 1271. T. F. B.

Animal skins ; Process for hardening and rendering impermeable ——. K. Hartmann. Fr. Pat. 432,696, July 27, 1911.

See Eng. Pat. 16,810 of 1911 ; this J., 1912, 82. T. F. B.

Artificial leather ; Process for making ——. E. Reidel. Fr. Pat. 433,281, June 29, 1911.

See Eng. Pat. 15,761 of 1911 ; this J., 1911, 1224.—T. F. B.

XVI.—SOILS ; FERTILISERS.

Manurial value of phosphoric acid contained in oil-cakes ; Influence of rice-bran upon the ——. Y. Kida. J. Coll. Agric., Tokyo, 1911, 1, 367—379.

In Japan vegetable manures, and particularly oil-cakes, such as rape seed cake and soy bean cake, are largely used. These oil-cakes are regarded as nitrogenous rather than phosphatic manures, although they contain 1 or 2 per cent. of phosphoric acid (P_2O_5), which is present mainly as phytin, nuclein and lecithin, the first in predominating and the last in smallest amount (see Tsuda, this J., 1909, 1053). Unfortunately the phosphorus of phytin is of much less manurial value than that of lecithin (see Aso and Yoshida, this J., 1909, 1053), and this fact probably accounts for the greater value of animal, as compared with vegetable phosphoric acid (see Nagaoka, this J., 1904, 993). It has been shown that phytin may be decomposed, and its phosphorus rendered soluble, by the agency of an enzyme, phytase (see Suzuki and Yoshimura, this J., 1907, 1061). This enzyme is present in much larger quantity in rice-bran than in oil-cakes. It is shown that, under the conditions of the author's experiments, in which the finely ground cake was digested with water for 7 days at ordinary temperature and at 35—40° C., the decomposition of the phytin present in oil-cakes into soluble compounds of phosphoric acid, may be rendered more complete by first mixing the cake with rice-bran. The author concludes, therefore, that the manurial value of oil-cakes must be enhanced by such admixture.—J. H. L.

Patents.

Metaphosphoric acid ; Preparation of alkaline earth and aluminium salts of —— soluble in citric acid. A. Hauck. Ger. Pat. 240,875, Dec. 25, 1908.

Alkaline-earth or aluminium salts of orthophosphoric acid are melted and subjected to the action of oxygen, air, or other oxidising agent at a temperature of at least 2000° C. —A. S.

Insecticides and anticryptogamic compounds ; Process of preparing sulphoricinates for use as ——. C. Flahault. Fr. Pat. 432,802, June 28, 1911.

Castor oil is treated with concentrated sulphuric acid, and, after the excess of acid has been removed by washing with water, the product is partially neutralised by the addition of alkali hydroxide or ammonia. The emulsion is then diluted with water and mixed with varying quantities of petroleum, amyl alcohol, or the like. Copper or silver salts may also be added.—W. P. S.

Plant pests ; Preparation for destroying ——. G. Grether. Ger. Pat. 240,285, Aug. 12, 1910.

The claim is for the addition of phenoxylacetic acid or cresoxylacetic acid or mixtures of the two to preparations used for destroying plant pests. The acids mentioned destroy both animal and vegetable plant pests.—A. S.

Superphosphate-chamber and means for emptying same. J. F. C. M. Tröbs, Harburg on Elbe, Assignor to H. Freudenthal, Hamburg, Germany. U.S. Pat. 1,013,334, Jan. 2, 1912.

See Eng. Pat. 15,940 of 1910 ; this J., 1911, 41.—T. F. B.

Purification and concentration of sulphite-cellulose waste lyes intended for the manufacture of cattle foods and fertilisers. Ger. Pat. 241,282. *See* V.

XVII.—SUGARS ; STARCHES ; GUMS.

Sugar beet plant ; Migration and accumulation of sugar in the ——. W. Ruhland. Z. Ver. deut. Zuckerind., 1912, 1—19.

From the author's studies it is concluded that the sugar passes to the root, not as sucrose, as Czapek and others believe, but principally as invert sugar, which is afterwards transformed into sucrose, although in the stalk sucrose is present as well as invert sugar. Throughout the second period of vegetation, however, the sugar found in the root is sucrose, and it is only on passing to the leaves that it becomes hydrolysed. Experiments were made on the permeability of the cells of the leaves and stalks towards carbohydrates, and positive results were obtained in the case of raffinose, sucrose, and of all hexoses from which starch can be formed. As to the degree of permeability in the leaf cells, this was found to be very small in the cases of sucrose, dextrose and lævulose ; whilst in the root cells it was even less for the same three sugars. Invertase was found to be present in every part, excepting the seeds and the fully developed root. It is found in the young root of the sprout, but as growth proceeds, the hydrolytic power of the enzyme gradually decreases. So far as the author's experiments have proceeded, it appears that the invertase is not localised in separate cells apart from the sucrose.—J. P. O.

Sugar cane ; The "incrustating" colouring substances of the ——. L. G. L. Steuerwald. Archief Suikerind. Nederl.-Indië, 1911, 19, 1543—1557.

Hitherto the so-called "incrustating" colouring matter of the sugar cane has not been fully investigated, although Prinsen-Geerligs has described its most characteristic properties (Archief Suikerind. Nederl.-Indië, 1897, 5, 359). The best method of isolating the colouring matter is to digest the washed finely divided bagasse in the cold for 3 days with a 3 per cent. solution of sodium hydroxide, to treat the brownish red liquor with Fehling's solution to precipitate the gum, and acidify the filtrate with sulphuric acid, the colouring matter thus being thrown out of solution as a flocculent precipitate, about 98 grms. being obtained from 3 kilos. of bagasse. It was carefully purified by dissolving in alcohol, and precipitating by the addition of water. From the elementary analysis, the empirical formula $(C_5H_7O_2)_n$ was deduced. It is an aromatic compound, giving pyrogallol on dry distillation, catechol on fusion with potash, and vanillin and vanillic acid on heating with mineral acids. It is now named "saccharetin." In discussing its rôle during sugar manufacture, it is pointed out that it is introduced into the raw juice with fine particles of bagasse to which it is firmly attached, and passes into solution to a greater or less extent during defecation, but is not decomposed during sulphitation or carbonatation, accumulating finally in the molasses. It is probable that the "undetermined" matter of cane molasses is largely made up of "saccharetin," or of substances derived from it, and that the lead compounds separated by Hazewinkel from syrups and molasses (Archief Suikerind. Nederl.-Indië, 1907, 15, 243) originate from it. It is suggested that crystals that are very dark coloured, in spite of only a small iron content, may be accounted for by the presence of this substance, the iron compounds of which are almost black. Its presence is a source of trouble in white sugar manufacture, and in order to limit its amount, care should be taken to separate all fine particles of bagasse by means of an efficient sifting appliance, and further to not use alkaline water for imbibition during milling, since in this way a greater or smaller amount is dissolved.—J. P. O.

Bagasse ; Directions for the determination of the sugar content of ——. J. J. Hazewinkel, J. S. De Haan, and G. L. Van Welie. Archief Suikerind. Nederl.-Indië, 1911, 19, 1687—1691.

It has recently been shown by one of the authors (this J., 1911, 42) that if in determining the sucrose content of Javan bagasse by the aqueous digestion method, the basic lead acetate be added before boiling, the results are too high, correct figures only being obtained when the defecant is added after the boiling. Taking this fact into consideration, a method has now been elaborated by means of which correct results are obtainable, and at the same time directions are given as to the best procedure in sampling (*cf.* also this J., 1911, 145). At the mill a large sample of bagasse is taken during 15 minutes, 24 samples in all being procured per day. It should be borne in mind that the bagasse at the corners of the "blanket" may have a different composition to that in the middle, and that the top of the layer may not be the same as the bottom. From the large sample, one of about 2 kilos. is immediately prepared, and subdivided in a suitable cutting machine to pieces not greater than 1 mm., all the material coming from the machine being passed through a 4 mm. sieve, and what remains behind sent through the cutter again. Of the well mixed sample thus obtained, 20 grms. are immediately weighed out into a tin pan, together with 250 grms. of water, which is heated to boiling point. Above the pan is placed a 50 c.c. pipette, from which water is allowed to drop into the pan at such a rate that at the end of boiling there still remains 250 grms. of water. As soon as boiling commences, the mass is well stirred by a glass rod, till a homogeneous pulp is obtained. Boiling usually lasts 15 minutes, and at the end of this time the contents of the tin are cooled, 5 or 10 c.c. of basic lead acetate added, the whole weighed, the liquid filtered, and finally polarised. The calculation of the percentage of sucrose is made in the usual way, and the existing tables may also be employed. It is pointed out that boiling for 15 minutes is generally sufficient, provided that subdivision has been fine enough, but that sometimes 30 minutes may be required, this being determined by experiment with the particular quality of bagasse. If water were not added whilst boiling to replace that lost by evaporation, concentration of the liquid would occur, and the density of the extract would be greater than that of the liquid remaining in the bagasse cells, a source of error thus being introduced.—J. P. O.

Defecated [beet] juice; Influence of temperature upon the nature of ——. A. Horowitz and R. Friedländer. Centr. Zuckerind., 1911, **20**, 469—470.

Preliminary experiments having shown that the amount of lime added has practically no influence upon the alkalinity of the defecated juice, tests were made to ascertain the relation between temperature and alkalinity, juice coming from the factory defecation tanks being filtered at different temperatures between 20° and 60° C. through a hot water funnel, and the several liquids titrated. Figures were thus obtained showing that the increase in the alkalinity with decrease of temperature is very appreciable, these being as follow: 60° C., 0·295; 50° C., 0·520; 48° C., 0·585; 40° C., 0·845; 30° C., 0·993, and 20° C., 1·53 per cent. of calcium oxide. Experiments were also conducted to determine whether the temperature at which the juice is limed has any influence upon the purity of the saturated juice. Defecation was carried out at 71° and 22° C., the corresponding alkalinity and purity values being 0·24, 1·64 and 91·8 72·5 before saturation, and 0·11, 0·135 and 95·0, 94·4 after saturation respectively, showing that the temperature of defecation is without appreciable effect. Tests in the factory on the effect of an excess of lime used in defecation at a given temperature, made by varying the amount of lime at stated intervals and taking 10-minute samples of diffusion, defecation, and saturation juices, showed that excess of lime had practically no influence on the purity of the juice.—J. P. O.

Raw [cane] sugar polarisations; Temperature corrections for ——. W. D. Horne. Intern. Sugar J., 1912, **14**, 39—43.

Two years ago the author carried out some experiments on the polarisation of raw cane sugars to ascertain the relative results of (1) polarisation at exactly 20° C., and (2) polarisation at some higher temperature, making a correction to bring the rotatory power of the sucrose and levulose to 20° C. In order to polarise at 20° C., the working parts of the instrument were enclosed in a galvanised iron box, which was covered with a ⅝in. layer of cork, and contained two ¼in. copper pipes passing along each side, through which water at 1° C. was circulated at the rate of 100 c.c. per minute. By means of a thermometer, which was placed near the analyser and compensation quartz wedges, and passed out of the box and covering, it was possible to ensure that the polariscope was maintained at exactly 20° C. In each case the sugar solution was made up to bulk at 20° C., and read in a tubulated 200 mm. observation tube, fitted with desiccating caps. When polarising at temperatures higher than 20° C., the temperature correction formulæ applied to bring the results to the standard temperature were: (*a*) for the sucrose, $P^{20°} = P^{t°}[1·0 + 0·0003 (t - 20)]$; and (*b*) for the levulose, $P^{20°} = P^{t} - 0·00812L(t - 20)$. It was then found when 8 samples of raw cane sugars, containing on an average 1·25 per cent. of reducing sugars, were polarised at 26·5° C., and the temperature correction formulæ for 20° C. applied, the results obtained were very close indeed to those found by actually polarising at 20° C., the corrected results being only 0·0247° V. lower. In another series of experiments, in which raw cane sugars containing 0·81—2·50 per cent. of reducing sugars, were polarised at 25°, 26°, and 28° C., and corrected to 20° C., practically identical results with those found by actual polarisation at 20° C. were again obtained, the corrected results being 0·0101° V. lower. Further, monthly comparisons between the polarisations made at 20° C. in the New York Sugar Trade Laboratory, and those made at higher temperatures in two other laboratories, (a) and (b) respectively, after correcting to 20° C., were made in the case of about 1000 samples, the differences from the figures of the Sugar Trade Laboratory in degrees Ventzke being as follow: March, (a) —0·0070, (b) —0·0096; April, (a) +0·0140, (b) +0·0200; May, (a) +0·1190, (b) +0·0710; June, (a) +0·0436, (b) +0·0117; July, (a) +0·0273, (b) —0·0170; August, (a) —0·0625, (b) +0·0193; and September, (a) +0·0047, (b) —0·0267, giving throughout the seven months an average difference of only 0·0148° V.—J. P. O.

Glucose and starch sugars; Composition of American commercial ——. A. H. Bryan. J. Franklin Inst., 1911, **172**, 337—342.

In the United States almost all the starch used for the manufacture of commercial glucose and starch sugars is prepared from the Indian corn or maize, potato starch being only used on a small scale. The hydrolysis is carried out in large copper boilers, or kettles, the starch being mixed with water and acid in weighed proportions and heated under pressure for varying lengths of time according as more or less complete conversion is required. Formerly sulphuric acid was used, but now hydrochloric acid is almost always employed. By varying the conditions the products of varying composition found in commerce can be made, as commercial glucose, "70 sugar," "80 sugar," and commercial dextrose. Commercial glucose (known in England as corn syrup or liquid glucose) is a thick viscous liquid never showing crystallisation, and contains more of the intermediate products of conversion than of *d*-glucose. It is concentrated to 42° to 45° Beaumé according to the purposes for which it is required. Analyses of 28 samples are given in the paper, the average of all the analyses, and the minimum and maximum figures of each constituent being:—

	Water, per cent.	Dextrose, per cent.	Ash, per cent.	Undetermined, per cent.	Polarisation of a solution of 26 grms. of the glucose in 100 c.c. on the Ventzke scale.					
					Direct.			Invert.		
					20°	87°	87° × 1·0315	20°	87°	87° × 1·0315
Average	16·47	35·51	0·52	47·14	173·9	166·0	171·3	173·1	163·6	168·7
Maximum	20·00	39·56	0·91	52·49	184·3	176·6	182·1	183·2	174·0	179·5
Minimum	11·95	30·21	0·24	40·46	155·8	150·0	154·7	155·6	146·4	151·0

The moisture was determined by the refractometer and Prinsen-Geerlig's table (Int. Sugar J., 1908, **10**, 69—70); the reducing sugars by Munson and Walker's method (this J., 1906, 656). For polarisation 13 grms. of glucose were weighed out, dissolved in water, and made up to 100 c.c. Powdered dry kaolin was added and shaken, then the whole filtered. A polarisation at 20° C. was made immediately and again after standing for 24 hours. Fifty c.c.

of the solution were transferred to a 100 c.c. flask, 5 c.c. of hydrochloric acid added, and the whole allowed to stand at room temperature for 24 hours for inversion. Polarisations on the inverted solution were made at 20° C. and at 87° C. A polarisation of the direct solution was also made at 87° C. The readings at 87° C. were corrected by the factor 1·0315 (1 c.c. of solution at 20° C. = 1·0315 c.c. at 87° C.). In this reading the temperature of the wedges was still 20° C. and the only change was the temperature of the solution. There was no muta-rotation shown after standing for 24 hours at 20° C.

Three distinct grades of starch-sugars are produced, named according to the percentage of *d*-glucose present, viz., 70 sugar, known as "Brewer's sugar" or "Nabob," 80 sugar called "Climax" or "Acme," and commercial dextrose. The first two products, while microscopically crystalline in structure, are placed on the market as an amorphous mass somewhat similar in appearance to soap, but differing in colour. The dextrose is generally in a fine powder, rarely in large crystals. Moisture was determined by drying to constant weight at 70° C. in a vacuum on sand. For dextrin, about 2 grms. were dissolved in 10 c.c. of water in a 200 c.c. flask by heating. After complete solution, the flask was cooled and absolute alcohol added to the mark with shaking. The flask was corked and allowed to stand for the precipitate to settle. The clear liquor was poured off, and the dextrin washed with 95 per cent. alcohol, then dissolved in water, washed into a dish and dried at 70° C. in a vacuum. The dried residue was again dissolved, tested for reducing sugar and the weight corrected for the *d*-glucose it contained. For polarisation a solution of 10 grms. was made up to 100 c.c., dry powdered kaolin added, and shaken, then filtered. The solution was allowed to stand 24 hours to come to constant polarisation. The results are given below :—

Appearance.	Water.	Dextrose.	Dextrin.	Ash.	Undetermined.	Polarisation, 10 grms. in 100 c.c.
Crystalline sugars.						
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	°V.
Cream granulate	5·04	90·70	0·52	0·97	2·77	28·65
,, ,,	5·10	89·96	0·16	1·06	3·72	27·70
,, ,,	5·67	89·36	0·54	0·48	3·95	28·00
Balls, small	9·57	82·68	0·31	0·62	6·82	27·50
,, ,,	9·94	81·52	0·37	0·64	7·53	27·70
,, ,,	9·21	83·76	0·44	0·64	5·95	27·80
Climax or 80.						
Dark yellow cake	10·61	77·24	1·15	1·17	9·83	28·40
,, ,,	9·06	77·84	0·96	1·18	10·96	26·50
Nabob or 70.						
Light yellow cake	13·77	72·32	0·57	1·08	12·26	26·15
,, ,,	16·55	67·46	1·45	0·95	13·59	30·30
,, ,,	15·66	70·64	0·60	0·94	12·16	26·30
,, ,,	16·65	70·12	1·24	0·47	11·52	30·30
,, ,,	15·76	73·16	0·81	0·97	9·30	25·10
,, ,,	17·33	66·72	2·42	0·45	13·08	33·45
,, ,,	18·03	69·70	0·65	1·00	10·60	24·90
,, ,,	17·74	70·12	0·67	1·12	10·35	28·45
,, ,,	17·63	66·60	0·94	0·48	14·35	32·50
,, ,,	15·20	71·28	2·32	0·52	10·68	32·00

—L. J. de W.

Sugars ; Action of amino-acids on ——; General method of formation of "mélanoïdines." L. C. Maillard. Comptes rend., 1912, **154**, 66—68.

If a mixture of 1 part of glycocoll, 4 parts of glucose and 3—4 parts of water is heated in a water-bath, the solution becomes dark brown after a short time and finally evolves carbon dioxide. The reaction appears to be a condensation, in which carbon dioxide and water are eliminated in the molecular proportions $CO_2 : 12H_2O$, the former being produced by breakdown of the carboxyl group of the amino-acid. At least two molecules of sugar, therefore, would seem to combine with one of glycocoll: the elimination of water must result in the formation of unsaturated linkages, and the products are probably polycyclic compounds containing one atom of nitrogen in the molecule. The reaction is quite general. Of the amino-acids tested, alanine shows it most readily. With glycocoll, xylose and arabinose react instantaneously, laevulose, galactose, dextrose and mannose quite readily, lactose and maltose slowly, and sucrose very slowly, a preliminary decomposition of the sugar being perhaps necessary in the last case. This reaction has an important bearing on many chemical processes. It probably explains the formation of dark coloured substances ("mélanoïdines") amongst the products of hydrolysis of proteins, a certain proportion of the amino-acids being decomposed by sugars present. (See this J., 1908, 1034).—J. H. L.

Wood dextrins [from filter-paper]. Yllner. *See* V.

Use of dried yeast for the manufacture of molasses-fodder Fallada. *See* XIXa.

Patent.

Starch and gluten from wheat-flour ; Production of ——. F. A. V. Klopfer, Leubnitz, Germany. U.S. Pat. 1,013,497, Jan. 2, 1912.

See Eng. Pat. 19,726 of 1908 : this J., 1909, 379.—T. F. B.

XVIII.—FERMENTATION INDUSTRIES.

Saké ; Some new varieties of Willia anomala as ageing yeast of ——. T. Takahashi and H. Satō. J. Coll. Agric., Tokyo, 1911, 1, 227—268.

In order to allow the sharp taste of freshly prepared saké to become mellow, it is usual, after clarification of the liquor, to store it throughout the summer months. The temperature during this ageing process is fairly high (24°—28° C.), and the exact nature of the changes which occur is not known. From a deposit formed in the storage vats the authors have isolated four types of yeast which they believe to be distinct varieties of *Willia anomala.* The characters of the four types are described fully and the points in which they differ from other known varieties of *Willia anomala* (20) are tabulated. Three of the four are believed to be new varieties, whilst the fourth resembles one isolated by Lindner from an American beer (see Woch. Brau., 1900, 17, 734). These yeasts are responsible for the ageing of saké, and by artificial addition of them to freshly prepared saké, the ageing process may be greatly accelerated.—J. H. L.

Sake yeast ; Formation of fusel oil by ——. K. Kurono. J. Coll. Agric., Tokyo, 1911, 1, 283—294.

The proportion of fusel oil in saké is higher than in beers and wines ; saké of superior quality contains about 0·05—0·1 per cent., whilst in poorer products there may be as much as 0·4 per cent. It is formed from leucine by the saké-yeast during fermentation (compare Ehrlich, this J., 1907, 28, 180), and its production in relatively large quantities is due to the high proportion of leucine present in rice proteins. The conversion of leucine into fusel oil can be partly prevented by addition of ammonium carbonate or phosphate to the fermenting liquid. These salts have their maximum inhibitive action when the quantity added is 2—3 times the weight of leucine present ; if this proportion is much exceeded, not only is there a greater production of fusel oil, but the growth of the yeast is unfavourably affected.—J. H. L.

Yeast ; Asparagine-clearing enzyme in ——. K. Kurono. J. Coll. Agric., Tokyo, 1911, 1, 295—300.

In 1908 Effront announced the isolation of an enzyme from yeast, capable of liberating ammonia from asparagine in alkaline media (see this J., 1908, 463). The author has extracted such an enzyme, in a crude state, from beer yeast and saké yeast. 500 grms. of washed yeast were mixed with a litre of water and 50 c.c. of $N/1$ caustic soda solution, and the mixture was covered with toluene and maintained at 37° C. for 2 days. After filtration the extract was treated with an equal volume of 97 per cent. alcohol, and the flocculent precipitate of crude enzyme was collected and washed with dilute alcohol and ether. Another method of preparation was to rub a mixture of the yeast with quartz sand in an iron mortar, afterwards macerating it for 2 hours with water and then filtering and precipitating the enzyme from the filtrate with alcohol. The products obtained by both methods were found to decompose asparagine in faintly acid or alkaline solutions, with production of ammonia. No such action was exerted on leucine, urea, formamide or butylamide, and the enzyme has therefore probably nothing to do with the formation of fusel oil during alcoholic fermentation.—J. H. L.

Saké ; Content of amino-acids and its relation to the quality of ——. T. Takahashi and H. Sato. J. Coll. Agric., Tokyo, 1911, 1, 269—274.

Takahashi has previously shown that saké of superior quality contains less fusel oil than poorer kinds. It is now shown that a similar statement applies to amino-acids. The average quantity of amino-acids (calculated as glycocoll) found in 68 samples of saké of good quality was 0·197 per cent., whilst for 46 samples of inferior quality the average was 0·268 per cent.—J. H. L.

Saccharomyces saké and other yeasts ; Assimilation and formation of amino-acids by ——. T. Takahashi and T. Yamamoto. J. Coll. Agric., Tokyo, 1911, 1, 275—281.

Sixty-two different "varieties" of *Saccharomyces saké* and seven yeasts of other kinds were grown in koji-wort for seven days at 25° C., and determinations were made of the alteration of the amino-acid content of the wort, the quantity of fusel oil formed, and also the total wort-acidity. The quantity of amino-acids assimilated varied considerably with the different saké yeasts, and in a few cases the liquor contained more at the end of the experiment than at the beginning. The yeasts which assimilated most, produced, as a rule, the largest amounts of fusel oil, but this was not always the case. For the production of saké those yeasts are most suitable which assimilate the largest quantity of amino-acids and produce the least fusel oil (see preceding abstract). The quantity of acids formed during fermentation does not appear to be related to that of other products.—J. H. L.

"*Saké-Moromi*" *; Butyric acid-forming bacillus of* ——. K. Kurono. J. Coll. Agric., Tokyo, 1911, 1, 301—312.

Samples were taken at various stages of "moromi" fermentation and cultures prepared, from which three new varieties of butyric acid bacilli were isolated, *viz.*, *Bacillus butyricus aromafaciensis moromi I.* and *II.*, and *B. butyricus roseus moromi.* Their characters are described fully and plates are appended. All three resemble other butyric acid bacilli physiologically in producing the acid chiefly from starch and glucose, and morphologically they stand nearest to *B. butyricus* Hüppe and *B. butyricus* Weber. The first two differ from the third in producing butyric ester in presence of alcohol and they are able to develop in media containing as much as 6 per cent. of the latter. The first two cannot give rise to putrefaction in saké or moromi, for their resistance towards acids is comparatively weak ; but they probably play an important part in producing the characteristic aroma perceptible at the "Takaawa" ("Hochkräusen") stage of saké-brewing, and they may perhaps be applied artificially for this purpose. The third bacillus is probably an agent in the production of the deep red colour which sometimes appears in moto-mash (then termed "akamoto"), for it produces a similar colour in starch cultures. ("Moto-mash" or "Saké moto," is prepared by mixing steamed rice, rice "Koji," and water. "Koji" is steamed rice upon which the mycelium of a particular species of fungus has been developed.)—J. H. L.

Wort and beer ; Determination of the content of bitter substances in ——. D. Wiegmann. Allgem. Brauer- und Hopfenzeit., 1911, No. 303 ; Woch. Brau., 1912, 29, 31—35.

In extracting the bitter substances from wort or beer by shaking the liquid with a solvent such as ether, light petroleum spirit, etc., a very persistent emulsion is always formed. It is found, however, that if the wort or beer be shaken with petroleum benzine of sp. gr. 0·735, and the mixture is subsequently heated to 80°—85° C. in a water-bath, the emulsion disappears practically completely. It is also shown that the benzine does not extract any acid substances insoluble in water from unhopped wort, and that it extracts, quantitatively, the bitter substances of hops (bitter acids) from wort to which these substances have been added. The procedure adopted was as follows : The liquid (500 c.c. of unhopped wort, or 300—600 c.c. of unfermented or fermented wort to which a known quantity of hop extract had been added) was shaken with 100 c.c. of benzine. The mixture was placed in a 1-litre Erlenmeyer flask, connected with a condenser, and was heated on the water-bath, and vigorously shaken until the emulsion had disappeared. The liquid was carefully poured into a separating funnel, and allowed to stand for a short time, the wort then being run off. The benzine extract was washed with distilled water until the wash-water showed a red colour on addition of phenolphthalein and 2 drops of $N/10$ alkali. The washed extract was filtered, treated with 75 c.c. of alcohol, and titrated with alcoholic potassium hydroxide. In the case of unhopped wort, the amounts of alkali required to neutralise the first benzine extract, the second benzine extract, and the third benzine extract (the last being made after boiling the wort with phosphoric acid), were practically equal to that required in a blank determination with 100 c.c. of benzine and 75 c.c. of alcohol. In the case of wort, or fermented wort, treated with known quantities of the petroleum ether extract of hops, the amounts of alkali required to neutralise the benzine extract, less that required in the blank determination, corresponded closely with the amounts of bitter substances added. With beers, the emulsion formed on shaking with benzine is often very persistent ; in such cases, the emulsion mixture should be transferred to the separating funnel, freed from beer as completely as possible, and washed with water until the wash-water is no longer acid, a few drops of alcohol then being added to the emulsion. The formation of a persistent emulsion may also be prevented by first boiling the beer with about 1—2 per cent. of phosphoric acid for about 15 minutes. As might be expected, on boiling wort with a known quantity of bitter substances for 2 hours under a reflux, the residue obtained by filtering the boiling wort and washing with hot water contains less bitter substances than that obtained when the wort is allowed to cool and to stand overnight prior to filtration and washing. In the latter case, however, the content of bitter substances in the filtrate is not correspondingly diminished and even here, the sum of the amounts of bitter substances in residue and filtrate is found to be only about two-thirds of the quantity originally added. The author points out that in these experiments, the worts were extracted with benzine, then boiled with phosphoric acid, and again extracted, although they no longer possessed a bitter flavour after the first extraction. It is also found that on boiling the same quantity of bitter substances with pure water for 2 hours, the sum of the amounts of bitter substances found in the filtrate and residue is less than the original quantity by about 10 per cent.; the difference may be accounted for by decomposition due to prolonged boiling. On cooling wort that has been boiled with bitter substances, a larger quantity of the latter separates than corresponds to the difference between the amounts of bitter substances in the hot and cold worts.—L. E.

Fermentation; Dihydroxyacetone as an intermediate product in alcoholic ——. S. Karauschanow. Ber. deutsch. Bot. Ges., 1911, **29**, 322—327. Z. ges. Brauw., 1912, **35**, 35.

According to Jensen, on treating glycerose with bone charcoal, the dihydroxyacetone present in the glycerose undergoes catalytic decomposition into alcohol and carbon dioxide. The author finds, however, that no alcohol is formed and observes that the formation of carbon dioxide is probably due to decomposition of carbonates present in the bone charcoal by acids present in the glycerose.—L. E.

Enzymes of malt and their employment in the textile industry. Hamburger. *See* VI.

Use of dried yeast for the manufacture of molasses-fodder. Fallada. *See* XIXa.

Patents.

Yeast; Process for improving pressed —— *of inferior quality.* H. Braasch. Fr. Pat. 432,860, Oct. 13, 1910.

With modern processes of manufacturing pressed yeast, much larger yields are obtained than formerly, but the danger of producing a yeast of inferior quality is greater. According to the present invention, such inferior yeast is suspended in a suitable nutrient solution (*e.g.*, the wort used in the manufacture of pressed yeast by the aeration process), the quantity of the latter being such that the ratio of its dry substance-content to that of the yeast is about 1 : 2·5. The yeast is left to ferment and mature, preferably at a low temperature, and subsequently pressed; the yeast grows very little or not at all during fermentation under these conditions, and its quality is much improved by the treatment.—L. E.

Yeast; Process of manufacturing pressed ——. J. Effront and A. Boidin. Fr. Pat. 433,119, Aug. 9, 1911. Under Int. Conv., Feb. 15, 1911.

In order that the yeast may be supplied with sufficient nitrogenous nutriment, a large proportion of malted grain is employed in the manufacture of pressed yeast, a procedure which is costly and wasteful. In the present process, the use of malt is avoided entirely or in part by subjecting raw grain, etc., to a special fermentation in which the nitrogenous matter is rendered assimilable without the loss of fermentable matter involved in malting. Maize, barley, rye, etc., or other amylaceous materials, are boiled under ordinary or higher pressure, liquefied with a small proportion of malt (at least 1 per cent.) at say, about 75° C., cooled to about 40° C., rendered slightly alkaline with an alkaline or alkaline earth carbonate, and pitched with a culture of peptonising bacteria or *mucedinae*. The liquid is aerated vigorously, and when the bulk of the nitrogenous matter has been rendered assimilable, the liquid is heated to 62°—64° C. and saccharified with 5—10 per cent. of malt. To prevent the action of any peptonising ferments during the alcoholic fermentation, the wort is either sterilised before saccharification or treated with an antiseptic, and slightly acidified. If desired, the wort may be peptonised after saccharification, but in this case it may be necessary to add malt extract during fermentation. Again, the material may be peptonised before boiling, in which case it is treated with water, heated to 40° C., treated with the peptonising ferment, and aerated until the bulk of the nitrogenous matter has been rendered soluble; the product is boiled and then saccharified either with malt or with *mucedinae*. —L. E.

Fruit juices; Portable apparatus for sulphiting and desulphiting ——. E. A. Barbet. Fr. Pat. 432,568, Oct. 6, 1910.

With this apparatus, which is supported on a truck and easily moved from place to place, desulphitation is effected nearly at atmospheric pressure with air deprived of most of its oxygen. The gaseous products of combustion from a wood charcoal furnace are washed, and charged with water vapour, and then passed to the lower part of the desulphitating column. They ascend through the latter, and encounter a descending stream of previously heated, sulphitated juice. The desulphitated juice passes from the bottom of the column through a refrigerator placed beneath. The gas and vapour pass from the top of the column to a chamber in which the liquid, carried over in the form of froth, collects; this liquid is returned to the column, whilst the gas is washed and used again. The apparatus is also used for sulphitation, in which case sulphur is burnt in the furnace instead of wood charcoal. —L. E.

Amylaceous materials; Process for liquefying, saccharifying, and fermenting —— *in an antiseptic medium exposed to the air.* F. Verbièse. Fr. Pat. 432,645, Oct. 7, 1910.

Pure cultures of a mould and of a yeast are grown, either separately or together, in a succession of media containing progressively increasing quantities of an antiseptic (*e.g.*, beginning with 3 grms. of hydrofluoric acid or sodium fluoride per hectolitre). When the mould and yeast have been acclimatised to as high a proportion of antiseptic as possible (which must be at least four times as great as the proportion to be sustained in actual working), they are ready for use. The grain or other amylaceous material is boiled, preferably under pressure and with addition of hydrochloric acid (0·01 per cent.) or some salt, such as calcium chloride, which facilitates the liquefaction of the starch paste. The wort is then cooled and transferred to the fermentation vat, being treated, before or after cooling, with the requisite quantity of antiseptic (2 to 12·15 grms. of hydrofluoric acid or fluoride per hl.). The wort, which is maintained at a temperature of 35°—37° C., is treated with 5—10 per cent. of vigorously fermenting wort from a preceding operation. For the initial fermentation, the culture of mould and yeast, acclimatised as above described, is first grown in a volume of wort equal to 1/10 of that to be treated and containing at least double the proportion of antiseptic.—L. E.

Malts; Process of kilning for the preparation of "character" ——. C. Brüne. Fr. Pat. 433,121, Aug. 9, 1911. Under Int. Conv., Dec. 27, 1910.

The malt is brought, by rapid increases, to the temperature requisite for producing the character desired, either on one or more than one floor, or during its passage from one floor to the floor below. The period occupied in heating the malt through each temperature-interval is very short in comparison with the period that the malt is kept at each desired temperature, and the temperature is kept as constant as possible on the floors and especially on the lowest floor of the kiln.—L. E.

Beer; Process for reducing the gravity of ——. J. L. Prudhon. Fr. Pat. 432,499, Oct. 5, 1910.

Water, preferably distilled, is passed through a coil immersed in cold water or ice, thence through charcoal filters to a reservoir, and thence, under pressure of carbon dioxide to a saturator in which it is charged with carbon dioxide. The treated water is passed into an air-tight vessel made of some inert metal and capable of sustaining a pressure of about 3 kilos. per sq. cm. From this vessel, the water is passed, under pressure of carbon dioxide, into a mixing vessel into which vessel also the concentrated beer to be treated is introduced. The diluted beer is subsequently racked into casks or bottles.—L. E.

Wines; Process for manufacturing sparkling —— and fermented effervescent beverages. A. Porte. Fr. Pat. 432,664, July 26, 1911.

The liquid to be fermented is introduced into a large closed vessel through an inlet at the bottom. This vessel is provided with a stirring device, and with an inlet-pipe through which yeast, solutions of sugar, tannin, gelatin, etc., are pumped as desired. A valved inlet-pipe connects the vessel with a cylinder of carbon dioxide, and a pipe, passing through a stuffing-box at the top of the vessel serves for racking off the fermented liquid through a refrigerator into a collecting vessel; this pipe may be immersed to any desired depth in the closed vessel, and its lower end is bent up or fitted with a cap in order to obviate any danger of disturbing the sediment when the liquid is racked off. The stirring device serves to keep the fermenting liquid homogeneous in respect of composition and temperature, to distribute the yeast, and to facilitate the subsequent clarification of the liquid. Before racking off the fermented and clarified beer, carbon dioxide is passed from the cylinder into the top of the fermentation vessel in order to obtain, in the latter, a pressure higher than that produced in fermentation; a pressure of carbon dioxide equal or nearly equal to that in the fermentation vessel, is also established in the collecting vessel above mentioned, and on reducing this pressure very gradually, the fermented liquid passes, without any frothing or loss of carbon dioxide, into the collecting vessel. When the latter contains the desired quantity of liquid, communication with the fermenting vessel is cut off, and the pressure in the collecting vessel is slowly diminished to that of the external atmosphere at which pressure the liquid is bottled.—L. E.

Alcohol, brandy, etc.; Process for denaturing ——. J. Kluge. Fr. Pat. 432,605, July 8, 1911.

See Eng. Pat. 16,153 of 1911; this J., 1912, 88.—T. F. B.

Fermented beverages; Process for making ——. E. W. Kuhn. Fr. Pat. 433,022, Aug. 5, 1911. Under Int. Conv., Aug. 6, 1910.

See Eng. Pat. 18,218 of 1909; this J., 1910, 1127.—T. F. B.

System of cooling plates for rectifying columns. Fr. Pat. 432,570. *See* I.

XIXa.—FOODS.

Milk; Iron content of cow's ——. F. Edelstein and F. v. Csonka. Biochem. Zeits., 1912, 38, 14—22.

The figures previously recorded for the iron content of cow's milk range from 1 to 15 mgrms. of iron per litre or even higher. The authors find that if milk be withdrawn from the cows directly into a glass vessel, the iron content is 0·4—0·7 mgrm. (average 0·5 mgrm.) per litre, or from one-third to one-half of that of human milk. In ordinary mixed dairy milk and in purchased milk, the iron content was higher (0·7—1·5 mgrms.) and less constant.—A. S.

Cocoanut oil in butter and lard; Detection of ——. E. Polenske. Arbb. Kais. Gesundh.-Amt, 1911, **38**, 402—414. Chem. Zentr., 1912, **1**, 290—291.

The author has compared the methods of Ewers (this J., 1910, 712) and of Fendler (this J., 1910, 713) with that previously published by him (this J., 1904, 387), which he states has in general given useful results. He finds that with butters of higher and lower saponification values and Reichert-Meissl values than those used by Ewers, "difference-numbers," considerably higher or lower than the 10—12, supposed to be constant for pure butters may be obtained. Fendler's methods also are uncertain: small additions of cocoanut oil might pass undetected and genuine butters might be rejected. Table E in Polenske's original paper (*loc. cit.*) is stated to afford data by aid of which an addition of cocoanut oil to lard can be easily detected.—A. S.

Cocoanut oil [in butter]; Shrewsbury and Knapp's process of determining ——. H. S. Shrewsbury and A. W. Knapp. Analyst, 1912, **37**, 3—7.

The authors, replying to a criticism of Cribb and Richards (this J., 1911, 975), give figures to show that the difference between their values for cocoanut oil and butter fat (this J., 1910, 1128) is about nine times as great as the difference between the corresponding Polenske values. Moreover, the Polenske figure may be depressed by partial separation of the more fluid glycerides, as in the preparation of substitutes for cacao butter, whereas the authors' value is but little affected. This is shown by the following results obtained with products from Cochin cocoanut oil:—

	Reichert-Meissl value.	Polenske figure.	Shrewsbury and Knapp figure.
Cocoanut "stearine" A .	4·2	12·1	169·0
Cocoanut "oleine" A ...	8·5	23·2	169·0
Cocoanut "stearine" B ..	3·9	11·1	165·3

The agreement between the Shrewsbury and Knapp figures for the "stearine" and "oleine" A, was accidental and due to the latter being raised to the same extent by glycerides of the lower fatty acids as it was lowered by the increase of olein. An old sample of palm-kernel "stearine" gave a Reichert value of 4·2, Polenske figure 9·35, and Shrewsbury and Knapp figure 162·9; whilst a sample of crude palm-kernel oil gave a value of 163·7. The non-volatile acids left after determination of the Reichert value cannot be used in the process, since they give abnormally high results. Objection is taken to the modification of Revis and Bolton (this J., 1911, 975) as being more tedious and giving wider variations in the case of pure butter. When large amounts of cocoanut oil are to be determined some modification may be required, and it is suggested that better results may be obtained by the use of a bath at 37° C. (see also this J., 1911, 697).—C. A. M.

Molasses-fodder; Use of dried yeast for the manufacture of ——. O. Fallada. Oesterr.-ung. Zeits. Zuckerind, 1911, **40**, 709—714. Chem. Zentr., 1912, **1**, 158—159.

A mixture of dried brewers' yeast and molasses can be used directly as a cattle food. A mixture of 1 kilo. of molasses and 800 grms. of dried yeast (9·46 per cent. of water) contained: water, 13·71; proteins, 20·81; amino-acids, 8·19; crude fat (ether extract), 1·80; sugar (direct polarisation), 28·80; invert sugar, traces; non-nitrogenous substances other than sugar, 18·09; "crude fibre," traces; and ash, 8·60 per cent. 90·1 per cent. of the protein was digestible (by pepsin). The composition of the product altered only slightly on keeping for 10 weeks in either open or closed containers.—A. S.

Persimmons; Experiments on the treatment of —— to render them non-astringent. H. C. Gore and D. Fairchild. U.S. Dept. Agric., Bureau of Chem., Bull. No. 141, Sept. 29, 1911, pp. 31.

The Japanese method of rendering persimmons non-astringent, by packing the fruit in casks which have contained beer or saké and closing them for from 5 to 15 days, is uncertain. On the contrary, persimmons kept in an atmosphere of carbon dioxide for from 3 to 5 days, become non-astringent whilst remaining firm. It was found advantageous to place lumps of well-dried starch or other absorbent material in the casks in order to prevent the fruit from cracking through the action of too much moisture. The experiments proved that some varieties of persimmons yield to the treatment, whilst others do not.—W. P. S.

Poppy seeds; Adulteration of —— with henbane [*Hyoscyamus seeds*]. J. Moeller. Z. Allgem. österr. Apoth.-Ver., 1912, 50, 22—23.

Poppy seeds from plants grown in Austria and Hungary are free from adulteration with henbane seeds. But owing to careless harvesting, Russian seeds are often contaminated to a dangerous extent, considering the use of these seeds in confectionery. It is suggested that a carefully selected sample of 250 grms. of the seeds should be made. If only one henbane seed is found in this, the parcel should be rejected. It is possible to remove the henbane seeds by repeated siftings through a sieve with a mesh 0·9 mm. in width.—F. Shdn.

Mustard oil in oil-cake from Cruciferæ and in mustard flour; Determination of ——. C. Brioux. Ann. Chim. Analyt., 1912, 17, 3—9.

The mustard oil in oil-cake can be determined as follows: 25 grms. of the finely powdered sample are mixed with 500 c.c. of distilled water at about 37° C., and 2 grms. of sodium fluoride dissolved in a little water are then added. The whole is allowed to stand for an hour. If foreign oil-cakes or mustard flour are being dealt with, 3—4 hours' maceration will be necessary. After the addition of 20—25 c.c. of 95 per cent. alcohol, the liquid is distilled, 150 c.c. of distillate being collected in a 250 c.c. flask containing 10 c.c. of pure ammonia. 25 or 50 c.c. of $N/10$ silver nitrate solution are added, and the flask heated on the water bath to 80°—85° C. for an hour. During the heating the flask is provided with an air-condenser. It is then cooled and the contents made up to 250 c.c. The liquid is filtered and 125 c.c. titrated with $N/10$ thiocyanate solution using ferric ammonium alum as indicator. The amounts of mustard oil can be calculated from the following figures giving the weight of oil equivalent to 1 c.c. of $N/10$ solution: crotonyl isothiocyanate, 0·00565; allyl isothiocyanate, 0·00495. These oils may be roughly separated by collecting the distillate in water, when allyl mustard oil which has the sp. gr. 1·028 sinks, whilst the crotonyl mustard oil floats.
—F. Shdn.

Patents.

Margarine emulsions and other liquids or semi-liquids; Mode of and apparatus for cooling ——. S. P. Rasmussen, Oosterhout, Holland. Eng. Pat. 29,831, Dec. 22, 1910.

The liquid margarine is spread in a thin film on the surface of a rotating cylinder, with open ends, which is mounted horizontally, being immersed, for about two-thirds of its diameter, in a tank of cold water. Guide bars and rollers are provided for regulating the thickness of the film and a knife or scraper removes the film of cooled fat from the drum and deposits it on to a travelling conveyor. Means may be provided for warming the guide bars.—W. P. S.

Margarine and like substances; Method of and apparatus for cooling ——. G. Jamieson, Corstorphine, N.B. Eng. Pat. 20,292, Sept. 13, 1911.

The melted fats are spread over the surface of a travelling carrier arranged in a casing; cooled and filtered air is then caused to come into contact with the fat, the necessary air-filters and pipes being provided in the lower part of the casing.—W. P. S.

Milk; Method of desiccating ——. H. I. Andrews, Assignor to C. A. Davis, Darien, Conn. U.S. Pat. 1,012,578, Dec. 26, 1911.

The cream is separated from the milk and the skimmed milk is treated with ozone, then subjected alternately to the action of heat and cold in order to evaporate the water, and the evaporated milk is mixed with the cream and with air. The whole is now frozen in the form of thin strips which are broken up into small pieces and then powdered.—W. P. S.

Evaporating apparatus [*for milk*]. E. Hornung. Fr. Pat. 432,778, July 31, 1911. Under Int. Conv., Aug. 10, 1910.

The apparatus consists of a cylindrical vessel divided into an upper and a lower chamber by a partition, communication being established between the two chambers by a number of narrow tubes inserted in the partition. The bottom chamber has an enlarged lower portion, provided with a door for withdrawing the evaporated product, and both chambers are heated by a spiral steam coil wound round the outside. The steam from the coil, after having served to heat the vessel, is utilised in an injector to produce a vacuum in both the upper and lower chambers. The upper chamber serves as a preheater and the lower as the evaporator proper.—W. H. C.

Wheat; Process of preparing ——. J. Brewster, Tombstone, Ariz. U.S. Pat. 1,012,979, Dec. 26, 1911.

Wheat is soaked in water, then boiled, and washed repeatedly with hot water until the wash-water is clear. The wheat is again boiled after the addition of salt, the mass being replenished with boiling water and subjected to a moderate heat until the water has been absorbed and evaporated; the product is then packed in tins.—W. P. S.

Flour and bread; Manufacture of ——. C. W. Chitty and W. Jago. Fr. Pat. 432,606, July 10, 1911. Under Int. Conv., Feb. 3, 1911.

From 0·5 to 1 oz. of potassium persulphate is added to 280 lb. of flour, or to the dough prepared therefrom. Other per-salts may be employed and preparations of malt, etc., may also be added.—W. P. S.

Soja flour and its derivatives. Yu Ying Li, Vallées, France. Eng. Pat. 30,350, Dec. 31, 1910.

See Fr. Pat. 424,124 of 1910; this J., 1911, 827.—T. F. B.

Coffee beans; Means for treating ——. L. Klein, Strassburg, Germany. Eng. Pat. 8815, April 18, 1911. Addition to Eng. Pat. 24,793, Oct. 25, 1910.

See Addition of April 5, 1911, to Fr. Pat. 409,700 of 1909: this J., 1911, 1276.—T. F. B.

Purification and concentration of sulphite-cellulose waste lyes intended for the manufacture of cattle foods and fertilisers. Ger. Pat. 241,282. *See* V.

XIXB.—WATER PURIFICATION; SANITATION.

Patents.

Liquids; Apparatus for treating —— with ultra-violet rays. V. Henri, A. Helbronner, and M. von Recklinghausen, Paris. Eng. Pat. 8157 of 1911, date of appl., Dec. 13, 1910.

Means are described for preventing the lamp operating before the cooling water has commenced to flow through its jacket. For this purpose the cooling water flows through a bucket which is fixed to one end of a pivoted lever. While the water is flowing, the weight of the water in the bucket depresses the lever and causes the other end to make an electrical contact and light the lamp; the water flows into the bucket at a greater rate than it can escape from a pipe at the bottom and, consequently, the bucket remains full. When the supply of cooling water is stopped, the bucket empties and the lever rises, thus breaking the electrical contact.—W. P. S.

Liquids; Apparatus for treating —— with ultra-violet rays. V. Henri, A. Helbronner, and M. von Recklinghausen, Paris. Eng. Pat. 8158 of 1911, date of appl., Dec. 23, 1910.

A device for forcing the liquid through the treatment vessel consists of a cylinder provided with a piston. Compressed air is admitted below the piston so as to cause it to rise to the top of the cylinder; the liquid is then allowed to flow into the part of the cylinder below the piston, and, when compressed air is admitted above the piston, the liquid is forced out into pipes which conduct it to the treatment containers. Another apparatus for removing dissolved air from the liquid previous to treatment with ultra-violet rays is described. It consists of a rotating bell-shaped vessel mounted in a chamber; the liquid is allowed to flow over the outer surface of the vessel while the air is exhausted from the chamber. —W. P. S.

Sterilising liquids by means of ultra-violet rays; Apparatus for ——. Banque du Radium, Paris. Eng. Pat. 15,010, June 27, 1911. Under Int. Conv., Oct. 15, 1910. Addition to Eng. Pat. 14,912, of 1911, dated June 27, 1910 (this J., 1911, 1468).

In the case of apparatus delivering a large quantity of liquid, the flat bottoms of the original apparatus (*loc. cit.*) may be replaced by bottoms having the form of truncated cones, the angle at the summit of which is such as to enable the whole of the ultra-violet rays to be utilised. —W. P. S.

Water; Method of and apparatus for purifying ——. W. B. Bull, Assignor to Chloride Process Co., Chicago, Ill. U.S. Pats. 1,012,808 and 1,012,809, Dec. 26, 1911.

A saline solution is electrolysed in an electrolytic chamber divided into anode and cathode compartments; the anode is chemically inert. The gaseous product containing chlorine, resulting from the electrolysis, is conducted from the anode chamber and absorbed by water in which iron is immersed. The solution thus obtained is added to the water under treatment and contained in a separate tank. Means are also provided for treating the water with the solution formed in the cathode compartment and for removing such solution from the compartment. —W. P. S.

Water; Process for removing manganese from ——. A Pappel. Ger. Pat. 241,571, Aug. 22, 1908.

The water is passed through a mass of pyrolusite (crude manganese dioxide) in lumps as it comes from the mine. The pyrolusite can be revivified by washing at the ordinary or slightly increased temperature.—A. S.

Liquids; Apparatus for treating —— by ultra-violet rays. V. Henri, A. Helbronner, and M. von Recklinghausen. First Addition, dated June 15, 1911, to Fr. Pat. 425,406, Jan. 30, 1911. Under Int. Conv., June 16, 1910.

See Eng. Pat. 14,605 of 1910; this J., 1911, 765.—T. F. B.

Sterilising liquids by means of ultra-violet rays; Apparatus for ——. Banque du Radium. First Addition, dated Oct. 15, 1910, to Fr. Pat. 428,666, June 27, 1910.

See Eng. Pat. 15,010 of 1911: preceding.—T. F. B.

Preparing sulphoricinates for use as insecticides and anticryptogamic compounds. Fr. Pat. 432,802. *See* XVI.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Alkaloids; Extraction and determination of —— present in syrups and other liquids containing sugar. E. Kohn-Abrest. Bull. Soc. Chim., 1912, **11**, 73—75.

By the following procedure alkaloids may be extracted quantitatively from solutions containing sugar, and the method has been employed successfully for the determination of morphine, codeine, quinine, strychnine, and atropine in such liquids. The sample (*e.g.*, 20 grms.) is shaken vigorously and repeatedly with about its own weight of solid potassium carbonate and four times its volume of alcohol, and is afterwards allowed to stand for about 12 hours. If the specific gravity of the original liquid is about 1·15—1·20, absolute alcohol should be used, but with samples of greater density alcohol of 95 per cent. is preferable. After the mixture has stood the necessary time, the whole of the sugar will be present in the pasty deposit of potassium carbonate, whilst the upper alcoholic layer will contain all the alkaloid as free base. The alcoholic layer is filtered and distilled, the residue being taken up with a little absolute alcohol which is afterwards filtered and evaporated. The residue thus obtained is boiled with 10—15 c.c. of chloroform which is then filtered and evaporated, the final residue being dissolved in hydrochloric acid, evaporated and left to crystallise. The whole of the alkaloid originally present in the sample, is thus obtained in the pure state as hydrochloride.—J. H. L.

Cinnamein in Peru balsam; Determination of ——. F. Lehmann and A. Müller. Arch. Pharm., 1912, **250**, 1—5.

A mixture of 2·5 grms. of Peru balsam and 5 grms. of water is shaken for one minute with 30 grms. of ether in a bottle of 75 grms. capacity. 5 grms. of sodium hydroxide solution are then added, the mixture shaken for a minute and allowed to stand for 10 minutes. The bottle is inverted and the aqueous portion allowed to run away, by carefully loosening the cork, till only 3 c.c. are left. After the addition of 0·5 grm. of tragacanth the bottle is shaken for 3—5 minutes and the greater portion of the ether poured off into a tared flask and weighed. The ether is evaporated off and the residue of cinnamein weighed after drying for 30—45 minutes at 100° C.—F. Shdn.

Oil of "Capé." Sci. and Ind. Bull. of Roure-Bertrand Fils, Grasse. Pharm. J., 1912, **88**, 97.

The native women of the Ivory Coast (French West Africa) use leaves called "Capé" for the purpose of perfuming themselves. A small quantity of these leaves have been examined, and 9 kilos. yielded 25·8 grms. of a very mobile essential oil of a greenish-yellow colour. The constants observed were:—Specific gravity at 15° C., 0·977; optical rotation, + 39°38′; acid value, 0·7; saponification value, 109·2. The oil is soluble in one volume of 80 per cent. alcohol, beyond which there is a slight turbidity. The odour of the oil first recalls that of patchouli; after evaporation it is particularly pleasant, and it remains extraordinarily powerful.

Jamaica camphor. H. W. Emerson and E. R. Weidlein. J. Ind. Eng. Chem., 1912, **4**, 33—36.

The results of experiments on the extraction of camphor by steam distillation from leaves, twigs, etc. of camphor trees grown in Jamaica are given. 56,940 grms. of green leaves yielded 1353·8 grms. (2·35 per cent.) of crude camphor and oil, consisting of 1·32 per cent. of camphor, 0·54 of camphor oil, and 0·49 per cent. of water, impurities, etc. 67,000 grms. of dried leaves yielded 1719·5 grms. (2·54 per cent.) of crude camphor and oil, composed of 1·57 per cent. of camphor, 0·46 of camphor oil, and 0·51 per cent. of water, impurities, etc. 22,425 grms. of twigs from green leaves yielded 0·58 per cent. of camphor and 0·26 per cent. of camphor oil. 8770 grms. of twigs from dried leaves yielded 0·54 per cent. of camphor.

1800 grms. of wood yielded 0·61 per cent. of camphor. The camphor oil was fractionated and from 400 c.c. 101 grms. of camphor were obtained by crystallisation from fractions distilling at 192°—215° C. Besides camphor, the oil contains pinene, phellandrene, cineol, dipentene, and safrol. It is pointed out that there is little or no loss of camphor from the leaves on ordinary air drying, so that the leaves could be allowed to fall from the trees and collected as and when convenient. The dried leaves contain proportionally more camphor and less camphor oil than the green leaves, probably owing to oxidation of the oil during the drying (compare this J., 1902, 1036). The leaves only should be harvested. The camphor obtained is stated to be equal to the best commercial product, and as cheap labour is available, the camphor industry should prove successful in Jamaica. —A. S.

Pyramidone [dimethylaminoantipyrine]; Reactions of ——. A. Moulin. Ann. Chim. Analyt., 1912, 17, 13—14.

Pyramidone produces a blue colouration with solutions of silver or mercury nitrate. There is no colouration with pure nitric acid, but if the acid contains nitrous acid, then the reaction is obtained.—F. Shdn.

Hydroxyphenylene dimercuric acetate and mercuri-salicylic acid; Determination of the mercury in ——. R. Brieger. Arch. Pharm., 1912, 250, 62—71.

In order to determine the mercury in mercuri-salicylic acid 0·5 grm. is dissolved by warming with 30 c.c. of $N/10$ potassium hydroxide solution. The solution is diluted with 100 c.c. of water and a few drops of o-nitrophenol solution added. 30 c.c. of $N/10$ hydrochloric acid are run in from a burette and the liquid titrated with $N/10$ potassium hydroxide solution till there is a yellow colouration. The amount of salicylic acid is calculated from the difference between the amounts of acid and alkali used. 1 c.c. corresponding to 0·0138 grm. of salicylic acid. The percentage of salicylic acid is subtracted from 100 and the result multiplied by 0·5952, giving the percentage of mercury. This value should agree with that obtained by the following method, which can also be applied to hydroxyphenylene dimercuric acetate. 0·3 grm. is dissolved in 10 c.c. of $N/1$ potassium hydroxide solution, and the solution treated with 25 c.c. of water and 5 c.c. of 30 per cent. acetic acid. 25 c.c. of $N/10$ iodine solution are added and the excess of iodine titrated by means of $N/10$ thiosulphate solution after 15 hours. 1 c.c. of $N/10$ iodine solution corresponds to 0·0100 grm. of mercury.—F. Shdn.

Benzaldehyde; Testing of —— for chlorine compounds. G. Heyl. Apoth.-Zeit., 1912, 27, 49—50.

10—15 drops are mixed with 1—2 grms. of pure slaked lime in a crucible. The mixture is covered over with a thin layer of lime and the whole burned off by heating to redness. The residue is taken up with 5—6 c.c. of water, dissolved in nitric acid, and tested with silver nitrate solution. 1 drop of monochlorobenzene in 50 grms. of benzaldehyde can be detected in this way.—F. Shdn.

Methyl alcohol; Determination of small quantities of ——. C. Simmonds. Analyst, 1912, 37, 16—18.

The colourimetric test of Denigès (this J., 1910, 585) may be quantitatively applied as follows:—The alcoholic mixture, after purification by the method of Thorpe and Holmes (this J., 1903, 232), or otherwise, is diluted with water or strengthened with ethyl alcohol until it contains 10 per cent. of alcohol by volume. A mixture of 5 c.c. of this liquid, 2·5 c.c. of permanganate solution (2 grms. per 100 c.c.) and 0·2 c.c. of strong sulphuric acid is allowed to stand for 3 minutes, after which 0·5 c.c. of oxalic acid solution (9·6 grms. per 100 c.c.) is added. The liquid is then shaken and treated with 1 c.c. of strong sulphuric acid, and finally tested with 5 c.c. of Schiff's reagent. A violet colouration, developing in the course of a few minutes to 20 or 30 minutes, according to the quantity of formaldehyde produced, gives an approximate idea of the amount of methyl alcohol; whilst the amount of sulphuric acid prevents any development of colour with any acetaldehyde produced. Further tests are now made with the liquid suitably diluted so as to contain from 0·001 to 0·004 grm. of methyl alcohol in 5 c.c., and the colourations are compared in Nessler tubes with those given by standards containing known quantities of methyl alcohol in 10 per cent. ethyl alcohol. In this way it is possible to detect 0·0003 grm. of methyl alcohol in the 5 c.c. of liquid. The method of Thorpe and Holmes (this J., 1904, 208) is not applicable to the determination of small quantities of methyl alcohol.—C. A. M.

[Fractional distillation] Separation of mixtures of substances having nearly identical boiling points and of mixtures of constant boiling point. A. Golodetz. J. Russ. Phys.-Chem. Ges., 1911, 43, 1041—1060. Chem. Zentr., 1912, 1, 69—70.

The author has extended the method proposed by Young for the preparation of absolute alcohol by distilling aqueous alcohol with benzene (this J., 1902, 721), to numerous other mixtures, and states as a general rule that if to a mixture of two substances (A and B) of constant boiling point, a third substance (C) be added, which forms with one of the substances in question a binary mixture (B + C) having a constant boiling point lower than that of the mixture (A + B) of the first two substances, then if the quantity of C be correctly chosen, the whole of the mixture B + C will pass over first on distillation, and the pure substance, A, will be left in the distillation flask. Similar results can be obtained with mixtures of two substances having nearly identical boiling points. The following are some of the results obtained by the author, a Hempel dephlegmator being used for the fractional distillation:—(1) *Separation of toluene and acetic acid by means of benzene.* Toluene and acetic acid form a mixture boiling at 104° C. and containing 31·9 per cent. of acetic acid. The mixture of benzene and acetic acid of constant boiling point boils at 80·05° C. and contains 2 per cent. of acetic acid. To 100 grms. of the first-mentioned mixture 1800 grms. of benzene were added and the whole was subjected to a single fractional distillation: the final fraction consisted of 46 grms. of pure toluene. (2) *Separation of toluene and acetic acid by means of water.* The heterogeneous mixture of toluene and water of constant boiling point boils at 84·1° C. and contains 19·6 per cent. of water. 400 grms. of the mixture of toluene and acetic acid of constant boiling point were treated with 67 grms. of water, and the whole fractionated: the last fraction consisted of 64 grms. of pure acetic acid. (3) *Separation of benzene and toluene by means of methyl alcohol.* A mixture of benzene with methyl alcohol containing 60·45 per cent. of the former has a constant boiling point of 58·35° C. On fractionating a mixture of 60·5 grms. of benzene, 242 grms. of toluene, and 39·5 grms. of methyl alcohol, the last fraction consisted of 228·5 grms. of pure toluene. (4) *Separation of benzene and methyl alcohol by means of carbon bisulphide.* A mixture of methyl alcohol and carbon bisulphide containing 12—13 per cent. of the former has a constant boiling point of 38° C. When a mixture of 60 grms. of the mixture of benzene and methyl alcohol of constant boiling point with 170 grms. of carbon bisulphide was fractionally distilled, the last fraction consisted of 23 grms. of pure benzene. (5) *Separation of amyl bromide and ethyl butyrate by means of n-propyl alcohol.* A mixture of amyl bromide and *n*-propyl alcohol containing 70·7 per cent. of the latter has a constant boiling point of 94° C. A mixture of 15 grms. of amyl bromide (b.pt. 118·5°—119° C.), 45 grms. of ethyl butyrate (b.pt. 119·9° C.), and 39 grms of *n*-propyl alcohol was fractionated: the last fraction consisted of 30 grms. of nearly pure ethyl butyrate.—A. S.

Adulteration of poppy seeds with henbane. Moeller. *See* XIXa.

Patents.

Terpene and allied series; Manufacture of new substances by condensation of formaldehyde with bodies of the ——. E. E. Naef, Swansea, and W. Thévenaz, Hull. Eng. Pat. 4649, Feb. 24, 1911.

A number of terpenes and their derivatives such as pinene, borneol, menthol, santal oil, eugenol, and others, when suspended in sulphuric acid, can be condensed with formaldehyde or substances producing it.—F. Shdn.

Esters of aromatic acids; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 8012, March 30, 1911.

Glycol or one of its derivatives is esterified with benzoic acid or its salts or derivatives other than salicylic acid, or with fatty acids of the series, $C_nH_{2n}O_2$, in which a hydrogen is replaced by an aromatic radicle, such as phenylacetic acid, hydratropic acid, phenylmono- or diethylacetic acid, hydrocinnamic acid, phenyldiethylcarbin-acetic acid, $C_6H_5.CH<\genfrac{}{}{0pt}{}{CH(C_2H_5)_2}{COOH}$, or of their salts. The esters may be produced by the action of the glycol on the acid or its salts, or by heating salts of the acids with dihalogen esters of glycol and water, or by heating with aqueous solutions of salts of weak acids the halogen substituted glycol esters of these acids. The new esters are stated to be suitable remedies for scabies, and to possess the advantage over Peru balsam of being odourless, non-irritant, and easily soluble. Tho following esters are described:—Phenylacetylglycol, b.pt. 185°—190° C. (25 mm.); benzoylglycol, b.pt. 176°—180° C. (20 mm.); *o*-toluylglycol, b.pt. 158° C. (10 mm.); o-chlorobenzoylglycol, b.pt. 203° C. (20 mm.); *p*-nitrobenzoylglycol, m pt. 63° C.; phenylethylacetylglycol, b.pt. 166° C. (4 mm.). T. F. B.

Pinacone; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 22,795, Oct. 16, 1911. Under Int. Conv., Oct. 20, 1910.

Pinacone is produced by treating acetone with aluminium amalgam either as such or generated in the course of the reaction. The mixture is diluted with benzene and boiled for some hours. The reaction can be accelerated by the addition of suitable agents such as iodine, bromine, or copper compounds.—F. Shdn.

Medicinal composition containing oil [and peat]. O. K. Zwingenberger, New York. U.S. Pat. 1,012,788, Dec. 26, 1911.

Medicinal oils are kneaded with peat and water, with or without the addition of soluble medicinal salts or sugar, and the mass is dried at a moderate heat in the presence of an inert gas. The product is then powdered.—F. Shdn.

Antitoxin; Process for producing hog-cholera ——. D. F. Luckey. U.S. Pat. 1,012,874. Dec. 26, 1911.

Virulent hog-cholera blood is injected into a domestic animal larger than the hog, and afterwards virulent blood is drawn from the same animal. The blood thus obtained is injected into a second animal so as to hyperimmunise it. Blood drawn from the second animal after this operation is converted into defibrinated blood or serum.—F. Shdn.

Isoprene from terpenic hydrocarbons; Process for producing ——. Badische Anilin und Soda Fabrik. First Addition, dated July 15, 1911, to Fr. Pat. 425,885, Jan. 28, 1911.

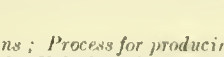
The term "terpenic hydrocarbons," used in the principal patent (this J., 1911, 968) is applied to all dipentenes, of any origin, or mixtures of the same, such as limonene, carvene, etc., which furnish much better yields of isoprene by this process than does turpentine oil.—T. F. B.

Hydrocarbons containing more than one double linkage [isoprene, etc.]; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 433,322, Aug. 16, 1911. Under Int. Conv., Aug. 30, 1910.

In the production of isoprene and other hydrocarbons having more than one double linkage, from turpentine oil, terpenes, etc., the source of energy is applied in such a manner that the isoprene, or other light decomposition products, are immediately removed from the further action of the source of energy; the primary material and the heavier products are continuously returned into contact with the source of energy. Any suitable method may be employed to carry out the process; for example, a carbon or other filament may be strongly heated electrically and plunged in the liquid, or the terpene may be submitted to the action of the silent electric discharge, or to ultra-violet light, or to a continuous stream of electric sparks.—T. F. B.

Hydrocarbons containing two double linkages and one triple linkage; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 241,424, Oct. 9, 1910.

When glycols of the type, : C(OH)·C : C·C(OH) :, are treated with agents which will eliminate water, unsaturated hydrocarbons of the type, : C : Ċ·C C·Ċ : C :, are produced, which may be used for pharmaceutical or other purposes. For example, the tetramethylglycol of the formula, $(CH_3)_2C(OH){\cdot}C\ \ C{\cdot}C(OH)(CH_3)_2$, is converted on heating with potassium bisulphate at 140°—150° C., into a new hydrocarbon



$$\genfrac{}{}{0pt}{}{CH_2}{CH_3}\!\!>C{\cdot}C : C{\cdot}C\!<\!\genfrac{}{}{0pt}{}{CH_2}{CH_3}.$$

—T. F. B.

Chloro-hydrocarbons; Process for producing ——. Badische Anilin und Soda Fabrik. Fr. Pat. 433,309, Aug. 5, 1911. Under Int. Conv., June 6, 1911.

Sulphuryl chloride is found to be an agent whereby chlorine can be added to the double linkage of unsaturated hydrocarbons; the formation of substitution products only takes place to a very small extent, whilst the sulphur dioxide liberated is dissolved in the reaction product and can readily be recovered and used to prepare further quantities of sulphuryl chloride. Example: 135 kilos. of cooled sulphuryl chloride are gradually introduced, with stirring, into an excess of cooled trimethylethylene, the temperature being maintained at −2° to 0° C.; after a further period of agitation, the sulphur dioxide and the excess of amylene are distilled off, and the residue is rectified in a vacuum: the product consists of trimethylethylene dichloride, of b. pt. 48°—52° C. (40 mm. pressure).
—T. F. B.

Iron halogen-albumin compounds rich in phosphorus; Process for preparing ——. W. Wolff und Co., G. m. b. H. Ger. Pat. 241,560, Dec. 24, 1909. Addition to Ger. Pat. 237,713, July 24, 1909 (see Eng. Pat. 16,048 of 1910; this J., 1911, 508).

The compounds are produced by the action of metaphosphoric acid on halogen-iron-albumin compounds, or by the action of soluble iron salts on the compounds of metaphosphoric acid with halogen-albumin compounds, or by the action of halogens on the iron-albumin-phosphorus compounds described in the principal patent. Similar products are obtained by treating halogen derivatives of albumoses, peptones, etc., with soluble iron salts and metaphosphoric acid or its alkali or alkaline-earth salts or with iron metaphosphate.—T. F. B.

Metal-albumin compounds rich in phosphorus; Process for preparing ——. W. Wolff und Co., G. m. b. H. Ger. Pat. 241,831, July 31, 1910. Addition to Ger. Pat. 237,713, July 24, 1909.

In the processes described in the principal patent (Eng. Pat. 16,048 of 1910; this J., 1911, 508) and in Ger. Pat. 241,560 (preceding), the iron salts may be replaced by salts of aluminium, lead, copper, mercury, silver, bismuth, or zinc. The properties of the substances thus produced are analogous with those of the phosphorus-iron-albumin compounds.—T. F. B.

Lecithin solutions; Process for preparing ——. Deutsche Chem. Werke "Victoria," and P. Salzmann. Ger. Pat. 241,564, Nov. 15, 1910.

Mono-, di-, and trichlorhydrins are used as solvents for lecithin, either alone or in combination with oils or fats, Monochlorhydrin dissolves 35 per cent. of lecithin in the cold and di- and trichlorhydrins 50 per cent., whilst with aid of heat more concentrated solutions can be produced. By this means concentrated solutions of lecithin may be obtained in oils, which by other methods could not be made to contain more than 5 per cent. of lecithin. The solutions are stated to be quite stable.—T. F. B.

Acetic anhydride; Process of manufacturing —— from salts of acetic acid. T. Goldschmidt, Essen on Ruhr, Germany. Eng. Pat. 611, Jan. 9, 1911. Under Int. Conv., Dec. 10, 1910. Addition to Eng. Pat. 25,433, Nov. 25, 1908.

See Addition of Dec. 29, 1910, to Fr. Pat. 407,046 of 1909; this J., 1911, 768.—T. F. B.

Suprarenal preparation; Non-toxic ——. G. Zuelzer, Berlin-Charlottenburg, Germany. U.S. Pat. 1,014,198, Jan. 9, 1912.

See Ger. Pat. 229,281 of 1909; this J., 1911, 240.—T. F. B.

Production of methyl alcohol from the residual products from the manufacture of [sulphate] cellulose. Fr. Pat. 433,168. *See* V.

Preparing a solid fat from partly saponified wool fat and mineral oil. Ger. Pat. 241,565. *See* XII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photographic gelatinobromide plates; Effect of heat on the sensitiveness of ——. E. Stenger. Phot. Rundschau, 1911. Chem. Zentr., 1911, 2, 1901.

The sensitiveness of panchromatic plates to light may be increased 2½ times by heating for 24 hours at 45° C.; the colour-sensitiveness is modified at the same time, the sensitiveness for green and orange increasing to a greater extent than that for blue. This increase of sensitiveness is permanent, and it is immaterial whether the plates be exposed warm or cold, and whether they be developed immediately after exposure or after some time. When highly sensitive plates which have not been colour-sensitised are similarly heated, only a slight alteration in sensitiveness is produced.—T. F. B.

Photographic images obtained by developing and fixing latent impressions on silver gelatinobromo-iodide or gelatinobromide; The composition of ——. A. and L. Lumière and A. Seyewetz. Bull. Soc. Franç. Phot., 1912, **58**, 36—40.

The images produced by development of gelatinobromo-iodide plates with an energetic developer and fixing with thiosulphate, do not consist of silver alone, but contain a considerable proportion of iodine and a small percentage of sulphur, but no bromine: this is the case even when development is prolonged much above the normal time. The amount of residue insoluble in nitric acid varies from 2·75 to 6 per cent. of the weight of the residue remaining after destroying the gelatin of the film, according to the exposure: the composition of the insoluble residue corresponds to that of a silver subiodide, Ag_5I_2, containing about 3 per cent. of sulphur. Gelatinobromide images similarly produced contain only silver and sulphur, the latter being present in considerably greater quantity than in the case of the gelatinobromo-iodide images. When the images are fixed with potassium cyanide in place of thiosulphate, they contain a small quantity of a brown substance which appears to be a subcyanide of silver. The above results explain why silver images when treated with certain reducers which dissolve the silver without the aid of thiosulphate (*e.g.*, bichromate or persulphate) leave an insoluble residue however long the reducer is allowed to act.—T. F. B.

Occurrence of chemically active rays in chemical reactions. Matuschek and Nenning. *See* XXIV.

Patents.

Ferrocyanide and silver-iron tracing process; Preliminary treatment of the material for the ——. A. Basler. Ger. Pat. 241,157, Oct. 19, 1910.

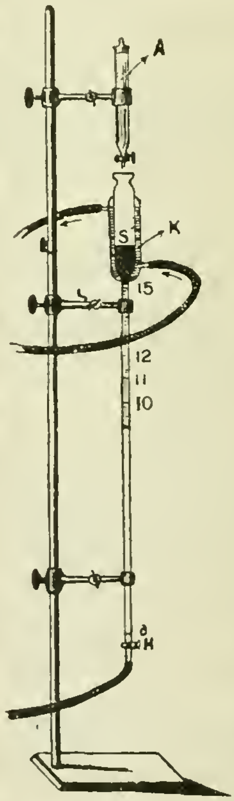
The paper to be used in preparing "blue-print" or similar tracing papers, is treated before sensitisation with a solution of chromic acid or a soluble chromate, or the paper pulp is mixed with such a solution during its conversion into paper. This treatment neutralises the reducing action of the paper and increases its stability, without affecting its sensitiveness to light.—T. F. B.

Colour photography; Bleach-out process of ——. J. H. Smith, Zürich, Switzerland, and W. Merckens, Mülhausen, Germany. U.S. Pat. 1,013,458, Jan. 2, 1912.

See Eng. Pat. 2461 of 1907; this J., 1907, 1109.—T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Dynamite glycerin; Determination of the yield of nitroglycerin from ——. F. Hofwimmer. Chem.-Zeit., 1912, **36**, 41—42.



The author considers that Hehner's bichromate method and the acetin method for determining the glycerol content of glycerin are not satisfactory for the purpose of ascertaining the yield of nitroglycerin on account of polyglycerins. Novak and Schlegel's laboratory nitration apparatus is somewhat dangerous owing to the quantity of glycerin used (150—200 grms.). The author's apparatus is shown in the accompanying diagram. The apparatus is filled with 60 grms. of nitrating acid (sulphuric acid, 55 and nitric acid, 45 per cent.), from a stop-cock (H) to the mark (S). Cold water (12°—15° C.) circulates round the jacket (K). As glycerin (10 grms.) is run in from the graduated pipette (A), a current of air is admitted through the stop-cock (H) to keep the whole in agitation. After the glycerin has been run in, air agitation is continued for one minute and the nitroglycerin is measured, after ¼ hour separation, by running off the acid until its level reaches the zero mark, when the volume of the nitroglycerin can be measured in the graduated tube.

—G. W. McD.

Trinitrotoluene; Decomposition of —— on heating. M. Vérola. Mém. Poudres et Salpêtres, 1911—1912, **16**, 40—51.

Trinitrotoluene was heated in a tube fitted with a manometer. At temperatures of 135° C. and 145°—150° C., no evolution of gas was observed and there was no alteration in the melting point. At 183° C., 201° C., and 207·5° C., gas was evolved at a fairly regular rate, and it was found that the melting point of the samples so heated had fallen from 81° C. to as low as 59° C. in the experiments at the highest temperature.—G. W. McD.

Picric acid, trinitrotoluene, and trinitrobenzene; Some properties of ——. H. Dautriche. Mém. Poudres et Salpêtres, 1911—1912, **16**, 27—39.

When crystals of the compounds are compressed into pellets at pressures varying from 275 to 4125 kilos. per sq. cm., the densities rise as follows:—Picric acid (1·315—1·740), trinitrotoluene (1·320—1·610), and trinitrobenzene (1·343—1·662). The following table gives the results for velocity of detonation in metre-seconds:—

	Picric acid.	Trinitrotoluene.	Trinitrobenzene.
Powdered explosive in paper tubes	5100	4100	3900
Powdered explosive compressed into pellets. (Density about 1·3)	6330	6200	6700
Powdered explosive in copper tubes	4900	4500	3900
Powdered explosive in glass tubes .	4512	2716	3104

The Trauzl block expansions for 10 grms. of the explosive were as follows:—Picric acid (228), trinitrotoluene (216), and trinitrobenzene (241).—G. W. McD.

Explosive proposed by the Soc. Anon. d'Explosifs et des Produits Chimique; Report on a new type of ——. H. Dautriche. Mém. Poudres et Salpêtres, 1911—1912, **16**, 1—13.

The explosive consisted of sodium nitrate (58 parts), trinitronaphthalene (27), and ammonium nitrate (15 parts). The velocity of detonation at a density of 1·11 was not much affected by the moisture content of the explosive up to about 7 per cent. The influence of moisture was more marked at higher densities, the explosive failing to detonate with a moisture content of 5·9 per cent. at a density of 1·44. The cartridges in a triple wrapper and in paraffined packages did not absorb moisture, and the Commission considered that they could be licenced for manufacture by the State.—G. W. McD.

Explosive N with 5 per cent. of potassium nitrate; Report on ——. H. Dautriche, Mém. Poudres et Salpêtres, 1911—1912, **16**, 14—20.

The explosive consisted of ammonium nitrate (90 parts), potassium nitrate (5) and trinitronaphthalene (5 parts). The sensitiveness to detonation was satisfactory and the temperature of explosion was below 1500° C. The Committee considered that the explosive could be licenced for manufacture by the State.—G. W. McD.

Patents.

Detonator cap charges. L. Wöhler. First Addition, dated June 27, 1911, to Fr. Pat. 387,640, Feb. 28, 1908 (see Ger. Pat. 196,824 of 1907; this J., 1908, 593).

When trinitrotoluene is used as the main detonating ingredient, it is primed with 0·02 grm. of fulminate and 0·01 grm. of lead hydrazoate. The fulminate can be replaced by 0·05 grm. of nitrogen sulphide, or 0·02 grm. of diazobenzene nitrate. If either fulminate, diazobenzene nitrate, or nitrogen sulphide, or a mixture of fulminate and chlorate is used, it is primed with 0·01 grm. of lead hydrazoate. A detonating charge can also be made by mixing fulminate with one-third of its weight of lead hydrazoate and compressing to 2000 atmospheres. (See also this J., 1911, 925, 1334.)
—G. W. McD.

Explosive; Gelatinous ——. Soc. Universelle d'Explosifs. Fr. Pat. 432,863, Oct. 13, 1910.

Collodion cotton containing about 14 per cent. of water (1—2 parts) is gelatinised with liquid trinitrotoluene (24 parts) at 40°—50° C. Chlorate or perchlorate of potassium, sodium, or ammonium (74—75 parts) is added and thoroughly incorporated. A mixture of ammonium perchlorate and an alkali nitrate may also be used.—G. W. McD.

Explosive charges; Method for preparing —— *by means of fusible explosives.* Dynamit A.-G. vorm. Alfred Nobel und Co. Fr. Pat. 432,981, Aug. 4, 1911.

By melting, *e.g.* trinitrotoluene, granulating the molten mass and mixing it with crystalline trinitrotoluene which has been powdered, it is claimed that a greater certainty of, and increase of velocity of detonation, is obtained than when either is used separately. G. W. McD.

Explosives; Perforated safety-door with safety-wall for drying apparatus for ——. E. Storch. Ger. Pat. 241,366, Nov. 11, 1910.

The door is mounted so that it can turn around a horizontal axis and beyond this axis it is suspended pendulum fashion, so that should an explosion occur in the drying apparatus, the first shock forces the door outwards in a vertical or nearly vertical position, thus leaving the whole of the end of the drying chamber open for the exit of the explosion gases, whilst after the safety wall is destroyed, the door turns to the horizontal position.—A. S.

Explosive; Safety ——. N. Ceipek. First Addition, dated June 14, 1911, to Fr. Pat. 428,748, April 21, 1911.

See Eng. Pat. 13,549 of 1911; this J., 1911, 1232.—T. F. B.

Match igniting tips; Paste for lucifer ——. D. A. Venot and L. F. Chasseigne, Pantin, France. Eng. Pat. 17,113, July 26, 1911.

See Fr. Pat. 430,714 of 1910; this J., 1911, 1411.—T. F. B.

XXIII.—ANALYTICAL PROCESSES.

[Gold and ammonia]. Two new and very delicate tests by use of the reagent, "tetramethyl base." R. J. Carney. J. Amer. Chem. Soc., 1912, **34**, 32—35.

The new tests relate to the detection of gold and ammonia by means of tetramethyldiaminodiphenylmethane ("tetramethyl base"), the compound originally employed by Trillat in testing for traces of lead and manganese (this J., 1903, 761) and since used by other investigators for the detection of ozone. The author has found that a citric acid solution of the reagent—prepared by dissolving 2·5 grms. of the latter in a solution of 10 grms. of citric acid in 10 c.c. of water and diluting to 500 c.c.—is more satisfactory than the acetic acid solution originally recommended.

The test for gold depends upon the oxidising action of auric chloride upon the reagent, a beautiful purple colour—much more distinct, it is stated, than "purple of Cassius"—being produced in cold, very dilute solutions: the colour soon changes to blue and the liquid finally becomes colourless, but the blue colour is restored by warming the solution. The test is not influenced by the presence of platinum, palladium or other elements; but, since free mineral acids interfere with the reaction, the gold solution, previously freed from chlorine by evaporation, must be neutralised and slightly acidified with acetic or citric acid before the reagent is added. The delicacy of the test in a solution containing nothing but gold was found to be 0·01 mgrm. of gold per 50 c.c.

The test for ammonia depends upon the fact that hydrogen peroxide has no action upon a solution of a manganous salt unless an alkali is present, a trace of the latter being sufficient to effect the oxidation, by the peroxide, of the manganese to a brown higher oxide. The solution supposed to contain the ammonium salt is boiled with sodium hydroxide in a flask provided with a rubber stopper and a delivery tube, the vapour issuing from the latter being made to impinge upon a piece of filter paper moistened with a solution prepared by dissolving 2 grms. of manganous sulphate in 200 c.c. of water and adding 5 c.c. of hydrogen peroxide solution. The presence of ammonia is indicated by a brown stain on the paper, which assumes a deep purple colour when moistened with a drop of the organic reagent; the purple colour is produced even when the quantity of ammonia present is so small that no brown stain is apparent. Steam has no action upon manganese sulphate but produces a slight brown stain with manganese acetate when no ammonia is present. It is stated that by means of this test the presence of 0·02 mgrm. of ammonia may be easily detected and that probably half this amount would be indicated by careful working.—W. E. F. P.

Manganese; The bismuthate method for ——. D. J. Demorest. J. Ind. Eng. Chem., 1912, 4, 19.

It has been stated that manganese cannot be accurately determined by the bismuthate method in presence of chromium, and this is true if the final titration is made by adding excess of ferrous sulphate and titrating back with permanganate. If, however, the permanganic acid solution obtained by the oxidation with bismuthate be titrated directly with sodium arsenite solution, any chromic or vanadic acid which may be present has no influence on the results.—A. S.

Gases dissolved in solids. [*Determination of oxygen.*] M. Guichard. Bull. Soc. Chim., 1912, 11, 49—50. (See also this J., 1911, 510, 960.)

Certain solids, capable of being used in the determination of oxygen, were investigated respecting the tenacity with which they retain dissolved gases. Phosphorus can be practically freed from contained gas by several sublimations *in vacuo*. The same is true of cadmium, but this metal does not appear a very suitable absorbent for oxygen, as its oxide possesses an appreciable dissociation pressure. Zinc, after five sublimations *in vacuo* in a bulbed tube, was found to give up as much as 2 c.c. of gas per 100 grms. of metal on the sixth sublimation. It seems that a portion of the gas liberated on vaporisation is again dissolved on solidification. Potassium, distilled three times *in vacuo*, continued to give up appreciable quantities of gas, possibly owing to the presence of a small quantity of hydride which is not readily decomposed under these conditions. Lead, heated for 11 hours, and partially volatilised, at 750° C., and then heated for 8 hours at 550° C., gave up gas during this second period, at the rate of about 0·1 c.c. per hour, per 100 grms. of metal.—J. H. L.

Amino-compounds; Colour reactions given by various —— in presence of potassium bichromate and mineral acids. H. Agulhon and P. Thomas. Bull. Soc. Chim., 1912, 11, 69—73.

The author describes two distinct bichromate tests which differ in that sulphuric acid is used with one and nitric acid with the other. In carrying out the first, 3 c.c. of pure sulphuric acid are mixed with 5 drops of a 2 per cent. solution of potassium bichromate in a test-tube, and a small crystal or a drop of the substance to be tested is then added and the tube immersed for 5 minutes in a bath of boiling water. More than 60 organic bases were subjected to this test, and the following general conclusions were drawn:—Simple fatty amines containing less than four atoms of carbon in the molecule undergo no change, whereas those containing more than four atoms of carbon are oxidised, the liquid turning green. Among the amino-acids, glycocoll and alanine give negative results, whilst amino-valeric acid and its higher homologues, and also glycocoll anhydride, produce a change of colour to green. The α-amino-acids are oxidised less readily than the corresponding unsubstituted acids. Bases containing a benzene nucleus in the molecule give rise to a brown or olive green colouration. In carrying out the second test mentioned above, 0·5 grm. of bichromate is dissolved in 100 c.c. of pure nitric acid (36° Bé.) and 3 c.c. of this solution are used as in the first test. Glucosamine produces a change of colour to blue even in the cold, whilst tyrosine, cystine, iso- (but not normal) amylamine, and a few other more complex bases react similarly on heating for 5 mins. at 100° C. Hippuric acid and sarcosine also produce a blue colour, but more slowly. By means of these two tests it is possible to discriminate between certain of the purine bases. Thus, adenine, hypoxanthine and parabanic acid give a negative result with both; xanthine, guanine and allantoïn give a green colouration at 100° C. in presence of sulphuric acid; uric acid, theobromine, caffeine, alloxan, dialuric acid and alloxantin answer positively to the sulphuric acid test both in the cold and at 100° C., but the last two substances differ from all the foregoing ones in producing a blue colouration with the nitric acid test at 100° C.—J. H. L.

Examination of mixtures containing petroleum. Coste and others. *See* IIA.

Examination of asphaltum. Loebell. *See* IIA.

Application of the formolite reaction in paraffin wax analysis. Sommer. *See* IIA.

Identification of dyestuffs on textile fibres by the spectrophotometric method. Poraï-Koschitz and Auschkap. *See* VI.

Identification on the fibre of the after-chrome blacks. Walker. *See* VI.

Dimethylglyoxime as a reagent for ferrous salts. Slawik. *See* VII.

Hydrosols of niobic and tantalic acids, and separation of niobium and tantalum by the method of Weiss and Landecker. Hauser and Lewite. *See* VII.

Determination of chromium and its separation from vanadium in steels. Cain. *See* X.

Rapid determination of sulphur in roasted blende. Nitchie. *See* X.

Determining insoluble particles in raw rubber. Beadle and Stevens. *See* XIV.

Determination of the sugar content of bagasse. Hazewinkel and others. *See* XVII.

Temperature corrections for raw [*cane*] *sugar polarisations.* Horne. *See* XVII.

Determination of the content of bitter substances in wort and beer. Wiegmann. *See* XVIII.

Detection of cocoanut oil in butter and lard. Polenske. *See* XIXA.

Shrewsbury and Knapp's process of determining cocoanut oil [*in butter*]. Shrewsbury and Knapp. *See* XIXA.

Determination of mustard oil in oil cake from Cruciferæ and in mustard flour. Brioux. *See* XIXA.

Extraction and determination of alkaloids in syrups, etc. Kohn-Abrest. *See* XX.

Determination of cinnameïn in Peru balsam. Lehmann and Müller. *See* XX.

Reactions of pyramidone [*dimethylaminoantipyrine*]. Moulin. *See* XX.

Determination of mercury in hydroxyphenylenedimercuric acetate and mercuri-salicylic acid. Brieger. *See* XX.

Testing of benzaldehyde for chlorine compounds. Heyl. *See* XX.

Determination of small quantities of methyl alcohol. Simmonds. *See* XX.

Examination of dynamite glycerin. Hofwimmer. *See* XXII.

Patents.

Analysis of solutions ; Method of quantitative —. I. F. Holmgren, Stockholm. U.S. Pat. 1,012,639, Dec. 26, 1911.

Unsized paper is impregnated with an indicating medium which changes in colour when brought into contact with a solution of the substance under examination. A drop of the solution is then applied to the paper and the percentage quantity of the substance in the solution is ascertained by determining the ratio between the portion of the wet spot which has changed in colour and the portion of the wet spot which has not changed its colour. —W. P. S.

Gas analysis ; Apparatus for —. J. F. Simmance and J. Abady. First Addition, dated June 15, 1911, to Fr. Pat. 378,622, June 8, 1907. Under Int. Conv., Nov. 10, 1910.

See Eng. Pat. 26,168 of 1910 ; this J., 1911, 511.—T. F. B.

XXIV. MISCELLANEOUS ABSTRACTS.

Chemically active rays ; Occurrence of — in chemical reactions. Matuschek and Nenning. Chem.-Zeit., 1912, **36**. 21.

Chemical reactions of the most different kind appear to produce light waves, or part of the thermal energy produced is transformed into light energy. If strips of zinc, copper, tin or lead are immersed in dilute sulphuric, hydrochloric, or nitric acid in a beaker, upon the bottom of which is glued a tin foil star, and the beaker is placed on a photographic plate in the dark, an image will be produced upon developing the plate after a given period. The time required to obtain a sharp image varied according to the nature of the metal and the acid, the longest period (4 days) being in the case of lead and nitric acid. Similar results were obtained by treating copper oxide and hydroxide with acids, and potassium hydroxide, calcium oxide, and calcium carbide with water, and in the formation of ammonium amalgam. The photographic effect of decomposing sodium metasilicate with dilute acids was especially rapid. Sharp images were also produced by leaving Portland cement to set upon a glass plate above the photographic plate, and in the hardening of a mixture of plaster of Paris and water. It is suggested that a photographic method of measuring and comparing the velocities of chemical reactions may be based upon these experiments.—C. A. M.

Amino-acids derived from albumins ; Compounds of chromic hydroxide with the ——. L. Hugounenq and A. Morel. Comptes rend., 1912, **154**, 119—121.

Freshly precipitated chromic hydroxide dissolves with a red colour in solutions of many amino-acids, and from such a solution, obtained by boiling a strong solution of glycocoll (6 mols.) with chromic hydroxide, $Cr_2(OH)_6$ (1 mol.), a purple red crystalline product, containing 2 hydroxyl groups and 4 mols. of amino-acid for each 2 atoms of chromium, has been found to be deposited, vermilion red crystals, containing 6 mols. of amino-acid for each 2 atoms of chromium, being obtained by slow evaporation of the mother liquor. These derivatives, which are but slowly attacked by acids and alkalis, are not regarded as true salts of chromium.—F. Sodn.

Trade Report.

British India. Revised Tariff valuations for 1912.

The issues of the Board of Trade Journal for Jan. 18, 1912, and following weeks, contain the new tariff valuations for 1912 relating to imports into India. The duties for chemical products, etc., will be found on pp. 130 and 131 of the issue of Jan. 18th.

Customs Tariff of Spain. Board of Trade J., Jan. 25, 1912.

A parliamentary return (Cd. 6040, price 4½d.) has been issued, containing a translation of the Spanish Tariff, which came into force on Jan. 1st last.

Books Received.

Dictionary of Applied Chemistry. By Sir Edward Thorpe, C.B., LL.D., F.R.S., assisted by eminent contributors. In five volumes. Vol. I. Revised and enlarged edition. With Illustrations. Longmans, Green and Co., 39, Paternoster Row, London. New York, Bombay, and Calcutta. 1912. Price £2 5s.

Large 8vo volume, containing 758 pages of text with numerous illustrations. The work commences with a preface, a table of abbreviations alphabetically given, one of the titles of journals and books, and a list of contributors to Volume I. The concluding subject in Volume I. is "Chestnut extract." It is stated that "since the original scope of this work has been greatly enlarged, all the articles in the first edition being revised and many wholly rewritten, and also a large number of new subjects added, the result is that the present edition is practically a new work." The new edition will appear in five volumes, £2 5s. each, and it is hoped that the entire work will be completed within two years from the present date. Volume II. is to be ready early in the summer.

The Chemistry of Breadmaking. By James Grant, M. Sc. Tech. Head of Fermentation Industries Dept., Municip. School of Technology, Manchester. Edward Arnold, 41 and 43, Maddox Street, Bond Street, London, W. 1912. Price 5s. net.

Small 8vo volume, containing 216 pages of subject matter with 47 illustrations and 4 plates, a bibliographic table, alphabetically arranged, and an alphabetical index of subjects. The subject matter is classified after the following plan :—I. The atmosphere. Water. II. Acids, alkalis, and salts. III. Bakery physics, etc. IV. Heat, and physical problems. V. Organic constituents of the cereals. VI. The cereals and their composition. VII. Milling meals, flours, malts and extracts. VIII. Ferments, yeasts, moulds, bacteria and barms. IX. Breadmaking, processes and breads. X. Antiseptics and bakehouse hygiene. XI. Fuels. Ovens. XII. Analysis of cereal food.

The Rubber Industry. Being the Official Report of the Proceedings of the International Rubber Congress, London, 1911, held at the International Rubber and Allied Trades Exhibition, 24th June to 14th July. Edited by Dr. Joseph Torrey and A. Staines Manders. The Internat. Rubber and Allied Trades Exhibition, Ltd., 75, Chancery Lane, London, W.C. 1912. Price 15s. 6d. net.

Large 8vo volume, containing 470 pages of subject matter with 50 illustrations. I. Historical and descriptive introduction (D. Spence). II. The rubber planting problem as it at present presents itself in different countries. Maintenance of health in rubber planting districts. III. The Para (Hevea) india rubber tree in the East. Manuring of rubber trees. Some diseases of Hevea Brasiliensis, etc. IV. Centrifugalisation of rubber latex. Viscosity of rubber and its solutions. Raw rubber testing, etc. V. Indiarubber research. Theory of vulcanisation. Extensibility of vulcanised rubber. Mechanical tests of rubber, etc.

Die Künstliche Seide. Ihre Herstellung, Eigenschaften und Verwendung. Mit besonderer Berücksichtigung der Patent-Literatur. Bearbeitet von Dr. Karl Süvern (Regierungsrat). Dritte, stark vermehrte Auflage. Julius Springer's Verlag. Berlin. 1912. Price M. 18.

8vo volume, bound in cloth, and containing 609 pages of subject matter, with 214 illustrations, indexes of names and subjects, and a patent list with the numbers of German, British, French, United States, Swiss, Austrian, and Belgian patents. The entire subject is sub-divided as follows :—I. Preparation of artificial silk. (i) From nitrocellulose. (ii) From non-nitrated vegetable matters. (iii) From solutions of cellulose in zinc chloride solution. (iv) From viscose. (v) From solutions of cellulose hydrate in caustic alkali. (vi) From cellulose fatty acid esters. (vii) From matters of animal origin, albuminous matters, the constituents of natural silks, etc., as also vegetable mucilages. (viii) The different forms of apparatus and arrangements, etc., for preparing artificial silks. (ix) Preparation of artificial horsehair. (x) Preparation of other objects by the artificial silk processes. II. Properties of artificial silks. III. Use of artificial silk.

L'Industrie des Matières Colorantes Organiques. Par André Wahl, D. ès Sc. Prof. de chim. ind. à la Faculté des Sciences de Nancy. Octave Doin et Fils. 8, Place de l'Odéon. Paris. 1912. Price 5 fr.

Small 8vo volume, containing 387 pages of subject matter with 5 illustrations, a bibliographic list, list of abbreviations used in the text, and an alphabetical index of subjects. The subject matter receives the following classification:— I. Primary products. II. Intermediate products. III. Dyestuffs. (i) Nitro; (ii) Nitroso-dyestuffs or quinoneoximes; (iii) Azo-dyestuffs; (iv) Hydrazones; (v) Stilbene colours; (vi) Diphenylmethane colours; (vii) Triphenylmethane colours; (viii) Xanthene colours; (ix) Acridine colours; (x) Anthracene derivatives; (xi) Quinone-imido derivatives. (xii) Indigo and indigo dyestuffs; (xiii) Thiazol colours; (xiv) Sulphurised dyestuffs; (xv) Aniline black.

The Everyday Uses of Portland Cement. Second Edition. 1912. Published by "The Associated Portland Cement Manufacturers (1900), Limited." Portland House, Lloyds Avenue, London, E.C. 1912. Price 2s. 6d. Paper covers 1s. 6d. net.

8vo volume, containing 326 pages of subject matter, with 330 illustrations, and an alphabetical index. The subject matter is subdivided and classified as follows:—I. Portland cement. II. Aggregates. III. Concrete. IV. Workmanship. V. Concrete blocks and moulded concrete. VI. Reinforced concrete. VII. Memoranda for concrete users VIII. Examples of the use of concrete. IX. Certain uncommon uses for concrete (telegraph posts, signal posts, boats and barges, etc.).

Anwendung Physikalisch-Chemischer Theorien auf technische Prozesse und Fabrikationsmethoden. Von Dr. Robert Kremann. Druck und Verlag von Wilhelm Knapp. Halle a. S. 1911. Price M. 9.60.

8vo volume, containing 208 pages of subject matter, with 35 illustrations. The subject matter is classified as follows:—I. The two chief doctrines of the mechanical theory of heat. II. Velocity of reaction and catalysers. III. Further special uses of the law of mass action and of the influence of temperature on the constants of equilibrium. IV. Dissociation pressure. Use of the phase rule. V. Use of the phase rule in the case of solid-liquid systems. VI. Transformation phenomena in the case of hydraulic cements (binding agents). VII. Further uses of the phase rule. (Absorption compounds. Reciprocal pairs of salts, etc.)

Who's Who in Science (International), 1912. Edited by H. H. Stephenson. J. and A. Churchill, 7, Great Marlborough Street, London. 1912. Price 6s. net.

A biographical dictionary and directory combined. It contains 323 pages of subject matter, commencing with a list of abbreviations used, an obituary (1911) and condensed tabulated lists of the world's universities. The biographies, alphabetically arranged, now follow, and continue from page 27 to page 301. These are followed, and the work concluded, by a classified index of names of scientists arranged under the different branches of pure and applied science represented, and in the different countries to which they belong.

A Text-Book of Inorganic Chemistry. By A. F. Holleman, Professor Ord. in the University of Amsterdam, etc. Issued in English in co-operation with H. C. Cooper. Fourth English Edition. John Wiley and Sons, New York. Chapman and Hall, Limited, London. 1912. Price 10s. 6d.

8vo volume, containing 492 pages of subject matter with 79 illustrations and one plate, followed by an alphabetical index of subjects. The subject matter is classified as follows:—I. Physical and Chemical Phenomena. II. Chemical operations. III. Conservation of matter. IV. Compounds and mixtures. V. Atomic theory, etc. VI. Stoichiometrical calculations. VII. Molecular weight from the measurement of the depression of the freezing-point and elevation of the boiling-point. VIII. Electrolytic dissociation. IX. Thermochemistry. X. Methods of determining atomic weights. XI. Periodic system of the elements. XII. Salt solutions. XIII. Acidimetry and alkalimetry. XIV. Spectroscopy. XV. Unity of matter. XVI. Electrochemistry, etc.

Church's Laboratory Guide. A Manual of Practical Chemistry for Colleges and Schools, specially arranged for agricultural students. Revised and largely rewritten by Edward Kinch, Professor of Chemistry in the Roy. Agric. College, Cirencester, etc. Ninth edition. Gurney and Jackson, 33, Paternoster Row, London, E.C. 1912. Price 6s. 6d. net. Oliver and Boyd, Edinburgh.

Small 8vo volume, containing 356 pages of subject matter, with 45 illustrations, and an alphabetical index of subjects, followed by sundry details of reagents and apparatus required by students using the "Guide." The book is divided into three parts:—Part I. Chemical manipulation. II. Qualitative analysis. III. Quantitative analysis. The general trend of this course being principally, though not exclusively, in the direction of agricultural, food, and water analysis, numerous examples follow of methods most suitable of employment.

Laboratory Exercises in Physical Chemistry. By J. N. Pring, D.Sc. Lecturer and Demonstrator in Electro-Chemistry. The University Press, Manchester, 1911. Price 4s. net. Sherratt and Hughes, 33, Soho Square, London, W. Longmans, Green and Co., 443—449, Fourth Avenue, New York, U.S.A.

8vo volume, containing 158 pages of subject matter, with 27 illustrations, an Appendix of 4 additional pages, and the alphabetical index. The subject matter is subdivided and classified as follows:—I. Physico-chemical measurements. (i) Calorimetry; (ii) Electro-chemistry. II. Electrolytic preparations. (*a*) Methods of electrolytic reduction; (*b*) Methods of electrolytic oxidation. III. Pyrometry. (*a*) Thermo-electric; (*b*) Radiation, and (*c*) Optical pyrometry.

Fourth Report of the Wellcome Tropical Research Laboratories at the Gordon Memorial College, Khartoum. Volume B.—General Science. By Andrew Balfour, M.D., etc., Director. Published for Departmt. of Education, Sudan Govt. Khartoum, by Baillière, Tindall and Cox, 8, Henrietta Street, Covent Garden, London. 1911. Price 18s. net.

Large quarto volume, containing 312 pages of subject matter, with 101 illustrations, many of them beautifully coloured. As frontispiece, a coloured map of the Anglo-Egyptian Sudan is given. An alphabetical index of subjects concludes the work. The volume contains a mass of data relating to matters chemical, geological, and biological. Birds, insects, animals, and bacteria have been systematically studied, so that with its illustrations, the book furnishes a complete account of tropical life. The questions of sociology, sanitation, sanitary engineering, and the characteristics of the Soudan soils, are also dealt with. The Reports are issued by the authority of the Department of Education of the Sudan Government. Among the technical subjects of investigation of special interest are:—I. Gypsum as a fertiliser for Soudan soils. II. Gum research, and experiments on gum production in Kordofan, with preliminary notes on the chemistry of the latex of *Caloptropis procera*. III. Ancient gold mining in the Soudan.

A First Year Physical Chemistry. By T. P. Hilditch, D.Sc., F.I.C. Methuen and Co., Ltd., 36, Essex Street, London, W.C. 1912. Price 2s.

Small 8vo. volume, containing 171 pages of subject matter, with 55 illustrations, and the alphabetical index. An Appendix gives a series of experiments for performance by students, the less important being in italics. Of this, Division A gives an outline of practical work, and B, some practical details to be observed, C following with a glossary of physico-chemical terms. The work is divided into four parts:—I. Some important physical properties. II. Physical chemistry of gases and liquids. III. Physical chemistry of solutions, and IV., Some important applications of physico-chemical theory.

Physico-Chemical Calculations. By Joseph Knox, D.Sc. Lecturer in Inorganic Chemistry, Univ. of Aberdeen. Methuen and Co., Ltd., 36, Essex Street, London, W.C. Price 2s. 6d.

Small 8vo volume, containing 186 pages of subject matter, and an alphabetical index. The problems, the solution of which is given, relate to:—I. Gas laws. II. Density and specific volume of solids and liquids. III. Specific and molecular refractivity. IV. Molecular weight from lowering of vapour-pressure, etc. V. Surface tension, molecular weights and degree of association of liquids, etc. VI. Thermochemistry, etc. VII. Velocity of reaction. VIII. Law of mass action. Equilibrium constant. Solubility of gases, etc. IX. Ohm's law. Faraday's law. Hydrolysis, etc. X. Electromotive force. Diffusion potential. Gibbs-Helmholtz equation. XI. Diffusion. Radio-activity.

L'Internationalisme Scientifique (Sciences pures et Lettres). By P. H. Eijkman, with an introduction by P. S. Reinsch. Le Bureau Préliminaire de la Fondation, pour l'Internationalisme, 6, Van Lennepweg, The Hague, Holland.

This volume gives an account of the various Societies, Congresses, and Committees of an international character which deal with the various sciences.

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*New Books.

Arnold, J.: Origin and history of beer and brewing: from prehistoric times to the beginning of brewing science and technology. Chic., Alumni Assn. of the Wahl-Henius Inst. of Fermentology. 1911. c. 16+411 p. il. 4°. $5.

Butler, G. M.: A pocket handbook of minerals, designed for use in the field or class-room with little reference to chemical tests. 2nd Ed. N.Y., Wiley, c. 1911. 9+311 p. figs. 16°. $3.

Carpini, C.: Elementi di elettrochimica ad uso specialmente delle scuole professionali ed industriali. Livorno. 32°. fig., p. 316. 1911. Lire 2.75.

Clowes, F., and J. B. *Coleman*: Quantitative chemical analysis; adapted for use in the laboratories of schools and colleges. 9th Ed. Phil., Blakiston. 1911. 24+565 p. il. 8°. $3.50.

Daniell, A.: Text-Book of the Principles of Physics. 8vo. Macmillan. London. 1912. Net 17s.

Doelter, C.: Über Gleichgewichte in Silikatschmelzen u. üb. die Bestimmung des Schmelzpunktes des Calciummetasilikates. [Aus: "Sitzungsber. d. k. Akad. Wiss."] (26 S. m. 3 Fig.) gr. 8°. Wien, A. Hölder. 1911. 95 Pf.

Dümmler, K.: Ziegel-Fabrikation. 2. Aufl. 10—14. Lfg. Halle, Knapp. 1911. M. 2.

—— Die Herstellg. der gesamten keram. Baumaterialien, wie Ziegel, Terrakotten, Röhren, Platten, Kacheln, feuerfeste Waren u. s. w. 2., stark verm. u. verb. Aufl. Lex. 8°. Halle, Knapp. 1911.

2. Abtlg. Das Formen u. Dekorieren der Ziegel, Terrakotten, Röhren, Platten, Kacheln, feuerfesten Waren u. aller anderen Baumaterialien aus gebranntem Ton. (S. 133—240 m. 134 Abbildgn.) M. 6.60.

Gmelin u. *Kraut's* anorgan. Chemie. 7. Aufl. v. Friedheim u. Peters. 145. u. 146. Lfg. Hdlbg., Carl Winter. 1911. M. 1.80.

Harbord, F. W., and J. W. *Hall*: The Metallurgy of Steel. 2 Vols. 4th Ed. Enlarged and Revised. 8vo, pp. 994. C. Griffin. London. 1912. Net 36s.

Hatch, F. H.: Mineralogy. 4th Ed. Entirely rewritten and enlarged. Cr. 8vo. pp. 261. Whittaker. London. 1912. Net 4s.

Helmholtz, H. v.: Vorlesungen üb. theoretische Physik. Hrsg. v. A. König, O. Krigar-Menzel, F. Richarz, C. Runge. 1. Bd. 2. Abtlg. Vorlesungen üb. die Dynamik discreter Massenpunkte. Hrsg. v. O. Krigar-Menzel. 2. durchgesch. Aufl. [Anastatischer Neudr.] (XI, 380 S. m. 21 Fig.) Lex. 8°. Leipzig, J. A. Barth [1898]. 1911. M. 15.

Jahrbuch der Elektrochemie u. angewandten physikalischen Chemie. Begründet u. bis 1901 hrsg. v. Profs. W. Nernst u. W. Borchers. Berichte üb. die Fortschritte des J. 1906. Hrsg. v. Dr. H. Danneel u. Prof. J. Meyer. 13. Jahrg. 1. Hälfte. (IV, 497 S. m. Abbildgn.) gr 8°. Halle, W. Knapp. 1911. M. 19.60.

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Jahresbericht d. Chemie: 1905—08. 32—34. Heft. Brnschwg., Vieweg & S. 1911. M. 12.

—— do. 1909. 5. u. 6. Heft. do. M. 12.

Kalender f. die Eisen-Emailindustrie 1912. Für den Fabrikanten, Emailchemiker, Email- u. Giessereitechniker, Betriebsleiter, Emailliermeister, Hüttenmann etc. bearb. v. Dr. J. Grünwald. 1. Jahrg. (VIII S., Schreibkalender u. 168 S. m. Fig.) kl. 8°. Leipzig-R., F. Stoll, jr. Cloth M. 2.10.

Lang, H.: Metallurgy. Vol. 1. Introductory. Roy. 8vo. Hill Pub. Co. London. 1912. Net 12s. 6d.

Ledebur, Prof. A.: Leitfaden f. Eisenhütten-Laboratorien. 9. neu bearb. Aufl. v. Prof. W. Heike. (IX, 176 S. m. 26 Abbildgn.) gr. 8°. Braunschweig, F. Vieweg & Sohn. 1911. M. 5.50; Cloth M. 6.

Naumann, Dr. C.: Die zur Konservierung v. Nahrungs- u. Genussmitteln verwendeten chemischen Verbindungen. (16 S.) gr. 8°. Berlin, Deutscher Verlag f. Volkswohlfahrt. 1911. 60 Pf.

Perkin, W. H., and F. S. *Kipping*: Organic Chemistry. Entirely New Ed. Cr. 8vo, pp. 696. Chambers. London. 1912. 7s. 6d.: or in two parts, each 4s.

Plotnikow, Dr. J.: Photochemische Versuchstechnik. (XV, 371 S. m. 189 Fig., 3 Taf. u. 50 Tab.) gr. 8°. Leipzig. Akadem. Verlagsgesellschaft. 1912. Cloth M. 11.

Poynting, J. H., and Sir J. J. *Thomson*: A Text-Book of Physics: Heat. 4th Ed. Revised. 8vo, pp. 370. C. Griffin. London. 1912. 15s.

Richter, M. M.: Lexikon d. Kohlenstoff-Verbindgn. 3. Aufl. 18—24. Lfg. Lpzg., L. Voss. 1911. M. 6.

Smith, A.: Trattato elementare di chimica inorganica. Versione italiana de Clemente Montemartini. Torino. 16° fig., p. 682. 1911. Liro 16.

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London Section.

Meeting held at Burlington House on Monday, February 5th, 1912.

MR. E. GRANT HOOPER IN THE CHAIR.

CONSTANT TEMPERATURE HEATING APPARATUS FOR EXPLOSIVES AND EXPERIMENTS ON THE DECOMPOSITION OF NITROCELLULOSES.

BY J. S. S. BRAME.

It is necessary in all stability tests that as uniform a temperature as possible shall be maintained, frequently for several hours or even days, and this has usually been attained by the use of baths fitted with thermostats and mechanical stirrers and generally with some arrangement for lowering and raising the bath. The advantage of heating by a vapour from a liquid of constant boiling point is obvious, and an apparatus for treating *in vacuo* by this system has been described by Hodgkinson and Coote (Chem. News, 1905, **91**, 194). In a later form (Service Explosives, 1907) a copper flask and heater connected with a reflux condenser are employed.

In the special form of apparatus described below for heating nitrocelluloses, provision is made for the usual manometric measurements and for collecting and measuring the gases evolved. The decomposition tubes are in duplicate so that two samples may be simultaneously examined, and there is no reason against extending the number of heaters so that one boiler would serve for four specimens.

The apparatus consists of three parts: (1) the boiler and heating jackets; (2) the decomposition and measuring apparatus; (3) the pump, which is an ordinary mercury one fitted with a specially deep trough in order that the measuring tube may be sunk to a proper level for measuring the gases at ordinary pressure. Phosphorus pentoxide, distributed in layers on glass wool, is employed in the drying tube of the pump.

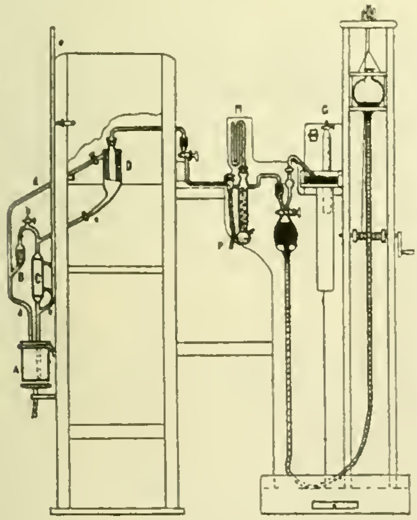

Fig. 1.

The general arrangement is shown in Fig. 1. The heating apparatus consists of a copper boiler, (A) 5½ inches high, 3½ inches diameter, fitted with a vapour tube (*d*) and a return liquid tube from the condenser (C) which reaches nearly to the bottom. This portion of the tube is brazed to the underside of the cover of the boiler, which itself is brazed to the body. The tubes are detachable by means of screw unions immediately above the cover. A hole in the top, closed by a screw cap, serves for filling. The vapour tube (*d*) branches into two copper heaters (Fig. 2, H^1, H^2,) the taps on these branches enabling the vapour to be sent through each heater after the decomposition tube has been exhausted. The return vapour tubes unite as is shown in Fig. 2 in the tube (*c*), which connects directly with the condenser (C). The two heaters are attached to the tubes (*c*) and (*d*) by screw unions. All parts where vapour circulates are well lagged with asbestos.

When starting the apparatus, provision is made for short-circuiting the vapour, this being accomplished by closing the taps on the vapour tubes, so causing the vapours to pass through a small ball valve (B) round to the condenser (C). The small cock (*b*) is opened until all air is driven out of the boiler and vapour is escaping, when it is closed. A glass safety tube (*e*, *e*), which indicates any undue pressure, is joined by a piece of thick walled rubber tubing to a short copper branch of the return liquid tube.

500 c.c. of liquid are employed in the boiler, and when starting this liquid is gradually heated until a steady flow of vapour passes through the ball valve and back to the boiler through the condenser. Care must be taken in adjusting the gas supply, for if the liquid is too rapidly boiled, undue pressure is set up by the ball valve and liquid may be ejected through the safety tube. The gas supply must be slightly increased as each heater is, in turn, put in action, and it has been found advisable to have a graduated gas tap for controlling the supply. A small quantity of high flashing oil is placed in the copper heaters to ensure ready heat conduction to the explosive, above the level of which the oil extends when the glass tubes are in position. The heaters are enclosed in a sheet iron chamber with doors on each side, the gas delivery tubes passing through vertical slots on the pump side. A wire gauze screen extends nearly across the interior of the chamber between the two tubes so that in the event of the explosive in one tube detonating, the other is well protected.

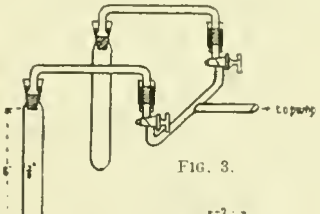

Fig. 3.

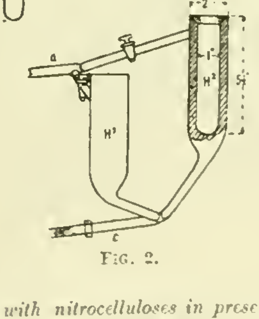

Fig. 2.

Experiments with nitrocelluloses in presence of decomposition products.—Robertson and Napper (Jour. Chem Soc., **91**, 764) have shown that the oxides of nitrogen evolved during the heating of guncotton are capable of acting on the residual explosive accelerating its rate of decomposition, and further, that nitrogen peroxide disappears from the products or is greatly reduced in quantity in the presence of liquid water. Wilcox (J. Amer. Chem. Soc., **30.** 271) has investigated the influence of the presence of the gaseous products of decomposition on the velocity of decomposition in the well-known Obermüller test (this J., 1905, 347) and found that the rate of increase is much more rapid when the gaseous products are present than in their absence. The volume concentration will of course affect the rate of increase and its effect was investigated by Wilcox. It has also been noted by Jacqué (this J., 1906, 1117) that nitrocellulose dried to constant weight at 50°—60° C. loses further water at 100° C.

In view of these considerations it was decided to carry out a series of tests on commercial guncottons and soluble nitrocelluloses in the absence of liquid water and in the presence of the gaseous products of decomposition. The temperature employed in most stability tests is usually between 130° and 140° C., the latter being the temperature of the Obermüller test. The velocity of decomposition has been determined by Saposnikov (Russ. Phys. Chem. Soc., **38**, 1186), who found a marked change in the rate at 143° C., and later (this J., 1908, 592) using Mittasch's method (this J., 1903, 1298), at 140°. Wilcox (J. Amer. Chem. Soc., **30**, No. 2, 271) observed changes in the rate at 138° and 145° C. Sy (this J., 1903, 924) has pointed out that at 100° C., although the rate of decomposition is slow, yet there is a marked difference in the rate for good and bad nitrocelluloses, and consequently adopted 115° C. for his well-known test. It was therefore decided to carry out the tests on the guncottons at 110°, 115°, and 130° C. The soluble nitrocelluloses available were found to give small gas evolution at 130° C., so lower temperatures were not employed in their case. In order to complete the test in a working day of 8 hours, which is very desirable, the time of heating was fixed at 6 hours.

The decomposition tubes are shown *in situ* in Fig. 1, and in detail in Fig. 3. A piece of rubber tubing is slipped over the conical end of the gas delivery tube and fits tightly into the decomposition tube, a small amount of mercury being put in to seal the joint. The other end of the delivery tube has a rubber tube connection, with mercury cups, to the gas tap. The tube from each of the two gas taps is connected through a single-way piece to the pump. The volume of the decomposition tube is 45 c.c., and of the gas tube up to the tap, 10 c.c.

Two grams of nitrocellulose, previously dried at 40° C., is closely packed in the decomposition tube, the apparatus connected up and the preliminary exhaustion made with a Fleuss pump attached by pressure tubing (*p*) to the three-way tap of the mercury pump. When both tubes have been pumped out in this way, the first is completely exhausted by the mercury pump, then the tap admitting vapour to the first apparatus is opened and heating started. Exhaustion of the second tube is then completed and the heating of this sample started ten minutes after the first one. The water which collects during the first 15 minutes' heating is removed by the pump at the end of this period, when the tap is closed and the test allowed to run for the six hours without further attention. At the end of this time the tap is opened, the pressure read off on the manometer, the gases being afterwards pumped out and measured. The manometer was first calibrated against gas volume by introducing air into the decomposition tubes, measuring the pressure and corresponding gas volume. In this way a useful check on the results was obtained. Owing to the removal of nitrogen peroxide by interaction with the nitrocellulose during the heating, and also the gases being well dried, there is very little action on the mercury of the pump or in the collecting tube, the volume of gases actually collected being very little lower than that deduced from the pressure (see Tables).

Tests at 110° *C.* (boiling toluene).—The volume of gas from good nitrocelluloses was very small, and its rate of evolution erratic, so experiments at this temperature were not pursued.

Tests at 115° *and* 130°.—The liquid employed for the former was a mixture of toluene (3 vols.) and xylene (1 vol.), whilst for 130° C., amyl alcohol (sold as boiling between 128—132° C.) was used. The nitrocelluloses were all manufactured material, not laboratory specimens, and the results obtained with the three classes at the above temperatures are given in Tables I and II.

It is not possible from the limited number of specimens examined under these conditions to suggest a permissible gas volume at either of these temperatures; the large evolution of gas at 115° C. with the guncottons known to be poor (Nos. 9 and 10) would clearly have condemned them, these results being in agreement with Sy's conclusions. It will be seen that, although at 115° C. two samples may give practically identical gas yields, yet at 130° C. one may give quite twice as much as the other, which suggests that the higher temperature is requisite for bringing out minor differences in stability, indeed, it would be an important step if a critical temperature could be found which would sharply differentiate between doubtful and satisfactory nitrocelluloses in any tests of this class, but this is probably impossible, as chemically independent substances are not being dealt with.

For purposes of comparison the Will test results for two selected specimens of each class of nitrocellulose of the same make are given, the first in each pair being for the fully stabilised product and the other for the partially stabilised nitrocellulose giving the highest gas yield in the test as described. The ratio of the nitrogen from the partially stabilised to the fully stabilised nitrocellulose, and the corresponding ratio for the gas yield under the above conditions are as follows:—

	No. of sample.	Will test.	Above conditions.
Insoluble N.C. .	4 and 1	1·15/1·0	2·04/1·0
Soluble N.C. ...	24 and 21	1·07/1·0	1·50/1·0
Highly sol. N.C.	29 and 27	1·07/1·0	2·00/1·0

Whilst from this limited number of experiments it cannot be claimed that the test as described above is as satisfactory as the Will test, although far simpler to carry out, the former certainly more clearly brings out the minor differences between the selected pairs of nitrocelluloses, where even the least stabilised specimens, as denoted by the "per cent. stabilised" figures, have already undergone a fairly complete purification, and give quite satisfactory Will figures.

TABLE I.

Insoluble nitrocelluloses.

Yield of gas in c.c. at 0° C. and 760 mm. from 2 grms.

No.	Description.	At 115° C.	At 130° C.	
		Gas by vol.	Gas by vol.	Gas by press.
1.	Fully stabilised	1·4	4·5	4·7
2.	75 % ,, ...	1·4	5·3	6·2
3.	50 % ,, ...	1·6	5·6	7·0
4.	25% ,, ...	2·5	9·2	9·5
5.	Fully ,, ...	2·6 —	14·1 13·6	16·3 15·2
6.	G.C. yarn	1·7 —	11·7 11·7	12·0 13·0
7.	2 oz. Primer	1·9 1·7	6·1 —	7·0 —
8.	1 oz. Primer	—	13·0	13·7
9.	Primer, very old........	59·3 54·5	— —	— —
10.	Primer, unstable	19·5 20·5	— —	— —

Will test :—

Mgms. of nitrogen from 2·5 grms. in 4 hours.

Sample 1	6·21	Sample 4	7·13

TABLE II.

Soluble nitrocelluloses.

Yield of gas in c.c. at 0° C. and 760 mm. from 2 grms.

No.	Description.	At 130° C.	
		Gas by vol.	Gas by press.
21.	Fully stabilised	5·1	5·8
22.	68 % ,,	5·7	6·4
23.	40 % ,,	6·4	7·5
24.	20 % ,,	7·2	8·3
25.	Fully ,,	7·6	8·0

Highly soluble.

No.	Description.	Gas by vol.	Gas by press.
26.	Fully stabilised	6·35 6·30	7·3 7·5
27.	75% ,,	5·1 5·0	6·3 5·4
28.	50% ,,	8·1	9·0
29.	25% ,,	10·0	11·2

Will test :—

Mgms. of nitrogen from 2·5 grms. in 4 hours.

Sample 21	5·93	Sample 27	5·88
,, 24	6·38	,, 29	6·27

DISCUSSION.

Dr. R. ROBERTSON said that the apparatus described was evidently well adapted for maintaining a constant temperature. The ordinary differences in barometric pressure occurring during the performance of a test would not seriously affect the temperature. While there was no catalytic acceleration of the decomposition by the volatile products when they were carried off in a stream of gas (as in the Will test), that acceleration occurred when the experiment was performed in a vacuum, and was especially noticeable, if it was carried on long enough, by the ascending form of the curve. Even in the early portion of the curve, however, when it appeared to be straight, there was acceleration, connected, as he (the speaker) had shown, with the fact that more nitric peroxide was reduced to nitric oxide in a vacuum than when the volatile products were swept away (J. Chem. Soc., 91, 785). As the reaction was accelerated catalytically and so was one in which erratic outbreaks occurred, it would be necessary to perform a large number of experiments under similar conditions to ascertain the uniformity of the results.

Mr. J. S. S. BRAME, in reply, said he had not worked the apparatus with variations of time extending beyond the six hour limit, and had not noticed during that period any very great difference between the gas yields at the same temperature for the same guncotton in duplicate; but he quite believed that one might find, if one went outside that limit, some great changes in the rate of gas evolution. Of course a variation in the capacity of the apparatus would have a very considerable effect, so that one could perhaps reduce the time factor by alteration in the space.

SOME PHYSICAL CONSTANTS OF STRUCTURELESS CELLULOSE FILAMENTS (ARTIFICIAL SILK).

BY W. P. DREAPER, F.I.C., AND J. O. DAVIS, B.SC., A.C.G.I.

A knowledge of the physical properties of precipitated cellulose and other colloids in their natural state of dehydration, under ordinary atmospheric conditions, is of increasing importance from a theoretical and practical point of view. The successful production of continuous filaments of cellulose, or hydrocellulose and other colloidal substances of organic origin naturally suggests a method of determining some of the physical constants or properties of these bodies. The results so obtained may be compared with those of other substances such as metals on the one hand or quartz fibres on the other. A preliminary record of some results already obtained has been given by one of us (Dreaper, this J., 1909, 28, 1300), and the matter is now considered in greater detail.

These filaments have been first considered in the form of composite bundles or threads, because of certain convenience in handling fine filaments in this form, and also because of the immediate value of such results when they are considered from the point of view of the growing artificial silk industry. The corresponding values for individual filaments (monofils) are also being observed, but for the time being certain tests only are here recorded. The other results are reserved for another occasion.

The definitions used in this investigation are as follows :—

Tenacity.—The tenacity of a material being the stress which causes it to fracture, is measured by $W_{max} \div (0{\cdot}7854\ d_0^2 N)$ nominally in the case of a composite thread, where $W_{max.}$ is the load at fracture and d the mean original diameter of each of the total number *n* of cylindrical fibres. Denoting this by $f_{max.}$ the dimensions are grms. per sq. centimetre, or, more conveniently with yarns, grms. per denier.*

It is to be noticed that the *true* tenacity exceeds the nominal value in the ratio $(d_0/d)^2$. where *d* is the actual diameter at the region of fracture. This applies to single filaments in the special case where n=1.

Elongation and elasticity.—From independent observations of the behaviour of monofils under a condition of strain it is known that Fig. M is characteristic of load-extension diagrams for cellulose threads. From a knowledge of the form of composite yarns or threads it would seem that the final elongation per cent. reckoned at fracture on the original length, *l*, is $e_{max.}$, and is dependent upon several distinct factors, apart from the nature of the material and the length tested, viz...(1) The false elongation (e_f) due to the mere drawing together or "packing" of the individual threads or filaments as the load is increased. This is naturally due to the axis of each filament moving towards a common axis of loading, as its sectional area decreases, and to a decrease of the mean diameter of the spirals formed by the filaments individually. (2). The true elastic elongation (*e*) measured between o and the elastic limit (see Fig. M); within the limit of loading (W_e) the filaments will recover their original shape practically at once, but outside that limit permanent set will be observed. It should be noticed that the length of the individual filaments, owing to the spiral disposition of the latter, will exceed the length (*l*) of the composite thread tested. (3). The plastic elongation (e_p), which with ductile substances such as metals, forms the bulk of the total elongation (e_t).

Total elongation.—For any composite thread whatever, the total elongation, $e_{max} = e_f + e + e_p$. For monofils (e) will be eliminated, assuming that the filament is initially straight, or, when measuring elongation as the increase in length from some value produced by a small initial load.

The modulus of elasticity (E) is calculated for the average material composing each thread, tested as the ratio of stress increase to the corresponding strain increase within the elastic stage. If, for instance, an increase in load Δw grms. produces an elongation Δe_{cm} in a length of filament $l_{cm.}$ the area of the filament in cross-section being *a* sq. cm., then the stress increase is equal to $\frac{\Delta W}{a}$ grms. per sq. cm., and the strain increase, $\Delta e/l$, is a mere ratio, viz., an extension per cm. length tested.

$$\text{Thus : } E = \frac{\Delta W}{a} \div \frac{\Delta e}{l} \text{ grms. per sq. cm.}$$

Experimental results of tests on artificial silk composite threads.—The values of the total elongation at fracture ($e_{max.}$) and of the corresponding breaking load for threads of various diameters (which are proportional to the square root of the deniers) have been observed and compared over numerous tests during the progress of the artificial silk industry.

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*A denier 10,000 metres length of yarn weighing 1 grm., and so on.

On the previous occasion mentioned it was shown that the composite threads, made up of a constant number of filaments of cellulose or hydrocellulose, are relatively stronger when the cross-sectional area of the individual filaments is smaller; also that the percentage elongation before breaking, which is generally but erroneously referred to as the "elasticity" of the thread, decreases under the same conditions. This matter is now considered in detail on results based on a series of tests made on a wider basis and under various conditions of manufacture. In all cases mentioned the number of filaments comprising the thread has been kept constant, the actual size of the individual filaments varying with the different sizes of the threads.

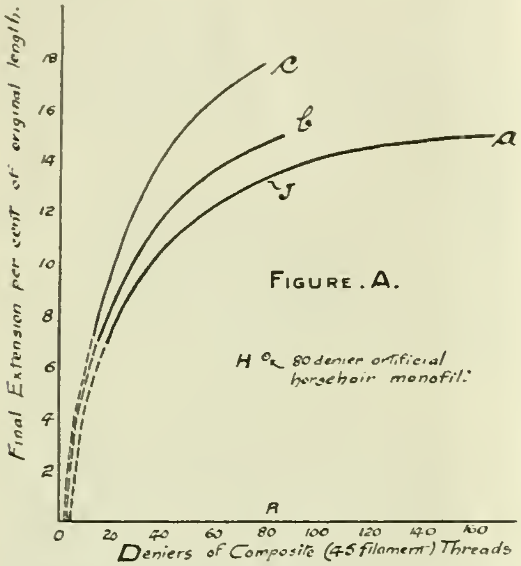


FIGURE. A.

The curves in figures A and B show the results obtained with threads consisting of 45 filaments and varying in size between 19 and 160 denier (that is to say, between the limits where a length of the composite thread of 10,000 metres weighs 19 grms. and 160 grms. respectively). This range in diameter allows for a size of individual filaments of 0·492 and 3·56 deniers respectively.

Seeing that a filament of natural silk has a diameter of between 10 μ and 15 μ respectively, and that the size of the filament of the same varies between 2·5 and 2·7 denier and that it has a sp. gr. of 1·36, and taking the sp. gr. of the artificial silk with which we happen to be dealing as 1·5, the denier of artificial silk would have a diameter of about 9·2 μ, which would make the smallest filament here dealt with have a size of about 6 μ or 0·006 diam. The average size of the artificial filaments tested is therefore considerably smaller (7—8 μ) than the natural product.

In a subsequent paper it is proposed to deal in greater detail with the properties of cellulose filaments (monofils) or wires of much larger diameter, but typical curves of the experimental results obtained with these single filaments up to a size of 300 denier (0·153 diam.) are here shown, sufficient to justify the statement made in relation to Fig. M as to the general form of the load extension curve.

The question of the ultimate strength of cellulose filaments and their behaviour under stress has a practical bearing when considering the behaviour of composite threads in the manufacture of textile materials. In the case of real silk the size of the thread is obtained by variation in the number of filaments, but in the case of the artificial ones it is possible to vary the diameter of the filaments and thus vary the physical nature of the threads themselves. For instance, in the case of composite threads of cellulose, the fact that the strength increases with the decrease in size of the individual filament makes it advantageous, other things being equal, to increase the number of filaments in any standard size of thread. This also increases the "covering power." As it may be expected that in the weaving of such threads the increase in length of the threads, due to the close packing of the filaments under extension and to their elongation individually, and the subsequent tendency to return to the original length, will be of importance in practice, the size of the individual filaments is worthy of the closest attention.

The "breaking down" of the thread and its elongation is hastened when the elastic limit is attained or exceeded. Then the rate of recovery, or return to its original length, is diminished, or even prevented, the elasticity being imperfect under these conditions. Figures showing this effect and also that of continued alterations in the condition of strain have been obtained experimentally, and the nature of the results is here indicated by typical curves. The remainder, it is hoped, will be subsequently published.

The effect of the "spring" in the thread, as exhibited under the term "packing," and the tendency to spring back under subsequent reduction of tension, must also be considered. These are important factors in the efficiency of a composite thread when used for textile purposes. In practice, a composite thread may break down filament by filament, and even if the point of ultimate fracture is not reached, the presence of loose filaments is sufficiently objectionable, especially if they are of large diameter and exceed those of natural silk.

The "spring" is connected with the important factor of "covering power," which may be expressed as the apparent thickness of the composite threads in relation to their weight when woven into a textile material. Many of the difficulties which the silk finisher meets with are connected with this factor, and his work is only complete when the maximum "covering power" has been achieved. It may be argued that the want of covering power in the artificial product which has characterised its use in the past may not have been altogether a defect in the early days of the industry, when the strength of the product was not all it should have been. This enabled a heavier thread to be used to get the same apparent thickness as a silk one and a corresponding increase in strength owing to this condition of affairs.

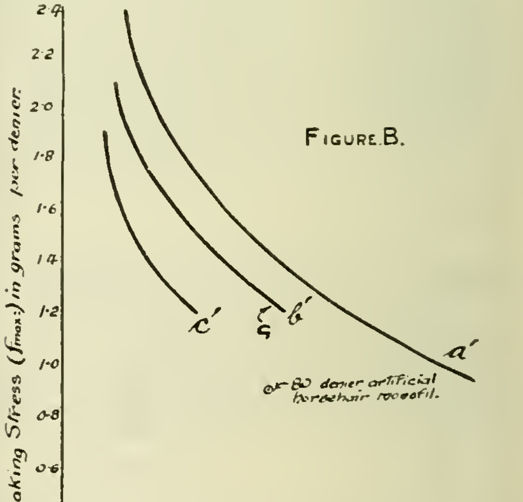


FIGURE. B.

When it is desired to obtain the maximum "covering power" with these artificial filaments, the actual size of the filaments is therefore of great importance. By the use of a greater number of filaments per unit weight of thread, the covering power of the artificial product may certainly be increased; coupled with this it has been shown that there is an accompanying increase in strength.

In Fig. A the curves a, b, c correspond with the curves a′, b′, c′ in Fig. B, each of these pairs of curves being plotted from corresponding values of e_{max} and f_{max} and each set of results relating to certain fixed conditions of manufacture of the threads concerned. From certain factors in the process of manufacture, which need not be discussed here, it is considered that for the purpose of this paper the general conditions of manufacture may be taken as fairly constant in these particular cases.

The tables of values for the three pairs of curves are given below :—

Table of values for tests on composite threads of artificial silk.

Curves.	Deniers (45 filaments).	Averages.		Final elongation per cent. on one metre.
		Ultimate strength, grams.	Breaking stress per denier, or tenacity.	
a and a′	25	58·5	2·345	8·67
	40	80·4	2·020	11·39
	50	84·3	1·686	10·31
	60	98·1	1·585	12·22
	70	118·7	1·695	12·79
	140	144·7	1·034	15·32
	160	151·9	1·950	14·14
b and b′	19·8	—	—	8·55
	21·0	36	1·886	9·20
	28	55	1·965	(omit)
	27·8	48·6	1·748	13·12
	29	49·8	1·710	10·56
	33·0	55·2	1·670	10·77
	34	56·3	1·666	11·47
	37	62·3	1·680	11·79
	60	79·2	1·320	13·20
	70	93·2	1·331	14·00
	80	101·8	1·273	14·50
c and c′	19·8	34·4	1·738	10·20
	21	34·5	1·645	10·00
	30	39·4	1·313	11·91
	30	41·1	1·370	11·94
	31	39·1	1·266	14·16
	32	44·5	1·390	12·41
	33	45·0	1·405	11·50
	32	44·1	1·378	13·32
	33	46·4	1·408	12·00
	33	46·1	1·397	11·89
	34	46·5	1·367	12·18
	34	46·0	1·304	12·39
	37	50·4	1·363	14·00
	41	55·7	1·358	13·71
	42	51·8	1·235	14·16
	44	60·1	1·365	14·96
	50	65·6	1·310	15·38
	55	68·8	1·200	15·80
(Special) Monofil	80 den.	71·9	* 0·90	* 6·40

Note.—Each value is the mean of a number of tests.

Deductions.—From the curves in Fig. A, it is apparent that :—

(1) The total elongation of the composite threads *decreases* as the size of the thread, and therefore of the individual filaments, as these remain constant in number.

(2) The rate at which it decreases is greater the smaller the size of filaments considered.

(3) Within the experimental range, the law connecting the total percentage elongation and the size of filaments (denier) is approximately parabolic and of the type $e_{max}=K+C(\text{den})^n$. where K, C, and n are constants determinable for each of the three conditions of manufacture taken above.

The laws in these three cases are as follows :—

(a) $e_{max}= -5·8+2·76\ (\text{denrs.})^{0·368}$
(b) $e_{max}= -6·0+2·77\ (\text{denrs.})^{0·41}$
(c) $e_{max}= -7·5+2·90\ (\text{denrs.})^{0·50}$
The "deniers" being that of the composite thread.

From the curves in Fig. B it is clear :—

(1′) that the tenacity of the thread *increases* as the size of the individual filaments composing it decreases.

(2′) That the rate at which it increases is *greater* the smaller the sizes of filament considered.

(3′) That there is an approximate hyperbolic law connecting the tenacity f_{max} and the size of the filaments which is regular within the experimental limits taken and is of the type :—

$$f_{max}(\text{denrs.})^m = \text{a constant} = Q$$

where m and Q have values varying with the conditions of manufacture and are determinable from the curves. The three laws are as follows :—

(a′) $f_{max}=9·33\ \text{denrs.}^{-0·125}$
(b′) $f_{max}=6·70\ \text{denrs.}^{-0·380}$
(c′) $f_{max}=4·97\ \text{denrs.}^{-0·358}$
The "deniers" being that of the composite thread.

It will now be shown that the above results indicate that certain deductions may be made from them, and these are indicated as follows :—

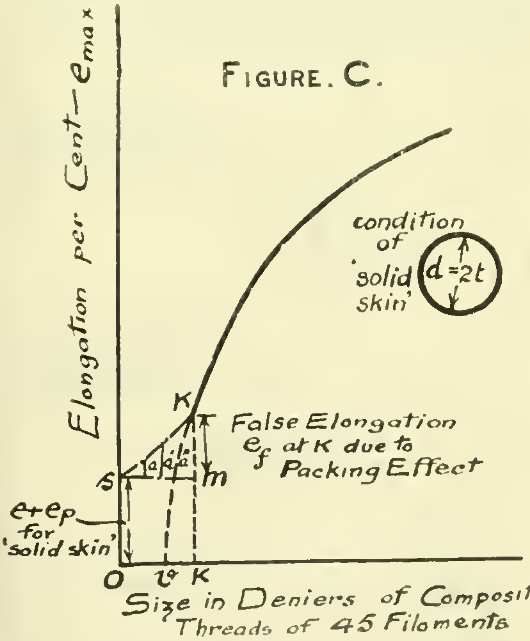
(1a) Either that there is present on the surface of these filaments a "skin" of constant thickness (t) which is unvarying for all deniers provided that the conditions of manufacture remain constant. In this case, we are not in a position to determine the value of (t) from the data now published, but an intimate knowledge of the conditions of manufacture seems to justify the assumption of constancy in this respect.

Or (1b) that in the absence of a skin of constant thickness the well-known condition of surface tension produces an effect equivalent to this.

Considering (1a) first, the skin will be considered as relatively harder and more tenacious than the interior portions, as in the case of drawn metallic filaments, even after annealing; and this adds weight to the probability of the skin being harder and tougher as suggested. On these lines it is clear that the greater the proportion of skin—that is to say the smaller the size of the filament—the greater will be the strength and the less the elongation, so that the conclusions (1) and (1′) are explained.

The following is a mathematical demonstration that the effect mentioned in (2′) and (2) above would be fully expected as a direct result of the above conditions (1a) holding for any artificial filament.

The further investigation of the possible condition of surface tension alone. see (1b) above, will be deferred.



Mathematical demonstration of the effect of a skin of constant thickness.—The overall diameter of the filament considered being *d*, and the ratio, area of skin : area of core, being R, the filament is strongest when R becomes a maximum, that is when $\frac{dR}{d\mathit{d}}=\frac{d}{d\mathit{d}}\left\{\frac{4(t\mathit{d}-t^2)}{\mathit{d}^2-4\mathit{d}t+4t^2}\right\}=0$; t being the skin thickness. This occurs when the condition of a "solid skin" filament is fulfilled that is, when $t=d/_2$, and R becomes infinite in consequence. This merely demonstrates that under the assumption of a constant thickness of the more tenacious "skin" the tenacity of filaments with small values of d is relatively greater, and the elongation less than for larger fibres.

The curves of Figs. A and B will evidently be steepest when R is changing most rapidly with respect to d. By differentiating the above expression for dR/dd, the general value of d^2R/dd^2 is obtained. Equate to zero, solve for t, and the value $t=d/_2$ is shewn to be the condition for maximum steepness of the said curves.

This demonstrates that for any fixed value of t, *the smaller the size of the filaments, the more rapidly is the proportion of skin increasing, and the more quickly is the ultimate elongation decreasing.*

This fully bears out all the conclusions drawn from the experimental curves.

The possibility and effect of filaments of solid skin.—If the experimental curves of Figs. A and B, be continued, the condition $d=2t$ would be attained at some point K (see Fig. C.).

If e_s represent the total elongation of a single fibre composed entirely of the skin material (some unchanging form of hydrocellulose probably) the elongation of all threads composed of filaments smaller than those at K will be constant so far as e and e_p are concerned, only decreasing slowly as the denier grows less by virtue of packing effect alone. The law of the curve therefore would be expected to change at K owing to some path Ks other than Kv being followed. It is to be noticed that for a thread composed of a constant number of filaments of diameter d the false elongation e_f will be relatively greater for large filaments than for small ones. It would also be expected that the plastic elongation e_p would increase more rapidly the more quickly the proportion of skin falls off.

Also in Fig. M it appears that the line representing the elastic stage becomes steeper the higher the value of the elastic constant E and the net result will be a value of e, decreasing as the thread becomes smaller.

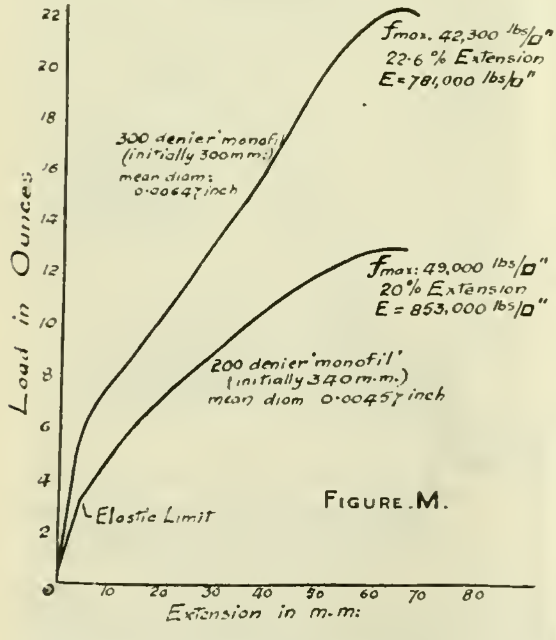


FIGURE. M.

Value of "e," etc.—The results of an 80 denier (monofil) thread of the same manufacture as the composite threads here tested are shown at H in Figs. A and B.

Tenacity.—The decrease in tenacity as represented by an ordinate HG in Fig. B shows very well the important part played by the skin (or by surface tension, as the case may be). Taking 1·25 grms. per denier as the mean tenacity of the tests recorded here, the skin or its equivalent (surface tension) is responsible for an increase in the tenacity of at least 38 per cent. in an 80 denier composite thread.

Elongation.—Curve A shows that with an 80 denier composite thread the elongation per cent. is more than twice, viz., RJ : RH that with an 80 denier thread (monofil). The monofil being on the whole softer material, a greater elastic elongation than that of the composite thread would naturally be expected. The value represented by HJ thus represents the *minimum* elongation due to packing in this size (80 deniers) of 45 filaments, namely 7·0 per cent. at the least.

Comparison between the properties of cellulose and metallic filaments.—The relative surface attraction effects produced or exhibited by cellulose and metallic filaments respectively are worth consideration. When the variations in physical properties of metallic filaments are regarded as connected with certain well recognised conditions of the metal at the surface, the variations in the former may have their corresponding values in the case of cellulose, although the effects observed may not be produced by identical means.

A maximum surface energy or skin effect as measured by the increased strength of the wire is only observed when the structure at the surface is a homogeneous one and therefore in the non-crystalline state, that is to say when the surface metal has been temporarily destroyed by an actual flow of the metal itself. This state may be regarded as equivalent to that of the cellulose in these filaments, as they never enter the crystalline state. The results obtained may therefore be compared. In the case of the metal wires subsequent annealing which brings back the crystalline state also reduces the tenacity of the wire. A system which is not broken up by crystalline form, and consequent localisation of the force of cohesion, may therefore be expected to exhibit this surface effect in an uninterrupted manner.

Tests on monofils.—Stress-strain relation: The following diagrams (Fig. M) are typical of the load-extension curves obtained experimentally for a considerable number of samples, the test being carried out with gradually increasing load up to fracture, and the corresponding loads and extensions noted.

The values are for artificial horsehair filaments of 200 and 300 denier, and the mean diameters of the specimens are 0·00457 inch and 0·00647 inch respectively, the corresponding cross-sections being $1{\cdot}65 \times 10^{-5}$ and $3{\cdot}29 \times 10^{-5}$ square inches.

The nominal stress at fracture is for the 200 denier thread $\frac{13}{16} \times \frac{10^5}{1{\cdot}65} = 49{,}000$ lb. per sq. in., and for the 300 denier is 42,300 lb. per sq. in. The percentage extension for the 200 denier is 20 per cent., and for the 300 denier is 22·6 per cent.

Values of Young's modulus.—The direct elasticity constant as determined from the curves is: for the 200 denier filament, E=853,000 lb. per sq. in., and for the 300 denier, E=781.000 lb. per sq. in., so that for such filaments the value of the modulus is, roughly, one-fortieth that for wrought iron or mild steel.

If the single filaments of the composite threads of Figs. A and B were tested independently, a considerably increased value of E would be obtained.

The "*steps*" occurring at intervals during the experiments appear to be due to *flow* of the material at a varying rate, possibly locally, but are characteristic of all the tests in spite of the elimination of slip in the apparatus and the equality of the intervals.

The table of values for Fig. M is as follows:—

Tests on 200 *denier monofil* (*horsehair*).
Mean diameter 0·00457 *inch ; initial length* 34 *cm.*

Load. oz.	Scale reading. m.m.	Load. oz.	Scale reading. m.m.	Load. oz	Scale reading. m.m.
·5	0	7	19·0	12·25	53·2
·75	·2	7·25	21	12·5	54
1	·5	7·5	22·8	12·5	54·8
1·25	1	7·75	24	12·5	55·1
1·5	1·3	8	25	12·75	57
1·75	1·8	8·25	26	12·5	57·5
2	2	8·5	27·5	12·4	58
2·25	2·3	8·75	29	12·5	59
2·5	2·9	9	30	12·75	59·8
2·75	3·3	9·25	31	13	60·2
3	3·8	9·5	32	13·25	61
3·25	4	9·75	33	13·5	62
3·5	5	10	34·3	13·25	64
3·75	5·8	10	36	12·75	65
4	6·5	10	36·8	12·5	65·5
4·25	7·2	10·25	38·0	12·75	67
4·5	8·1	10·5	39	13	68
4·75	9	10·75	41	Fracture.	
5	10	11	42		
5·25	11	11·25	43·8		
5·5	12	11	45		
5·75	13·2	11·25	46·2		
6	14	11·5	47·2		
6·25	15·2	12	50		
6·5	16·5	11·75	51		
6·75	16·9	12	52		

Tests on 300 *denier monofil* (*horsehair*).
Mean diameter 0·00647 *inch ; initial length* 30 *cm.*

Load. oz.	Scale reading. m.m.	Load. oz.	Scale reading. m.m.	Load. oz.	Scale reading. m.m.	Load. oz.	Scale reading m.m.
·5	0	7·25	8·4	13·75	32	19·75	50
·75	·2	7·5	9	14	32·8	20	51
1	·4	7·75	10	14·25	33·6	20·25	51·5
1·25	·6	8	11	14·5	34·6	20·5	52·4
1·5	·8	8·25	11·9	14·75	35·6	20·75	52·8
1·75	·9	8·5	13	15	36	21	53·8
2	1	8·75	13·9	15·25	36·9	21·25	54
2·25	1·2	9	14·9	15·5	37·2	21·5	55
2·5	1·4	9·25	15·8	15	39	21·75	55·6
2·75	1·6	9·5	16·9	15·5	40	22	57
3	1·9	9·75	17·8	15·75	40·6	22·25	59
3·25	2	10	18·7	16	41	22	60
3·5	2·1	19·25	19·6	16·25	41·5	21·75	60·5
3·75	2·3	10·5	20·4	16·5	42	21·75	61
4	2·6	10·75	21·2	16·75	42·8	21·5	61·5
4·25	2·8	11	22	17	43·1	21·75	62
4·5	3	11·25	23	17·25	43·8	22	62·5
4·75	3·3	11·5	24	17·5	44·2	22·25	63
5	3·6	11·75	25	17·75	44·8	22·5	64
5·25	4	12	26	18	45	22·75	66
5·75	4·1	12·25	26·9	18·25	46	22·25	68
6	4·8	12·5	28	18·5	46·5	Fracture.	
6·25	5·2	12·75	29	18·75	47		
6·5	5·8	13	29·8	19	47·4		
6·75	6·8	13·25	30·6	19·25	48		
7	7·2	13·5	31·1	19·5	49·2		

Manchester Section.

Meeting held at the Grand Hotel, on Friday, January 12th, 1912.

DR. GILBERT J. FOWLER IN THE CHAIR.

PRELIMINARY NOTES ON THE EXAMINATION OF VARIOUS STICK LACS AND SHELLACS.

BY J. H. HOSEASON AND O. KLUG.

Having at our disposal some samples of stick-lac representing various crops in different years, and obtained in the way of business, we have submitted them to a preliminary examination. We thought, too, that it would be a matter of considerable interest to know whether, as seems to be usually assumed, the resin contents of stick-lacs were really of uniform character. Numerous analyses showing total resin and the other extractives, wax, colour, etc., have been published by various observers from time to time. Up to a recent date the analytical factors published for lac resin[*] appear to be derived from, more or less authenticated, pure samples of the manufactured resin, *e.g.*, shellac or button lac, and not from resin obtained at first hand from raw material. The constituents of stick-lac, as is well known, are wax, resin, water soluble and insoluble colour, insect debris, woody matter, and moisture.

1. *The wax* constitutes, in the samples examined, from 3·6 to 5·52 per cent. It is readily removed from the dry powdered material by petroleum spirit of very low boiling point. Petroleum spirit extracts along with the wax an amount of brown coloured substance (or substances) varying from 1 to 1½ per cent. This is sparingly soluble in strong alcohol with a yellow colour, and gives a Hübl No. of 32. It is soluble in ether and gives a faint purple violet colour with alcoholic potash. Light-boiling petroleum, even when carefully fractionated over some non-volatile fat, is retained most obstinately by the wax. For quantitative work we have therefore discarded its use. We might here mention a precisely similar result by Hirschsohn.[†]

The composition of the wax has been most carefully and exhaustively studied by Gascard [‡] and reported at length in his monograph on this subject, together with Madagascar lac. He found the wax to be a mixture of 50 per cent. free myricyl alcohol, a much smaller amount of free ceryl alcohol, the balance consisting of esters of these alcohols with melissic, cerotic, oleic, and palmitic acids and a nitrogenous resin acid. Singh's wax, m. p. 58—59° C., is abnormal, and no doubt still contained considerable petroleum.

2. *Resin.* John's analysis appears to be the first in which the ether soluble resin is identified: his figures—ether soluble, 16·75; ether insol., 66·65—are somewhat akin to our own for Assam stick-lac. Unverdorben,[§] at a later date, 1828, examined stick-lac in very great detail. His work, a masterpiece of precision in observation and inductive reasoning, is thoroughly worthy of perusal by every student of chemistry. His results are defined by variations of solubility in various media; they constitute our present knowledge of the lac resins, advanced, as we shall show, only in certain directions.

In judging his analysis, one has to keep in mind the limited common knowledge of the higher fatty acids in his day.

Unverdorben's summary.

1. Wax.
2. Oleic and stearic acids in small quantities.
3. Resins soluble in alcohol and in ether. (*f*) crystalline. (*g*) non-crystalline.
4. One in alcohol but not in ether (to a great extent) B.
5. One slightly soluble in cold alcohol (a resin analogous body (γ)).
6. A brown extract, in small quantity. Seed and shell-lac contain besides these, John's lac-stuff and a colour extract.

Much later workers in this field are Tschirch and Farner,[||] who examined more especially the resin constituents of stick-lac. The raw material (stick-lac) was extracted with petroleum to remove the wax, and thoroughly exhausted by warm water to remove soluble colouring and water soluble albuminoid matter. An alcoholic extract of the resin was precipitated by ether whereby 65 per cent. of the total resinous matter was separated. The ether insoluble resin was saponified, precipitated by acid, and the residue saponified daily in like manner for three weeks. The final products were a pasty mass not identified or classified, and an acid named by the discoverers aleuritinic acid, which on oxidation gave azelaic and butyric acids.

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[*] Puran Singh, this J., 1910, **29**, 1435.

[†] Hirschsohn, Arch. Pharm., **213**, 290.

[‡] Gascard, L'Etude des Gommes Laques (Paris) 1893.

[§] O. Unverdorben. Poggendorf's Annalen, 1828, 14, 16.

[||] A. Tschirch, Die Harze und die Harzbehälter, Leipzig, 1900.

Other workers have also obtained evidence of both azelaic and butyric acids by oxidation.

The ether soluble resins (35 per cent.) were found to contain higher fatty acids (unidentified), a wax-like substance, to which the odour of lac resin is due, and a colouring matter, which they were able to crystallise, naming it erythrolaccin. This latter substance, when analysed and examined spectroscopically, appeared to be a tetroxymethyanthraquinone. These workers consider erythrolaccin to be the characteristic yellow colouring matter of fine shellac. It will be seen from our own figures that the proportions of ether soluble and insoluble bodies vary very considerably, the latter, however, always preponderating. Unverdorben considered that ether formed an insoluble compound with one of the lac resins. Tschirch has pointed out that on prolonged ether treatment, the resin insoluble in ether becomes insoluble in its usual solvents. This fact we discovered (before we were aware of Tschirch's work), in attempting to obtain a perfectly pure resin insoluble in ether. Until the ether-insoluble resin, if an entity, can be obtained in crystalline form, it seems idle to speculate whether the formation of a precipitate by ether from alcohol-solutions of lac resins, is simply a matter of solubility and subsequent dehydration, or the formation of a definite resin compound with ether. We have found this insolubility many times, and also noted that certain lac resins, *e.g.*, Nagaoli, are more prone than others to behave in this manner.

We find that the resin changed by ether is insoluble in potash, either aqueous or alcoholic, but can be dissolved in glacial acetic acid by continued boiling. The characteristic property of lac resin of becoming insoluble on exsiccation, is due to the ether-insoluble resin. No doubt, too, the value of lac resin as a varnish constituent depends on this fact.

Table of Lac Analyses.

Variety of lac.	Year.	Wax.		Water extract.	Ether sol.		Ether insol.		Residue.		Loss and moisture.
		per cent.	m.pt. °C.		per cent.	Hübl.	per cent.	Hübl.		Ash.	
Stick B	1907	5·52	83	5·33	23·5	8·9	35·25	4·63	23·63	4·32	6·77
,, B	1909	5·24	80·5	5·06	26·0	7·7	37·5	7·0	23·0	6·64	3·20
,, B	1910	5·24	80	2·46	28·1	7·4	49·5	2·6	10·85	7·3	3·85
,, N	1907	3·79	80	3·88	26·75	5·3	42·25	4·4	18·1	2·33	5·23
,, N	1909	3·75	80·5	4·0	27·75	9·54	41·5	3·8	19·46	6·07	3·54
,, N	1910	3·95	80	4·03	28·82	6·8	43·36	6·3	19·33	6·34	·51
,, K	1909	4·6	80	6·95	24	5·8	41·25	4·0	21·2	5·13	2·0
,, K	1910	5·01	80	4·42	23·5	8·1	37·0	7·4	22	7·3	8·07
,, J	1909	3·6	79·5	3·69	27·75	4·5	49·75	3·6	13·5	7·8	1·71
,, A	1910	5·2	82·5	4·45	17·01	13·9	61·0	5·3	6·7	·55	5·64
,, S	1910	4·59	82	4·45	26·25	10·06	55·0	6·1	7·88	·81	1·8
,, R	1910	5·11	82	6·47	26·25	10	52·25	6·1	8·6	1·1	1·92
Button:—											
dark 1	—	4·75	80	—	21·88	23·5	69·83	2·8	·1	—	3·44
Pale 2	—	1·16	77	—	30·0	—	65·38	—	·05	—	3·46
Pale 3	—	2·4	—	—	43·75	20·2	50·25	2·2	·750	—	3·6
medium 4	—	5·4	—	—	26·23	—	65·75	—	·05	—	2·62
Pale 5	—	6·7	—	—	48·75	8·2	40·0	3·2	1·350	—	4·55
Garnet	—	2·11	77	—	39·63	—	58·1	—	nil	—	·16
Shellacs :—											
Brown R	—	3·56	82	—	22·0	21·6	72·75	3·4	1·100	—	1·69
Dark brown B	—	5·55	—	—	30·25	10·1	61·4	2·8	1·550	—	2·80
Brown K	—	4·7	80·5	—	22·5	—	70·0	—	·700	—	2·8
Fine orange N	—	3·78	—	—	20·25	12·8	72·25	2·1	·900	—	3·72

With regard to the stick-lacs there are, under cultivation, four crops annually named according to the season of the year in which they occur.

B. Baisakhi	April—July	Indian stick lacs
J. Jetwa	August—October	
K. Katkhi	September—November	
N. Nagoli	November—March	

Besides these, stick-lac from Assam (A), Siam (S), and Rangoon (R) were examined, and of these we have no further information beyond the fact of origin.

Baisakhi is by far the largest and most important crop. These stick-lacs are considered in quality: 1st Nagoli, 2nd Jetwa, 3rd Baisakhi, 4th Katkhi. The shellacs examined have the source of the lac stated in the table. Arsenic sulphide was obtainable in every sample of button and shellac, preponderating in the latter. None was present in the garnet button examined.

We have obtained the following results. To get an average sample 5 kilos of the stick-lac were ground and sifted through a 40 to an inch mesh sieve and finally thoroughly mixed, 5 grams were taken for analysis—macerated in warm distilled water for 24 hours, thrown on a Büchner funnel, and washed two or three times. On evaporating, the coloured water extract is obtained. The residue is dried at warm air temperature. The air-dry powder is placed on a tared filter paper in a funnel fitted with a stop-cock and covered with 90 per cent. cold methylated alcohol. This maceration extends overnight. The alcoholic solution is then drawn off into a flask. This operation is repeated as often as necessary to extract fairly completely the resin contents of the stick-lac. The funnel should have ground edges and ground glass cover to obviate loss of alcohol, and also to prevent creeping of the resin to the edge of the filter paper, where, should it dry, it is troublesome to remove.

The alcoholic solution is concentrated to a syrupy liquid (about 20 c.c.) and dropped on fat-free, pure cotton wool, the flask rinsed with the smallest quantities of alcohol and these washings added to the wool. The impregnated wool is dried to remove the methylated alcohol and is extracted by cold ether (washed, dried, and distilled over sodium), either by maceration or in a continuous extraction apparatus. The ether extraction should be performed as quickly as possible since the ether-insoluble resin has a considerable tendency to become changed, as has already been pointed out. The wool is finally extracted by pure ethyl alcohol. The ether extract is distilled to a thick syrup, diluted with strong ethyl alcohol and again distilled to a syrup to remove all the ether; finally made up to convenient bulk, say 50 c.c., with alcohol, 5 c.c. being evaporated for resin content and two 20 c.c. for two Hübl tests. The alcohol extract is made up, or evaporated to 100 c.c. 5 c.c. taken for resin content two 20 c.c. for two Hübl's tests.

In determining the resin content, we have employed thin vertical-walled glass evaporating dishes, owing to the creeping propensities of the resin solutions. It is also essential to have a very thin film of resin substance to ensure thorough drying. We find that with a 50 mm. diameter dish 0·1 grm. of lac resin can be dried to constant weight in reasonable time. Lac resins hold traces of both water and alcohol very tenaciously: the ether soluble portion in particular. All our resin figures are calculated on dry substance and are probably between 2 or 3 per cent. incorrect in comparison with commercial button lac or shellac. The residue after drying is soluble in alcohol or potash in the case of the ether soluble resin only.

The substance on the tared filter paper extracted by water and alcohol, is now preferably extracted by chloroform in a Soxhlet apparatus. Evaporation and desiccation of the chloroform extract gives the wax content. There is contained in the chloroform extract a proportion of the brown substance mentioned at the beginning of this paper, in the method of extracting the wax by petroleum. This corresponds with Unverdorben's resin No. 5 of his summary. This substance is contained in our figures for wax. It is also no doubt the *raison d'être* of Singh's Hübl No. for lac wax. The final residue is now dried and weighed. This consists of woody fibres, insect remains, and probably albuminoid colour compounds attached thereto.

The figures obtained by analyses of this type must be considered as approximations. There is a certain overlapping due to the slight solubility of one class of lac substance in the main solvent of another. For example, the ether or alcohol extracts always contain percentages of wax, etc.

The Hübl test was performed by taking 20 to 25 c.c. of the alcoholic resin solution and adding to 25 c.c. of Hübl solution which had been mixed 24 hours previously. The test was allowed to proceed for 18 hours away from light and at a temperature of 15 to 20° C. 25 c.c. of 10 per cent. solution of potassium iodide were added, and allowed to stand one hour. The contents of the flask are transferred to a graduated vessel containing 250 c.c. of water, the test flask being washed out with 5 c.c. of thiosulphate solution and 10 c.c. water, then rinsed with four consecutive 10 c.c. of water. Finally, the mixture is titrated with freshly standardised *N*/10 thiosulphate. Some experiments were made, using pure methyl alcohol instead of ethyl alcohol, in making the Hübl solution, and we found that the stability was noticeably increased. The Hübl test has a great disadvantage in the length of time required—a factor of more than ordinary importance when there is taken into consideration the deterioration well known to occur, and also under changes of temperature, light, dilution, etc. In the interests of analysts, buyers, and sellers, it seems of utmost importance that some standard method, complete in all details, should be determined upon, in a similar manner to that adopted by American chemists.

One noticeable feature is the lowering of the Hübl number of the ether-insoluble portion of the manufactured (fused) lac as compared with the resin of lac extracted by alcohol and dried at a much lower temperature. The rosin present may also have its influence.

The authors wish to thank Messrs. Jardine, Skinner and Co., of Calcutta, for their kindness and assistance in obtaining various samples.

Discussion.

Mr. H. L. Terry said that he had been told by an authority that it was customary in India to add a small quantity (1·5 to 3·0 per cent.) of rosin to first class brands of lac, the object being to prevent blocking by heat during ocean transit. Langmuir (this J., 1905, 12) and others in America had, however, stated that the addition of rosin would facilitate blocking. Perhaps Mr. Hoseason would give his opinion on the matter, and would also state whether an addition of rosin could be considered an adulteration.

Mr. Thomas A. Davidson asked if there was any distinct difference between button and orange lacs? Was one variety of stick-lac kept exclusively for buttons and another variety for orange? An analysis of the total deliveries of lacs during the past 25 years showed that approximately 70 per cent. of the total deliveries were orange lac. Was this due to its superior quality? The authors mentioned the dried alcohol extract of resins. In his (the speaker's) experience the figure of the residues were generally over 100 per cent., or in other words it was not possible to obtain an extract free from solvent. Resin, on drying, appeared to bind over on the surface, or to skin over, thus preventing the complete evaporation of solvent. If one attempted to carry the evaporation further the resin was liable to some decomposition. The figure mentioned of 2 to 3 per cent. would sufficiently cover the difference. Mr. Hoseason's figures mainly had reference to the raw material. Stick-lac constituted a very small proportion of the lac used in this country. How far did the process of "cooking" modify the properties of the lac? During the bleaching of stick-lac by sodium hypochlorite liquors there was an evolution of non-inflammable gas, and more particularly so at higher temperatures. At the same time a very characteristic smell was produced. In bleaching ordinary shellac, or button lac, that smell was not produced except in certain marks. Was shellac-wax supplied in any large quantity on the market? In his experience the blocking of shellac was more common with resinous shellacs than with pure shellacs.

Mr. William Thomson, referring to the statement made by Mr. Davidson, said that nitrogenous matter of the nature of albumen was decomposed by sodium hypochlorite with liberation of nitrogen. Probably that was the gas which was liberated from nitrogenous constituents during the bleaching of the shellac.

Mr. S. B. Jatar inquired whether there was any crystalline appearance after treatment with solvents.

Mr. R. H. Clayton asked what became of the material left in the bag after it had been squeezed by the natives, as a considerable percentage of shellac must remain. Was that residue thrown away, or had it some commercial value? Was it put through any further process? Owing to the high value of the lac any small proportion would be well worth extraction. Were lac dyes still of any commercial value?

Mr. Hoseason, in reply, said that shellac-wax was not put on the market in large quantities. The lac was sometimes, but not usually, taken before the lac insect escaped. It was purely a question of climate It was outside the scope of this paper, and a debatable point, whether Langmuir's, Wijs', or Hübl's test showed the more accurate result. Hübl's test was one of incomplete iodine absorption, and was dependent upon various circumstances, such as time, dilution, temperature, and even on the proportion of resin present in the solution. The principal value of the iodine absorption test was that resin had a very high absorbing number, whilst lac had a very low number, and in that way it was a commercially possible test. As a scientific test he was of opinion the Hübl test could not be accepted as the best or absolute test. There could be no doubt that resin was added by the natives in the course of manufacture; owing to the fact that heat was applied, presumably an unsuitable dry heat the operator sprinkled water on the heated bag with a consequent lowering of the melting point of the resins. He was of opinion that the more resin there was put into the lac the less chance there was of it blocking; what was of far greater importance was the percentage of water in the finished product. Taking the figure for Assam stick-lac the ether soluble resin which was a soft resin, had only the small proportion of 17 as against the very large proportion 61 of the hard matter present in that particular lac. With respect to other lacs the proportion of these constituents varied from 2 to 1, and in some approached equality. T.N's were allowed a certain percentage of resin added for the purposes of manufacture. The difficulty in connection with the native method of manufacturing either button lac or shellac was that solid substances were mixed together, and therefore intimate mixture could not be obtained. By the native method of twisting the fusing resins, in a bag, a larger proportion of lac might come out at one time, and a larger proportion of resin at another. That was the explanation of the fact that there was variation in the proportion of resin in the shellac, even in the same chest. It was not that the native desired to adulterate the lac, but it was impossible to prevent (presumable) adulteration by the method employed.

Lemon and orange lacs were generally made from Nagoli lac, which was considered the finest lac. Baisakhi lac and Katkhi lac, which were the principal lacs of India, were used for T.N. makes. A proportion of button lacs was made from lower grades of material, together with mixtures of residues from first class workings. There was thus a distinct difference in the raw material for button lac as compared with that of orange lac, though he had no precise information upon the point. He was aware that the higher qualities of stick-lac were invariably used for making the finest grades of shellac, they being fairly constant. Experiments with the raw lac and the "cooked" lac (fused) by Singh showed that the iodine number was raised. There was no means of identifying lac by its crystalline appearance. The only crystalline substance obtained was erythrolaccin. With regard to the residues remaining in the bag, after the manufacture of the lac, there was a certain amount of waste. 15 to 20 per cent. of lac resin was lost in the crushing of the material, sifting, and so forth, and a great loss occurred in the washing; since the native cake lac dye contained a considerable proportion of resin. Most of the soluble colouring matter went down the river. The residues in the bag were worked up into various articles of native ornament, such as bracelets. Some of the lower qualities were manufactured into sealing wax. In fact, no part of the lac itself was wasted by the native. Owing to the cheapness of aniline dyes the lac colouring matter was not now of commercial importance, though it was quite possible, by a scientific process, to work up the wax, resin, and dye in a fairly profitable manner.

New York Section.

Meeting held at Chemists' Club on Tuesday, January 19th, 1912.

MR. M. C. WHITAKER IN THE CHAIR.

PRESENTATION OF THE PERKIN MEDAL TO MR. HERMAN FRASCH.

After some introductory remarks by the Chairman,

Prof. C. F. **CHANDLER** said:—It is my very pleasant privilege, as the senior Past President of the Society of Chemical Industry residing in this country, to present to Mr. Herman Frasch, on behalf of the Perkin Medal Committee of the associated Chemical and Electro-Chemical Societies of America, the sixth impression of the Perkin gold medal, in recognition of his most valuable work in Applied Chemistry.

Herman Frasch was born in Gaildorf, in Wuertemberg, in 1852. In 1868 he took up the practice of pharmacy, came to America, and was placed in charge of the laboratory of Professor Maisch at the Philadelphia College of Pharmacy. He found, however, that industrial chemistry interested him much more than pharmaceutical chemistry, and in 1874 he established a laboratory of his own. Here began the studies and investigations which resulted in some of the most important achievements ever accomplished in industrial chemistry.

In 1876, at the age of twenty-four, he evolved a process for refining paraffin wax which was purchased by a Cleveland Petroleum Company, affiliated with the Standard Oil Company. These companies were so well pleased with his first invention that they induced him to give up his work in Philadelphia, move to Cleveland, and make the petroleum industry his specialty. He devoted himself assiduously to the refining of petroleum, and made many improvements in the processes in use; for some of which he sought and obtained patents. The first was applied for on December 15th, 1876, for an improvement in apparatus and processes for the separation and treatment of oils, by more completely separating the more volatile constituents from the less volatile, in order to increase the density, improve the fire test, sweeten the odour, and otherwise improve the quality. This was followed by further applications for additional improvements for the same purpose. Five such patents were applied for between 1876 and 1885, all of which were granted.

He also obtained a patent in 1884 for the manufacture of waxed paper, a material saturated with paraffin which has found a great variety of applications. In 1885, Mr. Frasch invented an improved petroleum oil lamp.

Our great inventor's attention was not, however, confined to petroleum. In 1882 he invented a process for manufacturing white lead directly from the galena ore. In the same year he devoted considerable attention to improving the processes and apparatus for manufacturing salt, a subject which continued to occupy his attention for several years. Five patents for his improvements in this industry were applied for in the years 1882 to 1899, and subsequently granted. He also studied the ammonia process for making sodium carbonate from salt, and between 1882 and 1886 applied for four patents for improvements, all of which were granted.

In 1883, Mr. Frasch devised a very ingenious process of making elements for thermal electric generators, which was granted the same year. In the same year he obtained two patents for the manufacture of a superior carbon for electric light carbons, and carbons for other purposes, from "wax tailings" or "still wax" by treating the same with nitric or sulphuric acid in a specially designed furnace.

Mr. Frasch's contracts with the various oil companies expired in 1885, and he then moved to London, Ontario, where he went into business for himself, forming the Empire Oil Company. It was here that he solved the Canadian oil problem, by devising a simple process by which the offensive oils of Canada and Ohio could be made so pure that they became as valuable as the Pennsylvania oil. There had never been any difficulty in treating Pennsylvania oil so as to obtain perfectly sweet gasoline, benzine, naphtha, burning oil, lubricating oil, and paraffin, for the simple reason that these oils were practically free from sulphur. But the Canadian and Ohio oils contained about one per cent. of sulphur, in such offensive combinations that it was impossible to obtain from them, by the customary processes of treatment, products that could be marketed. So they were only available for fuel purposes. Many chemists attacked the problem of deodorising those oils by decomposing the sulphur compounds; many processes were devised and patented, but not one of them was satisfactory until Mr. Frasch began to study the subject. On February 1st, 1887, he applied for his first patent for "Refining Canadian and similar petroleum oils," and by December 31st, 1894, had applied for twenty patents for his inventions in connection with this subject, all of which were granted. The essence of his invention consisted in distilling the different products of the fractional distillation of the crude oil, with metallic oxides, especially oxide of copper, by which the sulphur was completely removed, by entering into combination with the copper, while the oils distilled over as odourless and sweet as those from the best Pennsylvania oil. The process was comparatively inexpensive, as Frasch devised simple processes for separating the sulphide of copper from the residuum, and restoring it by roasting to its original condition, making it possible to use it over and over again on fresh lots of oil.

It was in the works of the Empire Oil Company that Mr. Frasch solved the problem of raising the terribly offensive sulphur-containing oils of Canada and Ohio from the low grade of fuel oils, to the highest grade of purest oil. He had the process in operation on a large scale when, in May, 1888, the Standard Oil Company purchased his patents after they had been thoroughly investigated and tested by their experts. The Company bought the works of the Empire Oil Company at London, Ontario, and proceeded at once to construct large works for carrying out Frasch's inventions at Lima, Cleveland, Whiting, Olean, Philadelphia, and Bayonne. Mr. Frasch received in payment, stock of the Standard Oil Company, selling at that time for 168 and paying 7 per cent. After his process had been thoroughly established in the United States for Ohio oil, he sold half his stock at 820, and the company had been paying for some time 40 per cent. instead of 7 per cent. When one considers that the capital of the Standard Oil Company was one hundred million dollars, the pecuniary return from the Frasch process in he increased value of the stock, and the magnitude of he greatly increased dividends, assumes gigantic proportions.

In addition to the advantages to the owners of the stock of the Standard Oil Company, there were a host of others who profited to an enormous extent. Frasch's process sent up the price of crude Ohio oil from 14 c. a barrel to $1.00 and above, thus benefiting the farmers and oil producers of Ohio, Indiana, and Illinois; and also by greatly increasing the demand for this kind of oil, until the production of this field went up to 90,000 barrels per day, giving an increase in return to the land and well-owners of untold millions of dollars.

Other inventions of Mr. Frasch in connection with petroleum refining are :—

1890.—A process for removing from the heavier burning fraction of the oil, the sulphuric acid taken up during the acid treatment by the cracked products. This he accomplished by distillation with lime.

1895.—Processes for increasing the flow of oil wells. The Pennsylvania oil wells occur in the Devonian sandstone, and in order to rejuvenate an exhausted well, it had long been customary to shatter and crack the surrounding rock by exploding one or several hundred quarts of nitroglycerin at the bottom.

In Ohio, Indiana and Illinois, the wells occur at a much deeper geological horizon, in the Silurian limestones. Frasch substituted sulphuric or hydrochloric acid for nitroglycerin in order to rejuvenate the exhausted wells, one proving best in some localities, the other in other localities, as one yields insoluble calcium sulphate, and the other soluble calcium chloride.

By plugging the wells after the acid has been poured down, the pressure of the carbon dioxide gas forces the acid through the most minute cracks, which were thus widened so as to open communication with new cavities of supply.

1900.—The application of live steam to remove completely the gasoline, naphtha, and benzine from the burning oil in the process of distillation, in order to raise the fire test.

1902—A process for treating the peculiar crude oil of Fresno County, California, so as to remove the valuable aromatic hydrocarbons which it contains: Benzol, toluol, xylol, mesitylene, and naphthalene.

1902.—A process by which it is made possible to secure a satisfactory burning oil from the peculiar crude oil of Beaumont, Jefferson County, Texas; this consists in washing out of the burning oil fraction its peculiar smoke-producing hydrocarbons, by means of wood alcohol.

1899.—Improved processes to bring to the surface by solution, the rock salt reached by boring.

1894.—Process for purifying solvent-extracted oils, having special reference to linseed oil, consisting in removing the solvent naphtha from the oil by low tension steam in a partial vacuum.

1895.—Improvements in mining gold or like metal, which consist in saturating strata containing the diffused metal with an aqueous solution of a suitable solvent, the final solution being subsequently drawn from wells or borings through the strata.

On October 23rd, 1890, Mr. Frasch applied for a patent for an epoch-marking improvement in the sulphur industry. It had long been known that there was a large deposit of native sulphur in Calcasieu Parish, Louisiana, at a depth of one thousand feet below the surface. But all attempts to get at the deposit and bring the sulphur to the surface had failed completely, on account of the layers of quicksand above the deposit. Mr. Frasch evolved the idea of melting the sulphur in place, by means of superheated water forced down a boring, and forcing the melted sulphur to the surface, through an inner tube. During the period beginning October 23rd, 1890 to February 6th, 1905, Frasch applied for ten patents for his inventions of apparatus and processes for accomplishing this result.

His efforts have been entirely successful. The Union Sulphur Company was organised, he secured control of the sulphur deposit, set up the batteries of boilers, bored the wells, built the railroad to carry the sulphur to the seaboard, and the docks at Sabine Pass for the ships which deliver the sulphur to the ports accessible from the various chemical works where the sulphur is used.

There are seven batteries of boilers, each of which runs a well. A single well delivers about 450 tons of sulphur per day. In a two months' test, six wells delivered 122,000 tons of sulphur, proving the capacity of the works to exceed the entire consumption of the world. The sulphur is pumped into bins about fifty feet high, constructed of planks, where it congeals and forms a block of from 75,000 to 150,000 tons, over 99 per cent. pure sulphur. The planks are subsequently removed, the huge block is broken up by blasting, and the sulphur is loaded directly into the cars by a scooping derrick which picks up two tons at a time.

The effect of this work on the imports of sulphur into the United States is very far-reaching, as will be seen in the following figures, showing imports and exports of sulphur into and from the United States :—

	Imports.	Exports.
1903	188,888 tons	None.
1907	20,399 ,,	35,000 tons.

At present the Louisiana deposit supplies this country with sulphur, and might supply large quantities to European countries. Fortunately the company is owned by a few broad-minded and large-hearted men, who could not be induced to bring starvation and ruin upon the 250,000 people dependent upon the mining of sulphur in Sicily.

I have presented to you very briefly the great achievements of Mr. Frasch in the field of applied chemistry; but quite fully enough to satisfy you that your committee is fully justified in placing Mr. Frasch by the side of Sir William Perkin, as one of our greatest industrial chemists and chemical engineers.

It gives me great pleasure, as the representative of the Society of Chemical Industry, and the affiliated Chemical and Electro-Chemical Societies, to place in your hands, Mr. Frasch, this beautiful token of the appreciation and affection of your fellow chemists.

Mr. HERMAN FRASCH said: When I received the notification that I had been awarded the Perkin medal, I was most happily surprised. I recognise and appreciate fully the honour and distinction which the medal conveys, and I wish to express my sincere thanks and appreciation to the members of the Awarding Committee and to the Societies which they represent.

Oil.—Very little is known of the impurities contained in petroleum. They influence the price, however, to a remarkable degree. The best illustration of this is the case of Ohio oil. This contains about 0·75 per cent. of sulphur, and before my desulphurizing process was known sold at 14c. per barrel, while Pennsylvania oil, with a sulphur content of only 0·03 per cent., sold at $2.25 at the same time. Sulphur affects the value of petroleum in a greater degree than phosphorus does that of iron ore.

Canada.—One of the oils which contains an objectionable amount of sulphur is that found near Petrolia, Ontario. It is the only crude that has been found in the Dominion of Canada. When this oil was first discovered in 1868, it was refined in the usual way—treated with sulphuric acid and soda, and then put on the market. The result was disastrous. The odour emanating from the oil was very offensive and penetrating, so much so that the cargoes of ships carrying flour and bacon, anchored near a vessel loaded with Canadian oil, were spoiled, as the flour and bacon absorbed this odour. Lawsuits based upon these facts were decided against the shippers of Canadian oil, and all export ceased. In order to protect the home industry, the Canadian Government imposed a duty of 9c. per gallon on Pennsylvania oil, but in spite of this almost prohibitive duty, half the oil consumed in Canada was imported from Pennsylvania. The offensive odour of this oil, moreover, was not its only objection. It had also the property of depositing soot upon the lamp chimney, so that a large percentage of the light emitted by the flame was lost. The Canadian

Government, as well as the Canadian producers and refiners, made every effort to discover a method by which the objectionable properties of this crude oil could be eliminated, but practically nothing had been accomplished in twenty years, except perhaps in the matter of covering up the odour, when in 1885 I bought a refinery in Canada and made a thorough investigation of the character of this crude and decided to discover a remedy, if possible. This dreadful odour, which the Canadians called "skunk," arose from a peculiar hydro-organic sulphur compound, and the clouding of the lamp chimney was due to its sulphur contents. The sulphur in the oil burned into sulphuric acid, which condensed against the lamp chimney, and any unconsumed carbon or organic particles in the air would adhere thereto and form this objectionable soot. To remove the sulphur from the oil completely meant the elimination of the smoke as well as odour, and when this was effected the oil furnished an illuminant equal in quality to the best Pennsylvania.

To free petroleum of elementary sulphur or hydrogen sulphide presents comparatively little difficulty, but the sulphur compound which is the cause of this offensive odour is very stable and cannot be broken up into hydrogen sulphide or any other sulphur compound which can be eliminated. It was because of the presence of this peculiar compound that Canadian oil for so many years resisted all the efforts made to refine it. This sulphur compound has the peculiarity of dissolving a number of metallic oxides. When the oil is saturated with all the oxide it can carry in solution, the disagreeable odour disappears. It reappears, however, if an attempt is made to free the solution of its metal. I found that this solution of metal in petroleum has an intense affinity for sulphur, and also that when a portion of the sulphur has been precipitated with the metal as a sulphide, additional quantities of metal oxide can go into solution. If more oxide than that necessary to precipitate all the sulphur is added to the petroleum while it is being distilled, a complete desulphurization of the petroleum is effected. When this petroleum solution is made with water-white petroleum distillate, which has been freed of elementary sulphur and hydrogen sulphide, the solutions assume colours characteristic of each metal. The lead solution is a canary yellow, mercury orange, copper blood red, silver brown. I selected copper as the metal most suitable—first because it dissolves in the petroleum, and in the second place because of the readiness with which the sulphide of copper can be reconverted into oxide. When the laboratory work had been completed, I applied for letters patent and erected a 1200 barrel still, carrying on the process on a large scale. The shell of the still was 22 feet in diameter and 16 feet high, and was supplied with a stirring device which kept the copper in suspension while distillation was carried on. After 80 per cent. of the contents of the apparatus was distilled, the remainder, when cool, was pumped through a filter press. The solid portion was ignited and roasted, while the liquid residium was mixed with a new charge of revivified oxide of copper to be used for the desulphurizing of a further quantity of sulphur-containing distillate. I used a shelf furnace, operated by hand, to roast the resulting sulphide of copper. In this manner I produced a burning oil containing 0·02 per cent. sulphur, which is the percentage contained in Pennsylvania oil of similar specific gravity, while Canadian oil, refined by the ordinary method, has a sulphur content of 0·6 per cent.

Ohio oil.—It was about this time that oil almost identical with the Canadian was discovered in Ohio, and while the question of refining Canadian oil was interesting, the problem became intensely important when 30,000 barrels per day were being produced in Ohio. The new field proved to be very extensive, and the Standard Oil Company bought property near Lima, Ohio, upon which they erected a large refinery. They disregarded the enormous difference in the sulphur contents of Pennsylvania and Ohio oils, decided to refine the latter in the usual way and put it on the market. When the refined product had been distributed among their customers, it all came back as unfit for use. Every effort was made to solve the difficult problem, but in 1887, after two years of experimentation and with all the skill which the Standard Oil Company could call to their assistance, it was decided that no illuminating oil could be made from Ohio crude and that it was fit only for fuel. A pipe line for this purpose was built to Chicago, and long term contracts made at 14 cents per barrel.

My patents had now been granted and I was selling refined Canadian oil with a guarantee that it would burn equal to the best Pennsylvania. After an investigation which convinced them that I had solved this problem, the Standard Oil Company bought my patents and my refinery, and as soon as possible Lima, Cleveland, Whiting, Philadelphia, and Bayonne were refining oil by the new method.

The Ohio field was found to extend into Indiana and the production increased to 90,000 barrels per day. The price of this crude went up to nearly $1.00 per barrel, fluctuating between 60 cents and $1.00 for a great many years. The advantage resulting from the ability to use these oils for illuminants did not stop with the large profits of the Standard Oil Company, but the farmers and oil producers of Ohio and Indiana benefited by the enormous advance in the value of Ohio crude, which amounted to many millions of dollars per year.

Methods of desulphurization.—In desulphurizing petroleum, the oxide of copper is mixed with the petroleum distillate in a still supplied with an upright shaft and arms radiating therefrom, to keep the oxide in agitation during the process of distillation, flexible chains attached to the arms being used to prevent the copper from adhering to the bottom of the still. 100,000 lb. of oxide of copper is used for the first charge of 2000 barrels of distillate. After 80 per cent. has been distilled off, a new charge of distillate is added with an additional charge of 30,000 lb. of copper, which is followed by two further runs, so that about 200,000 lb. of copper material is in the still when the fourth run is made. The residuum is pumped through a filter press, and the solid product of the filter press has the oil adhering thereto burned off. The dry mixture of oxide and sulphide of copper is then put into a roasting furnace, where it is desulphurized to 1 per cent. or less.

A variation of my method treats the vapour coming from a still charged with crude petroleum, and consists in passing the vapour through two brushes made of No, 10 steel wire, the brushes being 5½ ft. in diameter and 16 ft. long. They are inserted into a shell which is almost the same diameter as the brush, and the requisite amounts of copper and heavy oil are pumped into two shells, each containing one brush. The vapour passes in series, first around the shell to prevent condensation, then through the shells on to the condenser. The brushes are made to resolve at about six revolutions per minute. These wires immersing continually in this oxide of copper magma, the shells containing the brushes are surrounded by the vapour coming from the still, and as the temperatures of the vapours increase, anything condensed thereon during the prior period is re-evaporated by the hotter vapour following. Both these processes are now in operation at different works.

Roasting furnace.—When the question of supplying the copper necessary for the works at Lima was under discussion, it was found that 160 furnaces, such as I used in Canada, would be required to do the work. In order to avoid the handling and transportation involved in such a gigantic furnace plant, I was obliged to construct a mechanical roasting furnace of a capacity in conformity with the magnitude of the business. To eliminate the difficulties of the warping of the shaft and the arms which had caused the failure of the McDougal furnace, I constructed a stirring device, the shaft and arms of which were cooled artificially to withstand the high temperature of the roasting furnace. I first forced air as a cooling medium through the stirring device, but found that the oxidation of the sulphide of copper and the carbon from the residuum of the petroleum produced a temperature even higher than that of the ordinary pyrites furnace. It therefore became necessary to substitute hot water for air as a cooling medium, which proved very satisfactory. This made possible an increase in the size of the furnace to 16 feet inside diameter, and to-day these shafts and arms are connected with steam drums and are used like a water tube boiler, so that the surplus heat extracted from the stirring device of the roasting furnace is converted into steam and utilised in the plant. The capacity of a furnace is fifty tons per day, and four to six are used in one refinery. After the copper has been revivified, it is ground and mixed with residual oil from the filter press. In this manner the copper charge is pumped into the still which may be half a mile away. During the twenty years that this process has been in operation many millions of barrels of oil have been desulphurized.

California.—In 1902 the California field became important, and it was discovered that another oil which smoked chimneys had to be refined. This oil, however, was practically free from sulphur, the smoke being due to a large percentage of the aromatic series of hydrocarbons and to the fact that the percentage of hydrogen to carbon was too small to maintain the flame temperature necessary to consume all the carbon. I ascertained further that sulphuric anhydride converts the aromatic series into sulpho products, insoluble in petroleum, and that by treating the distillates from the crude oil with sulphuric anhydride, the members of the aromatic series in the petroleum can readily be extracted.

The existence of a petroleum containing nearly 50 per cent. of the coal tar products is intensely interesting, especially in view of the theories advanced upon the origin of petroleum. The percentage of these hydrocarbons in the crude varies from the percentage contained in coal tar, benzol existing in a smaller proportion than toluol, while xylol represents 7 per cent. of the volume of the crude. Naphthalene, entirely free from all traces of carbolic odour, is quite prominent, while anthracene and carbolic acid are entirely absent.

I employed numerous methods for separating the products of California crude by physical means. Distillation, with large back flow condensers attached, showed very encouraging results, as did also the method of washing the distillates with alcohol, carried on in series, the aromatic series being more soluble in alcohol than the paraffin series. However, the sulphuric anhydride treatment, which I first used in determining the amount of the two series contained in the petroleum, has proved to be very simple and effective on a large scale, and is now used by the Standard Oil Company at their plant in Port Richmond, California. The process of making the sulphuric anhydride employed there, is the one purchased from the Verein Chemischer Fabriken of Mannheim. The capacity of the plant has been increased a number of times, until to-day it is by far the largest in the United States, if not in the world.

Sulphur.—In 1865, while boring for petroleum in Louisiana, a sulphur deposit was discovered beneath a layer of quicksand about 500 feet thick. As a result of this discovery, quarrels and controversies arose as to whether the lease covering the petroleum rights also included the sulphur. It was some time before the matter was decided, and by the time a decision had been reached, both parties had lost a great deal of money, and those who got the sulphur deposit lost still more in trying to exploit it. The deposit seemed to bring misfortune to every one connected with it, and I have heard many stories and met many people who told me of having lost money in the various schemes that marked the progress of Sulphur Mine. Progress there seemed to mean failure. An Austrian company, a French company, and numerous American companies—everybody failed, and not a ton of sulphur was produced.

When I heard of this extraordinary situation in 1891, I obtained a core from the sulphur deposit and many pamphlets from the various companies who had tried to operate it, each one telling the prospective purchaser that his fortune was made if he but owned a few shares of the stock of that particular sulphur company. I became interested, and having had a great deal of experience in drilling and mining petroleum and salt, I thought that the problem might be solved if all the facts concerning the deposit were known. Unfortunately, all the drilling records had been coloured by the people who expected to float companies—everything unfavourable was concealed, and only that given which would be likely to induce investment, so that what I had considered a correct report proved later to be entirely wrong.

Being misinformed as to the character of the deposit, I reached the conclusion that the sulphur was distributed in the rock as in Sicily, and when I heard of the limestone roof covering the deposit, I felt that sulphur could be found anywhere within reasonable proximity to the Sulphur Mine.

To meet the extraordinary conditions existing in this deposit, I decided that the only way to mine this sulphur was to melt it in the ground and pump it to the surface in the form of a liquid. After careful study and consideration, I became convinced that this could be done. In view of the information obtained from the various companies, I believed that there was sulphur over miles of territory, and started to drill on land I had purchased within a mile and a half of Sulphur Mine. I went down over 2,000 feet without finding anything, then I located a second, a third, and a fourth well, but found no sulphur in any instance. This took much time and money, and I finally reached the conclusion that all the sulphur was located on the land owned by the New York Company operating it at the time. They had a very ingenious scheme for sinking a shaft with a shield, but after the expenditure of a great deal of money, the shield was lost, and the danger due to the presence of water containing hydrogen sulphide was demonstrated by the death of a number of men. It was decided to abandon this method, especially after a drilling record had been made by a drilling company who reported direct to the owners, when it was discovered that there was no roof over the sulphur, and that sulphur water was permeating the deposit in inexhaustible quantities.

I realised at the outset that a method entirely different from that employed in the mines of Sicily was necessary for success here, as the class of labour required to operate this mine would demand at least $5·00 per day, while the Sicilian miners were being paid 60 cents.

I succeeded in getting possession of the property, and at once set to work to drill a well of sufficient diameter to determine finally the character of the existing material. When this had been done, I was obliged to modify completely the process and apparatus I had expected to employ.

At that time the drilling of a well in an alluvial deposit containing quicksand, etc., was a very tedious task, and it took from six to nine months to get through the alluvial material to the rock—work which we do to-day in three days.

I drilled a well through the alluvial deposit to the rock with a 10-in. pipe; then continued through the sulphur deposit, which was about 200 feet thick, with a 9-in. drill, and immersed a 6-in. pipe from the surface to the bottom in this well. The 6-in. pipe had a strainer only 6-in. long, at the very bottom, and a seat to receive the 3-in. pipe through which we expected to lift the sulphur to the surface. The 6-in. pipe, directly above the seat for the 3-in. pipe, was also perforated for a distance of 3 feet. After the well had been drilled and before the pipes were inserted, it was filled up with sand in order to insure a tight receptacle at the bottom for the liquid sulphur. After the sand had been washed out, the pipes were inserted and equipped, and the well was ready for the melting fluid.

This melting fluid consisted of water superheated to 335° F. The porosity of the rock in which the melting had to be done seemed to furnish an almost insurmountable obstacle to success, as I feared that the wild waters in the rock would break into the melting zone I expected to create and reduce the temperature of the fluid with which I expected to melt below the temperature necessary to fuse the sulphur. I had supplied a large number of boilers to furnish the heat necessary to maintain in the well a temperature higher than that required for the fusion of the sulphur.

The water was superheated in columns in which 100 lb. per square inch pressure was maintained, and the apparatus which I had constructed to accomplish this proved very efficient. We used twenty 150 H.P. boilers for a well, which represents experimentation on a ponderous scale.

When everything was ready to make the first trial, which would demonstrate either success or failure, we raised steam in the boilers, and sent the superheated water into the ground without a hitch. If for one instant the high temperature required should drop below the melting point of sulphur, it would mean failure—consequently intense interest centred in this first attempt.

After permitting the melting fluid to go into the ground for twenty-four hours, I decided that sufficient material must have been melted to produce some sulphur. The pumping engine was started on the sulphur line, and the increasing strain against the engine showed that work was being done. More and more slowly went the engine, more steam was supplied, until the man at the throttle sang out at the top of his voice, "She's pumping." A liquid appeared on the polished rod, and when I wiped it off with my finger, I found my finger covered with sulphur. Within five minutes the receptacles under pressure were opened, and a beautiful stream of the golden fluid shot into the barrels we had ready to receive the product. After pumping for about fifteen minutes, the forty barrels we had supplied were seen to be inadequate. Quickly we threw up embankments and lined them with boards to receive the sulphur that was gushing forth, and since that day no further attempt has been made to provide a vessel or a mould into which to put the sulphur.

When the sun went down we stopped the pump to hold the liquid sulphur below until we could prepare to receive more in the morning. The material on the ground had to be removed, and willing hands helped to make a clean slate for the next day. When everything had been finished, the sulphur all piled up in one heap, and the men had departed, I enjoyed all by myself this demonstration of success. I mounted the sulphur pile and seated myself on the very top. It pleased me to hear the slight noise caused by the contraction of the warm sulphur, which was like a greeting from below—proof that my object had been accomplished. Many days and many years intervened before financial success was assured, but the first step towards the ultimate goal had been achieved. We had melted the mineral in the ground and brought it to the surface as a liquid. We had demonstrated that it could be done. This was especially gratifying, as the criticisms I had received from technical papers and people who had heard of what I was attempting to do had been very adverse. Every one who expressed an opinion seemed to be convinced that this thing could not be done.

At first we pumped with an ordinary deep well oil pump, changed to meet the corrosive action of the sulphur. We experienced great difficulty with the valves in the pump, the high specific gravity of the sulphur, the great depth from which it had to be raised, and the corrosive action of the mineral itself, making the maintenance of valves very difficult. Zinc and aluminium are practically the only two metals unaffected by liquid sulphur, but both these, being soft and easily disintegrated, would not withstand the shock at the change of stroke of the pump. I decided that if the specific gravity of the sulphur could be lowered by the admixture of some other body much lighter, a point might be reached where the hydrostatic pressure of the water in the ground would raise the sulphur. Air seemed the most suitable, and we introduced compressed air into the column of liquid sulphur standing in the well, using a volume of two parts of air and one of sulphur. We have raised our sulphur discharge lines 70 feet above the ground, so that we can fill bins to a height of 65 feet without machinery or pump of any kind in the sulphur proper.

The first well lasted long enough to demonstrate the possibility of success, and to indicate in what directions improvements must be made. At that time, my sulphur enterprise was merely a hobby, the bulk of my time being devoted to my Standard Oil work.

Many difficulties arose which we had not foreseen. We lost some wells because of the parting of the pipes. As the mineral was melted from the bottom, the earth above would follow as the sulphur rock settled. The grip of the sand and earth against the pipe was so great that instead of sliding, it would pull the pipe in two and the well would be lost. A 12 in. pipe outside of the 10-in., with stuffing box and telescope joints, obviated this difficulty. All wells, however, are eventually broken and crushed, when the abstraction of sulphur becomes so great that the cavity made cannot withstand the weight of the ground above it.

We succeeded in increasing the life of a well greatly by lining the hole drilled through the rock with a 9 in. perforated pipe.

About that time we found that some wells gave out and ceased to pump when there had been no breaking of the pipes. I reached the conclusion that the cold sulphur water permeating the rock had broken into the melting zone, and brought the temperature of the melting water below the melting point of sulphur. I thought this might be remedied by pumping large amounts of a material like sawdust into the mine with the melting fluid, and that if the quantities of sawdust were large enough, the channels through which the wild waters in the rock entered the melting zone could be sealed. One well, after pumping about 7,000 tons, at the rate of approximately 350 tons per day, ceased to produce. The pipes were all in good order, and we started to pump sawdust into the ground with the melting water. After pumping in about six carloads per day for five days, the well "sealed" with sulphur and promptly produced 39,000 tons more before the caving of the rock broke the pipes. We perfected this method of artificially "sealing" the rock surrounding a melting zone, so that the amount now obtained from a well has been greatly increased. Whenever a well breaks, we shoot off with dynamite the 10-in. pipe in the quicksand above the rock, and permit the sand to follow into the cavity from which the sulphur has been abstracted, filling up the space of the extracted sulphur rock with sand. The surface, consisting of about 200 feet of clay, follows the quicksand, gently but surely, and in order to maintain the pressure which is necessary to prevent the melting water from breaking into steam, the volume of the sulphur abstracted from below must be replaced by earth from above. To do this a dredge with a capacity of 4,000 cubic yards per day became necessary. Numerous reservoirs have been dug on the outskirts of the mine to supply the material required to do this. This filling has been going on constantly, and the ground has sunk to such an extent that where our house once stood is now 80 feet below the original surface.

These improvements were made slowly, as all experiments had to be made on a ponderous scale, and the smallest change required a great deal of time. During the long intervals which necessarily elapsed between my visits to the mine, I could give this new enterprise no attention. It took months to drill a new well when an old one was lost. At one time the work lay idle for a whole year before I could take it up again, and it was not until 1903 that we could see financial success ahead. In that year we produced 35,000 tons, and in 1904 enough to supply the entire consumption of the United States. It was in that year that we sent the first cargo of American sulphur to France.

In order to demonstrate what the mine could do with six wells, we pumped that number simultaneously for two months, producing 122,000 tons of sulphur, which is more than the consumption of the whole world for that period of time.

Prior to the development of the Louisiana sulphur mine, the sulphur production of the United States was less than 0·5 per cent. of its consumption, practically the entire amount required being supplied by Sicily and Japan. The former really had a monopoly of the sulphur business for a great many years. The Sicilian sulphur industry was closely interwoven with the politics of the islands, both internal and external. It was in 1833 that an English fleet appeared in the Bay of Naples to compel the Italians to rescind the sulphur monopoly that had been granted to France. The ups and downs of the Sicilian sulphur business are extraordinary. The people, a large percentage of whom are employed in the mines, are very poor and used to be in the hands of dealers and usurers, who manipulated the sulphur market to suit themselves, and extremely high prices and extremely low prices followed each other as suited their convenience.

In England a process had been discovered for the recovery of sulphur from the waste products of the Leblanc soda process, quite a large amount of money being invested in the necessary machinery. When another sulphur crisis occurred in Sicily in 1894-5, and sulphur sold below the cost of production of English recovered sulphur, a number of English capitalists decided to finance and market the Sicilian output. They incorporated as "The Anglo-Sicilian Sulphur Company," and succeeded in getting between 75 and 85 per cent. of the Sicilian mine owners under contract for the entire output of their mines, whatever that might be, at a fixed price. This arrangement was made with the consent of the Italian Government for a term of five years, with the privilege of renewal for five years more. The scheme proved an excellent one, both for the Anglo-Sicilian Company and for the Sicilians. The former made a great deal of money, paying about 50 per cent. per annum on their common stock, and reserved large sums for contingencies. The contingencies arose in the form of the Louisiana sulphur production. The company had received complaints from their agents here that the business in the West had diminished on account of sulphur furnished from a mine that was no mine at all, but where the sulphur came out of the ground ready to ship. The Anglo-Company, as well as the Sicilians, declared that this was impossible.

I was very anxious to get all the business possible, as our stock pile was much larger than our bank account, and I was surprised to hear that the Anglo-Sicilian Company had accepted a contract for 20,000 tons to be delivered in America, very much below the price they generally quoted, and not far above their cost. I decided to go to London and have a talk with them in order to find out if it would be necessary for us to put the price below their cost in order to maintain the American business which we needed very badly. I was perfectly frank and explained our position fully. I met with a great lack of enthusiasm for this "American humbug," and was told that they would go their own way, and I could go mine. I did. I had arranged for the sale of our sulphur in the various European countries, and knowing the production cost to my competitors, I succeeded very shortly in demonstrating that Louisiana sulphur was not a swindle. I found out afterwards that the lesson had cost the Anglo-Sicilian Company £285,000—but then we were friends. Their attitude changed greatly, and they decided to go out of business and let the Sicilians and Americans take care of themselves.

The Anglo-Sicilian Company, especially during the last years of its life, had found it necessary to store a great deal of the sulphur tendered to them on their contracts, as they had lost the American market, which was their best customer, and it looked very much as though this enormous accumulation, approximating 500,000 tons, would have to be thrown on the market to be sold for whatever it would bring. To the poor Sicilian miner, whose lot under the most favourable circumstances is not an enviable one, this would have meant sulphur below cost, with the eventual closing of the Sicilian mines and misery and starvation to a large population.

The men well acquainted with the situation felt, as I did also, that this would result in revolution and bloodshed for Sicily. The labourers could not live on a wage lower than that which they already received. Frequent strikes and disturbances occurred when the misery of the working people was greater than usual. Understanding the peculiar character of the Sicilians, the Government, when the matter was brought to their attention, decided to form an obligatory trust, so that no sulphur would be sold below cost, and the Government was to finance the large stock on hand by issuing bonds and guaranteeing the interest. All the Sicilian sulphur mines were to be included in this obligatory trust, and the Government agreed to advance, in cash, four-fifths of the value of the sulphur when it was received from the mine owners, the remainder to be paid to them after payment for the sulphur sold had been received and the expenses of conducting the business deducted.

A law creating this obligatory trust, which is known as the "Consorzio Obbligatorio per l'Industria Solfifera Siciliana," was passed, and it has now been in operation since August 1st, 1906. It has gone through the vicissitudes of childhood and occupies a unique position among the various trusts, which is of special interest to the United States. Here we have in successful operation a trust created by force, which all those engaged in that particular business are obliged to join. It has a board of thirty directors, an executive committee of ten, four of whom are members of the Government, and a Royal Commissioner, also appointed by the Government, who is practically its president. Prices are fixed and maintained, and sulphur is sold to all comers at the same figure.

This obligatory trust has been a godsend to the people, and so well are the Sicilians satisfied with its operation, that they have already petitioned the Government to extend the period of its life beyond that originally decided upon. Moreover, the present Commissioner's able and wise administration has been so successful that the Sicilian stock of sulphur on hand and the obligation of the Consorzio towards the Government and the Bank of Sicily have been diminished to such an extent that the stock will be reduced to normal within two years, and the Consorzio will be entirely out of debt. It is a striking illustration of the fact that a trust may be beneficial to all concerned. Great credit is due to the Italian Government for averting the misery which would inevitably have followed another sulphur crisis.

Captain A. F. **Lucas** spoke as follows: The geology of the coastal plain containing the sulphur mines and oil fields—which, of course, includes the mounds or domes—extends over a vast area, practically beginning at the north-western coast of Florida for about 50 to 100 miles in width, and following the littoral zone of the Gulf States of Alabama, Mississippi, Louisiana, and Texas down to Mexico and beyond. This vast area is practically level, with a slight dip toward the sea, and in travelling westward one comes upon slight elevations of say from 10 to 100 feet in height over the surrounding prairie. These elevations, which are called "domes," are of limited area, say from 250 to 2,000 acres, which have by now assumed wonderful economic importance, since they now form the basis of the whole economic geology of the coastal plain in the states of Louisiana, Texas, and the Gulf States of Mexico.

To attempt to make soundings in search of minerals of economic value beyond this elevated zone is useless, as the drill will only encounter the clays, sands, and gravel of the Pleistocene Columbia series, then the red sands of the Neocene Lafayette series and deeper down the blue clays, "Gumbo" and sporadic laminations of limestone, at which time the driller (if he is lucky to have reached this depth safely) will be glad to pull out and call it done. It is true, however, that at times these elevations are so slight that they are often confused with the local phenomena of the ant mounds, and we have instances on record where the "wild catter" eventually hit the apex of a hidden dome as it happened, for instance, at Batsom Prairie, Texas, whereby he obtained economic results. Undoubtedly there are more such hidden domes scattered over this vast area.

Proceeding from New Orleans westward, we come upon "Belle Isle," the first of a series known as the five Salt Islands. They are called in sequence "Belle Isle," "Cote Blanche," "Grand Cote," "Petite Anse" and "Jefferson Island." The last named was the winter home of the late Joe Jefferson, the actor. These islands are from 250 to 1200 acres in extent and rise abruptly out of the surrounding marshes at an elevation of from 60 to 200 feet. They have all been explored and salt found thereon except "Cote Blanche." On Belle Isle salt was found at 101 feet in depth and the drill continued in salt to a depth of 3250 feet. Unfortunately, owing to its hardness at the bottom, it has been impossible to obtain drilling to classify the geological age upon which this enormous salt dome rests. Salt at Grand Cote was found at 102 feet and at 900 feet the drill stopped in salt. At Petite Anse salt was discovered 15 feet down, while digging a water well, and subsequent drill tests made failed to pass through salt at 1500 feet. At Jefferson Island, the shallowest soundings where salt was found was 91 feet from the surface and the drill stopped, still in salt, at 2090 feet. The salt of all these domes is of remarkable purity, 98 to 99 per cent. sodium chloride, except perhaps, at Belle Isle where part of this salt mass is saturated with petroleum. Following the contour of this dome by drilling near the apex and while sinking a shaft the occurrence of galena and sphalerite was ascertained: the crystals are all sharp, and show no sign of erosion.

Dr. A. C. Gill of Cornell University, states that the galena shows no silver and the probability is that it represents a deposition from salt water by chemical action.

The borings made at Belle Isle for oil and sulphur have disclosed lenses of considerable limestone and sulphur and pools of water escaping from some wells are strongly charged with hydrogen sulphide and sulphur dioxide, and yet the oil recovered from these wells gives no indication of containing sulphur in any form. This oil is paraffin base, of 45° B. and has the appearance of being like Pennsylvania crude, only somewhat lighter in colour. Upon submitting a sample of this oil to the Standard Oil Company officials it was difficult to convince them that this oil had not already been refined in whole or in part. Further explorations on this Island have been suspended, as it was found unpractical to work the same for oil or salt. Grand Cote and Petite Anse are now producing a superior quality of rock salt, most of which is shipped to the north-west in competition with the Michigan and New York salt.

Anse La Butte, six miles north of Lafayette, is also a salt dome of limited area which, however, has so far produced a few good oil wells. The oil carries some sulphur and is of 21° B. and is used principally for fuel.

The Jennings field on which oil was found at 1800 feet in considerable quantities is also a dome, but so far no salt has been found thereon. It is believed by Professor G. D. Harris, of Cornell University, who for many years has carried on most thorough and indefatigable work on the coastal plain of Texas and Louisiana, that larger oil resources lie beyond the limit of the proven field.

Of smaller importance is the field of Welsh, which is producing, however, an excellent grade of oil, but so far no salt-rock has been found, and the wells as a rule yield the best result at about 1000 feet. This field gives no indication on the surface of primary or secondary doming.

The oozing of petroleum and escape of gas at Bayou Choupique, now known as the sulphur mines, led the Louisiana Oil Company to drill for oil in 1868, and after going through the clays and sands of the Pleistocene, the quicksands and gravels of the Columbia to 443 feet, entered a grey massive limestone of about 60 feet in thickness. Under this, almost pure alternate layers of sulphur and limestone were found for a thickness of about 260 feet; below this lie the gypsum beds with occasional layers of pure sulphur. It remains to be proved by deeper drilling if this dome is also underlain by rock salt. The geological age of this dome has been ascribed by Hilgard as cretaceous, by Harris as eocene. The fossils as classified by Ban Ingen are of tertiary and by Dall and Aldrich, of miocene origin.

A new company was organised by General Jules Brody to win this sulphur by sinking an iron ringed shaft, and after reaching a depth of 110 feet the shaft was abandoned on account of a break in the lining and the asphyxiation of several miners by sulphur gas.

Since the advent of the sulphur, no serious attempt has been made to explore the sources of heavy oil that still flows from the upper layers of some old test wells, except by the Beaumont boomers in 1901, and I am of the opinion that if Mr. Frasch was to make a serious attempt he would succeed in getting the oil in gushers.

Numerous attempts have been made to explore the "Vinton dome" about fifteen miles west of Sulphur, but progress was impeded principally owing to the heavy gravel and quicksand beds of the Columbia, until about one year ago the many efforts have been crowned with success. The Vinton field now furnishes considerable oil of about 21° B., which carries about 0·5 per cent. sulphur.

The fields of "Spindle Top," "Sour Lake," "Saratoga," "Humble," etc., are also salt domes and have produced great quantities of sulphur oil of an average specific gravity of 22° B., and Spindle Top alone is credited with about forty-three million barrels of oil to date. On Spindle Top was made the first discovery of sulphur oil of the coastal plain on January 10th, 1901. It is also a salt dome and lies at an elevation of only 12 feet from the surrounding prairie, the surface of which contains about 235 acres only. Explorations had been made in 1882, 1885, and 1888 in search of sulphur or oil, but owing to alternating beds of quicksand and gravel of the Columbia, it was found impossible to go deeper than 300 feet, until in October, 1900, I made the second attempt, and after going through irregular alternating beds of clays, sand, gravel, lime, calcite and sulphur, reached the oil rock at 1120 feet depth. The pressure of gas and oil was so great that the 4-inch drill pipe was shot out to a great height, carrying the head block, swivel, and cable with it. Then a great rush of mud and water came out (the water used for drilling) followed by the ejection of large fragments of dolomite and fossils. It settled then to a steady flow of oil to a height of about 200 feet through a 6-inch pipe. The well flowed continuously for ten days, when it was finally closed by an 8-inch gate valve. This oil was heavily saturated with hydrogen sulphide and sulphur dioxide, and was very offensive to the nose while the well was in eruption, as within a radius of several miles all houses painted with white lead were blackened, also the silver in houses and even to the silver coins in circulation. It was estimated that this well flowed in ten days while in eruption about 750,000 barrels of oil. The oil rock is a porous dolomite carrying some sulphur in crystals and containing considerably more calcium than magnesium.

The size of the cavities in the dolomite can only be estimated by the large fragments shot out from the wells while in eruption. Drillers, however, reported instances of their tools dropping for several feet leading one to conclude that the oil rock is cavernous, which, in consequence, made an admirable storage reservoir for the oil. The actual thickness of the oil-bearing rock is undetermined, but it has been estimated to be from 75 to 150 feet thick. A test well drilled near the discovery well entered gypsum at about 1200 feet and at 1650 feet encountered rock salt which continued to a depth of 1900 feet, when the drilling stopped.

The discovery of this oil pool started a celebrated boom in Texas and Louisiana. The mere fact of land being in the vicinity of Beaumont sold it at fabulous prices, while fractions of an acre on Spindle Top sold at the rate of $760,000.00 per acre. Not that there was any value thereon warranting such prices, but that it enabled the boomer to capitalise his twenty-five by thirty feet of land, near a known gusher, at millions of dollars. However, by the time he was through with the sale of his stock, widely advertised, a well came in dry and the boom collapsed, and so did most of the many hundreds of companies capitalised at enormous figures. Had Spindle Top been sanely exploited by experienced drillers, I am confident that it would gush to-day.

Still travelling westward we come upon other domes such as "Hoskins," "Bryan Heights," "Big Hill in Matagorda" and "Big Hill in Jefferson County," "Damon," "Kyser," "High Island," "Barber Hill," etc., all of which have been explored but so far have been found barren in whole or in part.

High Island and Damon Mound, two interesting elevations of 50 to 100 feet above the surrounding prairies, and of about 3000 acres in extent each, have practically the same characteristic indications that Spindle Top had, to wit: The elevation above the prairie indicating a possible dome, the sour water, the springs charged with the hydrogen sulphide, the gas escape, etc. The opening of a well, drilled by hand at High Island in search of water, was plugged with straw and a few years later the plug was extracted and found to be a solid mass of sulphur, yet after repeated drilling to a considerable depth on this Island and Damon Mound, nothing of commercial impertance was found. The drill passed through alternate beds of quicksand, silicious clay, sulphur and clay, some oil and rock salt at bottom.

At Big Hill, Jefferson County, Texas, also an attractive possibility for an oil proposition, solid dolomite was found at 350 feet, which continued to a depth of 1400 feet, when drilling was discontinued.

At Bryan Height a great gas pressure was encountered in 1901 charged with hydrogen sulphide, but it was subsequently abandoned. Big Hill Matagorda County had a small production. The oil was found at depths of 885 to 1050 feet, in limestone which possesses the same characteristic features of the oil-bearing rock of Spindle Top. As much as 60 feet of solid sulphur was reported from some wells, and always near the oil horizon. The oil was proportionately charged with it and the gas, chiefly hydrogen sulphide mixed with sulphur dioxide.

In conclusion, I would say that the domes of the Coastal Plain have broken the world's records. First, for the limited area, second, for the productiveness as yet developed, and this holds good for sulphur, oil, and rock salt, which goes to the credit of the Coastal Plain only.

The Southern Pacific Railroad was found to be located on every field as fast as discovered, and this road was the first one to utilise this cheap and convenient resource as fuel and this at a minimum cost.

Mr. F. H. Pough said: Mr. Frasch has given us a most interesting description of the discovery and development of Sulphur Mine and of the Frasch Process, but for which this enormous deposit of sulphur would to-day be absolutely worthless. Much that he has told us was quite new to me and so little has been published heretofore about these deposits which was authentic, that I think we are all to be congratulated upon hearing at first hand so much of the inside history of the development of this, the largest sulphur mine in the world.

After what Mr. Frasch has told us there is really nothing more to be said in further description of the process, but I will try to give some further details as to the size of the deposit, the output and the method of storing, handling and shipping the product.

Sulphur Mine is located about three miles from Sulphur, Calcasieu Parish, Louisiana, a town of about 1000 inhabitants on the Southern Pacific. From 600 to 700 men are regularly employed at the mine, and every effort is made by the Company to further the comfort of the men. A complete sewerage system has been established and the Company owns a number of houses, which it rents to the older employes, the foremen, and members of the office force at a nominal rental. It is compelled as a matter of public necessity to operate a boarding-house for the unmarried men, but this results in a yearly loss to the Company of from $8000 to $10,000. Not only is no company store or anything of that nature permitted, but no private commercial enterprise of any kind is allowed upon or near the Company's property, unless a barber's shop can be so classed.

The sulphur deposit, as shown by test borings, is quite sharply defined and nearly circular in shape. It is considerably more than half a mile in diameter, and the mine is encircled by a standard gauge railroad some three miles in length.

The sulphur apparently was deposited in the cone of a great geyser, which dates back to the tertiary period; and is contained in a limestone formation in the proportion of about 70 per cent. sulphur to 30 per cent. limestone. The sulphur beds, which are underlain by a bed of gypsum, extend to a depth of 1100 feet or more.

The most conspicuous object at the mine, next to the well derricks which dot the landscape in great profusion, are the boiler stacks, of which there are over 130, each stack representing a boiler of 150 to 300 h.p. These boilers are arranged in eight batteries, containing with one exception 15 or 20 boilers each, and each battery is capable of operating a well. As a rule two batteries are placed in a group, so that one foreman can oversee both. The boilers are fired entirely with fuel oil and but three men (two firemen and one water tender) are required on each shift to attend to the firing, and the feed water in each battery. The total boiler capacity is in the neighbourhood of 25,000 h.p., constituting one of the largest industrial steam generating plants in the world, a unique feature of which is the fact that an almost negligible quantity of the steam generated is used for power.

In a building to the rear of each battery are located the pumps and superheaters. The latter are vertical, cylindrical receptacles, about 4 ft. in diameter by 16 ft. high, containing a series of shallow trays over which water pours and is thus brought into intimate contact with live steam from the boilers. The problem of heating the great quantity of water required for the operation of the wells to the proper temperature was a difficult one, and the method described is another of Mr. Frasch's ingenious inventions. The consumption of fuel oil amounts to 700 barrels per day at each battery, when operating at full capacity; the average total daily consumption of water is about 7,000,000 gallons, and the average yearly consumption of fuel oil over 1,000,000 barrels.

The enormous amount of water required for the boilers and superheaters is provided for by means of a pumping station located on the Houston River, about six miles from the mine. This pumping station contains a centrifugal pump having a capacity of 12,000,000 gallons per day, and the water is carried to the mine by means of a private canal. To supplement the pumping station and provide against breakdowns, there is an artificial storage reservoir, covering 150 acres.

The wells are sunk in groups, the individual wells being placed 50 to 100 feet apart, and one well will sometimes produce as much as 400 to 500 tons per day, and keep up a steady flow for months at a time—in one case the output from a single well reached 73,000 tons. One of our wells is now producing considerably more than 500 tons a day and has been for some weeks. The average output is over 250,000 tons per year, but the only limitation is the market demand. The liquid sulphur as it flows from the wells is so pure that we are able to guarantee a sulphur contents of 99½ per cent., for, as a matter of fact, the average purity is well above that figure. The sulphur is collected and stored in large bins about 150 ft. to 250 ft. square, which are made by setting posts into the ground to which are nailed 2-in. by 12-in. planks of suitable length. The sulphur is delivered into the centre of these bins and caused to spread in thin layers about 1 in. thick, which cool so rapidly as to permit continuous operation. A separate bin is used for each well in order to permit accurate measurement of the output which is carefully taken and recorded daily. As the bed of sulphur grows in thickness, the sides of the bins are raised by means of additional uprights and planking until they reach a height of 60 ft. or more. When a bin is filled, another is built alongside of it, so that in this way continuous blocks of sulphur may be formed several hundred feet in length by 150 ft. or more in width, and 60 to 65 ft. in height. Blocks of sulphur have thus been formed containing as much as 150,000 tons.

When it is desired to ship the sulphur, a movable track is laid as a spur from the main line, parallel to the long side of the bin. The boards from this side are then removed and the sulphur thrown down by means of blasts placed near the bottom of the pile. The sulphur is then picked up and loaded into cars by means of locomotive cranes, fitted with grab buckets, capable of handling two tons at a time and of loading a 35-ton car in 14 minutes. Shipments from the mine have frequently reached 1000 tons per day for periods of 20 to 30 consecutive days.

A large quantity of sulphur is shipped directly from the mine in closed cars which are loaded by box car loaders, but by far the largest portion of the sulphur is shipped by rail in open bottom dump cars to Sabine, Texas, in trains of about 20 cars, where it is loaded into steamers for distribution along the Atlantic Coast and for export to Europe.

The loading plant at Sabine has a capacity of from 600 to 800 tons per hour, and the facilities are such that it is possible for a 7500 ton steamer to dock, load, and sail within 12 hours. It is customary for the steamers to come to the dock with the hatch covers raised, and while I was at Sabine last January I saw our own steamer, the "Herman Frasch," begin to load sulphur within 15 minutes from the time she was made fast to the dock. The "Herman Frasch," was built for us at the Quincy Yards of the Fore River Shipbuilding Company and launched in December, 1909. She has a cargo carrying capacity of 5500 tons and we are now contemplating building a second ship of somewhat smaller capacity. In addition to our own steamer we usually have two or three steamers under charter.

The sulphur is handled at Sabine by means of cranes and grab buckets similar to those used at the mine, which deliver the sulphur into hoppers, from which it falls upon a rapidly moving system of belts, which carry it to the dock up an incline to a height of about 10 ft. above the steamer's deck. From the inclined belt it falls into an adjustable iron chute in the form of a pipe which telescopes, from which it drops into the hold of the steamer. By turning this iron chute from side to side, it is practical to load the cargo so evenly that no trimming is required in our own steamer, or vessel designed for carrying bulk cargoes.

The following is a list of the moving pictures, shown during the evening, illustrating the processes in operation at the mine of the Union Sulphur Co.:—Entrance to mine. Panorama of works from office. Scenes from belt line train. Sulphur wells and derricks. Filling bins with liquid sulphur. Blasting sulphur. Men working in sulphur. Loading sulphur in box cars. Loading sulphur in open cars. Dredge in operation. Men going home from work. Panoramic view of workmen's homes.

Sydney Section.

Meeting held at Sydney on Wednesday, November 15th, 1911.

MR. T. STEEL IN THE CHAIR.

THE CHEMICAL COMPOSITION OF SOME NEW ZEALAND MEAT EXTRACTS.

BY A. M. WRIGHT.

The object of this investigation was to determine as far as possible the complete chemical composition of various meat extracts manufactured in New Zealand in order to ascertain which constituents increased and which decreased the commercial value of this material. The earlier methods of analysis used in this laboratory did not satisfactorily reveal the differences in composition which might account for the varied value placed upon the extracts in the London market, where a consideration of the colour, odour, and taste largely determines the price offered.

In this investigation a number of the methods of analysis described by the author (this J., 1907, 26, 1229) were used, while others were discarded and a number of additional methods employed. The methods previously described for the determination of moisture, organic matter, mineral salts, chlorine, fat, and total nitrogen were retained; the separation of the nitrogen and substances precipitated by 50, 60, and 80 per cent. alcohol was abandoned, as it is now known that the results so obtained give no indication of the commercial value of the extract; the following additional methods were used in this investigation:—

Acidity.—A solution of 0·5 grm. in 800 c.c. of water is titrated with decinormal potassium hydroxide using phenolphthalein as indicator; the result is then calculated, and expressed in terms of acidity as lactic acid.

Insoluble and coagulable proteids.—The provisional methods of the Association of Official Agricultural Chemists were used.[*]

Proteoses.—The zinc-sulphate method was used.[†]

Peptone-like bodies and polypeptides.—These were precipitated together with the proteoses by the tannin-salt reagent, the amount of peptone-like bodies and polypeptides being found by difference.[‡]

Total meat bases.—From the nitrogen found in the tannin salt filtrate the nitrogen found as ammonia is deducted, the difference being the nitrogen as meat bases.

Ammonia.—Determined by the magnesium oxide method.[§]

Purin bases.—Determined by Schittenhelm's method.[‖]

Kreatin and kreatinin.—Determined by Follin's colorimetric method.[¶]

Phosphoric acid and potash.—Estimated in the residue from the ash determination.[**]

The following table shows the percentage composition of the extracts examined; the extracts are shown in the order of their relative market value, No. 1 being the highest and No 6 the lowest.

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Moisture	14·49	15·34	16·95	17·54	17·39	15·71
Organic matter	66·50	65·15	66·48	62·43	61·31	62·76
Mineral salts	19·01	19·51	16·57	20·03	21·30	21·53
Acidity as lactic acid	12·60	11·10	11·20	11·00	10·90	11·60
Fat	0·40	0·42	0·33	0·45	0·41	0·35
Total nitrogen	8·87	8·12	8·47	8·31	7·88	8·05
Insoluble proteids	1·23	1·23	1·17	1·12	1·02	0·98
Coagulable proteids	0·68	0·64	0·38	0·46	0·42	0·47
Proteoses	15·49	14·39	11·41	10·21	11·81	11·49
Peptone-like bodies and polypeptides	5·40	6·27	9·80	10·45	10·69	10·99
Total meat bases	14·00	12·40	12·98	13·48	11·17	11·21
Kreatin and Kreatinin	6·60	3·90	5·52	5·40	4·16	3·97
Purin bases	1·24	0·46	0·86	1·03	1·26	1·84
Other meat bases	6·16	8·04	6·60	7·05	5·75	5·40
Ammonia	0·90	0·66	0·82	0·52	0·64	0·75
Chlorine	2·52	3·07	1·87	2·71	2·68	3·05
Phosphoric acid	6·24	5·29	5·54	4·60	5·24	5·58
Potash	7·60	7·80	6·76	8·32	8·14	7·92

The following table shows the percentage composition of the mineral salts of the extracts examined:—

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Insoluble matter	1·02	0·88	1·32	0·82	1·12	0·24
Iron oxide	0·30	0·28	0·24	0·19	0·41	0·22
Calcium oxide	0·28	1·12	1·24	0·82	1·37	0·94
Magnesia	1·34	0·76	0·27	1·13	0·88	1·04
Potash	39·98	39·98	40·81	41·53	38·21	36·74
Soda	7·24	8·10	6·52	10·32	12·12	9·25
Sulphur trioxide	2·76	1·92	2·24	2·40	3·04	2.08
Phosphoric acid	32·82	27·11	33·48	22·96	24·60	25·91
Chlorine	13·25	15·73	11·27	13·52	12·54	14·16

Peptone-like substances and polypeptides so described in this paper correspond with the nitrogen usually determined as, and attributed to, peptones, but as the filtrate from the zinc sulphate precipitate furnished negative results when submitted to the biuret test, it is apparent that no natural peptones are present in the meat extracts examined. Other investigators have noted similar results. While natural peptones are excluded, it is probable that the nitrogen found in this determination is largely due to the non-biuret-reacting polypeptides of Fischer,[*] these substances being intermediate between the peptones and the amino acids.

The peptone-like substances are bitter in taste, and it has been found that in meat extracts which have a decidedly bitter or "burned" flavour, there are invariably present relatively large amounts of these compounds, and it is the "burned" flavour which valuers in London note when complaining of the taste of meat extract. In the six extracts examined in the present investigation it is noted that as the proportion of peptone-like substances increases, the relative value decreases; also that on the whole as the proportion of meat bases increases so the value of the extract increases.

Meat extracts containing low amounts of peptone-like substances are lighter in colour than those with high contents of these substances, and this again is a favourable condition to which some importance is attached by the valuer.

The presence or absence of a "burned" taste in meat extract is a factor of special importance in valuing this material, and the results of this investigation show that such flavour is due to the peptone-like compounds.

In the opinion of the author the presence of peptone-like substances in relatively large amounts is due to prolonged heating of the extract liquor at high temperatures, for an extract liquor rapidly concentrated under vacuum at low temperatures is found to contain but little of these compounds.*

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[*] U.S. Dept. of Agric., Bureau of Chem., Bull. 107, p. 115.
[†] *Ibid.*
[‡] J. Amer. Chem. Soc., 1906, **28**, p. 1485.
[§] U.S. Dept. of Agric., Bureau of Chem., Bull. 107, p. 9.
[‖] U.S. Dept. of Agric., Bureau of Chem., Bull. 90, p. 139.
[¶] Z. Physiol. Chem., 1904, **41**, 223.
[**] U.S. Dept. of Agric., Bureau of Chem., Bull. 107, pp. 3, 4, and 11.

[*] Untersuchungen über Aminosäure, Polypeptide, und Proteine, p. 23.

The characteristic salts of meat extracts in which no added sodium chloride is present are potassium dihydrogen phosphate and potassium monohydrogen phosphate; potassium chloride is also present in relatively large amounts, sodium chloride is a minor constituent of true meat extract.

Owing to the varied nature of the meats used in meat extract manufacture, the ratio of potash to the other mineral constituents shows great variation: this also applies to the ratio of the other mineral constituents to one another. For permission to publish these results the author desires to express his thanks to the Christchurch Meat Company, Limited, in whose chemical laboratory most of the work in connection with this investigation was carried out.

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* Trans. N.Z. Inst., 1910, **43**, pp. 7, 8.

Discussion.

The Chairman drew attention to the variation in the ratio of lime to magnesia in the different analyses: in No. 3 the lime greatly exceeded the magnesia, while in No. 1 the position was reversed. He asked whether, owing to the large proportion of phosphate present, there might not be some error in these determinations.

The Author wrote in reply that he believed his analyses were correct, and that analyses published by the U.S. Bureau of Chemistry showed similar variations.

Journal and Patent Literature.

Patent Specifications may be obtained by post by remitting as follows:—

English.—8*d*. each, to the Comptroller of the Patent Office, W. Temple Franks, Esq., Southampton Buildings, Chancery Lane, London, W.C.

United States.—1*s*. each, to the Secretary of the Society.

French.—1 fr. 05 c. each, as follows: Patents dated 1902 to 1907 inclusive, Belin et Cie., 56, Rue des Francs Bourgeois, Paris (3e.); Patents from 1908 to date, L'Imprimerie Nationale, 87, Rue Vieille du Temple, Paris.

German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

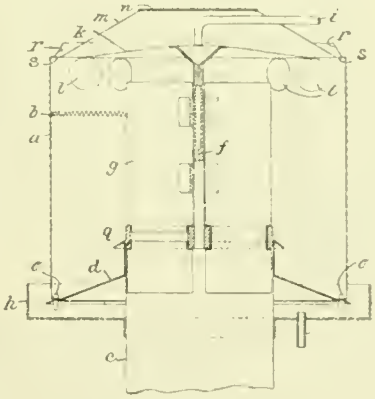
Separation and grading of solids suspended in liquids; New process for the ——. W. J. Gee. J. Roy. Soc. Arts, 1912, 60, 274—287.

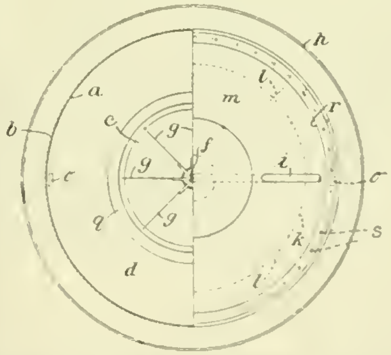
The author gives a description, with illustrations, of his centrifugal apparatus for the separation and grading of solids suspended in liquids (see Eng. Pats. 4155 of 1907 and 21,421 of 1909; this J., 1908, 227; 1910, 1239), and also of an apparatus specially designed for ore concentration. The former apparatus is stated to be applicable to the grading of China clay and other clays, whiting, fullers' earth, mineral pigments, Tripoli powder, pumice, emery, etc., and for separating fibrous matter from the effluents of paper mills, clarifying effluents from collieries, and possibly removing part of the mineral matter from waste coal. In the ore-concentrating machine, a number of longitudinal radial vanes rotate within a rapidly rotating drum; by means of the vanes the water within the drum is caused to rotate at a higher speed than the drum itself, but in the same direction. The heavier ore particles are deposited on the drum by centrifugal force, whilst the lighter particles, owing to their smaller inertia, are carried away by the water. The machine is stated to work very economically and to give good results with "slimes," this being of considerable advantage, since very fine grinding is essential for effecting mechanical separation of the ore particles from the particles of gangue.—A. S.

Patents.

Liquids and gases or vapours; Apparatus for producing interaction between ——. J. A. Hart, Blackburn. Eng. Pat. 29,391, Dec. 17, 1910.

One form of the apparatus is shown in the diagram. The cylindrical shell, *a*, supported on the top of the pipe, *c*, by means of the conical tray, *d*, is formed of thin sheet metal provided all over with a large number of small apertures, as shown at *b*; these apertures are staggered in rows and designed to cause the gas to enter tangentially, the construction employed being to punch hood-shaped projections in the metal. By means of a fan acting on the pipe, *c*, the gas or air is drawn into the apparatus through the perforations in such a manner that a whirling motion is set up in the cylindrical casing. Water or other liquid passes by the pipe, *i*, into the cup in the centre of the plate, *k*, which is supported at *f*, so that it can rotate. The whirling gas acting on the vanes, *l*, brings about the rotation, whereby the liquid is distributed in a thin layer over the inner walls of the perforated cylinder: the liquid may, in addition, be introduced through holes, *s*, in the circular channel, *r*. Intimate contact is effected between





the incoming gas and the liquid, any spray which may be formed being centrifugally thrown again on to the walls by the gas. A number of stationary vanes, *g*, are provided to check the rotation of the gas before it enters the pipe, *c*. The liquid after being used passes through the holes, *o*, and collects in the tray, *h* ; a flange, *q*, may be employed to prevent accidental splashing of liquid into the gas exit pipe. The cover of the apparatus consists of a conical metal part, *m*, and a glass inspection plate, *n*. Some modifications are :—the use of several concentric perforated cylinders : the rotation of the perforated cylinder, either by power supplied from without or by the turbine action of the gas on the perforations, so that a recirculation of the liquid may be produced ; the arrangement of the gas exit pipe at the top ; and the use of a surrounding casing of volute shape to force the gas into the apparatus.—B. G. McL.

Filtering apparatus [*cleansing mechanism*]. W. Paterson. London. Eng. Pat. 146, Jan. 3, 1911.

A SHORT distance above the circular vessel containing the filtering medium, and attached to the lower end of a central vertical shaft, are two horizontal radial arms, provided with a number of agitating blades. The latter may be caused to assume a vertical position, and in so doing they penetrate the filtering medium, or by means of screw gear at the ends of the horizontal arms, they may be caused to assume a horizontal position clear of the filtering medium. The cleansing is effected by reversing the direction of the flow of liquid through the filter, the agitating blades being lowered and rotated so as to stir up the medium ; these raking blades may be hollow and perforated near their ends so that a current of air may be forced through the filtering medium to aid the agitation, suitable connections being made for conveying the air down the central shaft and along the horizontal arms.—B. G. McL.

Shaking or tumbling barrels and the like. F. C. Sharp, Wolverhampton. Eng. Pat. 560, Jan. 9, 1911.

IN an apparatus for cleaning, burnishing, polishing, drying, etc., of metallic articles, consisting of a containing vessel of hexagonal section which is capable of being rotated, the containing vessel is suspended by pivots attached to its sides to a rotating frame in such a manner that the geometrical axis of the vessel may coincide with the axis of rotation or may be given any desired degree of inclination thereto ; clutches or thumb-screws hold the vessel in the desired position in the frame. One end of the vessel is provided with a removable lid and a compartment or additional chamber may be employed for the isolation of the liquid polishing material.—B. G. McL.

Metals and liquids or the like ; Means for treating —— by heat. W. A. Bone and J. W. Wilson, Leeds, and C. D. McCourt, London. Eng. Pat. 625, Jan. 10, 1911.

THE patent relates to the internal heating of masses of metals, etc., by means of an explosive mixture of gaseous fuel and air, the combustion of which is effected in "burners" adapted to be placed in and withdrawn from the material under treatment. The "burner" or heating element comprises a cylindrical casing or combustion chamber packed with granular refractory material and provided at the lower end with a fireclay plug or nozzle communicating with a supply pipe for the gaseous mixture. The latter is supplied to the combustion chamber at a velocity greater than the speed of back-ignition of the mixture, the combustion being effected practically without flame. A "torch," constructed and operated upon the same principle as the "burners," is employed for convenience in effecting the ignition of the latter. (See also this J., 1912, 61.)—W. E. F. P.

Furnaces ; Impts. connected with ——. J. Sackett, Charlton, Kent. Eng. Pat. 671, Jan. 10, 1911.

A FURNACE is described in which a mixture of equal parts of oxygen and nitrogen is heated by the combustion of a mixture of a preheated hydrocarbon gas with a small percentage of the oxy-nitrogen mixture until it reaches the temperature of ignition of the oxy-nitrogen mixture, when it produces a flame of the greatest calorific power. The supply of the hydrocarbon may then be reduced and finally cut off.—A. H. C.

Gas crucible and like furnaces. H. J. Yates, Birmingham. Eng. Pat. 3640, Feb. 13, 1911.

IN a furnace of the type heated with a gas and air burner from below, the crucible chamber is surrounded by an annular space through which the hot gases are conducted from the chamber to the chimney. Upon one side of the furnace the annular space is enlarged to form a preheating chamber for the material which is to be subsequently fed into the crucible, this chamber being provided with an exterior door. The lower end of the crucible chamber is closed by a counter-weighted cover or flap valve which, lowered by the weight of any material escaping from the crucible, allows the same to pass into a tray beneath, thus preventing the air and gas apertures from becoming choked and avoiding loss of the material under treatment. —W. E. F. P.

Dry-kiln. C. A. Wenborne, Chicago, Ill. U.S. Pat. 1,014,190, Jan. 9, 1912.

THE drying chamber has an air-heating chamber on one side and an air-cooling chamber on the other side. The partitions between the drying chamber and the cooling and heating chambers are formed of horizontal slats spaced apart. The air-heating chamber is provided with heating coils and the cooling chamber with cooling coils. The cooling chamber is connected with the heating chamber by a passage beneath the drying chamber and the air circulates from the heating chamber horizontally across the drying chamber to the cooling chamber, and becoming cooled sinks in that chamber and returns through the passage below to the heating chamber, where on becoming heated it rises again.—W. H. C.

Centrifugal separating machines ; Continuous ——. A. R. Robertson, Glasgow. Eng. Pat. 2925, Feb. 6, 1911.

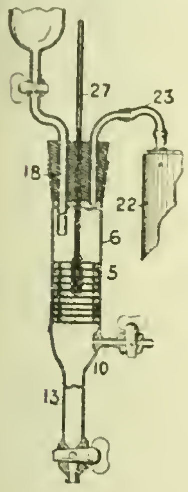
THE apparatus comprises a stationary vertical cylindrical casing provided with a central rotating shaft to which are attached six frames disposed symmetrically round it ; on each of these frames are a number of rollers disposed so as to support the baskets in which the separation is effected. The baskets consist of cylindrical perforated drums open at both ends and having a supporting flange projection at the top. They are inclined in such a manner that if their axes were produced downwards they would intersect the central vertical axis Each basket, in addition to rotating around the central shaft, is rotated about its own axis by means of gearing which operates on a cog-ring round the lower end, each gearing driving two adjacent baskets. Surrounding the central shaft is a conical charging hopper leading to a chamber rotating with the frames and situated somewhat below the level of the lower end of the baskets ; from this chamber hollow arms extend upwards into each of the lower ends of the baskets to a point close to that part of the periphery furthest from the central shaft. The material to be treated is fed into the central hopper and passes down into the rotating chamber, from which it is thrown by centrifugal force through the hollow arms on to that part of the lower surface of the basket which is furthest from the central shaft. Here, due to the main rotation, the liquid passes through the basket perforations, and is suitably collected from the lower part of the casing. When the basket has made one-half rotation about its own axis, the material on the part now nearest the shaft has been raised slightly owing to the inclination of the basket, and is thrown laterally across on to that part of the wall now farthest away from the shaft, reaching it at a point nearer the upper open end : in this way the material progresses upwards through the basket, and is finally thrown out at the top over the flange into a channel whence it can be removed. A stationary pipe with perforations for water or steam is placed between the hopper and the baskets, and may be employed for keeping the perforations in the latter from becoming blocked. An alternative method consists in imparting oscillatory motion to the baskets by

means of a concentric, in which case it is only necessary to have a basket segment sufficiently inclined to effect the progression upwards. The apparatus is driven from below by two Pelton water wheels running at different speeds. To prevent knocking due to oscillation, the hopper has a spider connecting with a journal on the central shaft and is attached to a cover capable of lateral movement, so that it oscillates with the baskets. The relative speeds of the two rotations may be so proportioned that the material remains in the baskets subjected to a given centrifugal force for any desired length of time.
—B. G. McL.

Drying apparatus comprising stirring and conveying blades. H. Zellner, Berlin. Eng. Pat. 11,198, May 9, 1911.

The claim is for forming the arms which support the stirring blades in two halves bolted together upon the shaft. The arms are made very thin in the longitudinal direction of the apparatus to enable a high speed to be maintained. The blades are fastened upon the arms and the latter upon the central shaft by nuts and bolts to allow of adjustment and easy removal and replacement.
—W. H. C.

Evaporation of liquids; Apparatus for measuring the ——. N. H. Freeman, Boulder, Colo. U.S. Pat. 1,014,139, Jan. 9, 1912.



The liquid to be evaporated is introduced through the tube, 18, into the vessel, 6, and is distributed over the porous diaphragms, 5. The receiver is connected by the pipe, 23, with an aspirator, 22, so that the air which enters the apparatus through the side tube, 10, can be measured by the amount of water flowing out of the aspirator. The temperature is measured by the thermometer, 27, and any excess of liquid collects in the lower constricted part, 13, which is graduated so that the excess can be measured.
—W. H. C.

Evaporating-pan. R. G. Hamilton, Tryon, N.C. U.S. Pat. 1,014,468, Jan. 9, 1912.

The main body of the pan is formed of one sheet of metal which has a series of parallel crimps on the sides and bottom. The crimps serve to support a series of baffles, placed within the vessel, and provided with flanges which are gripped by the crimps.—W. H. C.

Vacuum pans; Separator for ——. G. M. Newhall, Philadelphia, Pa. U.S. Pat. 1,015,629, Jan. 23, 1912.

A separating chamber arranged between the heating chamber of a vacuum pan and the vapour outlet is provided with a concentric series of perforated cylindrical walls, or screens, through which the vapour passes radially outwards. Liquid is thus separated from the vapour by capillary action at the screens.—A. T. L.

Heat of distillation; Process of utilising waste ——. F. Shuman, Philadelphia. U.S. Pat. 1,014,418, Jan. 9, 1912.

The vapour issuing from the still is condensed in two stages, the volume of condensing agent used in the first stage being less than that used in the second stage. The heat absorbed by the condensing agent used in the first stage is utilised by causing the escaping fluid to pass through a coil in a vessel containing a liquid having a lower boiling point than that of the condensing agent. This liquid is vapourised and the vapour is used in a suitable engine.—W. H. C.

Separator for removing gas from oil or other liquids. E. V. Bray, Assignor to R. S. Haseltine, Coalinga, Cal. U.S. Pat. 1,014,943, Jan. 16, 1912.

The apparatus consists of a cylindrical casing having a conical lower portion. The upper part of the casing has a number of conical screens or partitions, upon which the gas impinges, and deposits the liquid, which collects in the lower portion of the casing. At the bottom of the casing a valve is arranged connected by a hollow rod with a float which is situated within an inner casing below the screens. The float is provided with an overflow so that should the liquid not lift the float and valve, it can escape, after reaching a predetermined level. The lower portion of the casing is provided with a steam coil.—W. H. C.

Separating finely distributed substances from coarse or foreign admixtures by sliming or elutriation; Process for ——. G. B. Schwerin, Frankfort on Maine, Germany. Eng. Pat. 2379, Jan. 30, 1911. Under Int. Conv., Jan. 31, 1910.

See Fr. Pat. 429,310 of 1911; this J., 1911, 1299.—T. F. B.

Filter presses. C. W. Merrill, Berkeley, Cal., U.S.A. Eng. Pat. 2800, Feb. 3, 1911.

See Fr. Pat. 431,106 of 1911; this J., 1912, 16.—T. F. B.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Gas producers for gasifying coke breeze. Meyer. J. Gasbeleucht., 1912, 55, 73—80.

The waste coke from ovens and retorts, and also the waste taken from locomotive fire-boxes, can be used in suitable gas producers. In connection with one railroad, thirteen producers have been installed, of 100 to 500 H.P., using the material taken from the fire-boxes. The average grading of this fuel is 3 to 5 mm. cube, and 0·8 kilo. is required per H.P.-hour. This material was formerly used on the permanent way. The finest material which could be used graded as follows:—Over 6 mm., 2 per cent.; from 6 mm. to 2·5 mm., 18; from 2·5 to 1·5 mm., 22; under 1·5 mm. 58 per cent. Coke breeze from gasworks, if not too fine, can be gasified in an ordinary producer. One example of such a fuel graded as follows:—Over 13 mm., 9 per cent.; from 10 to 13 mm., 11·6; from 8 to 10 mm., 25·7; from 6 to 8 mm., 11·6; from 4 to 6 mm., 12·5; from 2 to 4 mm., 13·1; and under 2 mm., 16·4 per cent. The heat value was 5100—5900 calories per kilo.; moisture, 14 to 22 per cent.; ash, 15 to 19 per cent. With smaller fuel than this, continuous working cannot be guaranteed in an ordinary producer, because the fuel bed cannot be of the full depth without causing undue resistance, hence the removal of clinker cannot be effected without disturbing the whole of the incandescent zone. A fuel grading chiefly 8 to 6 mm. can be used in a producer with a rotating conical grate in an annular water-trough sealing the lower end of the producer, particularly if an excess of steam is used so as to make a producer gas rich in hydrogen. For a smaller fuel than this, a special producer having a chain-grate has been used. This producer has also given good results with brown-coal briquettes. Another producer is constructed on the lines of a blast-furnace, the blast being increased sufficiently to melt the clinkers. In this producer, however, a good deal of the small fuel is carried away with the gas. The producer used for the finest fuel, including that from locomotive fire-boxes, comprises a chamber of large sectional area, with a conical cap or hood in the centre of the fuel chamber forming a gas outlet space at about the centre of the height of the producer. The lower part of the producer chamber is of inverted conical shape, and comprises a stepped grate which can be kept free from clinker by poking, and is of large area so that a disturbance of the fuel bed at one point does not disturb the working. The hot gases generate low-pressure steam in a vapouriser, at a pressure of 1 to 1·5 m. water column, and this steam is introduced into the ash-pit through an injector, so that the proportions of air and steam are not disturbed by opening the clinkering doors. When the coke-breeze is not free from tar, the gas is drawn through a tar-extractor by means of an exhauster, and a by-pass is provided to the tar-extractor and exhauster. By regulating a valve in this by-pass, the suction at the inlet to the exhauster is kept constant, so that at reduced loads the gas is drawn through the extractor as rapidly as at full load, and is as efficiently scrubbed.—A. T. L.

Petroleum oil; Catalytic formation of ——. C. Engler and E. Severin. Z. angew. Chem., 1912, **25**, 153—158.

Sabatier, Senderens and Mailhe have shown the catalytic influence of various metallic oxides upon the decomposition of alcohols and fatty acids (this J., 1909, 45; 1910, 489, 814), whilst Hviid (this J., 1911, 121) concluded that petroleum hydrocarbons were produced by the catalytic action of silicious earth upon fats. In the authors' opinion, however, although such catalytic agents promote the decomposition and cause it to proceed at a lower temperature, it is not justifiable to regard them as the essential cause. Thus, for example, when crude oleic acid was distilled by itself during three hours and with the addition of various catalytic agents at a temperature above 370° C., the following results were obtained :—

	Oleic acid alone.	Oleic acid, 10 grms. + kieselguhr, 2·5 grms.	Oleic acid, 10 grms. + sand, 40 grms.	Oleic acid, 10 grms. + fuller's earth, 30 grms.	Oleic acid, 10 grms. + quartz powder, 40 grms.
Yield, per cent..	61·25	38	47	38	27·5
Sp. gr. at 15° C. .	0·8226	0·8696	0·867	0·8734	0·8686
Acid value	19·50	66·70	59·85	11	23·50
Coke, per cent...	2·90	2·0	2·20	5·50	2·10
Loss, per cent. .	3·35	3·0	13·80	11·50	15·90

In each case the distillates were mobile fluorescent liquids. Distillation began at 210° C. in the presence of fuller's earth, at 260° C. with the kieselguhr, at 315° C. with the sand and quartz, and at 340° C. with the oleic acid by itself. If, therefore, catalytic action played a principal part in these distillations it must have had some other explanation than the formation of a soap as an intermediate product, for this is out of the question in the case of pure silica. Fractional distillation of these different distillates, and elementary analyses of the fractions after treatment with potassium hydroxide and with sulphuric acid showed that the hydrocarbons of lower b.pt. contained a relatively larger proportion of paraffin hydrocarbons, whilst the other fractions apparently consisted, in the main, of naphthenes or other hydrocarbons still poorer in hydrogen. From these and analogous experiments with stearic acid and stearin, the authors conclude that the factors of temperature, pressure and time are sufficient to account for not only the transformation of organic residues into petroleum oil, but also the production of the different types of petroleum products, even in the absence of any catalytic agents. This view is supported by the results obtained by Ipatiew (this J., 1911, 1367) in the polymerisation of hydrocarbons at high temperatures and pressures.—C. A. M.

Mineral oils; Changes in the asphaltic constituents of dark-coloured ——. G. Meyerheim. Chem. Rev. Fett Ind., 1912, **19**, 28—29.

The increase which takes place in the asphaltic constituents of mineral oils (Holde, this J., 1909, 831), has been shown by Schreiber (this J., 1910, 202) to be caused by oxidation. The author has previously found (this J., 1910, 617) that radium rays have no perceptible influence in increasing the proportion of asphaltum, but his further experiments have shown that exposure of an oil to diffused daylight causes an increase in the amount of asphaltum insoluble in petroleum spirit. Analogous results were obtained by exposing oils to the ultra-violet rays of a mercury vapour lamp. On the other hand with the exception of one oil in diffused daylight the amount of asphaltic constituents insoluble in alcohol-ether was slightly reduced by exposure to either form of light.—C. A. M.

Patents.

Spent bark or analogous material; Method of utilising —— *as fuel.* G. M. Conway, Milwaukee, Wis. U.S. Pat. 1,013,988, Jan. 9, 1912.

The material is burned in a continuous sheet on an inclined grate and well agitated to remove the incombustible matter. The products of combustion and light hydrocarbon gases are caused to pass over an ignited bed of coal separated from the other fuel by a partition. The heavier hydrocarbon gases from the coal mingle with the lighter ones from the waste material and are burned together after being mixed, preheated, slightly compressed and mixed with a suitable quantity of air or oxygen.
—W. H. C.

Coal briquette and process of forming the same. W. W. Langdon, Assignor to Baker and Baker, Walla Walla, Wash. U.S. Pat. 1,015,033, Jan. 16, 1912.

The finely powdered coal, after being dried until the moisture it contains has been reduced to below 3 per cent., is mixed with oil and finely divided pitch. A "water-mixed paste" is subsequently added to the mass and the whole formed into briquettes. The pitch acts as a binding and waterproofing agent, and the "water-mixed paste" as a binder both in conjunction with the pitch and also after the latter has become softened in the fire.—W. H. C.

Gas-producer. C. M. Garland, Collingswood, N.J., Assignor to Camden Iron Works, Camden, N.J. U.S. Pat. 1,014,385, Jan. 9, 1912.

The claim is for the combination of two co-axial, superimposed, gas-generating chambers, the centre of the bottom of the upper chamber being connected with the centre of the top of the lower chamber by a valved pipe. By this means both gas and partially gasified fuel can be passed from the upper to the lower chamber. The gas generated is taken off through a pipe from the upper part of the lower chamber. The gas pipe has a branch provided with a valve which communicates with the pipe connecting the generators above the valve, so that when the latter is closed, and the valve in the gas pipe opened, gas can be discharged from both chambers at once.—W. H. C.

Gas-producer. C. Rorabeck, Newark, N.J. U.S. Pat. 1,014,522, Jan. 9, 1912.

The grate of the producer is circular and is so mounted that it can be rotated. A cylinder is mounted upon the grate so as to be rotated with it. The cylinder projects upwards beyond the combustion zone, into the decomposition zone, and has a vertical axial passage way cut through it which corresponds to a similar opening in the grate, which in turn communicates with a horizontal conduit extending beyond the ash-pit. The fuel is fed into the furnace through this conduit and is discharged into the centre of the decomposition zone.—W. H. C.

Gas-producer. W. B. Chapman, New York. U.S. Pat. 1,015,296, Jan. 23, 1912.

The producer which is of the up-draught type, comprises an upper stationary section carrying a fuel hopper, a rotating section below it containing the main body of the burning fuel, a second short stationary section below the rotating section, and a second rotating section containing mainly the bed of ashes. The whole is supported above the ash-pit which is provided with a central vertical blast column from which horizontal arms project in order to assist in agitating the lower part of the fuel column when the lowest section of the producer is rotated. This lowest section carries horizontal ribs which help in sustaining the bed of ashes. The fuel hopper extends downwards into the upper stationary section of the producer and is open at the bottom, and gases are drawn from the interior of this hopper and discharged into the lower stationary section of the producer.—A. T. L.

Gas-generating plant, and method and apparatus for generating gas, steam, and power. H. Foersterling, Perth Amboy, N.J., Assignor to Roessler and Hasslacher Chemical Co. U.S. Pats. 1,015,549 and 1,015,550, Jan. 23, 1912.

(1). Plant for producing gas continuously together with steam in excess of that used in the producer, comprises a gas producer, a separate multi-tubular boiler, and a separate tubular water heater. The upper part of the producer forms a gas-chamber and is surrounded by a water jacket forming a primary water-heater. The water from this jacket passes to the separate water heater and thence to the boiler. The hot gases from the producer pass through the tubes of the boiler and of the separate water-heater in succession.

(2). The upper part of a gas-producer is surrounded by a jacket in which water and air are heated. The hot gases pass first upwards and then downwards through tubes in a separate boiler, and are then scrubbed and used in a gas engine. The air from the jacket of the producer, and a part of the steam from the boiler are used in the producer, and the remainder of the steam is available for use in an engine or otherwise. The exhaust gases from the gas engine are passed first upwards and then downwards through tubes in a second boiler which is fed with hot water from the cylinder jackets, and a further quantity of steam is thus raised.—A. T. L.

Scrubber-washers or the like employed for the purification of gas ; Supporting device for use in horizontal rotary ——. R. and J. Dempster, Ltd. and G. F. H. Beard, Manchester. Eng. Pat. 15,856, July 8, 1911.

Instead of a solid shaft, a hollow buoyant shaft is used, connected at each end with trunnions by which it can be rotated. The liquid helps to support the hollow shaft, to which the brushes are attached.—W. H. C.

Petroleum ; Treatment of ——. B. Hellmann, Rietfontein, Transvaal. Eng. Pat. 475, Jan. 7, 1911.

The petroleum is mixed with one-third of its bulk of dilute sulphuric acid (one part acid to five parts water) and an oxidising agent, in about the proportion of one-fiftieth of the weight of the mixture, is added. The whole mixture is then heated to the boiling point and boiling continued for 15 minutes if lead dioxide is the oxidising agent used, for 30 minutes with manganese dioxide or chromium trioxide, and for 75 to 90 minutes with ferric oxide. In any case the boiling is continued until the petroleum, which from being colourless changes to yellow, ceases to change colour. The product is stated to be non-fluorescent, and to be specifically lighter, more volatile, and to have a more ethereal odour than the original petroleum.

—W. H. C.

Acid sludge from refining petroleum ; Utilising ——. C. I. Robinson, West New Brighton, N.Y., Assignor to Standard Oil Co., Bayonne, N.J. U.S. Pat. 1,014,520, Jan. 9, 1912.

The acid sludge is heated in a still to above 500° F. by which it is decomposed and a mixture of sulphur dioxide and hydrocarbon vapours given off. The mixture is passed through a condenser where the less volatile hydrocarbons are condensed and separated and the gaseous portion is then passed through a sulphur burner. In this way the gaseous hydrocarbons are burned and the sulphur dioxide together with that from the burning sulphur is passed forward to a sulphuric acid plant and transformed into sulphuric acid.—W. H. C.

Coking briquettes ; Method and apparatus for ——. C. Garz, Rixdorf, Germany. Eng. Pat, 2705, Feb. 2, 1911. Under Int. Conv., July 27, 1910.

See Fr. Pat. 425,348 of 1911 ; this J., 1911, 882.—T. F. B.

IIB.—DESTRUCTIVE DISTILLATION ; HEATING ; LIGHTING.

Patents.

Incandescent mantles. A. W. Mathys, London. From Front, G. m. b. H., Berlin. Eng. Pat. 17,492, Aug. 1, 1911.

The fabric is reinforced by providing thickened vertical and horizontal strands, and is impregnated with a solution containing thorium nitrate (70 per cent. oxide), 80 parts ; zirconium nitrate, 4 parts ; oxalic acid, 1 part ; beryllium nitrate, 5 parts ; cerium nitrate, 0·5 part ; and yttrium nitrate, 9·5 parts.—A.T.L.

Distilling wood ; Process of ——. R. Strobach, Prague-Zizkow, Austria-Hungary. U.S. Pat. 1,015,519, Jan. 23, 1912.

See Fr. Pat. 386,424 of 1908 ; this J., 1908, 679.—T.F.B.

III.—TAR AND TAR PRODUCTS.

Light : Chemical action of —— [*on aromatic hydrocarbons*]. *Autoxidations. I.* G. Ciamician and P. Silber. Ber., 1912, 45, 38—43.

A number of aromatic hydrocarbons have been exposed to the action of light in presence of water in sealed flasks filled with oxygen. In course of time most of the oxygen disappeared, and the hydrocarbons were oxidised to the corresponding carboxylic acids. Thus from toluene the main product was benzoic acid together with a little benzaldehyde ; formic acid was also formed. The isomeric xylenes yielded *o*-, *m*-, and *p*-toluic acids, also small quantities of the corresponding aldehydes, formic acid, and terephthalic acid (from *p*-xylene) or *iso*-phthalic acid (from *m*-xylene). *p*-Cymene yielded traces of aldehyde, *p*-cumic acid and methovinylbenzoic acid, $C_3H_5.C_6H_4.CO_2H$. When kept in the dark under otherwise identical conditions, the hydrocarbons were not changed. Nitrotoluene (*o*- and *p*-) remained unaffected on exposure to light and oxygen. Phenanthrene was also resistant to attack.

—E. F. A.

Patent.

Nitrophenylnitromethanes, their homologues and derivatives, Manufacture of ——. J. Koetschet, Lyons, and A. Barbier, St. Fons, Assignor to Soc. Chimique des Usines du Rhône, ancien. Gilliard, P. Monnet et Cartier, Paris. U.S. Pat. 1,015,496, Jan. 23, 1912.

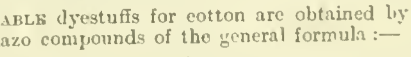
See Fr. Pat. 426,635 of 1911 ; this J., 1911, 981.—T. F. B.

IV.—COLOURING MATTERS AND DYES.

Patents.

Dyestuffs ; [Diazotisable ——.] R. B. Ransford, London. From L. Cassella und Co., G. m. b. H., Frankfort-on-Maine, Germany. Eng. Pat. 488, Jan. 7, 1911.

Diazotisable dyestuffs for cotton are obtained by combining diazo compounds of the general formula :—



$$(HSO_3)_x\text{—aryl}\langle{}^{N}_{NH}\rangle C.C_6H_4.N:N.(m)$$

with azo components which will cause a free diazotisable amino-group to be introduced into the molecule. Example 1 :—*m*-Aminophenyl-1 : 2-naphthiminazole-6-sulphonic acid is diazotised and combined with *p*-xylidine in acid solution. The product dyes cotton in golden yellow shades which when diazotised on the fibre and combined with β-naphthol change to claret. Example 2 :—The same starting material is diazotised and combined with m-aminophenyl-1 : 2-naphthiminazole-3-hydroxy-6-sulphonic acid in alkaline solution. The product dyes cotton in reddish-yellow shades and when diazotised on the fibre and developed with β-naphthol reddish-orange tints are obtained.—J. C. C.

Diazotisable dyestuffs : Manufacture of new ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 5955, March 9, 1911.

Dyestuffs producing green to greenish blue shades on cotton are obtained (1) by combining diazotised acyl-p-phenylenediamines or -1 : 4-naphthylenediamines with a suitable middle component, diazotising the product and combining it with 2-amino-8-naphthol-6-sulphonic acid, diazotising the product and combining it with methylketol and finally saponifying the trisazo dyestuffs thus produced; or (2) by combining diazotised acyl-1 : 4-naphthylenediamines with a middle component, diazotising the product and combining it with 2-amino-8-naphthol-6-sulphonic acid, diazotising the product and combining with a pyrazolone with a free 4-position, and finally saponifying the trisazo dyestuffs thus produced. Instead of the acylamino-compounds used in the first instance, the corresponding nitro-compounds may be used and the nitro-groups finally reduced.—J. C. C.

Azo dyestuffs ; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 8013, March 30, 1911. Addition to Eng. Pat. 12,443, May 21, 1910 (this J., 1911, 612).

The modification of the chief patent consists in using, instead of the nitroamino-compounds therein mentioned, such nitroamino- or monoacyldiaminoazo-compounds as contain the nitro- or acylamino-group in a benzenoid radicle which is combined with the azo complex as a carboxylic or sulphonic acid amide, or in producing the dyestuffs illustrated by Example 1 (below) by acting on the corresponding dyestuffs of the chief patent with nitrophenylacetyl-, nitrophenylcarbonyl- or nitrophenylsulphonyl-halogenides and their derivatives substituted in the phenyl group or in which the nitro-group is replaced by the acylamino-group, and by reducing the nitro-groups or eliminating the acyl radicles from the products thus obtained. Example 1.— m-nitrobenzoyl-2 : 6-tolylenediamine-4-sulphonic acid is diazotised and the diazo solution combined with cresidine in mineral acid solution. The monoazo dyestuff is converted into the symmetrical urea by treatment at 40° C. with phosgene. The nitro-groups are then reduced in alkaline solution with sodium sulphide and the dyestuff collected. It dyes cotton in yellow shades which when diazotised on the fibre and developed with 3-methyl-1-phenyl-5-pyrazolone turn into a yellow tint fast to washing. Example 2.— 3-p-aminophenylacetyl-5-formyldiaminobenzoic acid is diazotised and combined with acetyl-m-phenylenediamine and the product treated with phosgene. After eliminating the formyl groups the resulting dyestuff dyes cotton in yellow shades which can be developed as in Example 1.—J. C. C.

Azo dyestuffs and process of developing them on the fibre ; Manufacture of new ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 9433, April 18, 1911.

One molecule, or two molecules of the same or of different diazo-azo-compounds, free from amino- or hydroxy-groups, may be combined with one molecule of 2 : 2′-dinaphthylamine-5 : 5′-dihydroxy-7 : 7′-disulphonic acid. The dyestuffs produced, after being dyed on cotton, may be treated with diazotised nitroanilines. Example :— 452 parts of p-nitrobenzene-o-sulphonic acid-azo-1-naphthylamine-7-sulphonic acid are diazotised and added to an alkaline solution of 461 parts of 2 : 2′-dinaphthylamine-5 : 5′-dihydroxy-7 : 7′-disulphonic acid. The dyestuff is isolated in the usual way. Cotton is dyed in blue shades which on treatment with diazotised p-nitroaniline become deep violet fast to washing.—J. C. C.

Dyestuffs of the triphenylmethane series ; Manufacture of mordant ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 11,083, May 8, 1911.

The dyestuffs are obtained by condensing in the presence of oxidising agents, methylenedisalicylic acid or its symmetrical homologues with such derivatives of salicylic acid as possess a free para-position with respect to the hydroxy-group and one or two methyl or halogen radicles in the meta-position to the hydroxy-group. The operation may also be carried out by condensing the components first to the leuco-acid and then oxidising the product, or the corresponding formaurinedicarboxylic acids may be condensed with the derivatives of salicylic acid and the products oxidised. Example :— 23·7 parts of methylene-di-o-cresotinic acid and 13·7 parts of s-xylenol-o-carboxylic acid ($OH : CH_3 : CH_3 : CO_2H = 1 : 3 : 5 : 2$) are stirred at 20°—30° C. with 320 parts of sulphuric acid and the necessary quantity of nitrite until the evolution of nitrous fumes ceases and the quantity of the dyestuff produced no longer increases. The product is poured on ice and the dyestuff filtered off. It gives bluish violet shades on chrome-mordanted wool. A table is given showing the properties of analogous dyestuffs produced by this method.—J. C. C.

Dyestuffs of the triphenylmethane series ; Manufacture of ——. H. Imrie, London. From Anilinfarben und Extract-Fabriken, vorm. J. R. Geigy, Basel, Switzerland. Eng. Pat. 10,335, April 28, 1911.

The dyestuffs are produced by condensing 2 : 6-dichloro-4-dimethylaminobenzaldehyde with salicylic or o-cresotinic acid and oxidising the resulting leuco-compounds. Example :—10·9 kilos. of 2 : 6-dichloro-4-dimethylaminobenzaldehyde and 15·2 kilos. of o-cresotinic acid ($OH : CH_3 : CO_2H = 1 : 2 : 6$) are dissolved in 100 kilos. of sulphuric acid and stirred at the ordinary temperature for 3—4 hours. The resulting leuco-compound is oxidised by adding a solution of 3·5 kilos. of sodium nitrite in 25 kilos. of sulphuric acid, the temperature being slowly raised to 60° C. When the evolution of nitrous fumes has ceased, the mass is poured into 1000 kilos. of water and the dyestuff is filtered off, converted into its ammonium salt and the solution of the latter evaporated to dryness. The dyestuff produces claret red shades on wool which by treatment with potassium bichromate turns to a brilliant blue. The same colour is produced on chrome-mordanted wool. (Reference is directed to Eng. Pat. 15,204 of 1907 ; this J., 1908, 851.)—J. C. C.

Colouring matters of the anthracene series ; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 8143, March 31, 1911.

See Addition of April 1, 1911, to Fr. Pat. 365,920 of 1906 ; this J., 1911, 1153.—T. F. B.

Mordant dyestuffs ; Manufacture of violet to red ——. A. G. Bloxam, London. From Farbwerke vorm. L. Durand, Huguenin, und Co., Basle. Eng. Pat. 10,523, May 1, 1911.

See U.S. Pats. 1,002,825 and 1,003,257 of 1911 ; this J., 1911, 1204, 1205.—T. F. B.

Colouring matters from nigrosines and from indulines ; Manufacture of deep black water-soluble ——. L. Stange, Berlin. Eng. Pat. 10,635, May 2, 1911. Under Int. Conv., May 24, 1910.

See Ger. Pat. 233,600 of 1910 ; this J., 1911, 678.—T. F. B.

Black [azo] colouring matters ; Manufacture of ——. J. Turner and H. Dean, Huddersfield. U.S. Pats. 1,014,982, 1,014,983, and 1,014,984, Jan. 16, 1912.

See Fr. Pats. 430,289 and 430,321, and Eng. Pat. 8474 of 1911 ; this J., 1911, 1306 and 1246.—T. F. B.

Vat dyestuffs and process of making same. R. Maag, Sindlingen, Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,015,329, Jan. 23, 1912.

See Eng. Pat. 9116 of 1911; this J., 1911, 1204.—T. F. B.

Trisulphonic acid of the safranine series and process of making same. O. Sohst, Assignor to Farbwerke vorm. Meister, Lucius, und Bruning, Höchst on Maine Germany. U.S. Pat. 1,015,354, Jan. 23, 1912.

See Fr. Pat. 426,790 of 1910; this J., 1911, 1110.—T. F. B.

Azo dye. A. Zart, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,015,375, Jan. 23, 1912.

See Eng. Pat. 19,545 of 1910; this J., 1911, 1108.—T. F. B.

Indigo-o-nitrophenyl-lactic ketones; Process of producing ——. J. Koetschet, Lyons, and A. Barbier, St. Fons, Assignors to Soc. Chimique des Usines du Rhône, ancien. Gilliard, P. Monnet, et Cartier, Paris. U.S. Pat. 1,015,495, Jan. 23, 1912.

See Fr. Pat. 421,717 of 1910; this J., 1911, 413.—T. F. B.

Manufacture of new pigment colours. Eng. Pat. 8590. *See* XIII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Wood pulp; New system of alkali boiling for —— and recovery of useful by-products. E. L. Rinman. Svensk Kemisk Tidskrift; through Papierfabrikant, 1912, 10, 39—41, 101—104.

According to the author's experiments the resolution of 1 kilo. of pine wood with caustic soda yields approximately the following products:—oil of turpentine 4·0 grms.; wood spirit 5·0; ammonia and amines ?; resins, resin oils, and fatty oils 7·5; carbon dioxide ?; humus and humic acids 310; humic acids soluble in water, lactones and lactonic acids 200; acetic acid 30; formic acid 30; cellulose 370 grms. Spruce wood yields similar products, but less turpentine oil and resins. The volatile oils and resins recovered from the digestion lyes have been commercial articles for some considerable time. The humus matters are those with weakly acid function which are liberated from their sodium salts by treatment with carbon dioxide; they are precipitated in a granular form by saturating the liquor with carbon dioxide, at a temperature of 75° C. and at a suitable concentration, in presence of a sufficient quantity of sodium chloride and other salts. This precipitate can be washed with water, provided no sodium sulphide be present; the humus matter contains about one-third of its weight of resinous matter, soluble in alcohol, and if heated at 180° C. in presence of a little alkali, a colloidal solution is obtained suitable perhaps for the sizing of brown papers; alternatively the precipitate may be subjected to destructive distillation. The sodium salts of the humus acids are not decomposed by carbon dioxide and are not precipitated by salt; the acids may be liberated and precipitated by neutralising the liquor with a mineral acid; their calcium and barium salts are insoluble in water. The sum of the humus matters and humus acids is very constant, but their relative proportions vary within wide limits. After the removal of the above humus matters and acids, the soluble humus acids may be precipitated by adding lead acetate; the acids obtained by decomposing the lead salts form a pitch-like mass on evaporation, which is then insoluble in water. The lactonic acids are present in the black lyes to the extent of about 500 kilos. per ton of cellulose produced. They contain a very considerable proportion of ordinary lactic acid, besides saccharinic and other hydroxy-acids. An experimental plant has been erected at the Stora Kopparsberg pulp mill; by digesting the wood with caustic liquor containing common salt instead of sodium sulphate, the objectionable smell due to sulphur derivatives is avoided. The humus matters are precipitated in the ordinary lye-evaporators by means of lime-kiln gases containing 25 per cent. of carbon dioxide; the temperature of the lye should be 75° C., and its concentration equivalent to 90 grms. of alkali (as Na_2O) and 40 grms. of sodium chloride per litre. The alkali is recovered from the lye thus purified in the form of bicarbonate by the ammonia-soda process, all the organic acids being combined as ammonium salts. The solution is evaporated *in vacuo* to a syrup, from which, by means of lime, the ammonia is recovered and pure calcium formate and acetate are separated, whilst the calcium salts of the other acids are dried and subjected to destructive distillation. A simpler mode of treatment has also been worked out, according to which the lye is evaporated, mixed with lime or caustic soda and destructively distilled in specially designed retorts in presence of steam at a temperature of 400° C. The fuel-gases thus obtained amount to 400—500 kilos. per ton of cellulose. The acetone spirit amounts to about 100 kilos. and is obtained in the form of a 4 per cent. aqueous solution; it consists of about 50 per cent. of acetone, 25 of methyl-ethyl ketone, and 25 per cent. of ordinary alcohol. Very little wood-spirit is produced. Further, about 100 kilos. of insoluble oils are collected, consisting of higher alcohols and ketones, hydrocarbons, cresols, etc. The charcoal residue contains the alkali if only soda has been used, but if lime has been employed, it is contaminated with calcium carbonate; in the former case filtration is less easy, but the charcoal is more valuable. If the humus matters be first precipitated and removed, the subsequent operations are facilitated, both in the evaporation and the destructive distillation; separation of the humus is preferable but not essential. The cellulose obtained by the new process bleaches about 2 per cent. less easily than sulphate cellulose obtained with similar yield. If 1 per cent. of sodium thiosulphate or sulphide, calculated on the total alkali, be added, the cellulose is identical in quality with sulphate cellulose. In the manufacture of "Kraft" pulp, where less organic matter is extracted from the wood, the salt-soda lye may be used twice over, if the humus matter be removed and sufficient alkali be added between the two digestions.—J. F. B.

Rubber resins for paper sizing. C. Ellis. Papierfabrikant, 1912, 10, 106.

The waste resins derived from the purification of rubber resins, such as Jelutong or Pontianac, although totally unsaponifiable themselves are capable of forming emulsions with rosin soap so that they can be used to replace the free rosin generally present in paper-size emulsions. For instance, 50 parts of Pontianac, 5 parts of Guayule resin wastes and 50 parts of ordinary rosin are melted together to form a uniform mixture, and a hot solution of 10 parts of caustic potash in 50 parts of water is then stirred in. The emulsions prepared in this way are stable even when largely diluted and are completely precipitated by alum. These waste resins may also be emulsified with other colloids, for instance, 2 parts of glue, 1 of starch, 4 of Jelutong resin and 10 of water give a pasty emulsion which can be diluted for use as a size. It is claimed that these unsaponifiable resins do not deteriorate under the action of light like ordinary rosin size.—J. F. B.

Patents.

Artificial silk and like products; Manufacture of ——. Palatine Artificial Silk Yarn Co., Ltd., Manchester. From G. Ditzler, Verviers, Belgium. Eng. Pat. 9336, April 15, 1911.

In order to avoid the oxidation of the cellulose, the operation of dissolving it in an ammoniacal solution of copper oxide and the subsequent manipulation of the solution up to the coagulating process are carried out *in vacuo*, in an inert atmosphere, or in the presence of an inert isolating liquid.—P. F. C.

Viscose: Process for coagulating ——. J. E. Brandenberger, Thaon-les-Vosges, France. Eng. Pat. 24,045, Oct. 30, 1911. Under Int. Conv., Jan. 16, 1911.

The viscose is coagulated by treatment with soluble thiosulphates, such as those of potassium, sodium or ammonium, the coagulating action being accompanied by a purifying action, due to the solvent action of the thiosulphates on the alkali polysulphides, which form impurities in the viscose; the speed of coagulation is increased by raising the temperature.—B. N.

Metallic coated or foil covered paper, cardboard, and the like. The King's Norton Metal Co., Ltd., T. A. Bayliss and H. W. Brownsdon, London. Eng. Pat. 2648, Feb. 2, 1911.

The edges or other parts of metal-coated papers are united with a metallic soldered joint by first coating one or both papers with an alloy which softens and becomes pasty before it melts, the melting point of the alloy being below the charring temperature of the paper. Heat and slight pressure are then applied to the uncoated sides of the papers. One of many alloys given for this purpose is composed of two parts of lead and one part of tin. If it is desired to fasten the metal-coated paper to a metal, the latter must first be "tinned" with a suitable alloy of low melting point.—P. F. C.

Fibrous material for paper-making, textiles, and other purposes: Production of ——. V. Drewsen, Brooklyn, N.Y., U.S.A. Eng. Pat. 5157, March 1, 1911.

See U.S. Pat. 996,225 of 1911; this J., 1911, 950.—T. F. B.

Cellulose acetate composition and process of making the same. Plastic similar to celluloid and manufacturing the same. A. Eichengrün, Berlin. U.S. Pats. 1,015,155 and 1,015,156, Jan. 16, 1912.

See Fr. Pat. 412,797 of 1910; this J., 1910, 1005.—T. F. B.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Dyeing; Theory of ——*; colour and molecular state of picric acid.* W. P. Dreaper. Chem. Soc. Proc., 1911, **27**, 244.

Picric acid in the anhydrous state is probably colourless. In the presence of moisture it is yellow, and possibly then has a quinonoid structure. In continuation of a previous investigation into the relative inhibiting action of fibre colloids on this colour change (Dreaper and Stokes, this J., 1909, 137), the action of toluene on picric acid when present within the fibre area has been examined. The experimental results indicate that even in the case of cotton, although the change to the colourless type takes place readily in the presence of dehydrating agents, yet the presence of toluene will not bring about this change, in spite of the known fact that picric acid has little affinity for vegetable fibres in the presence of water; also, that under certain conditions picric acid in the yellow state will be adsorbed by cotton from a colourless toluene solution.

Patents.

Soda-lye rendered impure by the mercerisation process; Process for purifying ——. M. Petzold, Zittau, Germany. Eng. Pat. 17,626, Aug. 2, 1911. Under Int. Conv., Dec. 2, 1910. Addition to Eng. Pat. 993 of 1908, dated March 28, 1907 (this J., 1908, 1017).

The waste lye containing size is treated with a mixture of lime, clay and an agent for effecting flocculation such as sugar of lead (lead acetate).—P. F. C.

Wool; Production of blue shades on ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 14,901, June 26, 1911.

The new dyestuff, 4-methyl-1-hydroxybenzene-6-sulphonic-acid-2-azo-β-naphthol, is prepared by combining diazotised 4-methyl-2-aminophenol-6-sulphonic acid with β-naphthol. It produces fast blue shades on wool by dyeing according to the one-bath method in the presence of a chrome mordant.—B. N.

Dyeing-tub. R. B. Mills, Philadelphia, Pa. U.S. Pat. 1,014,243, Jan. 9, 1912.

A dye-vat is provided with a perforated false bottom on which rest one or more vertical partitions extending just above the level of the liquor in the vat and so forming heating chambers within it. A perforated pipe delivers steam into each heating chamber just above the false bottom and thereby produces a continuous overflow of heated liquor from the heating chambers into the dye-vat proper.—P. F. C.

Ageing, steaming and gassing fabrics; Chambers for ——. J. E. Gray, Birch Vale, Derby. Eng. Pat. 13,431, June 6, 1911.

An intermediate plate or steam-box is supported in bearings in the entrance and exit apertures of the chamber, and is loaded with weights or springs, so that in the absence of a fabric it is in constant contact with the bottom lip of the entrance aperture and the top lip of the exit aperture. The entrance and exit apertures may be opened, singly or simultaneously, for the passage of a fabric, thus avoiding loss of steam or waste of heat.—B. N.

Printing-plates; Process for preparing —— *in a grained manner.* H. Strecker-Aufermann, Munich, Germany. U.S. Pat. 1,014,740, Jan. 16, 1912.

See Addition of Dec. 28, 1909, to Fr. Pat. 408,259 of 1909; this J., 1910, 942.—T. F. B.

Manufacture of azo dyestuffs and developing them on the fibre. Eng. Pat. 9433. *See* IV.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Ammonia soda process; The ——. W. Hempel and H. Tedesco. Z. angew. Chem., 1912, **24**, 2459—2469.

The experiments of Fedotieff (this J., 1904, 865) were carried out at 15° C. and at the atmospheric pressure, whilst industrially the process is carried on at 30° C. and at a pressure of 2·8 atmospheres (1·8 above atmospheric). The authors therefore devised an apparatus by means of which salt solutions of various strengths, into which varying quantities of ammonia gas were led, could be saturated with carbon dioxide at 2·8 atmospheres pressure, the temperature being kept constant at 30° C., and the whole be left for some hours with occasional agitation, till equilibrium was certainly established. The contents of the apparatus were then filtered and drained on a Büchner funnel, the precipitate washed three times with sodium bicarbonate solution saturated at 30° C. (all this at a constant temperature of 30° C.), and the precipitate, the mother liquor, and the wash liquors separately examined. There were determined, in the original liquor, chlorine and ammonia; in the mother-liquor, chlorine, ammonia, carbon dioxide, and sodium; in the precipitate, chlorine, ammonia, and carbon dioxide; and in the wash-liquors chlorine and ammonia. The results of nine experiments are tabulated in three tables, the second of which, slightly modified, is given below. In the first is seen that as the ammonia-concentration rises, the percentage of the total chlorine present in the mother-liquor quickly falls from 96 to 85, remains for some time almost constant, and then suddenly falls to 36; very little remains in the washed precipitate at any time, but the proportion in the washing liquors rises as that in the mother-liquor falls. This is caused by the precipitation (and subsequent washing out) of ammonium chloride due to the formation of ammonium bicarbonate. The second table shows the amount of pure sodium bicarbonate precipitated, and the percentage composition of the actual precipitate; also the yield of pure sodium carbonate, expressed in percentage of the total amount equivalent to the salt used and to the ammonia used, in each experiment.

Looking first at the amount of precipitated (pure) bicarbonate, it is seen that this increases up to expt. 7 (1·1 mol. NH_3 : 1 mol. NaCl), then diminishes, partly of course because further increase of ammonia decreases the amount of salt that the original liquor can hold dissolved. Next as to the purity of the precipitate: save in expt. 1, the percentage of sodium chloride is negligible, but the ammonium bicarbonate increases steadily, and beyond expt. 7 so rapidly that its removal would be a commercial impossibility. Again, the proportion of the total salt utilised increases with the ammonia-concentration but the proportion of ammonia utilised diminishes. So far as these factors are concerned, the most advantageous concentration commercially will be determined by the price of salt on the one hand, of ammonia and carbonic acid on the other. The third table shows the percentages of the impurities in the unwashed precipitate which are removed by each successive portion of washwater. The chlorine, whether as sodium or ammonium chloride, since it exists dissolved in the mother-liquor adhering to the precipitate, is rapidly and very completely removed; but the ammonium bicarbonate which is precipitated along with the sodium bicarbonate, especially when there is excess of ammonia used, is much less completely washed out, and can only be removed by calcination. A tenth experiment, with a saturated salt solution (74·7 grms. of ammonia and 280·5 grms. of salt per litre) gave a yield of 271 grms. of pure bicarbonate, with 3·6 per cent. of contaminating ammonium salt, and 0·04 per cent. of sodium chloride, and showed a decomposition of 67·3 per cent. of the salt, or 73·4 per cent. of the ammonia, in the original liquor. Though the actual yield was higher, yet in other respects the results were less satisfactory than in expt. 6. An eleventh experiment, with the same amount of salt in the liquor as in expt. 6, but only 41 grms. of ammonia, gave so greatly reduced a yield (only 165 grms.) as to show that such an initial liquor would be useless industrially. The twelfth experiment was made with a liquor almost identical with that used for expt. 10, but the operations were conducted at 40° C. instead of 30°; the yield was only 228 grms., and the ammonium carbonate impurity almost as high as in expt. 10, so that rise of temperature to 40° C. is disadvantageous. On the other hand, an experiment at 22° C., with a liquor almost identical with that of expt. 5, gave 245 grms. (against 258 in expt. 5); and though the bicarbonate was less contaminated by ammonium salt than that from expt. 5 it contained 0·8 per cent. of sodium chloride, and was moreover so minutely crystalline that it was very difficult to separate from the mother- and wash-liquors.

	1 litre of liquor contained:		Washed precipitate contains:				Yield of $NaHCO_3$ reckoned as percentage on the:	
	NH_3 grms.	NaCl grms.	$NaHCO_3$ grms.	$NaHCO_3$ per cent.	NaCl per cent.	NH_4HCO_3 per cent.	Salt used.	Ammonia used.
1	17·99	291·97	74·13	98·90	0·68	0·42	17·67	83·37
2	57·89	274·66	232·84	97·69	0·033	2·28	59·05	81·37
3	58·21	272·86	234·18	97·66	0·016	2·32	59·78	81·36
4	63·71	270·66	248·76	96·44	0·028	3·53	64·01	73·98
5	72·35	264·92	258·02	96·12	0·037	3·84	67·86	72·25
6	76·52	260·22	269·46	95·80	0·009	4·19	72·13	71·25
7	82·86	257·86	282·08	96·09	0·005	3·91	76·20	68·86
8	133·27	222·56	261·34	75·69	0·014	24·30	82·17	39·67
9	210·31	194·98	218·50	30·52	0·001	69·48	89·60	24·45

Solubility of sodium chloride in ammonia-solutions at 30° C.—In connexion with this work, solubility determinations were made in the same apparatus, and the following table of results is given, the amounts of ammonia (NH_3) and of salt being expressed in grms. and grm. molecules per litre of liquid.

Sodium chloride.		Ammonia		Specific gravity.
grms.	grm.-mol.	grms.	grm.-mol.	
293·38	5·4836	29·535	1·7374	1·1735
292·5	4·9972	40·655	2·3915	1·1656
289·7	4·950	47·26	2·780	1·160
286·5	4·895	60·78	3·575	1·1494
283·38	4·8426	72·07	4·239	1·1406
283·06	4·7943	72·715	4·2773	1·1395
277·49	4·7413	81·855	4·815	1·1301
270·57	4·6123	97·49	5·7348	1·1205

—J. T. D.

Calcium; Some double carbonates of ——. Barre. Comptes rend., 1912, **154**, 279—280.

A double carbonate of calcium and sodium, $CaCO_3$, $Na_2CO_3,2H_2O$, is produced by boiling precipitated chalk with a sufficiently concentrated solution of sodium carbonate for several hours. The salt forms rhombic crystals which are slowly decomposed by water. The double carbonate of potassium and calcium is formed in the same way. It has the composition, $CaCO_3,K_2CO_3$, and forms fine prismatic needles. Both salts are stable in aqueous solutions of the corresponding carbonates.

—F. Sodn.

Alkalis in silicates; Determination of —— by fusion with calcium chloride. E. Mäkinen. Z. anorg. Chem., 1912, **74**, 74—78.

The powdered silicate (0·5 grm.) is mixed with 7 grms. of pure dry calcium chloride in a platinum crucible, which is fitted into a hole in a sheet of asbestos, so that only the lower half may be in contact with the flame, and is heated, at first gently, until all the chloride is melted, and then to full redness (though not with the blowpipe). After 25—30 minutes' heating, when the mass has become more or less solid, the crucible is cooled, and the contents are digested with water in a platinum dish. The insoluble residue is then filtered off and the calcium precipitated by adding ammonia and ammonium carbonate to the filtrate. The precipitate is re-dissolved in hot dilute hydrochloric acid and the calcium again precipitated in the same manner, after which the united filtrates are evaporated to dryness, ammonium salts are expelled, and the residue is dissolved in the smallest possible quantity of water. The last traces of calcium are then precipitated by adding ammonia and ammonium carbonate and allowing to stand for some hours, and finally, after filtering and evaporating, the ammonium salts are expelled, and the residual alkali chlorides weighed.—F. Sodn.

Ferrous oxide in silicate rocks; Determination of ——. M. Dittrich and A. Leonhard. Z. anorg. Chem., 1912, **74**, 21—32.

In accordance with the results of previous investigations (this J., 1910, 1054; 1911, 691, 1209), the determination is made as follows :—0·8—1·0 grm. of the rock. which is not too finely powdered, (with the addition of 0·5 grm. of powdered quartz, in the case of basic rocks) is mixed with 2 c.c. of concentrated sulphuric acid in a platinum crucible. of 30—40 c.c. capacity, the mixture being well stirred with a platinum spatula, 8 c.c. of hydrofluoric acid are added (quickly, in one portion), and the mixture is at once heated on the water-bath until solution is complete, which often occurs in a few minutes. An atmosphere of carbon dioxide is preferably maintained during heating by passing the gas into an inverted funnel placed over the crucible, the stirrer passing through the short stem of the funnel. The hot contents of the crucible are then added to about 100 c.c. of water, containing 10 grms. of pure powdered silica and, preferably, 20—25 grms. of potassium sulphate, to which 2 c.c. of strong sulphuric acid have been added, and, the crucible having been rinsed with boiled water, the whole is, as quickly as possible, titrated with $N/20$ permanganate.—F. Sodn.

Silicates ; Heats of formation of certain ——. D. Tschernobaeff and L. Wologdine. Comptes rend., 1912. **154.** 206—208.

The following determinations were made in the same way as those on cement clinker (this J., 1911, 364), the mixtures being fired with charcoal in a Mahler bomb.

Mixture.	Molecular heat of reaction.
$CaCO_3 + SiO_2$ (sand or rock crystal)	—25·3
$2CaCO_3 + SiO_2$	—56·7
$3CaCO_3 + Al_2O_3,2SiO_2$ (kaolin)	—77·5
$3CaCO_3 + Al_2O_3 + 2SiO_2$	—89·9

These figures differ considerably from those published by Tschernobaeff in 1905. If the heat of decomposition of calcium carbonate be allowed for (42·7 cal. per molecule), the following figures are obtained as the molecular heats of formation of the silicates from the materials shown :—

$CaO + SiO_2$	17·4
$2CaO + SiO_2$	28·7
$3CaO + Al_2O_3,2SiO_2$	50·6
$3CaO + Al_2O_3 + 2SiO_2$	38·2
$Al_2O_3 + 2SiO_2$	—12·4

The heat of formation of kaolin is thus shown to be negative.—J. T. D.

Chromium and aluminium nitrates. M. Z. Jovitschitsch. Monatsh. Chem., 1912, 33, 9—18.

The author has already shown that ignited chromium oxide is soluble, though incompletely, in concentrated nitric acid (this J., 1909, 242). It is now found that the oxide is completely dissolved by heating with nitric acid of 1·4 sp. gr. in a sealed tube for 1½ hours at 170° C. The resulting solution yielded, after a few days, large prisms of the hexanitrate containing only 15 mols. of water instead of the usual 18. The crystals which appear red by transmitted and dark brown by reflected light, are stable in the air if the amount of moisture be not more than 6·5 mgrms. per c.c. of air. The salt can be obtained with only 9 mols. of water by drying the crystals over sulphuric acid till the weight becomes constant and the colour changes to grey. Aluminium nitrates with 15 and 9 mols. of water respectively are similarly obtained ; the former is stable in the air and can be heated to 85° C. with loss of water only. Native alumina (corundum) is scarcely affected by the above treatment, and the method was unsuccessful in the case of strongly ignited ferric oxide. —A. Sbld.

Radium bromide ; Explosion of —— by the action of water. B. Jost. Chem.-Zeit., 1912, 36, 138.

The author reports several instances of small grains of radium bromide bursting into minute particles with explosive violence in the spinthariscope or in the air when the salt was transferred by means of a moistened needle. The phenomenon was only observed in the case of a very pure and old salt and when traces only of water were present.—A. Sbld.

Nitrous oxide ; Synthetic formation of ——. C. Matignon. Comptes rend. 1912. **154.** 203—206.

Both nitrous oxide and nitric oxide are endothermic compounds ; yet, whilst nitric oxide has, since the days of Cavendish, been known to be formed from its elements at a high temperature, there is no record of nitrous oxide ever having been observed to be so produced. With the help of Nernst's formula the author has investigated the thermal conditions for the formation of nitrous oxide, and finds that at 2700° C. and atmospheric pressure, the partial pressure of the nitrous oxide that could be formed would not be more than 1/50000 atm., and even at 3000 atmospheres would be only 3 atm., or 0·1 per cent. of the whole. Even if the maximum amount were formed, and there were no decomposition during cooling, it would thus be hardly recognisable.—J. T. D.

Hydrogen peroxide ; Catalytic decomposition of —— by bichromate. E. H. Riesenfeld. Z. anorg. Chem., 1912, **74.** 48—51.

The catalytic decomposition of hydrogen peroxide by a mixture of potassium chromate and bichromate is not a complex function of the composition of the mixture of the two salts, as has been supposed by Spitalsky (Z. anorg. Chem., 1907, 53, 184), but is found to be the sum of the effects produced by the individual salts, if the conversion of part of the bichromate into chromate, by the potassium hydroxide produced by hydrolysis of the latter, be taken into account. The addition of chromic acid does not affect the catalysis produced by bichromate solutions, and the acid does not itself act catalytically, being converted by the hydrogen peroxide into perchromic acid, which loses oxygen and becomes reduced to a chromic salt.—F. Sodn.

Silicon ; Amorphous ——. L. Cambi. Atti R. Accad. dei Lincei, Roma, 1911, 20, I., 440—442.

The chemically active product obtained by the hydrolysis of the black silicon sulphide previously described (this J., 1911, 83, 1011) is regarded by the author as consisting essentially of a variety of amorphous silicon. A sample containing 96 per cent. of silicon had the sp. gr. 2·08 as compared with about 2·35 for the amorphous silicon of Vigouroux. When heated *in vacuo* for 1 hour at 900° C., the author's bright reddish yellow product was converted into a denser brown substance, much less chemically active, and very similar to the product of Vigouroux. The active amorphous silicon always contains small quantities of hydrogen, and oxygen, probably combined with silicon. (Compare also Wilke-Dörfurt, this J., 1910, 23.)—A. S.

Potash dispute ; Settlement of the ——. Board of Trade J., Feb. 8, 1912. [T.R.]

The settlement of the difference between the United States and German Governments arising out of the application of the German Law of May, 1910, as to the disposal of salts of potash, provides for the withdrawal of all suits in United States courts involving liability for the payment of the potash tax levied by Germany ; for the assignment to the German Potash Syndicate of United States contracts with the independent mines ; for new contracts with the Syndicate covering the whole of the United States potash requirements on a price basis (32·40 dollars per ton) practically the same as that prevailing before the low-price contracts were obtained from the independent mines ; and for the re-entry of the independent mines into the Syndicate.

Sulphuric acid in Russia ; German ——. Chem. Trade J., Feb. 10, 1912. [T.R.]

Of the principal chemical products German competition is much felt in Russia in respect to sulphuric acid and its salts. This is particularly the case with superphosphates. The importation into Russia of the various sulphur compounds has constantly increased of late years, and along with superphosphates (in the first ten months of the year) amounted to 9,375,000 poods. Of this total superphosphates make 9,115,000 poods. The corresponding figures for the years 1910 and 1909 were for the importation of sulphates 7,004,000 poods, and 4,419,000 poods. During the past three years the importation of sulphuric acid has almost doubled. This is especially connected, as far as last year is concerned, with a large over-production of sulphuric acid in Prussian Silesia, as a by-product obtained in the process of roasting zinc ore. Quite recently police measures on behalf of the public health have been strengthened, with the result that zinc ore roasting establishments have been compelled more effectually to save the sulphurous gases and to produce more sulphuric acid than they could find a market for. The quantity of zinc ore roasted has fallen from 413,000 tons in the year 1908 to 390,000 tons in the year 1910; whereas the quantity of sulphuric acid manufactured has risen. Notwithstanding the reduced production of zinc, and that the sulphuric acid was sold very cheaply, it was found impossible to get rid of it all. In order to reduce the stocks, holders erected factories for the production of superphosphates, which used up about 20 per cent. of the sulphuric acid available. The existing necessity for fresh outlets is seen in the increased exports into Russia at exceedingly low prices; besides which the Prussian Government is granting specially low railway tariffs on to 1911 in favour of these products.

Detection of nitric acid in presence of excess of nitrous acid. Sen and Dey. *See* XXIII.

Detection of white phosphorus in presence of hypophosphites and of arsenic. Leclère. *See* XXIII.

Patents.

Ammonia-generator. A. E. Bossé, Pittsburgh, Pa., Assignor to Acme Refrigerating Co., Delaware. U.S. Pat. 1,014,040, Jan. 9, 1912.

The apparatus consists of a horizontal cylindrical casing which contains a cooling coil, arranged centrally, and a heating coil beneath; an inlet pipe for the ammonia gas is also provided at the lower part and an outlet pipe communicates with the upper part of the casing.
—F. Sodn.

Ammonia-still. H. S. Davis, Assignor to D. E. Knowlton, Buffalo, N.Y. U.S. Pat. 1,015,145, Jan. 16, 1912.

An ammonia-still is situated in a heating chamber, to which hot gases from burning fuel are conducted; the conduit, which conveys the hot gases from the furnace to the heating chamber, is provided with a by-pass, and means, thermostatically controlled by the temperature of the still, are provided for regulating the supply of hot gases to the heating chamber and to the by-pass; means for admitting air to the conduit are also provided and thermostatically controlled by the temperature of the hot gases in the conduit.—O. R.

Soda-calciner. G. H. Marshall, New York. U.S. Pat. 1,014,314, Jan. 9, 1912.

The furnace has a wall formed of a series of superposed, separable, and alternately disposed "water rings" and rings of masonry or refractory material, which correspond in internal and external diameter, so that each extends entirely through the wall, and the "water rings" and a cap have bosses projecting from their outer sides, which bosses are connected together by bolt rods.—F. Sodn.

Zinc oxide; Method of producing ——. H. H. Hughes, St. Louis, Mo. U.S. Pat. 1,014,062, Jan. 9, 1912.

Zinc sulphide, or other sulphur-bearing ore of zinc, is roasted so as to eliminate practically all the sulphur, and the roasted ore, while still hot, is delivered into a rotary furnace, the interior of which is heated by the combustion of hydrocarbons, the heated ore being continuously agitated while passing through the furnace, and air being introduced in order to convert the zinc vapour into oxide.
—F. Sodn.

Lead arsenate; Method of manufacturing ——. E. O. Barstow, Assignor to The Dow Chemical Co., Midland, Mich. U.S. Pat. 1,014,742, Jan. 16, 1912.

Finely divided, solid lead chloride is mixed with a solution of a soluble arsenate, the quantity of water present being insufficient to dissolve the lead chloride; the mixture is subjected to prolonged stirring, whereby lead arsenate is formed and may be separated from the solution.—O. R.

Titanium dioxide; Process of obtaining ——. E. Weintraub, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,014,793, Jan. 16, 1912.

Ilmenite is heated with about double its weight of concentrated sulphuric acid until a comparatively dry mass of sulphates is obtained; the mass is treated with water and a reducing agent to reduce any ferric sulphate present, and the liquid is then boiled for the deposition of metatitanic acid, while ferrous and other sulphates remain in solution.—O. R.

Hydrates of aluminium; Process of producing pulverulent and easily-washable ——. N. A. Langlet, Gottenborg, and E. L. Rinman, Upsala, Sweden. U.S. Pat. 1,015,499, Jan. 23, 1912.

See Fr. Pat. 388,527 of 1908; this J., 1908, 898. A powdered aluminium salt is added to a solution of ammonia or other alkali.—T. F. B.

Sulphuric acid; Apparatus for concentrating ——. P. Vialleix and F. Perrin, Volvic, France. Eng. Pat. 8142, March 31, 1911. Under Int. Conv., Sept. 20, 1910.

See Fr. Pat. 420,563 of 1910; this J., 1911, 360.—T. F. B.

Sulphuric acid; Treatment of ——. A. J. Boult, London. From I. J. Cox, Dupont, Wash., U.S.A. Eng. Pat. 8528, April 5, 1911.

See U.S. Pat. 1,002,824 of 1911; this J., 1911, 1210.—T. F. B.

Sodium-aluminium fluoride; Process of making ——. E. Teisler, Assignor to A. Humann, Dohna, Germany. U.S. Pat. 1,015,220, Jan. 16, 1912.

See Eng. Pat. 27,231 of 1909; this J., 1910, 565.—T. F. B.

Alkali-earth peroxide; Process of making ——. F. Bergius, Hanover, Germany. U.S. Pat. 1,015,286, Jan. 23, 1912.

See Fr. Pat. 427,866 of 1911; this J., 1911, 1160.—T. F. B.

Barium hydroxide; Process of making amorphous anhydrous ——. C. Rollin, Newcastle-on-Tyne. U.S. Pat. 1,015,345, Jan. 23, 1912.

See Eng. Pats. 26,696 of 1909 and 14,268 of 1910; this J., 1911, 129.—T. F. B.

Oxygen and nitrogen from the atmosphere; Process of obtaining and separating ——. G. Kaszner, Münster, Assignor to Rheinische Dampfkessel und Maschinen-Fabr. Büttner G. m. b. H., Uerdingen on Rhine, Germany. U.S. Pat. 1,015,566, Jan. 23, 1912.

See Ger. Pat. 233,383 of 1910; this J., 1911, 621.—T. F. B.

Separation of gases from gaseous mixtures, liquids, or solids [nitrogen from air or hydrogen from steam]; Process for the continuous ——. The Nitrogen Co. Fr. Pat. 433,239, Aug. 14, 1911.

See Eng. Pat. 17,666 of 1911; this J., 1912, 129.—T. F. B.

VIII.—GLASS; CERAMICS.

Glass production: Action of fluxes in ——. V. Vesely. Chem.-Zeit., 1912, **36**, 112.

A normal glass of known composition was fused with 4 per cent. and 8 per cent. respectively of eight different metallic oxides, and the effect on the fusibility or viscosity of the glass determined. With the oxides of sodium, potassium, lead, and boron, the fusibility increased in proportion to the amount added. Ferric oxide and manganese sesquioxide reduced the fusibility of the glass only when added in small quantities. When 8 per cent. was added, the efficacy of the fluxes increased in the following order: lead monoxide, ferric oxide, manganese sesquioxide, potassium oxide, boric oxide, sodium oxide. (See also this J., 1911, 1014.)—A. S.

Mirror silver; The structural modifications of silver. V. Kohlschütter and E. Fischmann. Annalen, 1912, **387**, 86—145.

The authors discuss in detail the various factors involved in the deposition of silver as a lustrous adherent deposit by reducing an ammoniacal solution of silver hydroxide with any of the following reducing agents: formaldehyde, acetaldehyde, cane sugar, milk sugar and tartaric acid. The essential oxidising agent in each case is silver hydroxide which exists in minute quantities in the solution in equilibrium with the complex hydroxide, $Ag(NH_3)_2OH$, according to the ionic equation, $Ag(NH_3)'_2 = Ag' + 2NH_3$. By measuring the electromotive force of concentration cells, it is possible to determine the concentration of silver ions, and tables are given showing this value for solutions of varying silver and ammonia content, as well as for the same solutions to which known quantities of caustic alkali or ammonium nitrate have been added. Consideration of the chemical reactions involved in the case of each reducing agent leads to the conclusion that in all the above cases, the final process is one of oxidation, whilst at the same time there is always the possibility that high molecular or colloidal products may be present (*e.g.*, aldehyde resin). The special conditions necessary for the formation of a satisfactory mirror appear to be that the reduction must proceed mainly or entirely at the surface, and that it must be so conditioned that the product takes the typical coherent mirror form. Differences in the nature of the glass have undoubtedly an effect on the course of the deposition, but this is not an essential consideration, as mirrors may be obtained on metals, indiarubber, porcelain, etc., or even on the free air-surface of the liquid. Traces of various foreign substances produce remarkable effects: thus excess of ammonia or ammonium salts, and salts of the halogen acids will prevent mirror formation, while caustic alkalis in small quantities will help to neutralise the preventive effects of the halogens. The advantage of using small quantities of a copper salt in silvering was recognised by Liebig. Generally speaking, it may be said that conditions which are unfavourable to the production of colloidal silver sols are likely to prevent the silvering process, although the converse is not necessarily true. It is also necessary that the velocity of reduction in the body of the solution should be extremely slow, so that the silver is not acted upon till it reaches the surface. Of the actual causes of reduction, the real driving force (the reduction potential) covers a very large range in the cases of the reducing agents available for silvering, a range which includes a great many unsuitable reducing agents as well. This factor is therefore not a dominant one in silvering. The velocity of reduction is apparently largely dependent on the surface, and particularly on the fact that silver oxide is very readily adsorbed. It is further shown by capillarity measurements that the reducing agent is also adsorbed, and it is this joint surface-activity which causes the reaction in these special cases to take place mainly at the surface. It is further probable that in the case of the special reducing agents, the colloidal by-products or intermediate products, cause the reduction to take place in such a way as to produce the characteristic mirror formation. A similar effect may be attributed to traces of metallic salts such as those of copper and lead, which presumably give rise to colloidal hydroxides. These hydroxides like the organic colloids have a "directing" influence on the form in which the silver is deposited. Each reducing agent and each added salt has a characteristic effect on the appearance of the deposit. The above views with regard to the mechanism of the silvering process are supported by experiments on the nature of the mirrors produced. The microscopic examination of the mirrors reveals no discontinuities, but the ultramicroscope shows a special appearance for each process, a disperse phase consisting of amorphous silver with characteristic structures. The adherent mirrors are extraordinarily sensitive to electrolytes. Although alkalis, ammonia, and most neutral salts are without much effect, dilute acids, acid salts, and salts of weak bases as well as normal halogen salts produce rapid detachment of the deposit. In the case of acids there is apparently something analogous to a "swelling value" ("*Schwellenwert*"), *i.e.*, a limiting concentration (of the order $10^{-4}N$) above which the mirror is destroyed. This value is greater for a given mirror for weak acids than for strong ones, and it also varies with the particular reducing process which has been used to form the mirror. Mirror silver from all sources shows practically the same E.M.F. as compact silver foil against $N/10$ silver nitrate, so that there is no doubt as to its physical simplicity. Numerous experiments on the conductivity of mirror silver are described particularly in connection with its development as the deposit is formed, its variation with time at ordinary temperatures and at 100° C., and the effect of various electrolytes, especially dilute acids. Here again the different reducing processes give mirrors with different properties. All the experiments however are in accordance with the views on the process of formation outlined above, the various directing colloids probably having each a special influence on the degree of dispersion of the deposited silver.—W. H. P.

Clay and kaolin; Formation of ——. P. Rohland. Sprechsaal, 1912, **45**, 51—52.

The formation of clay by decomposition of granite, gneiss, porphyry, etc., is briefly regarded under three aspects: the agencies of water and carbonic acid, of moor waters and humic compounds, and of postvolcanic and pneumatolytic processes, respectively. The presence of chemically combined water in kaolin has yet to be satisfactorily explained, and the existence of completely unplastic kaolins and of hydrated aluminium silicates such as collyrite, $2Al_2O_3,SiO_2,10H_2O$, must be taken into account. Humic compounds are not necessarily acid; the alkaline substances have their share in granite decomposition. But comparatively few clay strata have been in contact with moor waters and humic substances. The postvolcanic class has been subjected to hot solutions of fluorine, boron and sulphur compounds. It is impossible to generalise on clay formation; each case must be treated on its own merits. Clays with a high loss on ignition especially require further research, and the differing tastes and smells of various clays (see Rohland, Z. physiol. Chem., 1909, **59**) affords a sphere of investigation with regard to bacterial agency.—H. H. S.

Glaze of given composition; Selection of raw materials for a ——. A. Berge. Sprechsaal, 1912, **45**, 52—53, 67—68, 85—86.

The glaze of molecular formula: $0{\cdot}86\ PbO$, $0{\cdot}14\ K_2O$, $0{\cdot}22\ Al_2O_3$, $0{\cdot}34\ SnO_2$, $3{\cdot}9\ SiO_2$, was reproduced in twelve different ways by substituting red lead and tin oxide for tin ashes, alumina and sand for clay, and clays from several native and foreign sources for each other. The author concludes that if analyses of the raw materials be carefully made so that the formula is correctly reproduced, and if the burning be properly conducted, it is immaterial from what source the glaze materials come, so far as the finished glaze is concerned.—H. H. S.

Brown glazes for hard porcelain. H. Bollenbach. Keram. Zentralbl., 1912, 147; Sprechsaal, 1912, 45, 86.

Pukall's observation that rutile is favourable to the production of a brown colour is confirmed, and of the bases, lime and especially magnesia are recommended. Barium oxide should be avoided but some potash cannot be dispensed with. The best results were obtained from the two formulæ: 0·2 K_2O, 0·5 MgO, 0·3 CaO, 0·6 Al_2O_3, 7·0 SiO_2 with 5 per cent. of iron oxide and 1 per cent. of rutile; and 0·3 K_2O, 0·4 MgO, 0·3 CaO, 0·65 Al_2O_3, 7·5 SiO_2 with 7 per cent. of iron oxide, 0·5 of manganese oxide, and 2 of rutile. Mixtures of these glazes may be made, while the addition of 1 per cent. of chromium oxide tends to make the glaze matt.—H. H. S.

Separation and grading of solids suspended in liquids. Gee. *See* I.

Heats of formation of certain silicates. Tschernobaeff and Wologdine. *See* VII.

Patents.

Quartz or silica articles; Manufacture of ——. F. W. Burckhardt, Biebrich-on-Rhine, Germany. Eng. Pat. 25,886, Nov. 8, 1910.

Granulated quartz is packed round the resistance core of an electric furnace and is surrounded by coarser quartz particles, which occupy the remaining space between the core and the refractory walls of the furnace, the latter thus acting as a mould. On raising the core to a temperature of 2000° C., the surrounding quartz is vaporised and penetrates the cooler and more remote quartz particles, thereby softening them and binding them together. To obviate any internal pressure, vents are provided for the escape of quartz vapour; this may be done by employing a furnace of the Borchers type with a vertical resistance core supported at its upper extremity by means of a ring electrode; the latter is carried by the furnace casing and spaces are provided between the core and the ring electrode, through which the vapour may escape. Instead of using the furnace itself as mould, an independent mould may be provided, containing quartz packed to the required form, into which quartz vapour is conducted from the electric furnace by way of a quartz tube. The mould in this case is provided with a separate source of heat, preferably but not necessarily electrical, and need be heated to 1300° C. only, after which the quartz vapour, issuing from the electric furnace proper into the heated mould, will bind the particles together and complete the article.—O. R.

China and earthenware; Material to be used in the manufacture of ——. W. Mollart and F. Emery, Stoke-upon-Trent. Eng. Pat. 26,236, Nov. 11, 1910.

A substitute for bone is made by calcining milled or ground sea-shells. China manufactured therefrom is said to be thinner and more translucent whilst retaining the same strength as bone china.—H. H. S.

Earthenware; Production of ——. F. T. Moore and H. J. Warrington, Stoke-on-Trent. Eng. Pat. 6465, Mar. 15, 1911.

The firing of body and glaze in one fire is facilitated by mixing with the glaze a proportion of slip from which the body is made.—H. H. S.

Refractory body and process of making the same. E. G. Acheson. Stamford township, Canada. U.S. Pat. 1,014,199, Jan. 9, 1912.

The product contains, as essential constituents, silicon and carbon and is tougher than carborundum; it is made by heating a charge containing a silicious material, carbon and a compound of boron, by means of an electric resistance, the last ingredient being in less proportion than the silicious matter.—F. Sodn.

Fire- and water-proof articles; Process of producing ——. G. S. Donahey, Pittsburg, Kans. U.S. Pat. 1,015,426. Jan. 23, 1912.

A mixture composed of 25 lb. of fireclay, 60 lb. of coal shale, 10 lb. of sand and 5 lb. of crude petroleum, is moulded into the desired shape and fired to a point where a black or japanned coating is left on the ware without all the petroleum residue and coke being burnt off.—H. H. S.

Glass and method of manufacturing the same. F. Wolf-Burckhardt, Biebrich on Rhine, and W. Borchers, Aachen, Germany. Eng. Pat. 18,053, Aug. 9, 1911. Under Int. Conv., Feb. 20, 1911.

See Fr. Pat. 432,786 of 1911; this J., 1912, 130.—T. F. B.

Alumina, kaolin, and the like, Process for the deferrisation of silicated ——. F. Schulz, jun., Akt.-Ges., Leipzig, and H. Gruber, Leipzig-Plagwitz, Germany. Eng. Pat. 16,129, July 12, 1911.

See Fr. Pat. 432,866 of 1911; this J., 1912, 130.—T. F. B.

IX.—BUILDING MATERIALS.

Trass-lime mortar; The influence of the amount of added sand on the strength of ——. H. Burchartz. Tonind.-Zeit., 1912, 36, 150—154.

The effect was determined of increasing amounts of standard and Freienwald raw sand, which had been sifted through a 9-mesh sieve, and was much coarser than the standard sand in grain, on the tensile and compressive strengths of mortar made from Nettethal trass and standard lime (lime paste pressed until it contained 44·6 per cent. of water). Mixtures were made of 1 part by volume of trass to 1 part of lime, with 0, ½, 1, 1½, 2, 2½ and 3 parts of each of the sands. The test-pieces were exposed in a moist atmosphere for three days and then placed under water, and tested after 28 and 90 days. Details are given of the parts by weight, content of water, volume weights, etc., of the various mixtures and of the components. After 28 days the tensile strength of the pure trass-lime mixtures was considerably decreased by increasing additions of sand; but that of test-pieces which were 90 days old was increased by a small addition of sand (½ part by volume) and decreased again by larger additions, though to a less extent than was the case with the 28-day test pieces. The tensile strength was decreased less by the Freienwald raw sand, and in the 90 day test-pieces was higher, even in the leanest mixtures, than in the pure trass-lime mixture. Small additions of sand affected the compressive strengths very little, especially in the case of the test-pieces 90 days old, but larger additions produced fairly regular proportional decreases. The loss in compressive strength was also less with the Freienwald than with the standard sand. The results to a certain extent confirm those of Link (Zentralbl. der Bauverwaltung, 1909, 16), which were limited to the effect upon tensile strength, but the present experiments show that by the addition of sand the tensile strength may be somewhat increased in the case of older test-pieces, whereas the compressive strength is unmistakably reduced by the addition of sand, except in the case of the accidental increase in some fat mortars. The experiments emphasise the importance of applying compressive as well as tensile strength tests, and of testing pieces which have attained a considerable age, and not only fresh pieces. It was also found that the addition of sand did not affect the volume-weight to the same extent as the strength; the volume-weight of the mortars increases continually with increasing quantities of sand. By further increasing the sand it would be raised until that ratio of binding material to sand was reached, at which the content of voids in the sand exceeded the amount of the binding material, and from this limit a further addition of sand would diminish the volume-weight of the mortar. Mortars with the largest additions of sand had the highest volume-weights and gave the lowest values for strength, and this shows that one can draw conclusions as to the degree of strength from the volume-weight values alone. Tables are given showing the volume-weights of test-pieces (in grms. per c.c.) and the tensile and compressive strengths (in kilos. per sq. cm.) obtained in the seven series of mixtures.—W. C. H.

Heats of formation of certain silicates. Tschernobaeff and Wologdine. *See* VII.

Uses of blast-furnace slag. Fleissner. *See* X.

PATENT.

Artificial stone and process for making the same. W. Herdt. Wilmersdorf, and A. Fraass, Berlin. Eng. Pat. 8161, March 31, 1911. Under Int. Conv., April 6, 1910.

SEE Fr. Pat. 427,546 of 1911; this J., 1911, 1118.—T. F. B.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron alloys; Electrical resistance of ——. C. F. Burgess and J. Aston. Trans. Amer. Electrochem. Soc., 1911, 20, 205—224.

IN view of their possible use in rheostats, resistance heating wires, etc., the authors have determined the electrical resistance of the electrolytic iron and its alloys previously studied with respect to mechanical and magnetic properties (see this J., 1909, 1134, 1135, 1201; 1910, 28, 215, 430, 431, 569, 883, 1060; 1911, 89). The experimental results are given in tables and curves, the resistances being given in terms of the resistance of a standard bar of forged electrolytic iron (12·1 microhms per centimetre cube for the quenched metal). In general those alloys with high values for physical hardness and magnetic coercive force show also high electrical resistance. The most resistant alloys are those containing nickel and chromium, with or without silicon, carbon or vanadium. The elements, arsenic, silicon, and tin, which have a beneficial effect on the magnetic properties of iron also increase the electrical resistance. The effect of heat treatment on the electrical resistance is, in general, similar to the effect on the hardness of the alloy. In the following table the composition and electrical resistance of those alloys having a resistance more than seven times greater than that of the standard electrolytic iron, are given:—

Composition.	Electrical resistance in microhms. per cm³.
10% Cr, 5% Si	103·0
10% Cr, 12% Ni	99·6
10% Cr, 20% Ni, 2% Si	93·0
10% Cr, 5% W, 2% Si	92·2
15% Cr, 2% Si	91·6
7·23% Cr, 9% W, 3% Si	89·5
10% Cr, 3% Si	87·5
10% Cr, 2% Si, 2% Ti	86·0
13% Cr, 1·8% Si	85·6
10·3% Cr, 1% V, 2% Si, 0·3% C.	84·9

—A. S.

Iron; Porosity of —— and its relation to passivity and corrosion. J. A. N. Friend. Chem. Soc. Trans., 1912, **101**, 50—56.

THE author finds that the surface of iron is slightly porous, so that when the metal is immersed in certain solutions the latter are absorbed to a minute extent and this absorption, when induced by alkaline solutions, is responsible for the passivity produced. Such passivity is gradually lost by the iron when immersed in water or rapidly by the addition of acid, and is retained for a long time if the metal is kept dry. As this explanation of the passivity induced by alkaline solutions cannot be applied to that induced by nitric acid, the author concludes that passivity may be of various kinds. The author adheres to the acid theory of corrosion.—J. C. C.

Rusting of iron; Influence of paint coatings on the ——. E. Liebreich and F. Spitzer. Z. Elektrochem., 1912, **18**, 94—99.

THE authors have investigated the effect of varying numbers of coats of paint on the rusting of iron. Except in the case of a special rust preventing paint (Ger. Pat 203,957) which contains alkali, an increase in the number of coats from one to four is accompanied by a regular increase in the rusting effect.—W. H. P.

Manganese in ferro-tungsten, Rapid method for the determination of ——. P. Slawik. Chem.-Zeit., 1912, **36**, 106.

A MIXTURE of 1 grm. of the finely powdered substance and 10 grms. of sodium peroxide is fused for 2—3 minutes at a dull red heat, a porcelain crucible being employed, and, after cooling, the melt is dissolved in water and the solution cautiously acidified with hydrochloric acid; a moderate excess of this acid is then added and the solution boiled for 15—20 minutes, after which a slight excess of zinc oxide is introduced, and the liquid boiled and titrated with permanganate in the usual way.—F. SODN.

Matte smelting; Conditions influencing the entry of copper into the slag during ——; the state of combination of copper in the slag; and the reduction of copper loss by slagging. W. Wanjukoff. Metallurgie., 1912, **9**, 1—27, 48—62.

BESIDES copper contained in the prills of matte mechanically retained by slags, the amount of which depends on their viscosity and time of settling, some copper is really dissolved in the slag, in the form of cuprous sulphide. Matte dissolves a slight amount of silicate, and the slag dissolves some sulphide. Silicate slags are electrolytes, and as such are more or less dissociated. Replacing partly one base by another in the silicate diminishes the cation concentration of the former base, and increases that of the latter. The sulphides in matte are electrolytes, and the sulphides of those elements which are also present as bases in the slag having a cation in common, sulphides enter the silicate solution. The entrance of copper into the slag depends on the cation concentration of the sulphides present, and is governed by the degree of dissociability of the silicates and the sulphides respectively, and by the chemical affinity of sulphur for the metals of the sulphides. This affinity is shown to follow the series: copper—nickel—cobalt—iron—(manganese)—zinc—calcium—magnesium—aluminium. There is a relation between loss of copper by slagging and the relative affinity of sulphur for the elements composing the slag. The less the affinity of sulphur for the predominant base in the slag, the smaller is this loss. The farther the predominant base of the slag is from the beginning of the above given series the lower will be the copper content of the slag. The results of examination of Mansfeld and other slags, as well as laboratory preparations, agree well with theoretical figures.—R. W. N.

Bronzes; Effect of reheating on hardened friction ——. Portevin and Nusbaumer. Comptes rend., 1912, **154**, 213—215.

IN testing the rate of wear of friction bronzes (5 to 20 per cent. of tin, some without phosphorus and some with 0·011 to 0·020 per cent.) by pressure against a rapidly rotating steel disc, periods of no wear some hours in duration are sometimes observed, followed by periods of very rapid destruction. Microscopic examination of the rubbing surface during one of these periods of no wear, after polishing and attack by ferric chloride, showed perfectly normal appearances; but after reheating for 30 minutes at 600° C., the α-constituent appears in very well-defined twin polyhedra. A repolishing and etching destroys this appearance, showing that it existed only in a surface layer. It would seem, then, that the surface layer had been strongly hardened during the test, and that this hardening favoured crystallisation and the formation of twins during the reheating. This was confirmed when a sample of bronze was hardened by hammering, then reheated, polished and etched; the same crystallisation of the α-constituent was seen, whilst it was absent from another piece of the same sample which had been reheated but not hardened.—J. T. D.

Mercury, cadmium, zinc, potassium, and sodium ; The boiling points of ——. C. T. Heycock and F. E. E. Lamplough. Chem. Soc. Proc., 1912, 28, 3—4.

The authors have determined the boiling points of mercury, cadmium, zinc, potassium, and sodium at different pressures. The values for the boiling points under a pressure of 760 mm. are given below. The temperatures were in all cases determined by means of platinum resistance pyrometers. The temperatures assumed in calibrating the pyrometers were ice, steam, and the boiling point of sulphur, 444·53° (Callendar and Griffiths) :—

	Boiling point.	Change in b. p. per mm. at 760.
Mercury	356·7°	0·0746°
Cadmium	765·9	0·12
Zinc	905·7	0·133
Potassium	762·2	0·135
Sodium	882·9	0·153

Strüverite, a rare tantalum mineral from the Federated Malay States. Bull. Imp. Inst., 1911, 9, 354—355.

A specimen of a lustrous black mineral, found in the Kuala Kangsar District, Perak, was found to consist of the rare mineral, strüverite, essentially an isomorphous mixture of tapiolite (iron tantalate) and rutile. The sample examined, freed from foreign admixtures, gave the following results on analysis :—45·74 per cent. of titanium dioxide ; 35·96 of tantalic oxide ; 6·90 of niobic (columbic) oxide ; 8·27 of ferrous oxide ; trace of manganous oxide ; 2·67 of stannic oxide ; 0·20 of silica ; 0·08 of water expelled at 105° C., and 0·42 of water expelled above 105° C. It is considered that strüverite could be used as a source of tantalum, though it would have to be offered at a lower rate than tantalite, as it is poorer and more expensive to smelt.—H. E. P.

Radioactive disintegration products ; Simple methods for the preparation of ——. L. Meitner. Physik. Zeits., 1911, 12, 1094—1099. Chem. Zentr., 1912, 1, 322—323.

Two methods have been used by the author, viz., (1) the direct electrochemical separation of the radioactive product on a more electropositive metal, and (2) electrolytic separation of the radioactive metal at the cathode. By one or other of these methods the author has prepared radium B+C, radium E, radium C, mesothorium 2, thorium A, thorium B+C, actinium A, and actinium B. In using the electrolytic method, the best results were obtained with a platinum wire anode and a silver wire cathode, the E.M.F. being 200 volts, and the current strength regulated so that a 25-candle incandescence lamp placed in the circuit burned brightly ; the solution must be kept boiling and the volume of electrolyte kept small. In the case of radium B+C, the maximum yield was obtained after 15—20 mins. electrolysis ; in strongly acid solution, the yield was low and the deposit showed a varying excess of radium C. Radium C and E are best obtained by electrochemical precipitation on nickel ; using 200 grms. of lead chloride, 60 per cent. of the quantity of radium E contained therein was separated. The electrolytic separation of radium E proceeds best after removal of the lead. The purity of the radium E obtained was shown by the fact that the logarithm of the activity altered as a strictly linear function of the time ; the half-decay period was found to be 5 days. Separation of mesothorium 2 could be effected only in almost neutral solution. The active deposit of actinium, which on account of its short half-decay period (2·15 mins.) is difficult to prepare, can be obtained in a surprisingly pure condition by immersing a piece of sheet nickel in a boiling solution for a few minutes.—A. S.

Blast-furnace slag ; Uses of ——. H. Fleissner. Stahl u. Eisen, 1912, 32, 224—231.

There are four classes of cement made from slag : (*a*) Blast-furnace slag cement, consisting of rapidly-chilled vitreous slag, ground with 15 to 30 per cent. of Portland cement clinker made from slag and limestone. Chilling is usually effected by granulating with water, followed by drying. (*b*) Iron Portland cement, consisting of about 70 per cent. of Portland cement clinker made from slag and limestone, with 30 per cent. of vitreous slag. (*c*) Portland cement, made by the usual process, but substituting slag for clay. (*d*) Slag cement, made by mixing finely-ground, basic slag with powdered calcium hydroxide. A slag containing 26·45 per cent. of silica, 19·61 of alumina, and 50·10 of lime, requires about 45 parts by weight of calcium hydroxide for 100 parts of slag. Iron Portland cement is now recognised to be equal to Portland cement by the Prussian Government, and its use is allowed in public works.—R. W. N.

Platinum ; Price of ——. *Sources of supply and possibilities of an increased supply.* Chem. Trade J., 1912, 50, 171. (See also this J., 1911, 691.)

The price of platinum reached during 1911 the highest level yet recorded, viz., £9 5s. per oz. (£9 10s. to £10 in the United States). The prices for previous years were : 1910, £5 14s. ; 1909, £4 7s. ; 1908, £4 6s. ; 1907, £4 18s. ; 1906, £2 7s. ; 1905, £2. The production of crude platinum in the Urals, now the main source of the world's supply, was 175,716 oz. in 1910, according to the official figures, but the total production, including ore reaching the market through non-official channels, was probably at least 281,145 oz. The official figures for the production in previous years were : 1908, 156,792 oz. ; 1909, 164,118 oz. The increased supply has, however, not kept pace with the growing demand, and the price of the crude platinum has also tended to increase by reason of the decline in the yield, which has now fallen to as low as 0·07 oz. of crude platinum per ton of gravel (compare this J., 1909, 479). It is stated that it is tolerably certain that new deposits will not be found in Russia in positions where they can be profitably worked, unless it be in certain practically unknown areas in the Northern Urals. Attempts are being made, by introduction of modern mining systems, to obtain an increased supply from Colombia, which formerly furnished the chief portion of the world's supply. In the following tables statistics are given of the imports of refined platinum (mainly from France) and of crude platinum ore into the United Kingdom and of the exports of platinum from the United Kingdom :—

Imports of platinum.

	1905.	1906.	1907.	1908.	1909.	1910.
Oz.	44,741	40,317	24,797	10,437	22,086	48,162
Value	£89,606	£95,832	£122,111	£45,009	£96,926	£275,510

Imports of crude platinum ore.

	1905.	1906.	1907.	1908.	1909.	1910.
Oz.	14,200	840	—	116	566	4,167
Value	£14,970	£800	—	£435	£1,720	£16,360

Total exports of platinum.

	1905.	1906.	1907.	1908.	1909.	1910.
Oz.	17,484	23,181	28,024	14,165	7,146	9,137
Value	£54,753	£103,305	£99,559	£47,136	£30,054	£43,140

Exports of platinum to France.

	1905.	1906.	1907.	1908.	1909.	1910.
Oz.	11,943	9,402	10,716	10,510	3,807	7,072
Value	£33,390	£30,840	£26,371	£31,183	£16,584	£30,795

—A. S.

Separation and grading of solids suspended in liquids. Gee. *See* I.

Determination of ferrous oxide in silicate rocks. Dittrich and Leonhard. *See* VII.

Structural modifications of silver. I. Mirror silver. Kohlschütter and Fischmann. *See* VIII.

Aluminium fermentation and storage vats. Bleisch. *See* XVIII.

Patents.

Rust proof coating; Process for covering iron and steel articles with a ——. G. Bauer, Dusseldorf, Germany. Eng. Pat. 241, Jan. 4, 1911.

The articles, such as files, after being cleaned by sand blasting are dipped in a solution or emulsion of a mineral oil in about 20 to 50 parts of water, prepared by means of a soap of oleic acid or Turkey red oil and an alkali. They are then dried in an oven until the tang is dry, and while the rest is still wet this part is annealed in molten lead. After again dipping into a similar oil emulsion containing from two to three parts only of water, they are drained and are then ready for packing.—A. H. C.

Ore [of iron, etc.]; Reduction of ——. S. E. Sieurin Höganäs, Sweden. Eng. Pat. 1134, Jan. 16, 1911.

See Fr. Pat. 415,894 of 1910; this J., 1910, 1316. One claim covers the use of an annular furnace (Hoffmann kiln) for heating the charge.—T. F. B.

Steel; Manufacture of ——. W. R. Walker, New York. U.S. Pat. 1,014,425, Jan. 9, 1912.

The manufacture of steel from pig-iron is conducted in two stages. The proportion of carbon in the metal is first reduced to a definite amount by bessemerisation, the operation being discontinued when the flame of the converter "drops." A small quantity of carbon is then added to lessen "skulling" and the metal is transferred to an electric furnace in which the final conversion into steel is effected.—W. E. F. P.

Silver ores; Reduction of ——. C. G. Fink, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,013,931, Jan. 9, 1912.

In the treatment of certain arsenical silver ores, the material is fused and maintained in a liquid condition in an attenuated atmosphere, or other inert environment. The bulk of the arsenic is thus removed by distillation, crude silver separating out by gravity from the fused ore residue.—W. E. F. P.

Gold and silver; Apparatus for recovering ——, *by use of cyanide solutions.* W. L. Imlay, Philadelphia, Pa. U.S. Pat. 1,014,224, Jan. 9, 1912.

A horizontal, cylindrical chamber, to the interior wall of which a helical flange, extending along the whole length of the cylinder, is attached. A number of inwardly-directed, parallel ribs are also arranged, longitudinally, upon the wall, forming bucket devices; and, the width of the flange being less than the radius of the cylinder, a central passage or air-way extends through the cylinder from the inlet to the discharge opening. By the slow rotation of the cylinder, the charge of ore and cyanide solution is divided into numerous separate portions which are repeatedly raised and spilled during the passage of the material through the apparatus. The mixture is passed into an annular amalgamating chamber adjoining the exit end of the cylinder before being finally discharged.
—W. E. F. P.

Copper; Extraction of —— *from ores.* L. E. Bussey, London. From W. E. Evans, Berlin. Eng. Pat. 100, Jan. 2, 1911.

In a leaching process for the treatment of oxidised ores by means of sulphurous acid, the solvent is repeatedly passed through the charge until a suitable extraction is effected, the sulphur dioxide in the liquid being frequently replenished by passing the solution through scrubbers connected with roasting furnaces. The copper is recovered from the solution by electrolysis after the excess of sulphur dioxide has been removed, and the bulk of the copper sulphite converted to sulphate, by treatment with air and/or oxidising agents such as bichromates; it is essential that sufficient sulphurous acid be left in the solution to prevent polarisation during electrolysis.
—W. E. F. P.

Furnaces; Electric metallurgical ——. V. Stobie, Sheffield. Eng. Pat. 674, Jan. 10, 1911.

The furnace, which is adapted to the use of two-phase current, is provided with two electrodes or groups of electrodes above the bath and connected with the outer cables of each circuit, the inner or neutral cables terminating in two separate electrodes or groups of electrodes in the hearth of the furnace. The electrode connected with an outer cable is approximately over the electrode connected with the inner cable of the other circuit, the outer and inner electrodes of each circuit being removed from each other as far as practicable, so that the currents cross in direction and traverse the longest possible distance in passing through the bath.—B. N.

Furnace; Metallurgical ——. J. R. Moffitt, E. A. Moffitt, Administratrix, Denver, Colo. U.S. Pat. 1,014,971, Jan. 16, 1912.

A chamber adapted to hold molten metal is separated from a second chamber by a perforated partition. The material to be treated is introduced into the first chamber and the non-fusible portion forced through the opening into the second chamber where it may be removed by a mechanical skimmer as it rises to the surface of the metal. A liquid seal to the first chamber is also provided.
—A. H. C.

Electrolytically depositing metals or alloys thereof; Superficially metallizing the surface of cast iron, wood, gypsum, paper and other porous substances for the purpose of ——. P. Marino, London. Eng. Pat. 20,012, Sept. 8, 1911.

The article is coated with a solution of an alkali silicate, allowed to dry, and then painted with a solution of 60 parts of silver chloride and 100 parts of ammonium fluoride in a saturated solution of potassium cyanide. It is then treated with a saturated solution of 100 parts of hydrazine sulphate and 60 parts of sodium hydroxide, the reduced silver being made into a coherent deposit by friction against a rapidly rotating wire brush. The surface is now ready to received an electrolytic deposit.
—A. H. C.

Aluminium foil; Manufacture of ——. E. R. Lauber, and R. V. Neher, Emmishofen, Switzerland. Eng. Pat. 20,455, Sept. 15, 1911. Under Int. Conv., Oct. 27, 1910.

Aluminium foil between 0·008 and 0·02 mm. thick may be obtained by rolling with only a slight amount of pressure at a temperature of from 270° to 300° C. At this temperature the metal is at its maximum ductility while still retaining sufficient resistance to tensile strain to be able to withstand the high tractile force which is simultaneously applied. The rolls must be oiled.—A. H. C.

Aluminium and its alloys; Process of electroplating ——. E. and O. Becker, Iserlohn, Germany. U.S. Pat. 1,014,560, Jan. 9, 1912.

The aluminium articles are repeatedly immersed for a short time in a boiling bath of potassium cyanide, water and "liquid ammonia," the articles being cooled after each immersion in a solution of "tartar" and water. The plating with metal is afterwards effected directly without the application of an intermediate layer of another metal.—B. N.

Alloy for coating with metal. C. F. Burgess, Madison, Wis. U.S. Pat. 1,014,751, Jan. 16, 1912.

Iron is added to zinc dross at a red heat until the composition of $FeZn_{10}$ is reached, the brittle alloy then being reduced to a granular condition by mechanical means.
A. H C.

Sulphide ores ; Process for roasting ——. C W. Renwick, Isabella, Tenn., U.S.A. Eng Pat. 1267, Jan. 17, 1911.

See U.S. Pat. 981,880 of 1911 ; this J., 1911, 220.—T. F. B

Metallic articles ; Process for combining a permeating metallic protective with the surface of ——. H. W. Jordan, London. From The Lohmann Co., New York. Eng. Pat. 7901, March 30, 1911.

See U S. Pat. 990,113 of 1911 ; this J., 1911, 629. T. F. B.

Alloys used in making dynamos. W. Rubel, Berlin. Eng. Pat. 12,483, May 23, 1911.

See Fr. Pat. 429,758 of 1911 ; this J., 1911, 1219.—T. F B.

Alloy [ferro-silicon]. P. Debas, Savoie, Assignor to Soc. des Carbures Métalliques, Paris. U.S. Pat. 1,014,642, Jan. 16, 1912.

See Fr. Pat. 405,820 of 1909 ; this J., 1910, 433.—T. F. B.

Metal ; Coating with ——. *Alloy for coating with metal.* C. F. Burgess, Madison, Wis., Assignor to United States Sherardizing Co., New Castle, Pa. U.S. Pats. 1,014,749, 1,014,750, and 1,014,946, Jan. 16, 1912.

See Eng. Pat. 5811 of 1911 ; this J., 1911, 1219. T. F. B.

Copper from calcined ore or slags ; Method of extracting ——. A. Gadomsky, Tiflis, Russia. U.S. Pat. 1,014,868, Jan. 16, 1912.

See Fr. Pat. 413,727 of 1910 ; this J., 1910, 1116.—T. F. B.

Metals ; Apparatus for melting and mixing —— in vacuum. W. S. Simpson, London. U.S. Pat. 1,015,091, Jan. 16, 1912.

See Eng. Pat. 11,832 of 1910 ; this J., 1911, 1020.—T. F B.

Smelting-furnace with electric refining-hearths connected thereto. A. Helfenstein, Vienna. U.S. Pat. 1,015,439, Jan. 23, 1912.

See Fr. Pat. 426,694 of 1911 ; this J., 1911, 961.—T. F. B.

Means for treating metals and liquids or the like by heat. Eng. Pat. 625. *See* I.

Metallic coated or foil coated paper, cardboard, etc. Eng. Pat. 2648. *See* V.

XI.—ELECTRO-CHEMISTRY.

Electrical resistance of iron alloys. Burgess and Aston. *See* X.

Patent.

Vapours or gases ; Apparatus for the electrical treatment of ——. W. T. Hoofnagle, Glen Ridge, N.J. U.S. Pat. 1,014,151, Jan. 9, 1912.

An "exhaust mechanism" is connected with a tube of insulating material, the latter being surrounded by but separated from a casing also of insulating material, and means are provided for maintaining an electrical field between the tube and the casing. A closed chamber, adapted to contain a fluid as a liquid seal, communicates with the casing, the latter being intermediate between the chamber and the "exhaust mechanism," so that a flow of gas or vapour may be passed through it at substantially less than the atmospheric pressure.—B. N.

XII.—FATS ; OILS ; WAXES.

Patents.

Oil-bearing meal and the like ; Steam-cooker for ——. A. W. French, Piqua, Ohio. U.S. Pat. 1,015,013, Jan. 16, 1912.

The meal is passed through two or more kettles arranged at different levels, its discharge from an upper to a lower kettle being controlled by a gate which is kept closed by means of a latch or other device. When the material is reduced to a predetermined level in the lower kettle, the latch is acted upon in the upper kettle and the gate is automatically opened, whilst a further accumulation of material causes it to close again.—C. A. M.

Soap-like products ; Manufacture of ——. R. van den Capellen, Hasselt, Belgium. Eng. Pat. 261, Jan. 4, 1911.

See Fr. Pat. 424,599 of 1911 ; this J., 1911, 755.—T. F. B.

Treatment of carcases, slaughter-house refuse, etc. Eng. Pat. 8898. *See* XIXa.

XIII.—PAINTS ; PIGMENTS ; VARNISHES ; RESINS.

Lead orthoplumbate [red lead] ; Preparation of pure ——. J. Milbauer. Chem.-Zeit., 1912, 36, 112.

The preparation of pure red lead (Pb_2PbO_4) by the oxidation of litharge by air can be effected only under certain definite conditions of temperature and pressure (see this J., 1909, 612, 1049 ; 1910, 282 ; 1911, 37). Lead oxide prepared from lead carbonate is the best raw material. For the removal of lead oxide from mixtures, the author has found the method of Dumas, using a hot solution containing more than 10 per cent. of lead acetate, the most satisfactory. A new wet method for the preparation of red lead consists in treating a mixture of three molecular proportions of lead dioxide and two of lead monoxide with a solution of potassium hydroxide saturated with potassium plumbite and plumbate.—A. S.

Influence of paint coatings on rusting of iron. Liebreich and Spitzer. *See* X.

Patents.

Pigment colours ; Manufacture of new ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 8590, April 6, 1911.

The pigment colours are prepared by converting into colour lakes the azo dyestuffs obtained by combining diazotised *p*-nitroaniline or its derivatives with acetoacetic or benzoylacetic esters and by converting the products into amides, monoalkyl- or monoaralkyl-amides. Example: 10 parts of the monoazo dyestuff, *m*-nitrotoluene-*p*-azoacetoacetic methylamide are stirred into 50 parts of sulphuric acid and the solution precipitated with water. The resulting paste (which contains about 10 per cent. of the dry dyestuff) is mixed with an equal weight of finely ground heavy spar which must be moist. The mixture is filtered, dried, and ground.—J. C. C.

Paint ; Method of and apparatus for testing ——. A. M. Muckenfuss, University, Miss. U.S. Pat. 1,014,842, Jan. 16, 1912.

A porous diaphragm is coated with the paint and exposed on one side to the action of water vapour contained in a chamber or cavity, whilst on the other side is a second closed chamber provided with means for the quantitative absorption of the vapour which is drawn through the diaphragm. The weight of water vapour which has traversed the film in a given time affords a measure of the permeability of the paint.—C. A. M.

Lac; Treatment of ——. W. A. Freymuth, London. Eng. Pat. 1071, Jan. 14, 1911.

Diverging rollers, drums, endless bands or other means may take the place of the plates used in preparing silk-like strands of lac (Eng. Pat. 20,655 of 1910; this J., 1911, 1223). The lac, preferably in a semi-melted condition, is fed between the diverging devices, which may be heated externally or internally if desired, whilst means may be provided for removing the material when stretched into fine strands.—C. A. M.

Resinous products from rosin waste and the like; Process for recovering the ——. D. J. Ogilvy, Cincinnati, Ohio. U.S. Pat. 1,014,411, Jan. 9, 1912.

The resinous matter is extracted from rosin waste by digesting it in heated mineral oils, of sp. gr. 0·845 and upwards, the resulting resinous solution being clarified by separating it from the insoluble matter.—B. N.

Ultramarine blue; Manufacture of ——. G. Leroy, Orleans, France. Eng. Pat. 6959, March 20, 1911. Under Int. Conv., Sept. 20, 1910.

See Fr. Pat. 425,585 of 1910; this J., 1911, 908.—T. F. B.

Ultramarine blues; Furnace for making ——. F. Bellet, Paris. U.S. Pat. 1,014,689, Jan. 16, 1912.

See Fr. Pat. 403,247 of 1908; this J., 1909, 1320.—T. F. B.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Rubber tapping experiments in Trinidad and Tobago. A. E. Collins. India Rubber J., 1912, **43**, 99—101, 145—146.

Hevea trees were experimentally tapped. *H. Confusa* gave low yields and showed poor wound response and was condemned. Young trees of *H. Brasiliensis* were tapped on a system recently recommended by Gallagher, *i.e.*, a V-incision at 18 in. from the ground and tapping downward for 8 in. Older trees of *H. Brasiliensis* were also tapped by other methods. The latex during the rainy months contained on an average 30 to 33 per cent. of dry rubber, and in the dry season 35 to 45 per cent.; trees 30 years old yielded a latex containing 50 to 70 per cent. during the first few tappings. Coagulation was effected with a number of reagents, of which formic, acetic, and sulphuric acids, and lime juice gave the best results. For rapid coagulation, 1 c.c. of 10 per cent. formic acid or 5 per cent. sulphuric acid per 100 c.c. of latex was added. For slow coagulation half of these quantities was used. No special advantage appeared to result from previously creosoting the latex. About 200 c.c. of latex were coagulated in covered pans, by adding the above reagents, stirring and allowing to stand. Next day the biscuit was lifted out, gently washed in water and pressed. It was then rolled with a wooden roller and allowed to dry for 24 hours. Samples thus prepared were valued equal to fine Ceylon plantation rubber. It was noticed that the so-called "floating test" for unsound seeds is useless for *Hevea*, since all the seeds are lighter than water. *Castilloa elastica* was tapped with various instruments; prickers were not a success; better results were obtained with a special instrument designed by Tucker and Dickenson, having a curved knife-edge on one side and a thin knife blade on the other. Numerous chemical and other methods of coagulation were tried. The simplest and most workable was natural creaming, by diluting the latex with several volumes of water and washing the cream so obtained till the wash water was nearly colourless. The cream was then ladled off and centrifugalised, giving a compact mass of pure white rubber which could readily be blocked. The addition of small quantities of lime juice or sodium bicarbonate materially assisted the rising of the cream. The latter has the disadvantage of tending to impart a greenish colour to the rubber. It seems to diminish the resin content of the rubber in all cases. The average yield of 13 trees was 3 oz. per tree for the first tapping and ¾ oz. per tree 15 days later. A 30 year old *Castilloa* tree gave 3 lb. 3 oz. at one tapping, and 1 lb. 12 oz. some time later. Some trees in Tobago were tapped on the Smith system—using an ordinary kitchen knife with the blade broken to 2 in. and sharpened all round; this was struck with a wooden mallet. The latex was collected in oil-cloth aprons, and subsequently creamed three times, adding lime juice the last time. The cream was dried on tautly stretched cotton sheets and then smoked.
—H. E. P.

Para rubber from Seychelles. Bull. Imp. Inst., 1911, **9**, 343—346.

Hevea Brasiliensis was introduced into Seychelles experimentally some years ago, and subsequently adopted generally. At the end of 1910, about 70,000 Para trees were growing, 4500 of which were large enough to be tapped. The first consignment of rubber realised the same price as fine hard Para on the London market. Light biscuits contained 0·7 per cent. of moisture; 93·3 of caoutchouc; 2·7 of resin; 3·0 of protein; and 0·3 of ash. Dark biscuits contained 0·7 per cent. of moisture; 93·9 of caoutchouc; 2·8 of resin; 2·3 of protein; and 0·3 of ash. These samples, which were clean and well prepared, were from young trees five to seven years old. Previous samples had yielded similar analytical results (when calculated on the dry rubber), but contained more moisture. These earlier samples were also weak physically. It is considered that, when large quantities of the rubber first mentioned are available, the price realised will be equal to that of the finest plantation Para.—H. E. P.

Rubber tissue of balloons, Passage of hydrogen through the ——. G. Austerweil. Comptes rend., 1912, **154**, 196—198.

The rubber usually employed to render balloon tissues impervious is not very satisfactory, as it adsorbs hydrogen and allows it to pass through. If an inflated balloon should be losing much gas, the balloon should be deflated and the tissue exposed to the air till it has lost its adsorbed hydrogen.—F. Shdn.

Rubber resins for paper sizing. Ellis. *See* V.

XV.—LEATHER; BONE; HORN; GLUE.

Leather from different parts of the hide, Composition of —— *and the importance of a proper sample for analysis.* C. R. Oberfell. J. Amer. Leather Chem. Assoc., 1912, **7**, 27—31.

The variations in the physical nature of various parts of the hide make it essential that a representative sample should be obtained when required for analysis. Thin and loose parts are penetrated rapidly by the tannin and consequently more thoroughly tanned; penetration is slower in the heavier parts, but more tannin is physically absorbed and deposited in the interstitial spaces between the fibres. Three tanned and finished hides trimmed into bends, shoulders, and bellies were selected, and from the inside of each belly a strip, one inch wide, was taken. From each bend a strip two inches wide, was cut from the edge lying along the back-bone, and from each shoulder a strip of the same width from the inner edge. A part of each of the three samples was finely divided and analysed by the official method of the Amer. Leather Chem. Assoc. A representative sample of the whole hide was obtained by mixing the three samples in the ratio of 53 per cent. of butt, 21 per cent. of shoulder, and 26 per cent. of belly, and analysed as before. The figures thus obtained agreed closely with those calculated from the analysis of the three samples. It was found that the firmest or butt part of the hide did not show the greatest physical absorption of tannin as indicated by the figure for uncombined tannin, but other assumptions as to completeness of tannage were correct, there being as much as 3·57 per cent. difference in the tannage number for different parts of the hide. There was a greater penetration of oil in the shoulder and belly than in the butt. The analysis of the belly portion showed a very close agreement with that of the composite sample, so in cases where an average sample of the whole hide cannot be obtained, the most reliable results will be furnished by a sample from the belly.—D. J. L.

Occurrence of arsenic in table gelatin. Köpke. *See* XIXa.

Patents.

Plastic or elastic substance [from gelatin]; Process for the production of a ——. J Stockhausen, Crefeld, Germany. Eng. Pat. 9264, April 13, 1911. Under Int. Conv., April 16, 1910.

See Fr. Pat. 428,468 of 1911; this J., 1911, 1271.—T. F. B.

Utilising spent bark, etc., as fuel. U.S. Pat. 1,013 988. *See* IIa.

Treatment of carcases, slaughter-house refuse, etc. Eng. Pat. 8898. *See* XIXa.

XVI.—SOILS; FERTILISERS.

Phosphates; Solutions of —— in citric acid and ammonium citrate. I. The homogeneous equilibrium in aqueous solution studied by the cryoscopic method. G. Pratolongo. Atti R. Accad. dei Lincei, Roma, 1911, 20, I, 812—818.

This is an account of the first part of an investigation on the nature of solutions of calcium phosphates in citric acid and ammonium citrate, and deals with cryoscopic determinations on solutions of citric acid, of mono-, di-, and tricalcium phosphates in citric acid, of diammonium citrate, and of mono- and dicalcium phosphates in diammonium citrate. The detailed results are given in tables. They lend no support to the views of Herzfeld and Feuerlein (Z. anal. Chem., 1881, 20, 191), Barillé (this J., 1908, 807) and Quartaroli (this J., 1911, 127) that complex ions are formed by the citric and phosphoric acids, but can be brought into satisfactory accord with the supposition that double decomposition takes place (see Grupe and Tolleys. Ber., 1880, 13, 1267; Zulkowsky and Cedivoda, this J., 1903, 144), differences between observed and calculated results in the cryoscopic determinations being regarded as due to varying hydrolytic dissociation of the reaction products.—A. S.

Phosphate nutrition of plants. A. Baguley. J. Agric. Sci., 1912, 4, 318—322.

In order to study the effect of artificially prepared insoluble salts of phosphoric acid on the growth of plants, oats, peas and swedes were grown in soils made of white sand and pure chalk to which the other essential nutrient constituents were supplied in a dilute solution. Using ferric phosphate oats made strong, well-developed plants with dark foliage and plenty of seed ripening late; peas made healthy sturdy plants with well developed pods ripening late; swedes grew steadily and well from the start, finally making very good plants. Practically the same result was obtained with aluminium phosphate. Grown with calcium phosphate, oats germinated and died: peas made poorly developed plants with few flowers and puny pods ripening late; swedes commenced to grow about six weeks late and then continued to grow normally, becoming healthy plants though backward. Experiments are described to show that ignition and extraction with boiling water exercise a considerable effect in lowering the availability of the phosphate. It is also shown that insoluble calcium phosphate is markedly less effective in the growth of oats than is insoluble iron phosphate; this difference in efficiency is not apparent in the case of swedes and peas.—E. F. A.

Potassium contents of the "Rapokivi-" and pegmatite granites; Utilisation of the ——. O. Aschan. Z. anorg. Chem., 1912, 74, 55—73.

The potassium present in the felspar may be rendered soluble in water by fusing the powder with anhydrous calcium chloride or with lime and salt (see Rhodin, this J., 1901, 431), and both methods are considered of possible value in rendering the potassium available for agricultural purposes, the former offering distinct advantages if calcium chloride be obtainable at a cheap rate. The greater part of the potassium in felspar may also be converted into a soluble form, as hydroxide, by heating under pressure with lime and water; but treatment with acids has been found unsuitable.—F. Sodn.

Nitrogen; Direct assimilation of inorganic and organic forms of —— by higher plants. H. B. Hutchinson and N. H. J. Miller. J. Agric. Sci., 1912, 4, 282—302.

The results of previous work are summarised as follows: nitrites are assimilated by various plants from sufficiently dilute solutions, and the plants so fed contain higher percentages of nitrogen than when supplied with nitrates as source of nitrogen. Negative results have been obtained with other inorganic forms of nitrogen, *e.g.* aminosulphonic acid hydroxylamine, hydrazine, and azoimide. The majority of organic compounds tested have given negative if not uncertain results. A table is given of the positive results. Experiments with peas in water cultures have enabled the following classification of the substances tested. *Readily assimilated:* Ammonium salts, formamide, acetamide, carbamide (urea), barbituric acid, alloxan, humus. *Assimilated:* glycine, alanine, guanidine, cyanuric acid, oxamide, peptone. *Doubtful* or *not assimilated:* Hippuric acid, trimethylamine, p-urazine, hexamethylenetetramine, ethyl nitrate, propionitrile, hydroxylamine hydrochloride, methyl carbamate. *Toxic:* Tetranitromethane. The results are not sufficiently numerous to indicate any relation between the assimilability and constitution of the nitrogenous compounds. The best results were obtained with urea and barbituric acid; with the former more nitrogen is assimilated, whilst the latter gives the greater amount of dry produce. Acetamide gives the next best results. With humates the nitrogen assimilated amounted to only 5·9 mgrms. per 0·577 grm. of "dry produce"; the amount of dry produce was however high, being more than was obtained with urea. The above results apply only to peas, possibly other plants may behave quite differently.—E. F. A.

Nitrogen fixation by azotobacter; Utilisation of cellobiose as source of energy in ——. A. Koch and S. Seydel. Zentr. Bakt. u. Parasitenk., 1911, II. Abt. 31, 567—570. Chem. Zentr., 1912, 1, 432—433.

Cellobiose (see this J., 1910, 102) cannot be utilised directly by azotobacter, but only after it has been transformed, probably hydrolysed, by the action of other soil bacteria. It is then as efficacious as dextrose in promoting the fixation of atmospheric nitrogen by azotobacter. 10 mgrms. of nitrogen being fixed per grm. of cellobiose. —A. S.

Nitrogen fixation by azotobacter. A. Koch and S. Seydel. Zentr. Bakt. u. Parasitenk., 1911, II. Abt. 31, 570—577. Chem. Zentr, 1912, 1, 433.

Much more nitrogen is assimilated per unit of material used as source of energy by cultures of azotobacter in the first few days than later, for when the azotobacter cells are fully developed, the nitrogen fixation ceases; subsequently the material used as source of energy is transformed and utilised for other purposes. Hence rapidly grown cultures, showing a high fixation of nitrogen in a few days, give the highest yield of combined nitrogen per unit of dextrose. This indicates that a more rational and cheaper utilisation of atmospheric nitrogen by soil bacteria may be obtained if a material can be discovered by means of which the azotobacter cells can be induced to increase until the whole of the substance used as source of energy is consumed.—A. S.

Soil; Assimilation of ammonia and nitrates by the micro organisms of the ——. J. H. Vogel. Zentr. Bakt. u. Parasitenk., 1912, II. Abt., 32, 169—179. Chem. Zentr., 1912, 1, 424.

Whilst in liquid culture media soil micro-organisms produced an appreciable quantity of protein from ammonia and nitrates, no such result could be observed in the soil itself. Addition of calcium carbonate promoted the formation of insoluble nitrogen compounds in liquid media, but was without appreciable effect when added to the soil. When calcium carbonate and ammonium salts were present together in the soil, considerable losses of nitrogen occurred, which however, apart from loss of ammonia by volatilisation, appeared to be due entirely to nitrate formed from the ammonia. Under conditions similar to those obtaining in the author's experiments, loss of nitrogen by denitrification must be taken into account. —A. S.

Manure works of Paris; The smells of ——. O. Boudouard. Comptes rend., 1912, 154, 238—240.

In the past summer the smells from manure-works were particularly objectionable in Paris; and the author has endeavoured to investigate the circumstances which favour or hinder the diffusion of these smells. Stocks of mineral superphosphates give off little or no smell, but dissolved bones and phosphoguanos continue to evolve evil-smelling gases; and elevation of temperature heightens the effect. Movement favours the disengagement and diffusion of these gases, so that the smells are intensified when the manures are being loaded and sent out. Mineral superphosphates can be readily desiccated and rendered quite inodorous; but this is impracticable for dissolved bones and phosphoguanos. Variations of atmospheric pressure seem to increase the intensity of the smells, especially when the temperature is high; and the electrical state of the atmosphere seems also to have an influence. The smell from dry manures lessens with time; but that from moist manures seems to increase as they gradually dry. The complete suppression of this nuisance will be a very difficult if not impossible task, involving as it must very severe regulation of the conditions of work in the manufactories.—J. T. D.

Copper fungicides. S. U. Pickering. J. Agric. Sci., 1912. 4, 273—281.

THE most effective form of Bordeaux mixture is obtained by adding lime water to copper sulphate until just short of alkalinity: the basic sulphate has the formula $10CuO.SO_3$ and is known as Woburn Bordeaux. Direct experiments have shown it to be equivalent to six times the weight of ordinary Bordeaux. The copper in Bordeaux mixture is rendered soluble by the carbon dioxide; dissolved copper is invariably present in the drip water collected from trees which have been sprayed. Gimingham and Barker (this J., 1911, 760) have suggested that the solvent of the normally insoluble copper compound is a substance excreted by the fungus itself. This is denied and experiments are described to prove that the copper in Bordeaux mixture is brought into the soluble condition by the action of air. The greater the excess of lime present the longer is the interval before this action commences. Bordeaux mixture does not dissolve sufficiently to give a reaction for copper with ferrocyanide but it does dissolve enough to react with iron. An atmosphere of carbon dioxide greatly accelerates action, but until the carbon dioxide actually reaches a certain proportion a reduction of action is observed. Action is also increased by the presence of calcium sulphate. If fungicidal action depended on a solvent material exuded from the fungus, all basic sulphates and carbonates of copper would be equally efficacious for a given weight of copper present: this is not the case.—E. F. A.

Lead arsenate in viticulture. Muttelet and Touplain. *See* XVIII.

Probable function of essential oils and other volatile products in plants as cause of movement of sap in living tissues. Giglioli. *See* XX.

PATENT.

Phosphates; Treatment of ——. N. P. Pratt, Assignor to Pratt Process Co., Atlanta, Ga. U.S. Pats. 1,014,254 and 1,014,255, Jan. 9, 1912.

(1) NATIVE phosphates containing sulphates, especially calcium sulphate, are treated with water or a saline solution, such as sea-water, so as to dissolve the sulphates which are thus eliminated. (2) The method of separating sulphates by solution is claimed for mixtures of insoluble phosphates and soluble sulphates generally, any suitable solvent being employed.—F. SODN.

XVII.—SUGARS; STARCHES; GUMS.

Sugar factories: Comparative chemical control of Belgian and Dutch [beet] ——. H. Pellet. Betterave, 1911, 22, inset, 1—3.

COMMENTING upon the recently published report on the comparative chemical control of certain beet factories of Belgium and Holland for the past 19 years, the author calls attention to the fact that in the case of the Belgian factories the sugar lost in the pulp did not increase with the corresponding rise in the sugar content of the beet from 12·23 to 15·64 per cent., but on the contrary diminished from 0·36 to 0·24 per cent. This reduction in the sugar lost in the pulp was attained in spite of a reduction in the volume of juice drawn from the diffusion battery, this figure having fallen from 122 to 109·8 litres per cent. on the sliced roots. Moreover, although the juice became denser, and the filter-press work more difficult, the sugar in the scums did not increase, but diminished from 0·82 to 0·74 per cent., and the undetermined losses diminished from 0·45 to 0·39 per cent. on the sugar in the juice. In the Dutch factories the same general results, although more marked, were obtained, the figures being: sugar in the beet, 13·30—16·47 per cent.; sugar lost in the pulp, 0·43—0·26 per cent.; volume of juice drawn from the battery, 118—109·2 litres per cent. on the roots; sugar in the scum, 1·14—0·96 per cent.; and undetermined losses, 0·33—0·22 per cent. on the sugar in the juice. As to the purity of the first jet massecuite, this increased from 89·1° to 93·6° in the case of the Belgian, and from 91·1° to 93·8° in that of the Dutch factories. During 1906—1911 the saline quotient varied from 44·8 to 41·3 in the Belgian, and from 40·0 to 44·3 in the Dutch factories, the purity in both cases remaining about the same during this period, this difference apparently being due to the quality of seed used.—J. P. O.

Incrustations [in the beet sugar factory]; Removal of —— *by spontaneously fermenting molasses.* K. Hartmann Österr.-Ungar. Zeits. Zuckerind., 1911, 40, 715—717.

INSTEAD of the usual preliminary treatment with sodium carbonate and hydrochloric acid for the removal of incrustations, the author recommends the following procedure: At the end of the campaign, wash-waters, waste sugars, molasses, etc., are introduced into the body of the effect in such amount that on filling with warm water to about 20 in. above the top tube, the liquor contains 5 per cent. of sugar. After a short time fermentation sets in, and the acids subsequently formed act upon the incrustation and loosen it. Although only certain constituents of the incrustation actually enter into solution, it is stated that in this way a soft mass is formed that is capable of being readily removed. Usually four or five weeks suffice for the maximum effect, and at the end of this time the liquor is replaced by water. Finally the water is run away, and whilst still wet the incrustation is scraped and brushed off, trouble from dust being thus avoided. Other plant of the factory, such as filters, preheaters, and juice pipes, may be advantageously treated in this way, and removable parts, as the cocks and sieves of the scum presses, may be placed together in a tank, and there submitted to the action of the fermenting sugar liquor. An examination of the deposit on the walls of the fifth body of a multiple effect, (a) before, and (b) after treatment with a fermenting solution of molasses in the manner indicated gave the following analytical results: water, (a) 8·55, (b) 11·75; organic matter, (a) 47·80, (b) 55·68; matter insoluble in *aqua regia*, (a) 1·25, (b) 0·35; iron and alumina, (a) 16·88, (b) 2·68; cupric oxide, (a) nil, (b) nil; calcium oxide, (a) 18·91, (b) 29·08; magnesium oxide, (a) 0·40, (b) traces; sulphuric acid, (a) 0·42, (b) 0·34; and undetermined matter, (a) 5·69, (b) 0·11 per cent. The deposit in the outlet pipe of a third saturator that had been acted upon by fermenting molasses for two weeks gave the following figures : dry substance, 4·17 ; residue after ignition, 1·66 ; volatile acids, as acetic acid, 0·23 ; and non-volatile acids, as lactic acid, 0·26 per cent. —J. P. O.

Invertase and diastase in honey. T. von Fellenberg. Mitt. Lebensmittelunters. u. Hyg., 1911, 2, 369—377. Chem. Zentr., 1912, 1, 280—281. (See also this J., 1910, 291 ; 1911, 439, 564.)

THE author separated the enzymes from honey by dissolving in water, precipitating with alcohol, and purifying the precipitate by repeatedly suspending it in 70 per cent. alcohol and centrifuging. On treating 100 c.c. of a 10 per cent. solution of sucrose with 0·5 c.c. of an aqueous solution of the enzymes (=5 grms. of honey) at 37° C., invert sugar was produced rapidly at first and then more slowly : after a period of from 8 to 15 days, the amount remained nearly constant (1·7 grms.). In other experiments the honey itself was used instead of the enzyme preparation, and then it was observed that sometimes more invert sugar was produced than corresponded with the sucrose added, indicating that the honey dextrin, which according to Barschall (Arb. Kais. Gesundh.-Amt, 1908, 28, 405) is probably a triose, is also hydrolysed. Honey-dextrin is hydrolysed considerably more slowly than potato starch by ptyalin, and is not hydrolysed by the invertase of yeast, hence the hydrolysis mentioned above is probably for the most part due to the diastase present in the honey : possibly honey contains also a trisaccharose. When a 1 per cent. solution of honey was kept for 2 days in the dark at the ordinary temperature, the amount of invert sugar produced (reckoned as a percentage on the quantity of honey) varied within wide limits, *e.g.*, from 0·27 to 6·64 per cent. in 31 samples of genuine honey. The age of the honey has a notable influence on its inverting power : in general honeys with a high water content have a low inverting power and mostly contain a high proportion of invert sugar and a low proportion of sucrose. Honey which has been heated to a temperature high enough to destroy the enzymes should no longer be sold as normal honey.—A. S.

Gum in [liqueur] syrups ; Determination of ——. A. C. Chauvin. Ann. Falsif., 1912, 5, 27—30.

ALTHOUGH precipitation of the gum (gum arabic and similar gums), from its alcoholic solution by means of normal lead acetate as described by the author and subsequently by Rocques and Sellier (this J., 1911, 823) affords a satisfactory means of determining gum in syrups, the author prefers to precipitate the gum by means of alcohol containing hydrochloric acid : the precipitated gum is quite free from ash. Different commercial gums contain from 11·5 to 15·8 per cent. of water and from 1·7 to 2·9 per cent. of ash, and the actual amount of natural gum in any sample of syrup is found by adding to the weight of the precipitate 16·1 per cent. of its quantity (16·1 being the average percentage of water *plus* ash in the original gum). The determination is carried out as follows :—To 5 c.c. of the syrup solution are added 5 c.c. of hydrochloric acid, 5 c.c. of water, and 85 c.c. of absolute alcohol, the acid and alcohol being added drop by drop while the mixture is stirred continuously. The precipitate is then collected on a filter, washed with alcohol containing 10 per cent. of hydrochloric acid, next with absolute alcohol, dried, and weighed.—W. P. S.

Gum of Khaya madagascariensis. A. Gérard. Bull. Sci. Pharmacol., 1911, 18, 148—151. Chem. Zentr., 1912, 1, 357.

THE gum, which collects on the bark of the trunk of the tree, is a pale to dark yellow, tasteless and odourless substance partly soluble in water ; it is precipitated from solution by lead acetate. It contains 21 per cent. of water and the water-soluble portion amounts to 67 per cent. ; the rotatory power is $[\alpha]_D = +33^\circ 20'$ when referred to the gum itself or 19° 45′ when referred to the portion soluble in water. The gum contains an oxydase, a peroxydase, and emulsin, but no myrosin. The organic matter of the gum consists of galactans and pentosans : on heating 2 grms. of the gum with 100 c.c. of 8 per cent. sulphuric acid for 3 hours in an autoclave at 110°—115° C., there was obtained a quantity of reducing sugars equivalent to 85·6 per cent. of the dry substance of the gum and containing 48·40 per cent. of galactose and 31·38 per cent. of arabinose.—A. S.

PATENTS.

(1). *Composition of matter [mixture of starch conversion products] and process for manufacturing the same.* (2). *Apparatus for converting starch by a continuous operation into derivatives, dextrin, dextrose, etc.* S. M. Lillie, Philadelphia, Pa. U.S. Pats. 1,014,237 and 1,014,311, Jan. 9, 1912.

(1). STARCH is converted in a number of separate vessels, the degree of conversion being different in each vessel ; the products are then mixed in any desired proportions, the waste steam from the vessels being used to heat fresh charges of starch. (2). The apparatus consists of a tank in which the starch receives a preliminary heating, and a number of converting vessels which are supplied with steam under pressure. The heated starch is supplied to and withdrawn from the converting vessels continuously, the conversion products being received in a chamber from which the waste steam may be conducted to the preliminary heating tank.—W. P. S.

Sugar ; Process of manufacturing ——. G. Barker, Birmingham. From Henning Process Sugar Extraction Co., San Francisco. Eng. Pat. 8381, April 4, 1911.

SEE U.S. Pat. 991,505 of 1911 ; this J., 1911, 761. Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 3049 of 1895, 19,961 of 1898, and 26,570 of 1902.—T. F. B.

Sugar-juices ; Method of extracting ——. C. Steffen, Vienna. U.S. Pat. 1,015,650, Jan. 23, 1912.

SEE Eng. Pat. 4519 of 1911 ; this J., 1911, 914.—T. F. B.

XVIII.—FERMENTATION INDUSTRIES.

[Malt] Extract yield ; Influence of mashing liquor on the ——. R. L. Siau. J. Inst. Brew., 1912, 18, 19—29.

PARALLEL determinations of the extract yield of malt were made with different waters, *viz.*, distilled water, well-waters, and well-water further hardened by addition of sulphates and chlorides. When the values obtained were corrected for the gravity of the particular waters employed, it was found that distilled water produced higher extracts than any of the others. For example, a water containing much calcium sulphate gave, with one malt, an apparent yield 2·6 lb. per quarter higher than that given by distilled water, whereas the corrected value was 3·1 lb. less than the latter. The lowest (corrected) extracts were obtained with the waters of greatest alkalinity, and considerably higher values were obtained with the same waters after neutralisation with acid. The proportion of maltose to dextrin in the starch conversion products (calculated from the specific rotatory power of the worts) also differed somewhat in the different cases. The author points out that the Excise charge is based on the apparent yield, and therefore duty is paid not only on the extract of the malt but on the salts of the brewing water (*cp.* Baker and Hulton, this J., 1910, 644).—J. H. L.

Diastase of malt ; Special action exerted by temperature on the ——. H. van Laer. Bull. Soc. Chem. Belg., 1912, 26, 18—28.

IT is well known that if diastase is heated to a temperature not much above that at which its activity is greatest, it suffers a permanent enfeeblement which becomes more complete at higher temperatures. The author has found that when diastase so treated acts upon starch solutions the course of saccharification is abnormal. He has previously shown that the hydrolysis of starch by malt-extract normally follows the law of unimolecular reactions, the velocity-constant k remaining practically unchanged throughout the process; but frequently, particularly when the quantity of diastase employed is relatively large, the value of k increases with the progress of the reaction. It is now shown that the saccharification produced by malt-extract enfeebled by heating, is characterised by a velocity-constant which diminishes as the reaction proceeds. This effect is the more marked the higher the temperature and the longer the duration of heating. If, for example, a given malt-extract before heating produces saccharifications in which the value of k increases with the time, it will after heating at a certain temperature produce saccharifications conforming to the logarithmic law of unimolecular reactions (k constant), whilst after heating to a still higher temperature, saccharifications typical of enfeebled diastase will be obtained (k decreasing). These changes in the kinetics of saccharification are not prevented by the addition of maltose to the malt-extract before heating, although the diastase is thereby protected to some extent against the destructive influence of high temperatures. The temperature-coefficient of the velocity of the diastatic saccharification of starch, $\frac{k_{35^\circ}}{k_{25}}$, is practically 2, but this coefficient diminishes with rise in temperature. With respect to any one starch-transformation the coefficient only remains constant so long as the two conversions compared conform to the law of unimolecular reactions.—J. H. L.

Beer; Relation between the nitrogen of —— and that of malt. P. Petit. Woch. Brau., 1912, **29**, 50—52.

From an investigation respecting the relation between the total soluble non-coagulable nitrogen and the assimilable nitrogen of malt, as determined in the laboratory, on the one hand, and the nitrogen-content of the wort and the amount of protein assimilated by the yeast in practice, on the other hand, the author draws the following conclusions:—The protein-content of the wort (expressed as percentage of the extract) can be predicted from the content of soluble non-coagulable protein of the malt, and is independent of the method of mashing unless this includes a prolonged digestion of the mash at a comparatively low temperature (*e.g.*, for 1½ hours at 50° C.) to facilitate proteolysis, in which case the protein-content of the wort is increased by about 25 per cent. In the case of bottom-fermentation, the determination of the assimilable nitrogen of the wort gives results agreeing closely with the actual amounts assimilated in practice, but rather lower than those found by investigation of the malt in the laboratory. When the method of mashing employed includes a prolonged proteolytic stage (see above), the quantity of nitrogen assimilated by the yeast is no higher than in other cases in spite of the increased nitrogen-content of the wort, and the beers produced are therefore rich in proteins. The author concludes that the proteolysis occurring at 50° C., under these conditions, is limited to the solution of albuminous matters but produces no increase in the quantity of peptones and amino-acids present. As regards top-fermentation, the amount of proteins actually assimilated in practice agrees with the determination of assimilable nitrogen of the malt. Cold pre-mashing (for 14 hours) was found not to raise the nitrogen-content of the wort, but it increased the quantity of nitrogen assimilated by the yeast. The greater assimilation of nitrogen by top- as compared with bottom-fermentation yeasts may be due either to the higher temperature of fermentation or to a difference in the activity of the proteolytic enzymes of the two yeasts; the former is the more probable explanation.—J. H. L.

Pentoses; Behaviour of —— in fermenting mixtures. W. E. Cross and B. Tollens. J. Landw., 1911, **59**, 419; Woch. Brau., 1912, **29**. 68

From experiments on the fermentation of arabinose, xylose and rhamnose, the authors draw the following conclusions:—Solutions of pentoses free from hexoses are not decomposed by yeast. When dissolved together with hexoses in yeast-water, the pentoses are not fermented; but if the basis of the culture liquid is pure water or an artificial nutrient liquid containing little organic matter, the pentoses are decomposed during the fermentation of the accompanying hexoses. The pentoses are only employed in the formation of new cells by the growing yeast, when the culture medium is poor in nutrient material. In this investigation the authors employed yeast K of the Versuchs- und Lehranstalt für Brauerei, Berlin, and a wine-yeast.—J. H. L.

Alcoholic fermentation; Dihydroxyacetone as intermediate product of ——. A. Slator. Ber., 1912, **45**, 43—46.

If dihydroxyacetone is an intermediate product of alcoholic fermentation it must be decomposed by yeast at least as rapidly as sugar. Comparative fermentation tests, carried out by a method previously described (see this J., 1906, 227; 1908, 653), with solutions of dihydroxyacetone and of dextrose, showed that the former is not fermented by living yeast. That this result is not due to inhibition of the fermentative activity of the yeast by the relatively large quantities of dihydroxyacetone present, is proved by the fact that dextrose is fermented quite normally in presence of the former substance. The author concludes that dihydroxyacetone is not an intermediate product in the fermentation of dextrose. (Compare v. Lebedeff, this J., 1911, 1328.)—J. H. L.

Alcohol trade of Germany. U.S. Cons. Rep., Jan., 1912. [T.R.]

The following table gives tho production of alcohol in Germany, the amount consumed as a beverage, the consumption in the industries, and the exports to foreign countries during the past six campaign years:—

Years.	Production.	Consumed as a beverage.	Industrial arts.	Exports.
	Gallons.	Gallons.	Gallons.	Gallons.
1905—6	115,667,669	59,852,758	39,119,288	4,454,935
1906—7	101,352,013	64,450,194	35,484,784	5,695,933
1907—8	106,160,656	62,623,194	42,088,189	458,508
1908—9	112,675,045	68,740,462	39,233,146	281,077
1909—10	96,426,895	47,623,195	49,882,493	270,299
1910—11	91,765,078	51,860,069	37,141,633	310,479

The price of pure alcohol for consumption in Germany towards the close of last year was 60 marks per 100 litres, to which must be added 125 marks, the excise tax per 100 litres, making the selling price 185 marks per 100 litres, or about 6s. 8d. per gallon. The Customs duty on foreign alcohol imported into Germany from any country in casks is 275 marks per 100 kilos. This is at the rate of about 8s. 6d. per gallon. While the selling price may be somewhat higher in the future, it will probably not increase so as to overcome the import duty, which is virtually prohibitive.

Brewing; Influence of mineral constituents of water in ——. G. H. Gemmell. J. Inst. Brew., 1912, **18**, 34—45.

The author gives a summary of the present state of knowledge on this subject, based mainly on the work of Wüstenfeld (this J., 1910, 1126) and Readman (this J., 1894, 367—375). Respecting the influence of the mineral constituents of water on fermentation, it may be concluded that potassium, magnesium, calcium, phosphorus and sulphur are necessary, and deficiency of any one of these will give rise to difficulties. Of the salts which are injurious to yeast those of copper are of interest, for Chapman has shown (J. Inst. Brew., 1909, 36) that traces of these may be formed by the action of the wort-acids on the copper linings of fermentation vats. As regards the influence of salts during mashing, all that can be said with certainty is that saccharification is retarded by the carbonates of sodium, calcium and magnesium; that the effect of calcium sulphate up to 35 grains per gall. is good, and that a greater excess of this salt reduces the yield of extract but increases the proportion of malto-dextrins to maltose in the saccharification-products (see Baker and Day, this J., 1910, 644). Sodium chloride in small quantities is beneficial and increases the yield of maltose. Exceptionally hard waters containing large proportions of the sulphates and chlorides of calcium and magnesium are to be avoided ; 30° of hardness is all that is necessary.—J. H. L.

Mercaptan ; Formation of —— during alcoholic fermentation. L. Mathieu. Ann. Brass. et Dist., 1911, 329 ; Woch. Brau., 1912, 29, 58—59.

Mercaptan has frequently been detected in wines, to which it imparts an unpleasant flavour. Its formation is due to the interaction of alcohol with hydrogen sulphide. The latter may be detected during the early stages of primary fermentation of all wines which afterwards contain mercaptan. The actual formation of mercaptan, however, takes place at a later stage, chiefly during the first month after the primary fermentation. Respecting the origin of the hydrogen sulphide, yeast is able to produce it more or less readily from the most diverse sulphur compounds, *e.g.*, ultramarine (present in sugars), sulphites and even sulphates. This capacity is possessed by different races of yeast in different degrees, and is favoured by relatively high temperatures. The formation of mercaptan in wines is often preceded by an odour of toasted bread. This odour has been observed by Windisch during the fermentation of beer worts abnormally rich in furfural, and according to Lintner it is probably due to the presence of furfuromercaptan. In order to avoid the formation of mercaptan in wines, the safest way is to remove the yeast after the primary fermentation is completed, and in any case this should be done as soon as the formation of hydrogen sulphide is observed. In the case of sparkling wines which contain free or combined sulphurous acid, the evolution of carbon dioxide should be allowed to proceed in complete darkness and at relatively low temperatures. To remove the flavour of mercaptan from wines and brandies, they may be treated with fresh yeast, which appears to absorb the mercaptan. Unfortunately this treatment spoils to some extent the bouquet and colour of red wines. The mercaptan present in brandies can be decomposed by leaving the latter for two hours in contact with copper turnings, which unite with the sulphur of the mercaptan forming copper sulphide. The acids present, however, dissolve traces of copper, so that the brandy must afterwards be diluted and re-distilled.—J. H. L.

Aluminium fermentation- and storage-vats. C. Bleisch. Z. ges. Brauw., 1912, 35, 49—53.

The author has carried out experiments with aluminium such as is used for the construction of brewery plant ; it contained 99·52 per cent. of the pure metal, 0·26 per cent. of iron, 0·21 per cent. of silicon, and traces of zinc, copper and carbon. The washing of brewing vessels made of this metal, whether with hard or soft water, could, in the absence of more powerful cleansing agents, give rise to no considerable corrosion in practice, even in the course of years. In contact with fermenting wort, a clean surface of the metal loses a negligibly small amount of its substance during the first few days, but afterwards a hard incrustation begins to form, similar to that found in wooden vats. It resembles the latter in composition (containing no trace of aluminium), but possesses a smoother surface. It constitutes after a time a natural insulating layer between the metal and the wort, and since, on account of its smooth surface, it is not so liable to harbour obnoxious organisms, it would not be necessary to remove it so frequently as in the case of wooden vats. Its removal by mechanical means is not easy, and as alkaline cleansing liquids must not be used with aluminium, the best agent for loosening it would probably be dilute nitric acid (10—15 per cent.) which neither attacks the metal nor increases its susceptibility to other reagents. A similar incrustation, but much less in amount, is also formed during the storage of beers in aluminium vessels. Of a number of disinfectants tested, formaldehyde alone was found to be quite without action on the metal. The author concludes that aluminium of high purity possesses properties which render it particularly suitable for the construction of fermentation vessels. Its suitability depends to some extent on the treatment to which it has been subjected in manufacture. The cold-drawn or cold-rolled metal does not altogether answer the requirements of the brewing industry, but a subsequent heating at 450° C. effects a considerable improvement in the properties of the material. (See also this J., 1912, 87).—J. H. L.

Must from over-ripe grapes ; Proteolytic enzyme in ——. E. Pantanelli. Zentr. Bakt. u. Parasitenk., 1911, II. Abt. 31, 545—559. Chem. Zentr., 1912, 1, 422.

Must prepared from over ripe red and white grapes contains an enzyme which decomposes the protein of the must into soluble products not precipitated by copper hydroxide. The enzyme is most active in an acid medium, but is probably a mixture of enzymes, for it can also act in neutral or faintly alkaline media. After a certain time, condensation of the decomposition products of the protein appears to take place, until finally a more or less definite condition of equilibrium is attained. The equilibrium is displaced if the reaction of the medium be changed from acid to faintly alkaline or *vice versa*. If a mixture in which a condition of equilibrium has been reached be diluted, the proteolytic action usually predominates again until a new condition of equilibrium is attained. In studying this proteolytic action, thymol is preferable to formalin as an antiseptic ; potassium bisulphite may also be used, but probably acts chemically also, for the proteolysis increases with the concentration of sulphurous acid. It was found that all the races of yeast examined formed more protein, multiplied more readily, and produced more alcohol in pasteurised than in unpasteurised must.—A. S.

Fermentation of grape-must ; Influence of light on the ——. W. Lubimenko and A. Froloff-Bagreieff. Comptes rend., 1912, 154, 226—229.

The fermentative energy of yeast (race *Steinberg* 1892, was used in the authors' experiments) is considerably less in daylight than in the dark. Multiplication of cells and evolution of gas proceed less rapidly, and the total quantities of carbon dioxide and alcohol formed, and of sugar fermented, are also less. The production of acids, and especially volatile acids, in cultures exposed to light, is smaller than in those grown in the dark, but more glycerol is formed ; the formation of esters does not appear to be influenced by the light.—J. H. L.

Lead arsenate in viticulture. F. Muttelet and F. Touplain. Ann. Falsif., 1912, 5, 9—16.

Grapes, marc, wine, and lees obtained from vines which had been treated with lead arsenate were practically free from arsenic ; in any case, the quantity of arsenic present was not greater than that found in grapes, etc., from vines which had not been treated with this insecticide. The wine was also found to be free from lead, but the lees sometimes contained appreciable quantities of the metal. The grapes, in certain cases, retained on their surface a large amount of lead (up to 200 mgrms. per 100 grms. of dry grapes). (See also this J., 1910, 514.)—W. P. S.

Probable function of essential oils and other volatile products in plants as cause of movement of sap in living tissues. [Separation of zymase from yeast]. Giglioli. *See* XX.

Patent.

Wort ; Apparatus for macerating ——. R. Hoffmann, Ortelsburg, Germany. U.S. Pat. 1,015,443, Jan. 23, 1912.

See Eng. Pat. 3215 of 1911 : this J., 1911, 706.—T. F. B.

XIXa.—FOODS.

Arsenic in table gelatin ; Occurrence of ——. O. Köpke. Arbb. Kais. Gesundh.-Amt., 1911, 38, 290—293. Chem. Zentr., 1912, 1, 281—282.

When hides which have been subjected to a treatment with lime and arsenic sulphide are worked up into leather, the arsenic in part remains in the finished leather, and passes into the gelatin made from such leather (scraps, etc.). The author examined 12 samples of gelatin from different works, of which one was designed as a fining material for wine and the others were sold as table gelatin, and found that all of them contained arsenic, though in some cases only in traces. There was no relation between the arsenic content and the commercial value of the gelatin: one of the most expensive samples was also one of the richest in arsenic (0·3 mgrm. in 10 grms.).—A. S.

Determination of gum in syrups. Chauvin. See XVII.

Patents.

Carcases, slaughter-house waste and the like. Process and apparatus for the treatment of ——. A. Sommermeyer. Berlin. Eng. Pat. 8898, April 10, 1911. Under Int. Conv., July 13, 1910.

The material is treated with steam under pressure and vapours of benzine, carbon tetrachloride, or other solvent in a rotating, perforated cylinder, mounted horizontally in an outer casing. The material is disintegrated gradually as the cylinder rotates and the extracted substances, together with water and solvent, are discharged from the lower part of the casing. Means are provided for introducing fresh charges of material into the cylinder without diminishing the pressure in the same.—W. P. S.

Milk: Process of desiccating ——. J. Roeb, Assignor to Crystallised Milk Co., Spokane, Wash. U.S. Pat. 1,014,609, Jan. 9, 1912.

The milk is partially dried on the surface of rotating drums heated to a temperature of from 110° to 150° F., and is then pressed between the drums and subjected to the action of a current of warm dry air until it is converted into a hard compact mass which is removed by scrapers from the surface of the drums.—W. P. S.

Butter-flavoring. H. C. Buer, Bonn, Germany. U.S. Pat. 1,014,690, Jan. 16, 1912.

See Eng. Pat. 18,201 of 1909; this J., 1909, 1268.—T. F. B.

XIXb.—WATER PURIFICATION; SANITATION.

Chalk waters; Composition of ——. Gillet. Bull. Soc. Chim. Belg., 1912, **26**, 11—12.

The author has confirmed an observation made by Bödlander, that calcium carbonate dissolves slightly in water, undergoing hydrolysis at the same time, thus $2CaCO_3+2H_2O=Ca(OH)_2+CaH_2(CO_3)_2$. Sodium or ammonium chloride slowly produces a precipitate with this solution, the first stage in the production of which may be represented thus, $Ca(OH)_2+2NaCl=2NaOH+CaCl_2$. The caustic soda then interacts with the calcium bicarbonate.—$CaH_2(CO_3)_2+NaOH=CaCO_3+NaHCO_3+H_2O$. When all the calcium bicarbonate has been removed in this way, the caustic soda may react partially with the calcium chloride. It has been proved that natural chalk waters sometimes contain less calcium at considerable depths than at higher levels. The reactions described above explain this, for the water in descending frequently dissolves more sodium chloride, which occasions a precipitation of calcium carbonate. The author has also amplified his earlier explanation (given in 1892) of the formation of phosphate deposits at the surface of chalk strata. Water containing acid calcium phosphate in solution, on contact with the chalk, hydrolyses and dissolves some of the latter, and tri-calcium phosphate is precipitated according to the equation—

$$CaH_4(PO_4)_2+2Ca(OH)_2=Ca_3(PO_4)_2+4H_2O.$$

—J. H. L.

Arsenical dipping fluids; Spontaneous [bacterial] oxidation of ——. A. V. Fuller. U.S. Dept. Agric., Bureau of Animal Industry, Circular 182, Nov. 9, 1911.

Solutions of sodium arsenite (approximately 0·24 per cent. of arsenic trioxide) containing pine tar showed, on titration, an apparent loss of arsenic after standing in the vats for varying periods of time. Experiments proved that this was not due to purely chemical reactions, but was the result of oxidation of the sodium arsenite to sodium arsenate through the agency of one or more micro-organisms not yet identified. This oxidation may proceed very rapidly, and may be finally practically complete. For example, a sample of dip containing 0·236 per cent. of arsenic trioxide showed quantities ranging from 0·006 to 0·198 per cent. after being mixed with suitable culture media, then inoculated with sheep dip in which oxidation had already taken place, and left for a month in a dark room, at the ordinary temperature, with occasional agitation. Under the same conditions a sample of the sterilised dip contained 0·222 per cent. of arsenic trioxide. The velocity of the oxidation depends upon various factors, such as temperature, nature of the organic matter present, etc., so that no limit can be fixed for the time during which a wash exposed to the ordinary conditions in practice might be regarded as materially unaltered. As a safeguard it is advisable to discard any dip more than a few weeks of age, unless a test has shown it to contain its original proportion of arsenic trioxide.—C. A. M.

Alcohol: Bactericidal activity of aqueous —— *alone and in combination with other disinfectants.* A. Beyer. Z. Hyg. u. Infectionskrankh., 1911, **70**, 225. Apoth.-Zeit., 1912, **27**, 28.

Alcohol of 70 per cent. by weight concentration is markedly more efficient as a bactericide than either stronger or weaker alcohol. It is 40 times more powerful than 80 per cent., and 30 times stronger than 60 per cent. alcohol. Alcohol of more than 80 per cent., or less than 60 per cent. concentration is practically worthless as a germicide. Mixtures of alcohol with chloroform, ether, benzene, acetone, glycerin, carbon bisulphide, and light petroleum spirit, have no greater bactericidal action than aqueous alcohol. Eau de Cologne has a greater bactericidal action than alcohol of the same strength; this seems to increase with age. Most essential oils, both alone and in alcoholic solution, appear to have no great bactericidal value. Alcoholic solutions of iodine exceed all other preparations in bactericidal power, killing even anthrax bacilli within one minute. For Staphylococci a weak solution of iodine (0·25 per cent.) is quite effective. Chloro-*m*-cresol is a powerful germicide, and its addition to alcohol increases the bactericidal power of the latter; after alcoholic solution of iodine alcoholic chloro-*m*-cresol solution is the most active of germicides.—J. O. B.

Copper fungicides. Pickering. *See* XVI.

Patents.

Sewage; Tanks or pits used in the bacterial or septic treatment of ——. E. Dapino, London. Eng. Pat. 3263, Feb. 8, 1911.

The sewage is passed through four communicating tanks, the first two of which are air-tight, and have their openings ordinarily sealed. The third tank has a series of communicating compartments arranged in zig-zag fashion and containing coke or other filtering material; whilst the filtrate is discharged from the fourth tank.—C. A. M.

Water and other liquids; Apparatus for purifying ——. J. Wilson, Wandsworth. Eng. Pat. 7029, March 21, 1911.

The water is divided into proportional parts one of which passes into an oscillating bucket controlling the amount of the softening reagent. This stream of water discharges into an intermediate chamber provided with narrow vertical slots between the reagent reservoir and the main mixing tank. The other stream of water works a water-wheel which discharges direct to the main mixing chamber.
—C. W. McD.

Sewage and distillery or brewery wash or waste; Treatment and utilisation of ——. A. Dickson, Dublin. U.S. Pat. 1,015,302, Jan. 23, 1912.

See Eng. Pat. 25,108 of 1910; this J., 1911, 504.—T. F. B.

XX. ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Quinine, cupreine, 6-methoxyquinoline, and 6-hydroxyquinoline; Absorption spectra of ——. J. J. Dobbie and J. J. Fox. Chem. Soc. Trans., 1912, **101**, 77—81.

The authors find that the absorption spectra of quinine (which contains a 6-methoxyquinoline nucleus) and cupreine (which contains a 6-hydroxyquinoline nucleus) respectively are practically identical with those of 6-methoxyquinoline and 6-hydroxyquinoline. The absorption spectra of quinine and cupreine are thus little affected by the presence of the reduced rings which they contain (see also this J., 1911, 919).—J. C. C.

Strychnine and brucine; Research on ——. R. Ciusa and G. Scagliarini. Atti R. Accad. dei Lincei, Roma, 1911, **20**, II., 201—206.

The authors have repeated the work of Löbisch and Schoop (Monatsh. Chem., **6**, 855) on the action of bromine on strychnine in sulphuric acid solution, but have been able to obtain in this way only the known monobromostrychnine melting at 222°—223° C., which by the action of bromine in glacial acetic acid is converted into the perbromide, $C_{21}H_{21}N_2O_2Br,HBr,Br_4,H_2O$, previously described (this J., 1911, 238). They conclude that the so-called β-monobromostrychnine of Löbisch and Schoop has no existence. By the action of bromine on brucine in glacial acetic acid solution, a perbromide, $C_{23}H_{25}N_2O_4Br,HBr,Br,H_2O$, which does not melt at 270° C., and a small quantity of a monobromobrucine, which was isolated in the form of its platinum chloride derivative, were produced. By the action of potassium chlorate on strychnine dissolved in hydrochloric acid, in the cold, the tetrachlorostrychnine of Minunni (Gaz. chim. ital., 1900 **30**, I., 39), $C_{21}H_{18}N_2O_2Cl_4$, was obtained, together with another amorphous tetrachloro-derivative. On carrying out the same reaction, with heating, only a small quantity of tetrachlorostrychnine was obtained, but an octochloro-derivative, $C_{21}H_{14}N_2O_2Cl_8,3H_2O$, of a ketonic character was produced, the *p*-nitrophenylhydrazone of which was prepared. This formation of a ketonic compound is held to support Minunni's view that the strychnine molecule contains a phenolic hydroxyl group. The two dibromides of strychnine, $C_{21}H_{22}N_2O_2Br_2$, melting at 122° and 260° C. respectively, monobromostrychnine, and the dibromide corresponding to it, are not less toxic than strychnine itself, but the octochlorostrychnine Minunni's tetrachlorostrychnine, and the acid, $C_{19}H_{22}N_2O_6$, described previously are not toxic.—A. S.

Sparteine; Decomposition of ——. *Formation of a hydrocarbon, sparteilene.* C. Moureu and A. Valeur. Comptes rend., 1912, **154**, 161—163.

The exhaustive methylation of sparteine by Hofmann's method has now been completed (Comptes rend., 1907, **145**, 815). Methylhemisparteiline, $C_{15}H_{22}NCH_3$, was treated with methyl iodide and the product submitted to the action of moist silver oxide. The substance was heated in a vacuum to 70° C., when dimethylhemisparteiline was obtained, which boiled at 201°—202° C. at 27·5 mm. and was optically inactive. By repeating the process, sparteilene, $C_{15}H_{20}$, was produced. This hydrocarbon is a colourless liquid boiling at 157°—159° C. at 18 mm., and is optically inactive. The molecular refraction, 69·39, agrees with that calculated for a hydrocarbon with six double linkages. When oxidised by means of a neutral solution of potassium permanganate, an acid, $C_{10}H_{10}O_5$, was produced melting at 300°—305° C. on the Maquenne block.—F. Shdn.

Peganum harmala. Formation of bromine compounds of the alkaloids of ——, *and of the related bases.* V. Hasenfratz. Comptes rend., 1912, **154**, 215—217.

Bromine dissolved in acetic acid was allowed to act upon the alkaloids of *Peganum harmala* and their derivatives, when a number of bromine compounds were isolated. Bromoharmaline, $C_{13}H_{12}N_2OBr$, forms fine white needles, m. pt. 195° C. Harmine gives rise to two isomeric derivatives: bromoharmine, $C_{13}H_{11}N_2OBr$, colourless rhombic prisms, m. pt. 275° C., and isobromoharmine, long colourless needles, m. pt. 203° C. Bromoapoharmine crystallises from alcohol in long colourless needles, m. pt. 229° C. Bromomethylapoharmine has the same crystalline form and melts at 196° C. Harmine was dissolved in dilute sulphuric acid and treated with bromine water. The product was boiled with dilute alcohol till solution took place and allowed to cool. The salt which separated was decomposed by means of ammonia, with the production of dibromoharmine, $C_{13}H_{10}N_2OBr_2$, m. pt. 209° C. All these bromine compounds are mono-acid bases, in which the halogen is attached to the carbon and not to the nitrogen.—F. Shdn.

Catha edulis Forsk; Pharmacodynamic investigation of ——. J. Chevalier. Bull. Sci. Pharmacol., 1911, **18**, 264—275. Chem. Zentr., 1912, 1, 371. (See also this J., 1899, 1049; 1910, 1091).

For the isolation of cathine (compare Beitter, Diss., Strassburg, 1900), the coarsely powdered leaves of *Catha edulis* are stirred with dilute ammonia solution to a thick paste, which, after 24 hours, is exhausted with 80 per cent. alcohol. The extract is evaporated in a vacuum to a syrup, and treated with excess of ammonia: the yellow precipitate produced is filtered off, and dried with the aid of the pump, and then it and the filtrate are separately extracted with chloroform. The chloroform is distilled off from the solution, the residue is dissolved in water containing hydrochloric acid, and the cathine precipitated by ammonia and purified by again dissolving in chloroform, shaking out with dilute acid, and re-precipitating with ammonia. The yield is 0·11—0·125 per cent.: the older leaves are richer in alkaloid than the younger ones: the twigs are practically free from alkaloid. Cathine is soluble in alcohol and chloroform, very slightly soluble in water, ether, and light petroleum spirit. According to Beitter, when dissolved in sulphuric acid it gives a transient lemon yellow colouration with ammonium selenite. *Catha edulis* has a stimulating action on the heart and muscles similar to that of caffeine and although it is not an analgesic or local anæsthetic it possesses the nerve-sedative properties of cocaine or of small doses of morphine.—A. S.

Tobacco; Formation of alkaloids in ——. C. Ravenna and V. Babini. Atti R. Accad. dei Lincei, Roma, 1911, **20**, II., 393—398. (See also this J., 1911, 1029.)

Young tobacco plants were grown with their roots immersed in: (*a*) a solution containing per litre, 1 grm. of calcium nitrate, 0·25 grm. each of potassium chloride, magnesium sulphate, and monopotassium phosphate, and traces of ferric chloride; (*b*) a similar solution with some calcium carbonate in place of the nitrate: (*c*) the same as (*a*) but in the dark; (*d*) the same as (*a*) but with addition of 2 per cent. of dextrose; (*e*) the same as (*d*) but in the dark. The experimental results are tabulated. The plants grown in the solution containing nitrate and dextrose in the light showed the greatest, and those grown in the same solution in the dark the smallest increase of nicotine content. The conditions most favourable to the production of nicotine are similar to those found most favourable to the formation of hydrocyanic acid in cyanogenetic plants (see Ravenna and Peli, Gaz. chim. ital., 1907, **37**, II., 586).—A. S.

Hydrocyanic acid: Formation of —— *in the germination of seeds.* C. Ravenna and C. Vecchi. Atti R. Accad. dei Lincei, Roma, 1911, **20**, II., 491—495.

The results obtained by Ravenna and Zamorani (this J., 1911, 104) indicated that the hydrocyanic acid produced in the germination of seeds is formed from carbohydrates and inorganic nitrogen compounds, such as ammonia. Comparative experiments with flax seed which were allowed to germinate in sand moistened with distilled water and with a 0·1 per cent. solution of ammonium chloride respectively, showed that in all cases the ammonium chloride caused an increase in the amount of hydrocyanic acid produced. Similar results were obtained with Indian millet (*Sorghum vulgare*), and in these experiments, which were carried out in the light, it was found that the formation of hydrocyanic acid began not at the beginning of germination, but only at the period where the formation of chlorophyll began.—A. S.

Sabadilla seeds; Determination of the total alkaloid of ——. T. Rydén. Apoth.-Zeit., 1912, 27, 104.

The alkaloidal content of sabadilla seeds shows considerable variations. The method of the Swiss Pharmacopœia occasionally gives results which are too low. The Swiss Pharmacopœia of 1908 requires 3·5 per cent. of alkaloid, but this is too high, 3·0 per cent. being a more reasonable requirement. In order to determine the alkaloid, 10 grms. of the powdered drug are shaken for half an hour with 100 grms. of ether. Then 10 grms. of 10 per cent. ammonia solution are added and the whole shaken vigorously for two hours. The ether is filtered off through a plug of cotton wool and 50 c.c. are concentrated to about 10—15 c.c. The ethereal solution is then shaken out first with 15 c.c. of $N/1$ hydrochloric acid, next with successive portions of 10 c.c. of water, till 0·5 c.c. of the acid solution gives no reaction with Mayer's reagent. The whole of the acid solution is made alkaline with 33 per cent. sodium carbonate solution and extracted with 25, 10, and 10 c.c. of ether. This is repeated till the ethereal extract does not react with Mayer's reagent. The ethereal extract is evaporated and dried to constant weight or titrated with $N/10$ acid using iodeosin as indicator. 1 c.c. of $N/10$ acid is equivalent to 0·05984 grm. of alkaloid.—F. Shdn.

Oleander; Examination of the sap, bark, and seeds of the ——. A. Leulier. J. Pharm. Chim., 1912, 5, 108—116.

All parts of the oleander plant, with the exception of the sap, contain a toxic glucoside *l*-strophanthin. This substance known formerly as neriin has the same composition as strophanthin, and is closely related to it.

—F. Shdn.

Methyl alcohol; Substitution of —— *for ethyl alcohol in the preparation of pharmaceutical extracts.* Batta. Bull. Soc. Chim. Belg., 1912, 26, 7.

When applied to the extraction of *Belladonna* and *Nux Vomica* methyl alcohol, containing the same quantity of water as the ethyl alcohol prescribed by the Belgian Pharmacopœia, possesses a dissolving power rather greater than that of the latter. In the preparation of cinchona-extracts, however, ethyl alcohol gives the best results. Both alcohols when pure give lower yields of extract than when diluted, but the extract is richer in alkaloids. In view of the accidents caused by methyl alcohol, great caution would be required in using it. Schoofs has proved that the toxic properties of alcohols increase generally with the molecular weight, but methyl alcohol is an exception to this rule and is markedly toxic.—J. H. L.

Ibean camphor tree of E. Africa Protectorate. Bull. Imp. Inst. 1911, 9, 340—343.

D. E. Hutchins (Colonial Reports, Miscellaneous, No. 41 [Cd. 3561], 1907) has found that the "Ibean Camphor" tree is not a true camphor tree, but is closely related thereto, being the *Ocotea usambarensis*, Engl. It yields timber of good quality. The younger parts of the tree yield small quantities of volatile oil containing cineol. The quantity of oil is too small to make the wood of value as a source of essential oil, but it probably exerts a certain preservative action on the wood.—H. E. P.

Chinchilla otto of rose. J. C. Umney. Perfumery and Ess. Oil Record, 1912, 3, 3.

A sample of Chinchilla otto of rose had the following characters:—

Specific gravity $\frac{30^\circ}{15^\circ}$	0·844
Optical rotation	—2
Refractive index	1·4565
Melting point	27—28° C.
Percentage of stearoptene	33·3
Melting point of separated stearoptene	31·32° C.

The odour is particularly sweet and pleasant. These characters agree very closely with the ottos of rose distilled in France and Germany.

Lavender oil; English ——. *Changes on storing.* E. T. Brewis and J. C. Umney. Perfumery and Essent. Oil Rec., 1912, 3, 5—7.

Samples of English lavender oil after having been stored for several years showed a marked increase in acidity and ester value. The age of lavender oil, however, has no direct bearing upon its composition. The changes noticed are not dependent upon the season of the year, nor are the changes uniform. The percentage of water remaining in the oil is a matter of some importance, as probably the oxidation of the terpenes proceeds more rapidly in the presence of water. It is suggested that all essential oils should be carefully dried before storage. The addition of absolute alcohol to lavender oil is undoubtedly beneficial.—F. Shdn.

Essential oil of Bupleurum fructicosum. Action of nitrosyl chloride on, and presence of β-phellandrene in the oil. L. Francesconi and E. Sernagiotto. Atti R. Accad. dei Lincei, Roma, 1911, 20, II., 190—196, 230—233, 325—331, 388—392.

A large quantity of the oil (see this J., 1911, 921, 1137) was prepared from twigs, leaves, and flowers of plants grown at Laconi in the province of Cagliari, and the oil from the leaves was fractionated in a vacuum in the apparatus described on page 205; seventeen fractions were thus collected, after which two further fractions were obtained from the residue by distillation with steam. The first seventeen fractions differed considerably only in rotatory power, which fell from $[\alpha_D = +53{\cdot}37^\circ$ in the first to $[\alpha]_D = +19{\cdot}15^\circ$ in the seventeenth fraction: the range in specific gravity was only from 0·8506 to 0·8573 and in refractive index from 1·4712 to 1·4874. Small quantities of a free acid, and alcohol, $C_{10}H_{18}O$, and an ester were present in all the fractions, but these accumulated chiefly in the residue and in the two fractions obtained by steam distillation.

By the action of nitrosyl chloride on the oil, according to a modification of Wallach's method, a mixture of two isomeric nitrosochlorides was obtained, which was separated by fractional precipitation with methyl alcohol from chloroform solution into a β-compound, m.pt. 100°—101° C., $[\alpha]_D = -285^\circ$, and an α-compound, m.pt. 101°—102° C., $[\alpha]_D = -175^\circ$. When heated with acetic acid the nitrosochloride yields, besides a compound containing nitrogen, Δ-1·5-dihydrocumic aldehyde, b.pt. 136°—140° C. at 15 mm., identical with that obtained by Wallach by reduction of nitro-β-phellandrene; the oxime of the aldehyde melts at 42°—44° C. and the semi-carbazone at 197°—198° C. By splitting off nitrosyl chloride from the nitrosochloride, the terpene constituent of the oil was obtained and proved to be β-phellandrene, which however has a higher rotatory power than β-phellandrene from other sources.—A. S.

Essential oil of Santolina Chamaecyparissus, L. (lavender cotton). L. Francesconi and P. Scarafia. Atti R. Accad. dei Lincei, Roma, 1911, 20, II., 318—324, 383—387.

By the action of hydroxylamine hydrochloride on the oil (see this J., 1911, 1332) there are produced a hydroxylamino-oxime of a ketone, $C_{10}H_{16}O$, an oxime of the same ketone, and an oxime of another ketone. The hydroxylamino-oxime, $C_{10}H_{17}(NHOH):NOH$, melts at 190° C. and on further heating decomposes with formation of a di-oxime, $C_{10}H_{16}(:NOH)_2$, and an amino-oxime, $C_{10}H_{17}(NH_2)(:NOH)$. The di-oxime is also produced by the atmospheric oxidation of an alcoholic solution of the hydroxylamino-oxime and by the action of nitrous acid on the latter substance ; it decomposes at 268° C. after melting to a reddish liquid. The nature of the ketone which furnishes the hydroxylamino-oxime, and to which the name santolineneone is given, is discussed, and it is considered to be most probably Δ(1·7)-menthene-2-one. The terpene which is left unaltered when the oil is treated with hydroxylamine hydrochloride, is a colourless oil, b.pt. 165°—170° C. ; it probably contains only one double linkage in its molecule.—A. S.

Essential oil of Seseli Bocconi. L. Francesconi and E. Sernagiotto. Atti R. Accad. dei Lincei, Roma, 1911, **20**, II., 481—486.

The roots, stalks, and leaves from plants collected in July-August were distilled with steam. The yield of oil was 295 grms. from 100 kilos. The roots contained very little oil. The oil is a yellowish liquid with a greenish reflex. It has the sp. gr 0·8475 at 27° C., optical rotation, +4·29° to +5·89°, n_D = 1·4637—1·4673. It contains a compound containing a carbonyl group, probably an aldehyde ; this was separated by means of sodium bisulphite, as a colourless oil with n_D = 1·4488, which formed a semicarbazone melting at about 178° C. The greater portion of the oil remained unaltered in the treatment with bisulphite. This was fractionated and was found to contain *l*-pinene and β-phellandrene.—A. S.

Essential oils and other volatile products in plants ; Probable function of —— as cause of movement of sap in living tissues. [Separation of zymase from yeast.] I. Giglioli. Atti R. Accad. dei Lincei, Roma, 1911, **20**, II., 349—361.

The author discusses the action of essential oils and other volatile products (chloroform, ether, etc.) on plants (compare H. E. and E. F. Armstrong, this J., 1911, 822), and considers that the effects produced are chiefly due to changes in the surface tension of the water or sap, whereby movement of the latter is caused. Experiments are described showing that if fine sand be moistened with water and then exposed to the vapour of chloroform or of certain essential oils, etc., a portion of the imbibed water separates and drains out from the sand. In cellular vegetable tissues the amount of surface is very much larger than in a mass of sand, and the effect on the surface tension is correspondingly magnified, and hence active motion of the plant sap is caused. Following this movement of the sap, enzymic reactions set in, and the decompositions produced lead to an increase of osmotic pressure and thus to a renewed inflow of water. Not only chloroform, benzene, and toluene, but also many essential oils and similar compounds have the power of causing the sap to flow out from the cells, passing through membranes that are otherwise impermeable to the sap. For example if commercial pressed beer yeast be exposed to the action of chloroform, eucalyptus oil, camphor oil or camphor, it becomes soft and pappy in a few hours, and after some days the juice can be filtered through paper or porous porcelain. The clear filtered juice contains the zymase and this method is stated to be preferable to the original process of Buchner (this J., 1901, 55) or Lebedeff's maceration process (this J., 1911, 147).—A. S.

Copaiba. T. T. Cocking. Chem. and Drug., Jan. 27, 1912, 128.

Contrary to the statement of Parry (this J., 1912, 90), the author has found that the characteristics of copaiba oil are essentially the same whether the oil be separated from the resin by distillation in a current of steam or *in vacuo*. The author adheres to his previous statement that all genuine specimens of copaiba yield oils having a higher optical rotatory power than the first 10 per cent. distilled from them *in vacuo*. In the case of several samples of copaiba which gave figures similar to those recorded by Parry, the volatile oil gave a marked colour reaction when tested for gurjun oil, although the same reaction applied to the oleoresin itself gave a negative result.—A. S.

Chrysophanic acid ; Constitution of ——. E. Léger. Comptes rend., 1912, **154**, 281—283.

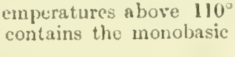
After fusion with potassium hydroxide at 250° C., chrysophanic acid yields symmetrical hydroxymetaphthalic acid, $C_8H_6O_5$, melting at 308·5° C. The position of the methyl group, which has hitherto been uncertain, is then established, and chrysophanic acid is dihydroxy-1·8 methyl-3-anthraquinone.—F. Shdn.

Agathin (salicylaldehyde-methylphenylhydrazone) ; Characters and tests for ——. K. Schuster. Z. Allgem. oesterr. Apoth.-Verein, 1911, [33]. Pharm.-Zeit., 1911, **56**, 723.

Agathin forms white, crystalline leaflets, with a greenish tinge ; it is odourless, almost insoluble in water, fairly soluble in alcohol, readily dissolved by chloroform, benzene, and ether. It melts at about 74° C. When 0·1 grm. of agathin is treated with 1 c.c. of strong hydrochloric acid, an orange-yellow precipitate is formed, dissolving on warming, and evolving the characteristic odour of phenylhydrazine. After cooling and adding 5 c.c. of water, a white precipitate is formed. On shaking out the mixture with ether, separating and evaporating that solvent, the residue should give the characteristic reactions for salicylic acid. If 0·02 grm. of agathin be treated as above with hydrochloric acid and water, and the diluted solution be made alkaline with caustic soda, the resulting yellow liquid should reduce Nessler's reagent in the cold, forming a green precipitate. On treating 0·03 grm. of agathin with 2 to 3 c.c. of sulphuric acid, a brownish yellow colour is obtained ; on adding a trace of nitric acid, the colour changes to blue, then green. On standing, the yellow colour reappears, and the further addition of nitric acid does not then cause the reappearance of the green tint. If 1 grm. of agathin be shaken with water and filtered, the filtrate should give no reaction for sulphate or chloride ; nor, when made alkaline, for salicylate.
—J. O. B.

Sodium glycerophosphate ; Poulenc's ——, and a free glycerophosphoric acid. V. Paolini. Atti R. Accad. dei Lincei, Roma, 1911, **20**, I., 807—812.

A specimen of Poulenc's sodium glycerophosphate (see Fr. Pat. 373,112 of 1906 ; this J., 1907, 716) was found to agree in composition with the formula $(NaO)_2PO.OC_3H_5(OH)_2$. In its preparation a temperature of 130°—180° C. is used, and as Carré and Power and Tutin (see this J., 1905, 511), have shown that in the interaction of glycerol and phosphoric acid at temperatures above 110° C., the reaction product always contains the monobasic acid,



$$HO.PO{<}^{O}_{O}{>}C_3H_5OH,$$

in addition to the dibasic acid, $(HO)_2PO.OC_3H_5(OH)_2$, the author concludes that Poulenc's salt must have a different structural constitution from that of the acid prepared from glycerol and phosphoric acid. Brucine glycerophosphate prepared from Poulenc's salt proved to be identical with the symm. β-glycerophosphate of brucine prepared by Tutin and Hahn (Chem. Soc. Trans., 1906, **89**, 1749) from αα-dichlorhydrin. The same brucine salt was also prepared from the free glycerophosphoric acid isolated from Poulenc's disodium salt by way of the silver salt.—A. S.

Glycerophosphoric acid obtained by esterifying glycerol with phosphoric acid or with sodium phosphate ; Constitution of ——. P. Carré. Comptes rend., 1912, **154**, 220—222.

When glycerol is esterified by means of phosphoric acid or monosodium phosphate, the principal portion of the product consists of α-glycerophosphoric acid, $PO(OH)_2{\cdot}O{\cdot}CH_2{\cdot}CH(OH){\cdot}CH_2(OH)$. This corresponds to the fact that when glycerol is treated with an equivalent amount of hydrogen chloride, the chief product is α-chlorhydrin, $CH_2(OH){\cdot}CHOH{\cdot}CH_2Cl$, together with a small amount of β-chlorhydrin, $CH_2(OH){\cdot}CHCl{\cdot}CH_2OH$.
—F. Shdn.

Esters of fatty acids from esters of formic acid ; Catalytic formation of ——. P. Sabatier and A. Mailhe. Comptes rend., 1912, **154**, 175—177.

A mixture of methyl formate and isobutyric acid in equivalent proportions was passed over titanium oxide at 250° C. The following substances were formed: methyl isobutyrate, isobutyric aldehyde, and carbon monoxide. Similarly isobutyric acid and isoamyl formate gave isoamyl isobutyrate, isoamyl alcohol and isobutyric aldehyde. If thorium oxide be used in place of titanium oxide, a temperature of 300° C. is required to obtain similar results. In this case, however, more or less acetone is formed. Using thorium oxide at 300°—330° C., isovaleric acid and methyl formate give rise to methyl isovalerate and isovaleric aldehyde. In addition carbon monoxide and dioxide are formed. At about 370° C. isovalerone is produced. Results of a similar nature were obtained by using methyl formate with either isobutyric or caproic acid in the presence of thorium oxide.—F. Sodn.

Detection of white phosphorus in presence of hypophosphites and of arsenic. Leclère. *See* XXIII.

Patents.

Iodine solution. J. Wemer, New York. U.S. Pat. 1,013,913, Jan. 9, 1912.

Powdered crystalline iodine is placed in a closed vessel with "glycerite of tannic acid" and the iodine is caused to move through the liquid. The finished solution may contain tannin (4 pts.), glycerin (16 pts.), and iodine (1 pt.), and sugar syrup and water may be added as a preservative. —F. Sodn.

Diethylbromo-acetylisourea ; Manufacture of ethers of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 8011, March 30, 1911.

See Ger. Pat. 240,353 of 1910 ; this J., 1911, 1409.—T. F. B.

Glycol ester of benzoic acid. L. Taub and H. Hahl, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,014,859, Jan. 16, 1911.

See Eng. Pat. 8012 of 1911 ; this J., 1912, 151.—T. F. B.

Blood or its constituents ; Compounds of —— and process of making same. E. Scheitlin, Basle, Switzerland. U.S. Pat. 1,015,641, Jan. 23, 1912.

See Eng. Pat. 11,736 of 1911 ; this J., 1912, 91.—T. F. B.

XXII.—EXPLOSIVES ; MATCHES.

Smokeless powders ; Decomposition of —— by ultraviolet rays. Influence of stabilisers. Examination of damaged powders. D. Berthelot and H. Gaudechon. Comptes rend., 1912, **154**, 201—203.

A continuation of the work abstracted in this J., 1912, 47. *Nitroglycerin*, 0·10 grm., after 30 minutes' exposure at 20 mm. gave 1·32 c.c. of gas containing: carbon dioxide 24, monoxide 10·5, nitrogen 17·5, nitrous oxide (N_2O) 8·5, nitric oxide (NO) 39·5 per cent. Some nitric oxide was also destroyed in attacking the mercury. This high percentage of nitric oxide explains its presence in the products of decomposition of powders containing nitroglycerin. *Nitrocellulose* (collodion) a piece, 15 by 5 by 1·6 mm., after 2 hours at 20 mm., gave 0·87 c.c. of gas, the percentages of its constituents in the same order as above being 25·5, 19·5, 39, 7, 9. Collodion, though less nitrated than the French service powders B, decomposes more readily than they, and evolves a notable amount of nitric oxide. This shows the use of the gelatinisation adopted for B powder, and of the stabilisers incorporated in it. *Amyl alcohol and diphenylamine as stabilisers.*—Comparison of two powders of the same age and make (B.F. AM_2, and BF. D_2 of 1905) stabilised by amyl alcohol and diphenylamine respectively, showed that, at 20 mm. (temp. 75° C.) amyl alcohol is the more efficient, the AM powder giving off less gas, and the gas containing a very much lower percentage of nitric oxide, than the D powder. (As new D powders do not show nitric oxide in the products of their "photolysis," the source of it in this six year old powder is no doubt the nitrosodiphenylamine formed during the slow decomposition of the powder). At 50 mm. (temp. 40° C.), on the other hand, diphenylamine is the more efficient stabiliser. Exactly similar results were obtained with two naval powders of 1908, save that these more recent powders evolved no nitrogen oxides. When the BF powders were treated with alkali (1 grm. with 20 c.c. of $N/2$ potassium hydroxide for 30 minutes at 15° and at 50° C.), it was found that the D powder showed less decomposition than that stabilised with amyl alcohol. *Damaged powders.*—A damaged naval powder, in which the brownish yellow plates of 1·5 mm. thickness showed whitish stripes 10 or 12 by 1 or $1\frac{1}{2}$ c.m., was examined by the lamp. At both distances the damaged parts gave off more gas than the unaltered parts, and this gas contained from 12 to 30 per cent. of nitrogen oxides, whilst the gas from the unaltered parts contained none.—J. T. D.

Nitrocellulose ; Stabilising ——. A. Baschieri. Z. ges Schiess- und Sprengstoffw., 1912, **7**, 41—43.

The author considers that Robertson's process for stabilising nitrocellulose (this J., 1906, 624) is unnecessarily lengthy and costly. He states that the following method gives a stable product. After freeing the nitrocellulose from acid, it is twice washed with cold water, the final wash-liquor containing about 0·05 per cent. of sulphuric acid. The nitrocellulose is boiled in this acid water for 2 hours, and, after two cold water washings, it is again boiled for 2 hours in water containing so much sodium carbonate that the whole of the calcium salts are precipitated, leaving 0·1 per cent. of sodium carbonate in excess. The nitrocellulose is again washed twice in cold water and is then finally pulped. During this process the nitrogen content of the nitrocellulose fell from 13·3 per cent. to 13·02 per cent., and the heat test rose from 7 minutes to 35 minutes.—G. W. McD.

Nitroisobutylglycerol trinitrate. F. Hofwimmer. Z. ges. Schiess- und Sprengstoffw., 1912, **7**, 43.

Nitromethane (1 part) and a 40 per cent. solution of formaldehyde (4 parts) are condensed, in the cold, in presence of potassium bicarbonate. The mixture, after standing a short time, is boiled and then evaporated in a vacuum. The crystalline residue is washed with alcohol and crystallised from ether-alcohol. If the compound is not purified before nitration, unstable products are also obtained, which cannot be removed by sodium carbonate. 100 grms. of the product are nitrated with 600 grms. of a mixed acid containing sulphuric acid (60) and nitric acid (40 per cent.). A 90 per cent. yield of the trinitrate is obtained. The pure trinitrate is a viscous pale yellow oil (sp. gr. 1·68) containing 14·69 per cent. of nitrogen. It does not freeze at −35° C., but turns to a gelatinous mass. It is very similar to nitroglycerin in its behaviour towards shock and friction.—G. W. McD.

Patents.

Explosives and cartridges ; Packing ——. E. Goltstein, Cologne, Germany. Eng. Pat. 21,506, Sept. 29, 1911.

The explosive is contained in an air-tight case to which a valve is fitted, through which air, or any other gas, under pressure, can be admitted to the container. —G. W. McD.

Explosive ; High ——. G. A. Gregorini, Brescia, Italy. Eng. Pat. 1237, Jan. 17, 1911. Under Int. Conv., Jan. 17, 1910.

See Fr. Pat. 427,902 of 1911 ; this J., 1911, 1186.—T. F. B.

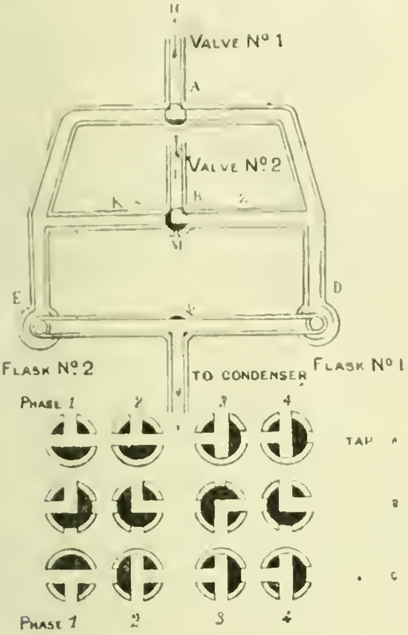
Explosives. A. Voigt, Giessen, Germany. Eng. Pat. 1712, Jan. 23, 1911.

See Fr. Pat. 425,550 of 1911 ; this J., 1911, 926.—T. F. B.

XXIII. ANALYTICAL PROCESSES.

Distillation in vacuo; Apparatus for continuous fractional ——. L. Francesconi and E. Sernagiotto. Atti R. Accad. dei Lincei, Roma, 1911, 20, II., 30—35.

The apparatus is intended for the fractional distillation of large quantities of liquid. It is stated that with it a complete fractionation of 5 litres of an essential oil was effected in one week, whilst a similar operation with the well-known apparatus of Brühl required about three months. The novel feature of the apparatus is the collector and distributor shown in the figure. The branches, H and L, lead by way of two mercury valves to the pump. The mercury valves consist of long inverted U-tubes, the shorter limb being connected with the apparatus, whilst the longer limb dips a few centimetres into mercury contained in a flask provided with a side tube which is connected with the pump. Phase 1 (see Fig.) shows the positions of the various taps while the apparatus is being exhausted. When the desired degree of vacuum has been established and distillation is commenced, the condenser is placed in communication with one of the receiving flasks (phase 2). When a sufficient quantity of distillate has been collected, the taps are turned to the positions shown in phase 3, whereupon the distillate goes to the other receiving flask, and air is admitted to the first receiving flask through the opening, M, and the tap, B. This flask can now be removed and emptied and then again attached to the apparatus, after which the tap, B, is turned to the position shown in phase 4. The air contained in the flask is removed by the pump through valve No. 2, and when the exhaustion is complete, the flask is ready, after again adjusting the taps, to receive another fraction of distillate.—A. S.



Nitric acid in presence of excess of nitrous acid; Detection of ——. H. K. Sen and B. B. Dey. Z. anorg. Chem., 1912, 74, 52—54.

The solution to be examined is added to a saturated solution of hydrazine sulphate (this J., 1911, 1011) and is then tested for nitrate by the diphenylamine reaction. Traces of nitric acid are formed when nitrites are decomposed by means of urea or by boiling with ammonium chloride, but this is not the case when hydrazine sulphate is used.—F. Sodn.

Phosphorus; Detection of white —— *in presence of hypophosphites and of arsenic.* A. Leclère. J. Pharm. Chim., 1912, 5, 15—18.

The solution to be tested is mixed with 10 c.c. of caustic potash solution (35—40 : 100) and 0·5 c.c. of sodium persulphate solution (1 : 10) in a test-tube, and two small pieces of aluminium foil are added. A plug of cotton-wool is inserted above the liquid and over this a strip of paper impregnated with ammoniacal silver nitrate solution. The tube is then immersed in a water-bath maintained at 15° C., and the whole is protected from light. Under these conditions the presence of 1 : 10,000 of free phosphorus will be indicated in a few moments by a darkening of the test paper. Alcohol, oil of turpentine, and fats do not interfere with the reaction.—J. O. B.

Determination of alkalis in silicates by fusion with calcium chloride. Mäkinen. *See* VII.

Determination of ferrous oxide in silicate rocks. Dittrich and Leonhard. *See* VII.

Determination of manganese in ferro-tungsten. Slawik. *See* X.

Determination of gum in syrups. Chauvin. *See* XVII.

Determination of total alkaloid of sabadilla seeds. Rydén. *See* XX.

Characters and tests for agathin [salicyl aldehyde-methyl-phenylhydrazone]. Schuster. *See* XX.

Patents.

Apparatus for measuring the evaporation of liquids. U.S. Pat. 1,014,139. *See* I.

Method and apparatus for testing paint. U.S. Pat. 1,014,842. *See* XIII.

Trade Report.

Changes in the Monthly Trade Accounts for 1912.

Among the changes which have been made as from Jan. 1st, 1912, in the "Accounts relating to Trade and Navigation of the United Kingdom," are the following:—

Imports.—"Acetic acid," "calcium carbide," and "potash salts, other salts," are now shown separately. Sulphuric acid and ammonium chloride, formerly shown separately, are now included with "Chemicals, unenumerated." Stearine is now shown separately, and "Belgium" and "other countries" are shown. "Tallow, unrefined," is also shown separately.

Exports.—Potassium nitrate (British prepared), potassium chromate and bichromate, and sodium chromate and bichromate are now shown separately as regards exports of British produce. In the *Exports of Foreign and Colonial Merchandise*, calcium acetate, acetic acid, acetone, bleaching materials, soda compounds, ammonium chloride, sulphur, and sulphuric acid are now included in "Chemical manufactures of all other sorts." Under the heading "Painters' Colours and Pigments," barytes, nickel oxide, red and white lead, and zinc oxide are now shown as one total. Dry chemical wood pulp is now shown separately.

Books Received.

Die Elektrochemischen Verfahren der chemischen Gross-Industrie. Ihre Prinzipien und ihre Ausführung. Von Dr. Jean Billiter. Privatdozent an der Universität Wien. II. Band: Elektrolysen mit unlöslichen Anoden ohne Metallabscheidung. Anhang: Neuerungen der letzten Zeit auf dem Gesamtgebiete der technischen Elektrolyse wässriger Lösungen. Wilhelm Knapp's Verlag. Halle a. S. 1911. Price M. 28.50 net.

This is vol. II. of a work of which vol. I. appeared in 1909 (this J., 1909, 924). Large 8vo volume, containing 514 pages of subject matter, of which 445 belong to the main bulk of the work, 69 pages being devoted to an appendix. The 445 pages contain 228 illustrations and 53 tables, whilst the Appendix has 9 illustrations. The work concludes with alphabetical indexes of authors and subjects. The subject matter is subdivided and classified as follows:—I. Electrolysis of water. (i), Theoretical. (ii). Technical preparation of the elements of water. (iii), Electrolytic reductions. (iv), Electrolytic oxidations. II. Electrolysis of alkali chloride solutions. (i). General and theoretical. (ii), Processes and apparatus with solid metal cathodes and diaphragms. (iii), Ditto with solid metal cathodes and horizontal arrangement. (iv), Ditto with solid metal cathodes, without diaphragms. (v), Ditto with mercury cathodes. (vi). Short recapitulation of the different systems. (vii), Hypochlorites and electrolytic bleaching. (viii), Analytical processes, etc. (ix), Electro-preparation of chlorates and perchlorates. III. Electrolysis of bromide solutions. (i), Preparation of bromine. (ii), Preparation of bromates. IV. Additions and substitutions in electrolytic separation of the halogens. Appendix. I. Electrometallurgy of aqueous solutions. (i), Copper, (ii). Silver. (iii). Gold. (iv), Lead. (v), Zinc; extraction from ores. (vi). De-tinning of tin plate scrap. (vii). Nickel, antimony, iron. II. Electrolysis with insoluble anodes. (i), Preparation of chlorine and alkali. (ii), Electrolytic bleaching and preparation of chlorates.

Theorie und Praxis der Grossgasindustrie. Von Rudolf Mewes. I. Band. Erste Hälfte. H. A. Ludwig Degener's Verlag. Leipzig, Germany. 1912. Price 18s. net. Messrs. Williams and Norgate, 14, Henrietta Street, Covent Garden, London, W.C.

Large 8vo volume, containing 403 pages of subject matter, with 95 illustrations, numerous tables, and 6 large charts at the end. The contents are divided into two chief parts, and these again into chapters, as follow:—Part I. Historical development of the principles of mechanics and physics. Part II. Fundamental laws of thermodynamics (changes of state). (i), Introduction. (ii), Changes of state for pressure and volume by isothermal compression. (iii), Derivation of the exponential relationship between pressure and intermolecular volume from the equation for the work of isothermal compression. (iv), Changes of state for heat and pressure. (v), Agreement of the law of intermolecular-volume with the laws of radiation of ether and mass attraction. (vi), Result of the investigations in chaps. i—v. (vii), Change of state of vapours and technically important liquids (water, mercury, petroleum spirit, pentane, etc.). (viii), Laws of vapour pressure and boiling point. (ix), Dependence on temperature of the viscosity of gases and vapours. (x), Ditto of liquids (xi), Dependence of the constants of capillarity on temperature. (xii), Specific heat. (xiii), Entropy of steam. (xiv), Entropy of vapours at very low temperatures. (xv), Changes of elasticity with temperature. (xvi), Transmission of heat. (xvii), Radiation of heat. (xviii), Transmission of heat by conduction. (xix), The flowing movement of liquids, vapours, and gases with reference to friction. (xx), Elementary derivation of the laws of movement of flow of liquids (or fluids which are capable of forming drops) and vapours from the principle of stream lines.

Die Arzneimittel-Synthese auf Grundlage der Beziehungen zwischen chemischem Aufbau und Wirkung. Für Aertzte, Chemiker und Pharmazeuten. Von Dr. Sigmund Fränkel. Professor für med Chemie an der Wiener Universität. Dritte, umgearbeitete Auflage. Julius Springer's Verlag. Berlin. 1912. Price M. 24. Bound, M. 26.50.

Large 8vo volume, containing 750 pages of subject matter, a page of errata, six pages of a register of German patents, and fifty-nine of alphabetical indexes of names of authors and subjects; also an alphabetical index referring to changes in the organism and the substances produced thereby. The text of this work is divided into:—I. General, and II. Special. Under the former, we have:—(i), Theory of the actions of inorganic substances. (ii), Theory of the action of organic substances. (iii), Significance of the single atomic groups as to the effects produced. (iv), Changes of organic substances in the organism. Under the latter:—(i), General methods for the preparation from well-known active substances, of substances with like physiological action, but not having certain unpleasant side effects. (ii), Antipyretics. (iii), Alkaloids. (iv), Narcotics and anæsthetics (inhalation). (v), Antiseptics and astringents. (vi), Sulphur preparations, and the ichthyol group. (vii), Substances active on the mucous membrane of the intestines. (viii), Anthelmintics. (ix), Camphor and terpenes. (x), Glucosides. (xi), Skin remedies. (xii), Glycerophosphates. (xiii), Diuretics. (xiv), Gout remedies.

J. H. Van't Hoff's Amsterdamer Periode 1877—1895. Von Dr. W. P. Jorissen und Dr. L. Th. Reicher. Verlag von C. de Boer, Jr. Helder, Holland. 1912.

This is an 8vo volume, containing 106 pages of subject matter, with 21 illustrations and portraits. It includes a description of Van't Hoff's life in Amsterdam, a selection of obituary notices, and a bibliography of his published works, pamphlets, and papers.

Blowing Stumps with Dynamite. Kentucky Agricultural Experiment Station, Lexington, Ky. Bulletin No. 154.

Wheat. Kentucky Agricultural Experiment Station, Lexington, Ky. Bulletin No. 155.

Concentrated Commercial Feeding Stuffs. Kentucky Agricultural Experiment Station, Lexington, Ky. Bulletin. No. 156.

This book, consisting of 118 8vo pages, deals with the law regulating the manufacture and sale of "concentrated commercial feeding stuffs," and with their composition, adulteration, and analysis; chapters on the function of nutrients and the digestibility of various feeding stuffs are added.

The Chemical World. A Monthly Journal of Chemistry and Chemical Engineering. Vol. I. No. 1. J. and A. Churchill, 7, Great Marlborough Street, London, W.

A new monthly journal of chemistry, pure and applied, of which the editor is Mr. W. P. Dreaper, F.I.C.

Imperial Institute. No. 82. Colonial Reports. Miscellaneous. Selected Reports from the Scientific and Technical Department. Edited by the Director (W. R. Dunstan). IV.—Rubber and Gutta Percha. Presented to both Houses of Parliament by Command of His Majesty. January 12, 1912. Wyman and Sons, Ltd., Fetter Lane, E.C., and 32, Abingdon Street, S.W., London, or Oliver and Boyd, Tweeddale Court, Edinburgh, or E. Ponsonby, Ltd., 116, Grafton Street, Dublin. Price 9d.

8vo volume, containing 440 pages of subject matter, and an alphabetical index of subjects. An appendix is included on the utilisation of the seeds of the Para rubber tree as a source of oil.

Theory of Sizing. By Harry Nisbet, Weaving and Designing Master, Municipal Technical School, Bolton. Emmott and Co., Ltd., 65, King Street, Manchester. 20, Bedford Street, London, W.C. 1912. Price 2s. 6d. net.

Demy 8vo volume, containing 71 pages of subject matter with 8 illustrations, and an alphabetical index. There is also a frontispiece, with enlarged microscopic views of starch granules (scale 1 × 200), of wheat, rice, maize, farina, tapioca, and sago. The subject matter is treated under the following heads:—I. Introduction on the "Commercial and technical policy of sizing yarn." II. Sizing ingredients. III. Size mixing and boiling. IV. Data for size-mixing recipes. Also "useful formulæ and data."

Journal of the Society of Chemical Industry.

No. 5, Vol. XXXI. MARCH 15, 1912. No. 5, Vol. XXXI

Birmingham Section.

Meeting held at Birmingham University, on Thursday, December 14th, 1911.

MR. E. C. ROSSITER IN THE CHAIR.

THE LIVACHE AND OTHER TESTS FOR LINSEED OIL AND ITS ADULTERANTS.

BY J. F. LIVERSEEGE, F.I.C., AND G. D. ELSDON, B.SC., A.I.C.

Of the various methods which have been proposed for obtaining quantitative results for the drying power of oils, that due to Livache (this J., 1891, 405) appears to have been used the most. Various modifications of the test have been suggested, but that of Walker (Bulletin No. 109 Bureau of Chemistry, U.S. Dept. of Agriculture: Chemical News, 1910, 102, 57) is the only one that seems to be an improvement. In using this modification, however, we have often found that duplicate determinations showed serious disagreement, the gain from one oil varying from 7·8 per cent. to 12·2 per cent. As the result of a number of experiments we have devised the following process:—

Litharge is finely powdered and passed through a No. 40 sieve, it is then spread out in a thin layer in an incubator at 20—22° C. and left overnight in order to gain constancy in weight. About 10 grms. are placed in a German silver dish three inches in diameter and one inch deep with a flat bottom. The whole is weighed and about 0·7 to 0·9 grm. of oil added. After weighing, 5 c.c. of methylated ether (sp. gr. 0·720) are then added and the litharge spread out in a uniform layer by thoroughly rocking the dish, which is then put into the incubator and weighed after one, two, or more days, until the weight is either constant or diminishing. The gain is expressed as a percentage of the weight of the oil taken. The added ether is almost completely volatilised in half an hour, and tests proved that the amount of residue left by it does not exceed three milligrammes and is often less.

Proceeding in this way a genuine raw linseed oil ceases to gain in two days, and after that time usually loses. In one case the gain in two days was 17·4 per cent., in three days 16·9 per cent., and in fourteen days 15·9 per cent. In the case of a boiled oil the oxidation is usually complete in one day: one sample gained 14·1 per cent. in one day, whilst after two days the gain was only 13·6 per cent.

Duplicate experiments with an oil have always agreed well; the following successive determinations obtained with a sample of genuine linseed oil, are typical of the degree of accuracy attainable.

Percentage gain, 17·2, 16·8, 17·4, 17·0, 17·4.

Of the other vegetable oils examined, soy showed the largest gain, 8·4 per cent. to 8·9 per cent. being obtained. Cottonseed oil came next with a gain of 6·6 per cent. The oxidation was usually complete in two days. Colza oil and arachis oil each gained 2·5 per cent., and two samples of olive oil gained 0·6 per cent. and 1·4 per cent. respectively in two days. These samples continued to gain up to 21 days, the figures then being 5·7 per cent., 4·1 per cent., 2·5 per cent., and 3·4 per cent. respectively. Of the fish oils whale oil gained 6·4 per cent. and seal 4·9 per cent. in two days. Resin oil behaved peculiarly; it *lost* 0·3 per cent. in one day, and then gained rapidly the figures being 9·9 per cent. in two days, and 19·4 per cent. in 13 days.

It has been found that in the case of oils of the same kind a very close relationship exists between the oxygen absorbed and the iodine value (Wijs). In the following tables the oils are arranged in the order of their iodine values: it will be noticed that in nearly every case a fall in iodine value is accompanied by a fall of oxygen absorbed.

Raw linseed oil.

Iodine value . .	194	188	181	181	180	180	179	176
Percentage gain	17·4	16·3	15·5	15·1	15·2	15·0	14·6	13·8

Boiled linseed oil.

Iodine value	176	171	168	164	163
Percentage gain	13·9	13·6	14·1	13·5	12·6

As might be expected the above relationship does not hold strictly when oils of different classes are compared: however, even among such various oils as linseed, rape, cottonseed, and olive, the same kind of gradation is present.

The results obtained by the above process may be summed up as follows:—

1. Genuine raw linseed oil ceases to gain weight after two days. The gain in weight being from about 15 per cent. to 18 per cent., and depending on the quality of the oil.

2. Genuine boiled linseed oil ceases to gain after one day, the amount being fairly constant about 12 per cent. to 14 per cent.

3. Whilst drying oils do not gain after about two days, non-drying oils may continue to gain for weeks

4. When oils of a particular class are compared the gain in weight varies with the iodine value, and there is evidence of some relationship between the figures in oils of different classes.

Other tests.

During the examination of many samples of raw and boiled linseed oil, we have been struck with the utility of the test which depends upon the addition of water to the alcoholic soap solution. We carry out this as follows:— Roughly 5 grms. of the oil are placed in a wide mouth Jena glass flask of 250 c.c. capacity, and 50 c.c. of *N*/2 alcoholic sodium hydroxide added, the mouth of the flask is covered with a watch glass and the flask placed on the top of the boiling water-oven until saponification is quite complete. 100 c.c. of boiling water are then slowly added to the flask and the appearance of the liquid observed. Genuine raw linseed oils gave a perfectly clear and bright solution, whilst that of genuine boiled oils is only very slightly turbid. As little as 5 per cent. of unsaponifiable matter gives a very turbid solution. By adding an excess of acid to the solution obtained, the fatty acids are set free—these may be separated, washed with hot water, and refraction or other tests applied.

A useful test for the detection of some adulterants is the determination of volatile matter. Two grms. of the oil are heated on the water bath for two hours in a German silver dish with a flat bottom. It is of course necessary to avoid the presence of extraneous water in the oil. Adulterated linseed oils lost from 1·6 per cent. to 7·2 per cent. when treated in this way, and a sample of boiled oil substitute as much as 55·6 per cent.

It has been shown by Genthe (Z. angew. Chem., 1896, 2087) that during the boiling of linseed oil a certain amount of volatile acids are formed, but as far as we know no use of this fact has been made in the examination of boiled linseed oil. It would seem that the figure may be of value in finding out to what amount of boiling an oil has been submitted. We found that boiled linseed oils yielded volatile acids equivalent to 1·0 to 2·0 c.c. of *N*/10 sodium hydroxide; 5 grms. of the oil being taken, and glycerol soda used for the saponification. Raw linseed oils, cottonseed seal and whale oils yielded no volatile acids, but three samples of soy oil yielded 0·1, 0·3 and 0·4 c.c. respectively, the corresponding Wijs iodine values of these oils being 138, 132 and 137.

We may add that 5 genuine samples of boiled linseed oil yielded 0·35 to 0·65 per cent. of ash, and a boiled oil substitute 2·06 per cent.

Discussion.

Mr. F. H. Alcock drew attention to omissions in Mr. Liverseege's method of procedure. If litharge were used then it must be said to be in a fine powder; that was essential. Regarding the use of ether, in the process, the solution of oil crept up the sides of the vessel, and often vitiated the results. The dishes (German dishes, flat-bottomed and vertical sides) might, however, obviate that difficulty. The ether process did not work satisfactorily with ordinary porcelain vessels. He thought the process was wasteful. Could not a less quantity of the litharge be used for a minute quantity of oil? What proportion of ether should be used? If they used it, ordinarily so-called, they would have 10 per cent., alcohol and water; probably much of it would be the latter. That could hardly be got rid of at a temperature of 21° centigrade. On the whole he agreed with Mr. Liverseege when he said that the process would tell them when it was a genuine drying oil; but he was against him when he suggested it would inform them when it was genuine linseed oil.

The Chairman said the difficulty seemed to be to get the proper mixture of litharge and oil. Could not that be done without the addition of any foreign substance? Say, by taking the weighed dish, in connection with a weighed pestle, and simply putting the weight of litharge, and the weight of oil together; and then, thoroughly mixing them and making one homogeneous mixture?

Mr. Liverseege, in reply, said that on no occasion was the "creeping" of the oil noticeable. Had there been creeping the consistency of the results would not have been maintained. The use of the metal dishes, with straight sides, might have prevented creeping. The oil must be thoroughly incorporated with the litharge. It was oxidised equally, and there was no sign of creeping. Originally seven grms. of litharge were tried, but the use of 10 grms. was found to be more effective. Litharge was not particularly expensive. The question of the use of foreign ingredients like ether was considered and experiments made. The residue never exceeded 3 mgrms. The ether went off in under half an hour, and there was no reason to think that any foreign ingredient was left. It was distinctly advantageous to get a thorough incorporation of the oil with the litharge. So far as he knew no mechanical method would be as effective. There was no interference due to foreign matter. They tried ether mixed with lead oxide alone. The mixture was put in the incubator. 24 hours after, the lead oxide had gained only 2 or 3 mgrms. As to whether the method showed if it were genuine linseed oil he pointed out that several adulterated samples were dealt with. One gained 13·2 per cent., a very bad sample 5·4 per cent., another 8·4 per cent., and a fourth 10·2 per cent. One sample which contained 10 per cent. of resin oil gained 15·2 per cent. Resin oil was peculiar because it gained a large amount of oxygen and he was not prepared to say that it would necessarily detect adulterated oil. Resin oil was easily detected in other ways. If the figure for the gain of oxygen was high there would be no adulteration. If an oil which took up 17 per cent. of oxygen were diluted with another oil the diminution in oxygen gained would indicate either adulteration or inferiority in quality. It has been stated that the higher the iodine value, the better the oil was for use in paint.

Nottingham Section.

Meeting held at Nottingham, on Wednesday, December 20th 1911.

MR. S. R. TROTMAN IN THE CHAIR.

THE ACTION OF IODINE ON PHENOLS.

Part II.—The Catalytic Decomposition of Tri-iodophenol.

BY JOHN M. WILKIE, B.SC., F.I.C.

The conversion of tri-iodophenol to tetra-iododiphenylene quinone (Lautemann's red substance) is of great theoretical interest, and incidentally is noteworthy because of the striking colour change. As already stated in a previous paper (this J., 1911, 398) some considerable help is afforded if we postulate that tri-iodophenol is tautomeric in alkaline solution and that the keto-dihydro form determines the ready conversion.

Before proceeding farther it is necessary to recapitulate previous work on the subject. Lautemann (Annalen, **120**, 309) obtained the red body by heating tri-iodophenol with iodine and sodium carbonate in aqueous solution. He stated that the red body was characterised by extreme stability and insolubility in the majority of organic solvents, the only practical solvent being carbon disulphide from solution in which it did not crystallise. He found that the empirical formula of the red substance was $C_6H_2I_2O$. It was unaltered at ordinary temperatures by fuming concentrated acids and strong alkalis but prolonged boiling with concentrated nitric acid converted it to picric acid. Kämmerer and Benzinger (Ber., **11**, 557) again examined the red substance and confirmed the correctness of Lautemann's empirical formula. It is evident that $C_6H_2I_2O$ would demand an inner anhydride constitution, which on reduction should give a di-iodophenol. They found on reduction with aqueous sulphur dioxide at 100° (under pressure) that one atom of hydrogen was absorbed for every six atoms of carbon with the production of a new colourless body of the empirical formula, $C_6H_3I_2O$. The reduction was quantitative and for that reason they were of opinion that the molecular weight was double the empirical. They considered that such a reduction excluded the possibility of the molecule containing more than two benzene nuclei and that a mono-nuclear molecule was impossible for the reasons already stated.

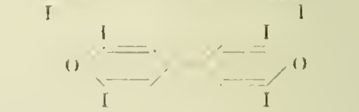
Owing to its limited solubility and non-volatility a molecular weight determination presents considerable difficulty, but I am at present endeavouring to obtain it by the boiling point method. Benzinger and Kämmerer obtained the red body in practically the same manner as Lautemann, by boiling tri iodophenol with iodine and aqueous sodium carbonate. They gave as the essential reactions:—

$$(1)\ 2C_6H_2I_3OH+2KOH$$
$$=2KI+2H_2O+C_{12}H_4I_4O_2$$

$$(2)\ 2C_6H_5OH+12I+4Na_2CO_3$$
$$=C_{12}H_4I_4O_2+8NaI+4CO_2+4HaO.$$

In their own words, the production of the red substance from phenol is to be regarded as "taking place through the formation of tri-iodophenol with coincident decomposition of the latter by alkali carbonate.

In the paper already referred to I stated that the conversion probably occurred in some such manner as the following, a para quinonoid form being assumed:—



The essence of reality is wanting, however, in such schemes for solutions of tri-iodophenol in alkali hydroxides are stable and no formation of the red substance occurs even after 12 months.

Lautemann and Benzinger and Kämmerer employed heat to convert the tri-iodophenol into the red substance, but I showed that complete conversion readily occurred in the cold—in 15 to 20 minutes 95 per cent. of the tri-iodophenol being converted—and on longer standing the conversion is complete. The acid (hydriodic) produced in the conversion was used as a measure of the extent to which the reaction had proceeded. It is to be noted that in my experience either alkali hydroxide or carbonate might be used indifferently.

At that time I felt that either alkali hypoiodite or hypoiodous acid was probably the activating substance, and at this stage it may be profitable to consider the theoretical aspect, since this led me originally to the solution of the problem. The equations,

$$2I_2 + 2HOH \rightleftarrows 2HI + 2HOI \qquad (1)$$

$$2C_6H_2I_3ONa + 2HOI = C_{12}H_4I_4O_2 + 2I_2 + 2NaOH \qquad (2)$$

if representing any actual conditions, would indicate that iodine has a catalytic action on the tri-iodophenol, the amounts of free iodine in both initial and final phases being identical. That equation (2) is only (1) reversed becomes more clear if (2) is written in another form.

$$2[(C_6H_2I_2O)NaI] + 2HOI = (C_6H_2I_2O)_2 + 2I_2 + 2NaOH \qquad (2a)$$

where $C_6H_2I_2O{\cdot}HI$ is the diketo or ψ form of tri-iodophenol.

Combining in one addition formula we have:—

$$2I_2 + 2C_6H_2I_3ONa + 2HOH = 2I_2 + (C_6H_2I_2O)_2 + 2HOH + 2NaI.$$

Preliminary experiments on this line were not encouraging until it was discovered that if any appreciable excess of alkali were present the reaction did not go (this will be referred to later).

Bougault (see this Journal, 1908, 767) has stated that the final product of the action of iodine in presence of hot alkali on salicylic acid (the reaction runs the same course as with phenol) is the red substance (tetra-iodo-diphenylene quinone). As mentioned in my previous paper, I found that in cold alkaline solutions more iodine was absorbed than corresponds to the requirements of theory if the line of reaction was prolonged and though the actual excess of iodine so absorbed is small it is quite distinct. Though my work on this point is not yet complete it appears that this extra absorption of iodine involves nuclear rupture—a distinct odour of iodoform at times having been observed. The importance of this is that with very small amounts of iodine this extra absorption of iodine may decide whether catalytic decomposition can be realised or not under particular conditions.

As already mentioned, the hydriodic acid formed was used to measure the degree and rate of conversion:

$$2C_6H_2I_3OH \rightarrow (C_6H_2I_2O)_2 + 2HI$$

In some formal experiments the weight relations between the tri-iodophenol and the quinone were investigated, and the hydriodic acid produced was determined by standard silver nitrate.

That the active agent is a hypoiodite the experimental work to be enumerated does not appear to leave in much doubt, but the rigid exclusion of the action being due to free iodine is exceedingly difficult on the experimental side. Tri-iodophenol is exceedingly insoluble in water distinctly less than a mgrm. per litre. Certainly saturated aqueous solutions in presence or absence of excess of the phenol do not react with iodine, and the substitution of an alcoholic or aqueous-alcoholic menstruum does not help matters (the phenol is fairly soluble in alcohol). This failure to obtain the reaction in alcoholic solution would almost certainly seem to decide that under these conditions free iodine is not the active body. Glacial acetic acid readily dissolves the phenol, but in this solvent, as might be anticipated, iodine is without action. It is, perhaps, worthy of mention that a glacial acetic acid solution of iodine chloride (Wijs solution) certainly produces a red substance, but not much support can be derived for the hypoiodous acid theory from this fact, for a second halogen is present and the substance produced, though only cursorily examined, did not appear to be the quinone. Certainly chlorine and bromine in presence of alkali, likewise react with the production of a red body, but the product was not examined.

From a consideration of the empirical equation,

$$2(C_6H_2I_2O)HI = (C_6H_2I_2O)_2 + 2HI.$$

it appeared just possible that by treatment of the red substance with hydriodic acid the action might be reversed with regeneration of tri-iodophenol.

Reaction readily occurs, but the product is pale yellow in colour and contains distinctly less iodine than the parent substance. It is worthy of mention here that I have obtained similar coloured products by treatment of the quinone with (*a*) aqueous or aqueous-alcoholic potash at 100°, (*b*) phenol at 100°. I have done a considerable amount of work on these substances, but my results are not yet sufficiently definite to justify describing them in the present communication, but will be communicated to the Section in due course. It would thus appear that Lautemann's red substance is fairly reactive. I have found pyridine the most satisfactory solvent for this group of substances.

Auwers' and Zincke's work on pseudo-phenols merits consideration in regard to the reaction. They found that phenol alcohols react with halogen hydracids to form the corresponding alcohol esters taking $OH{\cdot}C_6H_3BrCH_2OH$ is a type $\rightarrow OHC_6H_3BrCH_2Br$—the reaction product is insoluble in alkalis and the side-chain bromine atom is exceedingly reactive, its constitution being probably $O:C_6H_3Br{<}\begin{smallmatrix}CH_2Br.\\ H.\end{smallmatrix}$ On treatment with potash HBr is split off with the formation of a condensation product insoluble in alkalis. The analogy with tri-iodophenol is interesting. The ψ form is $O:C_6H_2I_2{<}\begin{smallmatrix}H,\\ I,\end{smallmatrix}$ the condensation product being the red substance which readily forms and is insoluble in alkalis.

Experimental part.—Excess of tri-iodophenol was shaken with normal soda so as to give a saturated solution of the sodium salt in presence of undissolved phenol. My original intention was to add to a few c.c. of this solution $N/10$ iodine in fair amount, but the first drop added immediately produced a striking colour effect, the solution finally going semi-solid owing to precipitation of the red quinone. The subsequent work was largely influenced by this experiment.

A rough quantitative experiment was next made: 0·472 grm. (mol. wt. of $C_6H_2I_3OH$ = 471·9) was dissolved in 10·5 c.c. $N/10$ caustic soda (theory for $C_6H_2I_3ONa$ = 10·0 c.c. $N/10$ caustic soda) and the solution diluted somewhat with water, 1 drop (0·05 c.c.) $N/10$ iodine was added and the solution which quickly deepened in colour, was set aside for several weeks. At the end of that time 5 c.c. $N/10$ sulphuric acid was added—and then excess of potassium iodate—and the liberated iodine corresponding to the residual acidity was determined by means of $N/10$ sodium thiosulphate, of which 4·1 c.c. was required. Thus the developed acidity (hydriodic acid) was 10·5−(5·0−4·1) = 9·6 c.c. $N/10$; the theoretical acid development is 10 c.c. $N/10$, so that the conversion has gone to the extent of 96 per cent. In other words the 0·05 c.c. $N/10$ iodine (= 0·0006 grm. of iodine) initially added has caused iodine (in the form of hydriodic acid), equivalent to 0·122 grm. of iodine to leave the molecule, that is nearly 200 times as much. These results were confirmed on the same specimen of tri-iodophenol which had been prepared from phenol and also on fresh material prepared from salicylic acid.

Subsequent experiments were carried out to show that:—

(1) The action is truly catalytic—*i.e.*, that no iodine is lost and that the iodine in the final phase corresponds precisely with that initially added;

(2) The acid liberated is really hydriodic acid;

(3) The weight of the insoluble red substance produced corresponds to the tri-iodophenol taken.

Measurement of residual iodine. 0·472 grm. of tri-iodophenol was dissolved in 10 c.c. of $N/10$ caustic soda, after adjustment of the volume to 100 c.c., 0·05 c.c. of $N/10$ iodine was added. After 24 hours the conversion was found to be 82 per cent. (determined as described, 20 c.c. of the solution being used). 50 c.c. of the solution was acidified and filtered through asbestos, and to 20 c.c. of the filtrate (= 0·01 c.c. of $N/10$ iodine) was added:—

(*a*) starch—distinct positive reaction;

(*b*) $N/10$ sodium thiosulphate 0·01 c.c. $N/10$—blue colour discharged.

In a duplicate experiment 0·0075 c.c. $N/10$ thiosulphate was added and then starch, when a very faint blue tint was developed.

A number of such determinations were made with similar results.

The following experiment well illustrates the extra absorption of iodine already referred to: 0·472 grm. of tri-iodophenol was dissolved in 15 c.c. $N/10$ caustic soda and diluted to 100 c.c. 0·15 c.c. of $N/10$ iodine was added in portions of 0·05 c.c., a distinct interval elapsing between each addition. After 28 hours the solution had only the very slight pink tint it initially possessed. It was acidified and the filtrate tested for free iodine, as above, with negative results. The iodine had entered into combination. This observation has been confirmed.

(2) *Recognition and determination of hydriodic acid.* 0·472 grm. of tri-iodophenol dissolved in 10 c.c. of *N*/10 caustic soda was diluted to 100 c.c. and treated with 0·05 c.c. *N*/10 iodine and set aside for about a month. Distinct excess of dilute sulphur acid was then added and the whole poured on to a tared filter, the precipitate being transferred and washed with slightly acid water. In the colourless filtrate hydriodic acid was determined by *N*/10 silver nitrate:—Found, 9·7 c.c. *N*/10. Theory = 10·0. The precipitate was dried at 60° and weighed:—Found, 0·3414 grm. Theory = 0·343 grm. This determination was repeated with fresh material. 0·944 grm. of tri-iodophenol was dissolved in 25 c.c. of *N*/10 caustic soda, and 25 c.c. of water and 0·1 c.c. of *N*/10 iodine were added. After two months 10 c.c. of *N*/10 sulphuric acid was added and the whole transferred to a weighed filter and washed with water so as to give 250 c.c. of filtrate:—

(1) 50 c.c. treated with potassium iodide and iodate required 1·05 c.c. *N*/10 thiosulphate, equivalent to 9·9 c.c. of *N*/10 acid due to the tri-iodophenol. Theory 10·0 c.c. *N*/10.

(2) 100 c.c. treated with a particle of sodium sulphite and then nitric acid corresponded to 9·8 c.c. of *N*/10 silver nitrate by Volhard's method, a correction being made for the *N*/10 iodine originally added. Theory = 10·0 c.c. *N*/10 hydriodic acid.

(3) 10 c.c. treated with a drop of *N*/1 acid gave a distinct blue colour with starch of the order of 0·003 c.c. *N*/10 iodine. Theory = 0·004 c.c.

(4) The precipitate after drying weighed 0·650 grm. Theory = 0·648 grm.

Conversion rate.—0·944 grm. of tri-iodophenol was dissolved in 20 c.c. of *N*/10 caustic soda and the volume adjusted to 100 c.c.; 0·05 c.c. of *N*/10 iodine was then added, and after the interval specified 20 c.c. of the mixed solution was transferred by means of a pipette to a stoppered bottle, 10 c.c. *N*/10 sulphuric acid was added and then potassium iodate solution; after standing a minute some water was added and the liberated iodine titrated with *N*/10 thiosulphate and starch. If no acid had been formed 6 c.c. of *N*/10 thiosulphate would be needed, and so the developed acidity = c.c. *N*/10 thiosulphate — 6·0 c.c. per 20 c.c. of solution.

After 15 mins. the developed acidity was 1·12 c.c. *N*/10 (theory = 4·0 c.c. *N*/10), therefore the percentage converted was 28 per cent.
30 mins. developed acidity = 3·04 c.c. *N*/10 = 76 per cent.
45 ,, ,, ,, = 3·60 c.c. *N*/10 = 90 ,, ,,
60 ,, ,, ,, = 3·70 c.c. *N*/10 = 92·5 ,, ,,

In this experiment no precipitation occurred, the progressive conversion being indicated by deepening of colour. The velocity of reaction, it may be noted, is not always the same under what would appear to be identical conditions. Thus, in duplicate experiments identical with the above, the conversion was found to be: (1) 86 per cent. in 24 hours; (2) 80 per cent. in 3½ hours; (3) 82 per cent. in 27 hours.

Since the tri-iodophenol dissolves only with difficulty in the theoretical amount of decinormal soda, in many of the above experiments solution was effected by using slight excess of soda, decinormal sulphuric or hydrochloric acid equivalent to the excess of soda being subsequently added. This is mentioned as it probably affords the key to the variation in the velocity of the reaction already referred to.

In conclusion, I might state that the work originated with the observation that in the method devised by me for the volumetric determination of phenol and salicylic acid (this J., 1911, 398) the reaction product was of variable colour. At times it was nearly white, at others deeply coloured.

The investigation has shown that the conversion of the colourless tri-iodophenol to Lautemann's red substance is due to iodine; the action is truly catalytic, an exceedingly small amount of iodine being capable of decomposing relatively unlimited amounts of tri-iodophenol. The reaction has a high initial velocity, and, in some cases is practically complete in one hour. It is noteworthy that the reaction does not go in neutral solution, but a certain quantity of alkali must be present, in amount not much exceeding that corresponding to the sodium salt of tri-iodophenol. On the other hand, a comparatively small excess of alkali completely inhibits the reaction, it being difficult to get a satisfactory conversion if the alkali exceeds two molecules of caustic soda per molecule of tri-iodophenol and under such conditions the iodine added is not recoverable. With solutions containing inhibitive amounts of alkali reaction occurs if highly dilute acid is added cautiously so as to restore the optimum condition. Carbon dioxide acts similarly if slowly bubbled through the solution. If considerable amounts of iodine are added the inhibitory effects of alkali is also overcome. It would thus appear that hypoiodous acid as distinct from alkali hypoiodite is the active agent. It appears to me that the reaction may be of a pulsating nature—the hypoiodous acid has to reach a certain limiting concentration for conversion of the tri-iodophenol to the quinone to occur, the concentration then rapidly falling and again rising to the limiting value before further conversion occurs. In support of this is the fact that if a drop of decinormal iodine be added to a solution containing an inhibitive amount of alkali avoiding rapid admixture a slight initial colouration is produced which does not subsequently intensify—indicative of a slight initial reaction, but conditions are unfavourable for the subsequent formation of further hypoiodous acid.

In conclusion, I have to express my cordial thanks to Messrs. Boots Ltd. for the use of their laboratory, in which the work was carried out.

DISCUSSION.

Professor KIPPING said that the reaction was of great interest, and inquired if Mr. Wilkie had tried the effect of other oxidising agents. Did such unstable substances undergo change in the air? Had any experiments been carried out with the corresponding tribromophenol?

Mr. WOOD did not think that Mr. Wilkie's explanation of the "pulsating" nature of the reaction could be entirely correct.

Dr. SAND agreed, and asked Mr. Wilkie if he had any further evidence of "pulsations."

Mr. WILKIE, in reply, stated that he had tried other oxidisers. Chlorine and bromine certainly could act as starters, but as hydriodic acid was liberated in the course of the reaction, they very soon liberated a corresponding amount of iodine and further progress was then due entirely to iodine as before. He had also tried hydrogen peroxide, but did not obtain positive results. Both tri-iodophenol and the red substance were stable in air. He had made no extensive experiments with tribromophenol, but so far as he had gone he had been unable to realise any similar reaction. With regard to the exact mode of action of the iodine further work might show that his tentative "pulsation" theory was not wholly tenable, but it certainly appeared to be in good agreement with the experimental evidence.

Meeting held at Nottingham, on Wednesday, January 31st, 1912.

MR. S. R. TROTMAN IN THE CHAIR.

A METHOD FOR THE QUANTITATIVE DETERMINATION OF THE FALLING OF SKIN IN THE PUERING OR BATING PROCESS.

BY HENRY J. S. SAND, JOSEPH T. WOOD, AND DOUGLAS J. LAW.

As is very generally known, the skin, in the course of leather manufacture, is before tanning subjected to the liming and then to the puering or bating process. In the former, it is "plumped," *i.e.*, it takes up a large amount of water which causes it to swell and to acquire a considerable degree of resiliency. In the latter process in which it is treated with an infusion of dog or other manure or with artificial bates the skin falls, *i.e.*, the water appears to leave the interior of the cells, an appreciable quantity of the material of which the latter are composed goes into solution, and the skin should become soft and practically lose its resiliency completely. For the purposes of leather manufacture an experienced operative can tell in a perfectly satisfactory manner, whether a skin has been properly puered or not, by experience. For scientific investigations, however, on the relative efficiency of different bates, it becomes desirable to possess a method which will allow us to express the degree of falling in a quantitative and objective manner. In the following process this is done by measuring the resiliency of the skin. A piece of the latter is subjected to successive increasing and then decreasing pressures and its thickness is measured under each load.

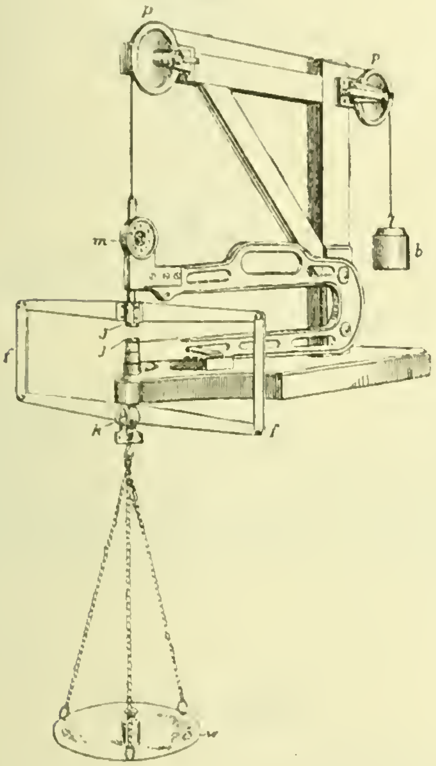


Fig. 1.

APPARATUS FOR MEASURING DEGREE OF FALLING.

m = micrometer dial.
JJ = jaws between which the skin is placed.
b = balance-weight attached to cord passing over pulleys *pp*, to counterbalance weight of frame, pan, etc.
k = knife edge supporting pan and weights *w*.

Fig. 1 shows the apparatus* that we have employed for this purpose. It consists essentially of a commercial form of micrometer sold for the purpose of measuring the thickness of leather. A pan for weights is attached to one of its jaws by means of the frame, f.f., in such a manner as to secure a perfectly straight pull. The weights of the frame and pan are counter-balanced in the manner shown, by the counterpoise b.

This apparatus proved perfectly satisfactory for heavy loads. For light loads, however, the results are somewhat vitiated by the very considerable friction shown by the rack and pinion of the micrometer. The difficulty was got over to a certain extent by inserting rollers into the micrometer and supplying it with large jaws up to a cross-section of ten square centimetres. A correction was also made by placing a weight approximately equal to the friction in the pan while loading; and on the counterpoise while unloading.

Fig. 2 represents an apparatus* which has been designed so as to be free from the faults inherent in the form just described.

It consists essentially of a balanced lever, A, to which the upper jaw, J, is rigidly attached. By means of a sliding weight, W, various loads from zero upwards, may be put on this jaw. The lower jaw, J_2, is movable without rotation vertically up and down, its position being controlled by the micrometer-nut, M, in conjunction with the spring, S. To use the apparatus the piece of skin is laid on the table, T, the weight, W, is placed in the desired position and the micrometer-nut, M, adjusted until the lever, A, is brought to what we shall call its normal position, which is detected by means of the contact device, E, of Shaw's electric micrometer. As is known this consists of an electric circuit made up of a dry cell, a telephone and the contact device proper comprising a small iridio-platinum contact plane and a slightly larger iridium plate. The making or breaking of contact which shows the correct position of the lever during loading or unloading respectively is indicated with very great accuracy by the telephone, and the thickness of the skin may be accurately read by the position of the micrometer-nut, M, conveniently illuminated by a small electric flash-light. The tapered disc, D, causes the water forced out of the skin to run on the table, T, and thus keeps it away from the screw of the micrometer.

Table.

Load per sq. cm. in grm.	Thickness in mm.		Δ
	Limed skin.	Puered skin.	
0	3·45	1·78	1·67
20	3·43	1·58	1·85
40	3·33	1·43	1·90
60	3·28	1·35	1·93
80	3·22	1·23	1·99
100	3·15	1·13	2·02
120	3·08	1·08	2·00
140	3.03	1·05	1·98
160	2·95	1·01	1·94
180	2·90	·98	1·92
200	2·83	·95	1·88
300	2·73	·88	1·85
All off	2·98	—	—
380	2·61	·82	1·79
600	2·43	·76	1·67
All off	—	·76	—

Δ = difference in thickness of the skin in the limed and puered respectively, *i.e.*, compression under the same load.

The table gives representative numbers obtained on the same sheep-skin (roan) in the limed and in the puered condition. The results are expressed graphically in Fig. 3.

The following is a brief summary of the results obtained thus far: A limed skin is first compressed, and then on releasing the pressure recovers more or less of its former thickness, according to the amount of plumping it has received, *i.e.*, it shows a certain amount of resiliency. A well puered sheep-skin, on the other hand, shows no resiliency at all, *i.e.*, on releasing the pressure the whole of the compression persists. In the case of an ox-hide subjected to a bate of hen dung, a slight recovery takes place on releasing the pressure. This accords with the fact that it will never be possible to puer a thick ox-hide so effectively as a thin sheep-skin. A piece of india-rubber, on the other hand, is completely resilient, *i.e.*, it wholly recovers its thickness on releasing the pressure.

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* The apparatus was constructed by Mr. W. Linney of the University College, Nottingham.

Since this apparatus was constructed Professor H. R. Procter has informed us that an appliance devised by Mr. Anderson of the Leeds University for measuring the thickness of leather under varying pressures, has been in use in the Leather Industries Department for some months for the purpose of measuring the proportion of the permanent to the elastic compression.

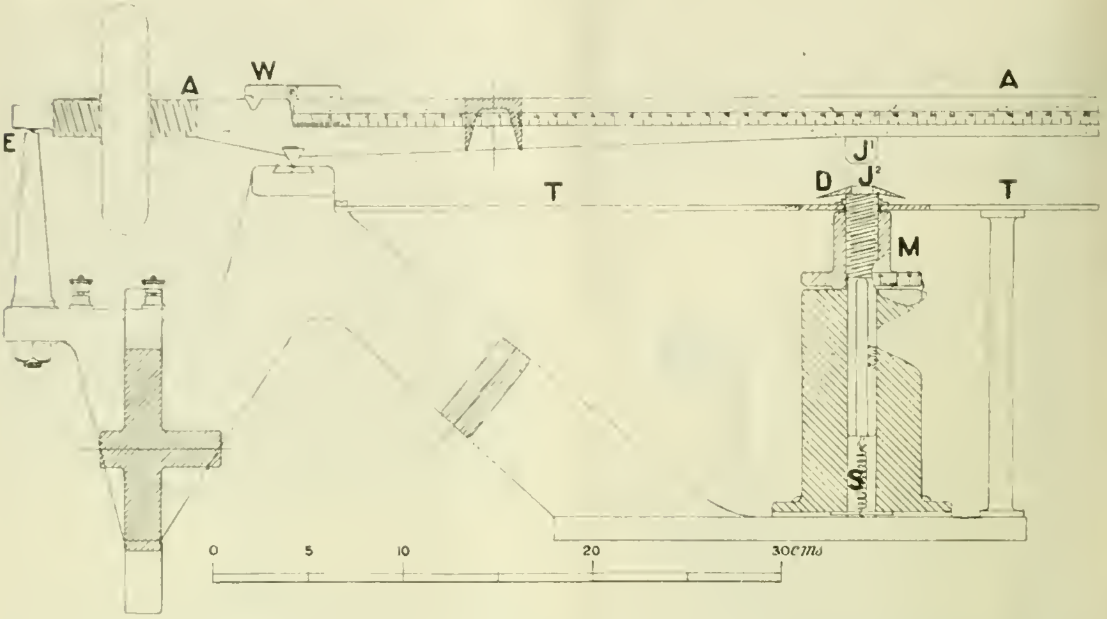

Fig. 2.

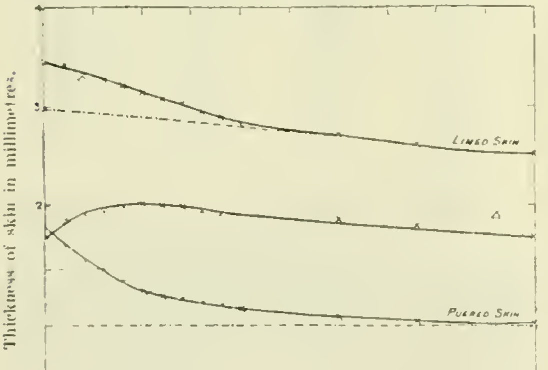

Fig. 3.

Load in grams per square centimetre.

The dotted lines show the thickness on taking off the load.

The relative thickness of the same skin in the limed and puered conditions under varying loads is also of interest. The process of puering may, as a rule, be taken to reduce a limed skin to between two-thirds and one-half of its thickness in the swollen condition. If both limed and puered skin be subjected to the same load, the puered skin will at first be compressed very much more than the limed one. This is probably due to the expulsion from it of water, held simply by capillary attraction. On further increasing the load, however, the compression decreases greatly in the case of the puered skin; with both limed and puered skin increase of compression ultimately becomes practically proportional to increase of pressure, and is slightly greater with the former than with the latter.

Discussion

Mr. Dunford enquired whether it was necessary to carry out measurements on the same parts of a skin before and after puering, or whether the authors took the mean of a large number of measurements from different parts of the skin.

Mr. Harvey asked whether measurements made on different parts of the same piece of skin varied much and what was the amount of divergence.

Mr. Wood, in reply, said that as a rule only small pieces of skin had been taken, so that the pieces measured before and after puering were not far apart. The compression-curves obtained from different parts of the same skin were not identical but showed the same general form. If it was desired to obtain an average compression curve for a skin the simplest plan was to double it up before putting into the apparatus and to divide the measured thickness by two.

Sydney Section.

Meeting held at Sydney on Wednesday, November 15th, 1911.

MR. T. STEEL IN THE CHAIR.

THE MANGROVE BARK OF NORTH QUEENSLAND, AND THE MANUFACTURE OF MANGROVE CUTCH.

BY F. A. COOMBS AND G. HARRISON RUSSELL.

Forests of mangrove trees and shrubs (*Rhizophoraceæ*) extend all round the coast of Northern Australia, and grow in great profusion along the north-east coast of Queensland, especially on the mud flats extending three to four chains inland.

The authorities were at first averse from granting concessions to strip and utilise the bark, mainly on the ground that the removal of the trees would lead to greatly-increased erosion of the foreshores; but, as a result of experiments made by the Department of Agriculture, a code of regulations was eventually drawn up, and in 1903 a concession to strip mangrove bark from Halifax Bay to the Johnstone River, a distance of about 150 miles, was granted. A second concession included the coast from the Johnstone River to Double Island, north of Cairns.

Of recent years mangrove bark has come into favour as a tanning agent, especially in Continental Europe and America, where the forests yielding tanning materials are nearly exhausted.

The following are the chief species of mangrove trees used for tanning purposes which are found in the Eastern tropics, Dutch East Africa, and Borneo, as well as in Queensland, viz: *Rhizophora mucronata* and *conjugata*, *Bruguiera eriopetala*, *parviflora*, *caryophylloides* and *gymnorrhiza*, and *Ceriops candolleana*.

The bark from these varies considerably in astringency the tannin value in some cases ranging as high as 50 per cent., and rarely falling below 30 per cent. The varieties, *Rhizophora mucronata*, *Bruguiera gymnorrhiza*, and *Ceriops candolleana*, are reputed the best commercially, and have well developed barks, constituting 10 to 25 per cent. of the total weight of the stem, in which the proportion of tannin increases with the age of the trees.

The following analysis of mangrove bark from Cairns was made at the Imperial Institute in London some years ago, and may be cited as representative of the quality of that in North Queensland :

	Per cent.
Tanning matters ...	39·50
Non-tanning matters	8·40
*Insoluble matters ...	42·75
Moisture....	9·35
*Containing ash	4·78

We have also tested three bulk samples of black mangrove (*rhizophora mucronata*) from the Northern district which results as follows :—

	Per cent.	Per cent.	Per cent.
Tanning matters	38·8	38·2	39·54
Non-tanning matters	8·4	8·1	7·86
Insoluble matter	42·2	43·9	41·00
Moisture..................	10·6	9·8	11·80
Extract	47·2	46·3	47·2

Harvesting and exporting the bark.—The cost of collecting and preparing the bark for the market is comparatively small, and Northern Queensland should be able to compete with the East Coast of Africa, British India, North Borneo, and the Philippines.

The average mangrove bark is from ¼ to 1 inch in thickness, and would return a much greater weight of bark compared with wattle and gum trees of equal size. When stripped it is soft, and contains a large proportion of moisture, and unless cured under cover the same grade of bark will show a wide range in quality. If the best bark is allowed to become wet or is exposed to the direct rays of the sun whilst curing, oxidation takes place, which seriously impairs the colour, so that instead of a live, quebracho pink, a deep brick-red colour is developed. The bark has to be carefully removed from the stems and branches, so that the trees are not damaged. Stripped trees are said to renew their bark in from four to six months, but we doubt this. It is conveyed to convenient centres, broken up, and dried in the sun, but would be better roughly ground and packed in small pressed bales to reduce the cost of transport somewhat.

The exportation of bark containing less than 40 per cent. of tannin is prohibited in German East Africa ; and even if such regulations are not in force elsewhere, it is advisable for exporters to recognise the trade requirements, since tanning materials are now almost universally bought on their actual tannin content by analysis.

Manufacturing extract from the bark. The best method of handling mangrove bark commercially is by means of an extract factory at the source of supply. The establishment of extract factories in connection with bark-farms as carried on at present in German East Africa, Borneo, and the Philippines, might certainly apply to North Queensland. The bark has a dead outer casing or rind, which cannot be removed in a profitable manner ; but from 15 to 20 per cent. breaks off during drying and in the processes preparatory to extraction, so that the remainder is a very much smaller proportion of the total weight of the bark. A preliminary preparation to actual grinding is necessary, and the bark is either "hatched" into pieces a few inches long by chopping by hand, or by cutting with a machine having a flywheel with radial knives, somewhat like a chaff cutter ; or, in place of "hatching," a "bark-breaker" is used, in which two toothed rollers made to fit each other, crush and break the material. The bark is then ground in some form of disintegrator, in which rapidly revolving beaters, either radial or concentric steel bar cylinders, dash the material against a serrated surface and knock it to a powder. Into the serrated case is fixed a grating, which allows the dust to get away. If the bark is dry, it can be ground with very little trouble, the fibres being very brittle and the bark fairly triable ; but care must be taken not to grind it too finely, or the subsequent extraction will be tedious and inefficient ; the material should be sufficiently coarse for water to percolate slowly through it.

There are in vogue at least three methods of extraction, viz., open diffusion, decoction, and percolation, all of which leave something to be desired in rapidity and completeness of extraction with the minimum of water and expenditure of heat.

The diffusion system is that of continuously pumping forward the liquor from one extractor to the next, the material being immersed all the time ; and the means employed for moving the liquor forward is either compressed air or a steam jet, mechanical pumping having been discarded long ago.

The greatest objection to this process is the time it takes to complete the extraction, it usually being from two and a half to four days from the time an extractor is filled until it is emptied. This entails the use of a much greater number of extractors and the continuous heating of a large quantity of water ; and at the same time the tan liquor is too much exposed to atmospheric influences.

Decoction is a much older method than diffusion, and has been discarded to a large extent by tanners ; but when applied to extract manufacture, it has been found to be more efficient than the diffusion process. Extraction by decoction means immersing the raw material to be extracted in water and then boiling it. This is exactly what is done in leaching bark by this method. Extraction is made in large, deep, circular vats, which have a copper coil below the false bottom running round three times and passing several inches up the centre of the vat, where it is covered by a copper funnel. The vats have thick oak removable lids, protected against spurting by a copper bell. After two hours' steaming on the first lot of bark, the liquor is pumped on to a fresh lot in another vat, and so on. When the liquor comes out of the last vat it is generally about 3 B., and very dark-coloured, because of the metallic "tannates" it contains. Sulphuric acid is sometimes used in the extraction to obviate this, but excess is carefully avoided. Fresh waters come over the partially spent wood, and, after one or two changes, it is quite spent. After extraction the liquor is allowed to settle in tanks, and the clear liquor strained off from the "reds," fibre, resinous matter, etc., into a brewer's cooler, which brings the temperature down to about 55° C. Next to extracting under pressure, which has certain disadvantages, this is the most rapid and consequently most satisfactory method employed.

With a properly-equipped system, a battery of ten "leaches" can be turned over in less than twenty-four hours. That is to say, instead of two and a half to four days, the time is reduced to less than one, and the number of leaches and volume of water in use are reduced in like proportion. There is another advantage in extracting by decoction, and that refers to the preparation of the bark. In diffusion and percolation not only the completeness of the extraction, but the time and volume of water necessary to effect it, are largely governed by the fineness and condition of the bark after grinding.

Percolation consists in sprinkling water over the top of the leach by means of a mechanical arrangement, and drawing the liquor off from underneath the false bottom as it collects, never allowing the bark to become immersed.

To properly carry out this system the mass of bark in the leach must be steamed by means of a perforated steam pipe in the bottom of the leach, until it has settled down as uniformly and compactly as possible. Boiling water is then sprayed on by the revolving sprinkler and continued until extraction is complete, which will be in about twenty-four hours. When properly carried out this method is very thorough in its results, and possesses the advantage of making every leach a separate unit, and a much less volume of water is required than with the other two systems.

We had a set of copper vats for our experimental work, linked up on the diffusion or "press-leach system," and nine days were allowed for extraction, passing 7 volumes of cold water and one at 90° C.—each sufficient to cover the bark in one vat—through the material before it was rejected. Boiling water is generally advocated for completing the extraction process, but this is not desirable in treating mangrove bark, as the red colouring matter is much more largely extracted at higher temperatures; besides which "difficultly-soluble matters" are liable to be dissolved, which are rendered insoluble again on cooling, and further concentration. The bark extracts very readily, but was inclined to cake, especially if the material was very dry and yielded a large proportion of fine powder in the grinding process. Our analysis of the spent bark, from the foregoing trial-plant, showed 6·85 per cent. of tanning matters—equivalent to 3·55 per cent. of the original 39 per cent. tannin in the fresh bark. This cannot be considered an entirely satisfactory result, but in Australia, where the percentage of tanning matter in the bark is much higher than in other countries, and, in the case of mangrove bark especially, the proportion of "difficultly-soluble matters" is also above the average, it may be taken as a fair result—good enough for extract manufacture where solubility is a first consideration.

In spite of the apparent ease with which the material "spends" in leaching, however, the apparently spent bark still contains appreciable quantities of tannin, which can only be leached out with some difficulty and expense. From our experience it seems probable that the last 5 to 10 per cent. of tanoing matter in mangrove and wattle barks is not easily extracted, and although it represents a very large quantity in spent bark, we doubt whether tanners in this country leave much less than this quantity of the original tannin-content in their spent bark, since recent analyses made have ranged between 7 and 11 per cent.

It is impossible for us to afford any indication of the practical results of "leaching" on a large scale, as we only dealt with small quantities, and it would be necessary to work any system for some time to obtain proper uniform conditions. We feel sure, however, that this bark will prove no exception to the general rule, and in the manufacture of extract will offer no great difficulties to the skilled worker. The process already outlined will yield a satisfactory extract of "cutch" for the purpose of dyeing fabrics, but a further process is necessary in making tanning extract—viz., decolourising the liquor. This is desirable, not only because of the colouring matter naturally present, but also because, in expediting the process of manufacture by the application of heat, the tannin and extractive matters develop dark-coloured substances by partial decomposition. The liquor is now run into the decolouring plant, which consists of a deep vat with a false bottom, a coil of pipes beneath this to raise the temperature, and a mechanical stirrer, attached to power. Many substances, such as lead acetate, alum casein, potassium ferrocyanide, oxalic acid, etc., have been suggested as decolourising agents; but none is so good as the originally used material—blood albumin. The bullock's blood, or "blood crystals," dissolved in water, is run into the vat, and well mixed. The vat is now heated up to 70° C.; the albumin coagulates, and carries down with it much of the colouring matter, and some little tannin. After standing for an hour or two, the clear liquor is then gently run off, by means of taps fixed at different heights in the sides of the vats, and passed into the evaporating plant.

Concentration used to be accomplished by means of the single effect steam coil type of vacuum pan, which subjected the tan liquor to very extended boiling, and consequent damage to both tannin and colour, besides being very wasteful of steam. Nowadays evaporation is carried out either in steam-heated tube or film vacuum pans, in which the temperature is kept low, oxidation prevented, and the process is continuous. The Yaryan apparatus is well suited for this purpose, evaporation being quickened by conversion of the liquor into spray by admission into steam-heated copper tubes, these passing into a separating chamber, at the other end, kept at a low pressure by an air pump. The steam formed from the evaporation of the first liquor, after straining from any spray, is then used to heat up a second arrangement of pipes, maintained at a low pressure, and so double, triple, and quadruple effects are obtained.

The film evaporator consists of a bank of copper tubes, suspended horizontally in a header, placed in one end of a horizontal drum, arranged so that steam fills the interior of the tubes, while the tan liquor, distributed uniformly over the outside of the top row of tubes, runs over each succeeding row downwards to the receiving chamber, from which it is pumped to the next effect. In passing over the tubes, the liquor forms a very thin film, from which vapour readily escapes. It is usually necessary to pass the liquor through each of these plants twice before getting it to the proper density, as it is not possible to concentrate much beyond 25° B., so that for very heavy extracts it is advisable to finish off either in an ordinary vacuum pan or a strike pan. When solid extract is being manufactured these last pans need to be broad and shallow, and have a wide exit, as evaporation is continued until the extract will only just run out into the cooling boxes and by accident may very easily be taken too far.

It is claimed that the Kestner evaporator gives a much greater output and efficiency in working. In this plant concentration is also effected in tubes, the tan liquor, distributed in the lower part of a vertical set of tubes by a special arrangement, is divided equally into all of the tubes under conditions which realise a great advantage from the point of view of damage to products sensitive to air, such as tannin extracts; also of the quantity of liquor in circulation. In the latter instance the difference is very remarkable, compared with the other systems described. Thus, for two apparatus doing the same work, an ordinary quadruple effect vacuum pan will contain thirty times as much liquor in process of concentration as a Kestner plant. This great difference indicates that an entirely new principle is applied in this latest form of evaporator. It is the phenomenon term "grimpage," or "climbing," which causes the liquor to rise in the tubes. Bubbles are first formed at the bottom of the tubes, but when the steam supply to the jacket surrounding the vertical tubes is sufficient, the liquor assumes an ascending motion in the form of an extremely thin layer along the interior of the tubes. Under these conditions evaporation is highly intensive, and the liquor is actually under the best conditions to avoid damage.

The vacuum pan we used in the laboratory of the Sydney Technical College (Tanning Department) was capable of holding four gallons of liquor, and when working the gauge showed a vacuum of 70 cm., the temperature being about 83° C., which pointed to some defect in our experimental plant. By further experiments the temperature was reduced to 72° C. This evaporator had a water-jacket which prevented the temperature rising above boiling point, and the process lasted about twelve hours in the first case and was subsequently reduced to five hours. The liquor showed a density of 85 per cent. bark, before treatment, and when the extract had reached that stage that it would set on cooling, it was poured out into a flat dish, and set into a hard mass.

Concentration and evaporation of liquid for tannin extracts should be carried out by the aid of the best machinery available and under skilled supervision—factors which we were not able to make use of in our experimental work, but it will be readily recognised that any defects in our evaporating plant would not increase the tannin value of the extract, and consequently the following results show that the black mangrove bark of North Queensland is suitable for the production of an extract of high tannin value.

The following analyses were made of solid extract "cutch" from black mangrove bark, viz.:—

	(1) p.c.	(2) p.c.	(3) p.c.
Tanning matters (absorbed by hide-powder)	67·42	68·5	70·66
Soluble non-tanning matters	16·21	17·3	18·00
Insoluble matter	0·00	1·7	0·00
Moisture	10·31	12·5	11·31

These results show a very high percentage of tanning matter, combined with a reasonably small proportion of soluble non-tanning substances, and prove that mangrove bark is capable of yielding an extract of tannin value equal to any extract on the market at the present time.

Taking the average of three analyses we find that the dry bark yields 46·9 per cent. of extract.

Commercial extracts contain varying amounts of water, the percentage yield of extract from the bark we treated was as follows:—

(1) 55·83 per cent. cutch, containing 16 per cent. moisture.

(2) 58·6 per cent. cutch, containing 20 per cent. moisture.

(3) 66·7 per cent. extract, containing 29·75 per cent. moisture

(4) 53·6 per cent. powdered extract, containing 12·5 per cent. moisture.

Allowing one-sixth for loss on a large scale, the working yields will approximate to: 46·53, 48·9 and 55·6 per cent. cutch, and 44·7 per cent. powdered extract. These figures show that a high percentage of solid extract can be obtained from the bark.

"Mangrove-cutch" is largely used by dyers of woollen and other fabrics, and it seems to have taken the place, to some extent, of the true "cutch" produced in North-West India and Burmah, from the wood of "Acacia catechu." It yields better and brighter liquors than gambier and ordinary "cutch," and runs much cheaper.

Mangrove bark, and the extract made from it, have hardly received the serious consideration from the Australian tanning trade generally of which they are worthy. This is partly due to the discouraging results some tanners have had with it in point of colour, but chiefly owing to the abundant supplies of wattle bark hitherto available, and the comparatively unknown properties of the former. Reviewing the world's supplies of tanning materials, it is not improbable that a shortage will be felt before very many years have elapsed. The requirements of Europe and America are growing yearly to enormous proportions, and despite the great developments of the quebracho extract industry in South America, the output there is not unlimited, and it really seems as though mangrove bark were the only tanning substance in view which exists in sufficiently remunerative quantities to justify a further development of extract manufacture. The attractive price, and, under certain conditions, desirable properties of the North Queensland bark commend it as a desirable raw material from which Australian ingenuity should develop a cheap and satisfactory tanning agent, both for home consumption and the export trade. At the present time it is no longer a simple matter for tanners to pick and choose what materials they will use in their trade as formerly; they are more or less restricted to market supplies and ruling prices nowadays, and we venture the opinion that mangrove bark is destined to be the bark of the future for the supply of what are known as "catechol tannins"; "pyrogallol tannins," the other variety, are far too expensive to use alone, besides which their supply is very limited. Hence we submit that the extract manufacturer who will be careful in the selection of his bark, who will develop a method for eliminating the high percentage of ash in the bark, due to the fact that it grows chiefly in salt marshes and tidal waters, and institute an effective system for permanently decolourising the extract, and will offer his product at a reasonable price, should certainly find friends amongst the Australian tanners of heavy leather.

DISCUSSION.

The CHAIRMAN said the mechanical difficulties in the way of extraction seemed to be considerable, and suggested the use of stirrers to ensure good mixing. He thought it would be necessary to have the bark finely ground, and there would be no difficulty in mechanically mixing the powder with water till solution of the extract was complete, after which the contents of the cell could be left to settle, and the extract run off to the second cell. It might be necessary to use more cells, and have less bark in each. Another suggestion was to mix the powdered mangrove bark with a fibrous bark. He asked whether the objection to the red colour was not merely a trade prejudice that would ultimately be overcome? If the leather were afterwards to be made into black boots, its original colour did not seem to be important.

Mr. R. DAVIDSON asked what increase in weight resulted from the use of this mangrove tannin? He understood that in a trial made with it, a red colour had been produced, and there was not much strength.

Mr. COOMBS, in reply, said he thought the Chairman's idea of mechanical agitation was worth trying, though it was difficult to test it properly on the small scale on which he had worked. The advantage would be seen best in a vessel of about 5 feet in diameter. A red colour did not necessarily mean a bad leather, but the objection was that red was often developed in the case of inferior tannages, in which alkali sulphides and alkalis were used. These were difficult to neutralise, often appearing to be acid on the outside when the centre was still alkaline, the red colour being the result of imperfect neutralisation. The increase of weight after tanning was exceptionally good with mangrove bark.

Journal and Patent Literature.

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I.—GENERAL PLANT; MACHINERY.

Furnace walls; Thermal insulation of ——. C. Hering. Met. and Chem. Eng., 1912, 10. 97—102.

A COLLECTION of the salient features in various previously published papers of the author on the passage of heat through bodies and simplified methods of calculating such passage for furnaces of different designs. It includes discussions of the effects of several layers of different materials and of joints and air-spaces, of the temperature coefficients of the heat resistance of different materials, of the most suitable shapes for furnaces, and of the emission of heat from surfaces exposed to the air.—A. S.

Fractional distillation with steam. A. Golodetz. Z. physik. Chem., 1912, 78, 641—656. (See also this J., 1912, 150.)

THE author's experiments were carried out with mixtures of substances insoluble or nearly insoluble in water. Water was added to the mixture and the whole was distilled in an apparatus fitted with a dephlegmating column. The amount of water added was found to have little effect, the degree of fractionation attained depending chiefly on the efficacy of the dephlegmator and the difference between the boiling points of the binary mixtures of the individual components with water. The results of experiments with benzene and toluene, amyl formate and amyl acetate, mono- and di-ethylaniline, and a fraction (b. pt. 110 — 145° C.) from Grosny petroleum are given, and these show that fractionation with steam is superior to ordinary fractional distillation for substances of not too high boiling point, whilst even with high-boiling substances good results are obtainable by use of a tall dephlegmating column. Fractionation with steam is especially useful in the case of small quantities or of costly substances, for the presence of water allows the distillation to be continued until the whole of the substance passes over. From a mixture of 300 grms. each of benzene and toluene with 29 grms. of water, distilled at a pressure of 734 mm., using a "birectifier" with aluminium packing (74 cm. high) (Golodetz, Mitt. des Polytechn. zu Kiew, 1911), there were obtained a first fraction (up to 69° C.) of 246 grms. of benzene and water, containing 217 grms. of almost pure benzene, and a final fraction consisting of 247 grms. of pure toluene. Using a Le Bel-Henninger bulb dephlegmator the results were not quite so good, but were superior to those obtainable by ordinary fractional distillation. From a mixture of amyl formate (100 grms.), amyl acetate (100 grms.), and water (32 grms.), using a "birectifier" with aluminium packing (76 cm. high), 82 per cent. of the amyl formate and 95 per cent. of the amyl acetate were recovered. From a mixture of 10 grms. of mono- and 90 grms. of di-ethylaniline with a large excess of water, using a "birectifier" filled with cuttings of thick aluminium wire (1 m. high), 76·5 grms. of the diethylaniline were recovered in the pure condition. From 275 grms. of the petroleum fraction mentioned above, six fractions were obtained by fractionation with steam ("birectifier" with aluminium packing 76 cm. high), the weights and specific gravities (at 17° C.) of the respective fractions being: (1), 15 grms., 0·7680; (2), 25 grms., 0·7690; (3), 27 grms., 0·7650; (4), 60·5 grms., 0·7510; (5), 49 grms.; (6), 48·5 grms., 0·7498. The sixth fraction which distilled completely at 148°—149° C. at 768 mm. without steam, could not be further fractionated and was found to consist of a saturated cyclic hydrocarbon of the C_nH_{2n} series.—A. S.

PATENTS.

Smoke from furnaces and the like; Apparatus for the treatment of ——. W. L. Thomas, Wheatley, Oxon. Eng. Pat. 28,976, Dec. 13, 1910.

A CONICAL spiral coil of perforated pipe, having its base uppermost, is rotated about an axis within a vertical cylindrical chamber. Water is passed through the coiled pipe, and the smoke to be treated is drawn into the upper part of the chamber by a fan and passes downwards, being deflected outwards by baffles of truncated conical form fixed at intervals along the axis and between the turns of the coil. In this way the smoke comes into intimate contact with a shower of water spray delivered from the perforations of the coil. The water and smoke then pass through horizontal screens fastened across the lower part of the chamber after which the water containing the soot, etc., is separated and the purified gases discharged. —W. H. C.

Smoke and fumes; Treating ——. J. and E. J. Mercer, New Brighton. Eng. Pat. 12,791, May 29, 1911.

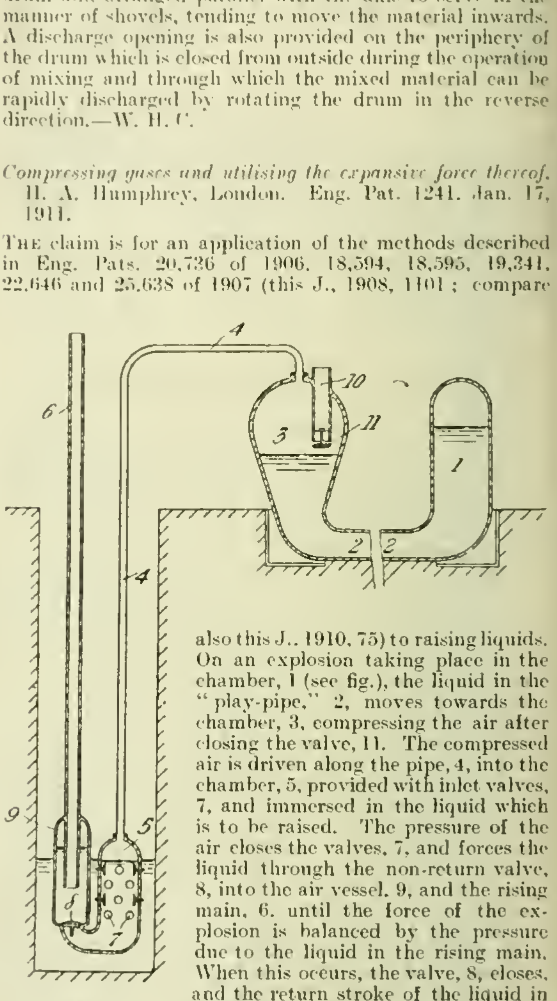
THE products of combustion from the heating flues are delivered into a "diffusion chamber" which communicates by an opening below with a conduit through which air is passing and which is also connected with a chimney. The heavy incombustible gases sink through the opening into the flue below and pass to the chimney, and the lighter air or oxygen rises through the opening in the bottom of the "diffusion chamber," and after mixing with the lighter combustible gases enters the space below the grate of the furnace.—W. H. C.

Mixing machine. Maschinenbau-Anstalt Humboldt, Köln-Kalk, Germany. Eng. Pat. 29,499, Dec. 19, 1910. Under Int. Conv., Dec. 20, 1909.

THE claim relates to drum mixing machines having internal blades which cause the materials to be raised and to fall in continually crossing showers. Additional blades are provided projecting obliquely from the internal surface of the drum and arranged parallel with the axis to serve in the manner of shovels, tending to move the material inwards. A discharge opening is also provided on the periphery of the drum which is closed from outside during the operation of mixing and through which the mixed material can be rapidly discharged by rotating the drum in the reverse direction.—W. H. C.

Compressing gases and utilising the expansive force thereof. H. A. Humphrey, London. Eng. Pat. 1241, Jan. 17, 1911.

THE claim is for an application of the methods described in Eng. Pats. 20,736 of 1906, 18,594, 18,595, 19,341, 22,646 and 25,638 of 1907 (this J., 1908, 1101; compare also this J., 1910, 75) to raising liquids. On an explosion taking place in the chamber, 1 (see fig.), the liquid in the "play-pipe," 2, moves towards the chamber, 3, compressing the air after closing the valve, 11. The compressed air is driven along the pipe, 4, into the chamber, 5, provided with inlet valves, 7, and immersed in the liquid which is to be raised. The pressure of the air closes the valves, 7, and forces the liquid through the non-return valve, 8, into the air vessel, 9, and the rising main, 6, until the force of the explosion is balanced by the pressure due to the liquid in the rising main. When this occurs, the valve, 8, closes, and the return stroke of the liquid in the "play-pipe," 2, commences. When the pressure in the chamber, 3, has fallen sufficiently, the valves, 7, re-open and the vessel, 5, refills with liquid. Meanwhile the explosive mixture in the chamber, 1, is compressed and when another explosion takes place the operation is repeated. The pipe, 10, open to the air above, and provided below with the valve, 11, which is closed by the rising liquid, enables the column of liquid in the "play-pipe," 2, to commence its stroke without doing work until the valve, 11, is closed. By this means higher compression of the air in the chamber, 3, is obtained and consequently the height to which the liquid in the main, 6, can be raised is increased.—W. H. C.



Extraction apparatus. J. Merz, Brünn, Austria. Eng. Pat. 9736, Apr. 21, 1911. Under Int. Conv., Oct. 8, 1910.

THE apparatus consists of a vertical cylindrical shell provided with a charging door at the top. The lower part of the vessel, which forms the still, is provided with an internal heating coil and is separated from the extractor by a partition, sloping slightly towards a lateral discharging door and on the upper side of which is a second heating coil. A wide internal vertical pipe extends from the still through the partition, terminating just under a condenser coil placed in the top of the apparatus; this pipe may be closed at the top by an externally operated valve, the vapour then passing from it down two lateral pipes to the bottom of the charge lying on the partition, in which case, using the heating coil on the partition if desired, a vapour extraction is effected. It is claimed that by following a liquid extraction by a vapour extraction, a residue retaining the minimum of solvent is obtained. (See also this J., 1896, 792.)—B. G. McL.

Dryers; Rotary —. E. R. Sutcliffe, Leigh, Lancs. Eng. Pat. 18,068, Aug. 9, 1911.

The apparatus consists of two cylinders somewhat inclined to the horizontal, and rotated on rollers by suitable gearing. The upper, or drying cylinder is of smaller diameter than the lower or cooling cylinder, and the lower end of the former enters a short way into the upper end of the latter leaving an annular space. The junction between the two cylinders is surrounded by a chamber connected with a furnace. A fan situated at the upper end of the upper cylinder draws the products of combustion from the furnace through the annular space and also draws air through the cooling cylinder. The air, which becomes heated, helps to complete the combustion of the gases from the furnace. The material to be treated is fed into the upper end of the upper cylinder and is dried during its passage downwards. It then passes into the lower cylinder where it is cooled by the current of air, which is regulated by a damper, the cooled material being discharged into a closed receiving chamber.—W. H. C.

Drying apparatus. A. Gerlach, Nordhausen, Germany. U.S. Pat. 1,015,796, Jan. 30, 1912.

A horizontal cylindrical, stationary heater is mounted centrally in a double-walled trough. The material to be dried is conveyed by a rotary conveyor through the heater to one end of the trough and is then returned in the contrary direction spirally about the outer wall of the cylinder to the other end of the trough by a conveyor rotated about the cylinder.—W. H. C.

Dryer. W. Landes, Canton, Kans. U.S. Pat. 1,016,568, Feb. 6, 1912.

The material to be dried is conveyed by a worm elevator to the top of a spiral flat-bottomed perforated gutter supported on a central vertical shaft within a cylindrical casing open at the top. Oscillatory motion imparted to the central shaft causes the material to pass down the spiral and in doing so it meets an upward current of hot air or other drying medium. The whole apparatus is mounted on wheels to facilitate transport.—B. G. McL.

Drying of vegetable and mineral substances; Rolling pressure-band for ——. E. Abresch. Fr. Pat. 434,085, Sept. 9. 1911.

In one form the apparatus, which is intended for drying peat and the like, comprises an endless band travelling over two hexagonal driving pulleys and made up of a flexible framework surmounted by sections of double perforated sheet-iron, the perforations in the two sheets being staggered. Underneath, on a second set of driving pulleys, one of which is hexagonal and the other octagonal, is another framework placed so that its upper side converges on one end of the lower side of the upper band. Travelling along with this lower framework and on each section of it are a number of open oblong boxes similarly doubly perforated, the side of each nearest the framework being closed by a similarly perforated piston which is attached to the framework by rods. The two systems are caused to rotate so that the upper side of the lower one moves in the same direction as and towards the lower side of the upper one. As the boxes approach the upper side, they are filled with the material to be treated, thereupon their upper side becomes closed by the perforated sheet-iron of the upper system and while moving towards the other end the pistons are caused by the convergence to compress the material to any desired degree and finally to expel the cake, the liquid expressed passing through the perforations. Guide-bars are arranged to draw the pistons back and retain them in position during the return travel. Within each system is a set of rollers for supporting the framework during the pressing.—B. G. McL.

Drying of compressed air; Process and apparatus for the —— *for industrial application.* E. L. Collon. Fr. Pat. 433,785, Aug. 18, 1911.

To eliminate the disturbing influences caused by the presence of condensed water in compressed air, claim is made for two closely allied processes. In the first case the cooling effect produced by the expansion of a portion of the air (in practice about one-third) is caused to cool and condense the moisture in the remainder; while in the second case the same result is obtained by causing a portion of the compressed air to bring about the evaporation of a film of water on the outside wall of the vessel containing the air. The apparatus consists of a cylindrical vessel with a cambered bottom provided with an insulated jacket. Part of the air from the compressor passes into this vessel, the remainder being conveyed to the annular space and after expansion it is caused to come intimately in contact with the walls of the cylinder. If water is used, as in the second case, it is conveyed from a tank above on to the outer walls of the cylinder by a circular perforated pipe, a large evaporating surface being obtained by surrounding the cylinder with wire gauze. In each case the condensed water is trapped off at the bottom, the amount of water collected automatically governing the air employed for effecting the cooling. The first process is less economical but the more easily regulated.—B. G. McL.

Antifriction-bearing compound. F. C. Winkler, Victoria, British Columbia. U.S. Pat. 1,015,920, Jan. 30, 1912.

The compound consists of powdered or flake graphite either with or without fibrous asbestos mixed with magnesium carbonate made into a paste with a solution of magnesium chloride.—W. H. C.

Slimes-filtering apparatus. D. J. Kelly, Salt Lake City, Utah. U.S. Pats. 1,015,960 and 1,015,961, Jan. 30, 1912.

A filter carrier is arranged so that it can be moved into or out of an inclined tank having one end open. The end of the filter carrier is provided with a head adapted to close the open end of the tank when the filter carrier is within. A shaft provided with a movable sleeve projects from the centre of the outer side of the head. The joint is locked by radial levers attached to the sleeve and actuated by the rotation of a transverse shaft connected with the sleeve by a toggle-lever. The locking and unlocking mechanism is operated by a fluid pressure system.
—W. H. C.

Solids and liquids; Process of separating ——. J. J. Berrigan, Orange, N.J., Assignor to F. J. Arend, New York, and J. Bernstrom, Stockholm. U.S. Pat. 1,016,870, Feb. 6, 1912.

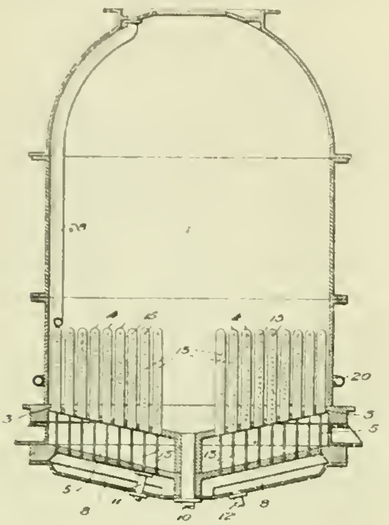
In the treatment of material by the process described in U.S. Pat. 1,013,413 (this J., 1912, 110), liberated vapour is removed by circulating a gas over the material, the gas charged with vapour leaving the drum by the openings provided for liquid discharge.—B. G. McL.

Evaporating apparatus. P. Kestner, Lille, France, Assignor to Kestner Evaporator Co., Philadelphia, Pa. U.S. Pat. 1,016,160, Jan. 30, 1912.

The liquid to be evaporated is fed into the first element of a multiple effect vacuum evaporator. From the last effect the concentrated liquid is conveyed into an evaporator working under pressure and heated independently. The evaporation is here completed, the product being discharged into a vacuum receiver, and the vapour given off conveyed to the heating chamber of the first effect.
—W. H. C.

Evaporating apparatus. T. F. Sanborn. Fr. Pat. 433,573, Aug. 24, 1911. Under Int. Conv., Dec. 28, 1910.

THE patent involves a method for applying the heat to each "effect" of a multiple-effect evaporator; a single effect is shown in the diagram. The evaporator, 1, is surmounted by a spray trap (not shown), leading to the eduction pipe, which returns the liquid by the pipe, 28. The heating is effected by means of a number of concentric rows of vertical pipes closed at their upper ends, 4, which project through the base plate, 3. This base plate slopes to a central opening, 10, for removal (continuously or intermittently) of the liquor to the next effect, which it enters at several points in the circumference from a surrounding pipe, 20. Below this base plate is a chamber, 5, from which the steam is distributed to the pipes, 4, afterwards passing away by the pipe, 11, through a water-separator, the uncondensed vapour passing into the heating chamber of the next effect. Into each of the heating tubes narrow vertical tubes, 13, 15, extend from the chamber, 8, their object being to effect a removal of the non-condensable gases which accompany the steam from the upper ends of the heating tubes; these gases pass on separately by the tube, 12, to the heating chamber of the next effect. Incrustations which may form between the heating tubes are broken off by the expansion caused by the heat in these tubes.—B. G. McL.



Liquefaction of gases of low critical temperature. A. Levi-Cases. Fr. Pat. 433,639, Aug. 17, 1911.

IN the ordinary process of liquefaction the heat of compression is usually lost; in the present claim the compressed gas passes through a heat interchanger where the heat is transferred to the cold gas which has escaped liquefaction returning from the expansion chamber. The compressed gas may then be further cooled in a second vessel after which it passes to the expansion vessel which consists of an annular vessel down the inner tube of which the cooled gas passes to the expansion valve; after expansion the liquefied portion collects at the bottom of the outer vessel, the non-liquefied gas passing upwards and further chilling the gas in the inner tube. The expansion is allowed to take place only to a moderate degree: the gas finally leaving the apparatus warm and under pressure is used in connection with the production of power.—B. G. McL.

Furnaces; Recuperative ——. J. Fleuret. Fr. Pat. 433,717, Aug. 29, 1911.

THE claim is for the combination in one unit of several coke-furnaces, the sensible heat of the gas from which is employed for roasting operations not requiring excessive heat, as for example plaster burning; this is effected in closed chambers placed above each oven. The gas then passes round the coke-furnaces and is utilised in a centrally disposed kiln for lime burning.—B. G. McL.

Volatile liquids; Process and apparatus for the recovery of ——. S. C. Early, Boulogne-sur-Mer, France, A. S. Christiansen, East Dulwich, and The Farringdon Works and H. Pontifex and Sons, Ltd., London. Eng. Pat. 3602, Feb. 13, 1911.

SEE Fr. Pat. 429,934 of 1911; this J., 1911, 1301.—T. F. B.

Liquid-separator. G. E. Sanford, Chicago, Assignor to Sanford Clarifying and Separating Co. U.S. Pat. 1,016,366, Feb. 6, 1912.

SEE Fr. Pat. 415,858 of 1910; this J., 1910, 1291.—T. F. B.

Catalysts; Apparatus for producing ——. M. Wilbuschewitsch, Nischninovgorod, Russia. U.S. Pat. 1,016,864, Feb. 6, 1912.

SEE Fr. Pat. 426,343 of 1910; this J., 1911, 966.—T. F. B.

Evaporating liquids; Process of ——. C. R. Mabee. Fr. Pat. 434,192, July 18, 1911.

SEE U.S. Pat. 998,020 of 1911; this J., 1911, 1001.—T. F. B.

IIA.—FUEL; GAS; MINERAL OILS AND WAXES.

Mine gases; Composition of some ——, *and a simple methane [determination] apparatus.* G. A. Burrell. J. Ind. Eng. Chem., 1912, 4, 96—100.

THE results of analyses of a number of samples of mine gases collected under different conditions (after firing explosives, after fires, and after explosions) are given, and these in most cases show the presence of injurious amounts of carbon monoxide (compare also this J., 1909, 816).
—A. S.

Petrol air gas as an adjunct to coal gas. W. Key. J. Gas Lighting, 1912, 118, 425—426.

IN order to prevent deterioration in the illuminating power of coal gas due to low temperatures (40° F. and under) at the condenser outlet, it has been proposed to use reversible condensers, the gas at 140° F. being passed alternately through the condensers from opposite ends. The author proposes, as a cheaper alternative, to prevent excessive deposition of tar in the condensers by introducing from 10 to 20 per cent. of cold petrol air gas through the covers of each hydraulic main. Besides cleaning the condensers and pipes from tarry deposit, the addition of the air gas effects considerable savings in the quantity of lime required and in the expenditure on labour on the purifiers.—H. H.

Naphthalene; Removal of —— *from coal-gas by washing.* F. Pannertz. J. Gasbeleucht., 1912, 55, 148—150.

IN order to show the effect of temperature on the efficiency of a naphthalene scrubber, laboratory experiments were made by passing the gas at 17°—18° C. through a cylinder containing naphthalene, and then through pure anthracene oil at different temperatures in an absorption vessel, the gas being afterwards passed through picric acid solution and its naphthalene content determined. The gas was passed for 5 hours at the rate of 40 litres per hour, and contained 18—19 grms. of naphthalene per 100 cb. m. after passing through the naphthalene. The amount of naphthalene remaining in the gas after washing with the oil at 0° C., was 1·2 grms. per cb. m.: at 17°—17·8° C., 1·1 grms.; at 28·9°—29·3° C., 4·1 grms.; at 40·3°—40·6° C., 10 grms.; and at 50·2°—50·4° C., 16·7 grms. These results are in accordance with experience obtained since 1903 at Krefeld, where the gas is cooled to at least 20° C. before entering the naphthalene washer, with very satisfactory results.—A. T. L.

Fractional distillation with steam. Golodetz. *See* I.

Apparatus for detecting the presence of inflammable gases. Schröter. *See* XXIII.

Patents.

Coal; Process for treating fine ——. O. Rindfleisch, Dortmund, Germany. Eng. Pat. 10,521, May 1 1911. Under Int. Conv., Jan. 10, 1911.

In preparing fine coal, of 0 to 10 or 12 mm. in size, for coking, the fine dust up to 0·2 or 0·3 mm. in size is first separated by means of a rotary fan or blower, the blast or suction being suitably regulated so as not to lose the larger particles of dust. The fine coal is then washed, giving a yield of washed coal of about 70 per cent. of the original fine coal. A part of the separated fine dust may be added to the washed coal before coking, if desired.—A. T. L.

Coke or like carbonaceous fuel; Manufacture or treatment of —— and apparatus therefor. E. Allen and R. E. Gibson, Liverpool. Eng. Pat. 29,189, Dec. 15, 1910.

The coke is pushed out of the gas retort into a long box or casing which is slung from an overhead traveller and presented end-on to the opened gas retort. By this means contact with the air is practically avoided during the discharge. As soon as the unbroken coke is in the box, the ends are closed with self-sealing doors and the box is transported by the overhead traveller and dipped into a tank of water, so that the coke is cooled without coming directly into contact with either air, steam or water. When cooled the box is transported to the coke heap and the cold coke discharged.—W. H. C.

Coke; Manufacture of —— for metallurgical purposes. L. H. Diehl and P. Faber. Fr. Pat. 433,695, Aug. 29, 1911. Under Int. Conv., July 26, 1911.

Finely powdered coal is intimately mixed with ground limestone in such a proportion that the total oxides of calcium, magnesium and manganese present will be sufficient to form monosilicates with the silica contained in the coal. The mixture is compressed into blocks and placed in coke-ovens. The temperature is then slowly raised in order to allow the volatile products from the coal, including volatile sulphur, to be expelled completely before the limestone is decomposed. The limestone consequently during this period remains inactive. Finally the temperature is raised as much as possible when quicklime and the monosilicates are successively formed. The lime also combines with the non-volatile sulphur forming calcium sulphate. The silicates thus formed melt and serve to agglomerate and harden the coke.—T. St.

Retort for treating carbonaceous substances, such as coal, and for other purposes. W. G. Moore, Birmingham. Eng. Pat. 29,019, Dec. 14, 1910.

To facilitate the heating of the material within the retort, the latter is provided at intervals with transverse flues through which the heating gases pass. These flues are enlarged at approximately the central line of the retorts to increase their heating surface. The webs or partitions between the flues are continued round the exterior of the retort as ribs. The door is provided with a movable ring having projecting teeth which correspond to the intervals between a series of projecting bent lugs spaced round the mouth of the retort. When the door is closed, the ring is given a slight turn, so that the teeth become locked beneath the projecting lugs.—W. H. C.

Fuel; Manufacture of ——. E. W. Smith, Manchester. Eng. Pat. 7273, Mar. 23, 1911.

For the production of readily ignitable smokeless fuel from bituminous coal by destructive distillation, retorts are used which consist of several vertical chambers of oval cross-section or rectangular cross-section with rounded ends, cast in one piece with horizontal baffle-plates, whereby rigidity is obtained; these baffles cause the heating medium to pass backwards and forwards over the chambers effecting a uniform heating of the fuel. The chambers may be slightly tapered towards their upper ends to facilitate discharging of the contents.

—B. G. McL.

Distillation furnaces. Soc. du Gaz de Paris. Fr. Pat. 433,829, Sept. 1, 1911.

Where attempts have been made in distillation furnaces with horizontal retorts to take off the gases at both ends of the retorts, difficulties have been encountered due to the different liquid pressures acting on the two sets of eduction pipes. This is overcome by bringing the gases into one hydraulic main, the double dip-pipe into which is cast in one piece, thus ensuring the same liquid pressure on each branch. The pipes are brought into this at an angle and are provided with blank ends to facilitate cleaning.—B. G. McL.

Gas producers. A. Folliet-Mieusset, Liège, Belgium. Eng. Pat. 2253, Jan. 28, 1911.

In a producer of the kind having no grate, the open lower end of the producer casing being sealed in water in the ash-pit, the air supply is introduced at the base of the producer at the centre and also at the periphery, the relative quantities being adjustable. The lower part of the producer casing comprises an annular air chamber in which the air supply is heated, and from which the air supply for the central tuyère is taken by pipes provided with regulating valves. The remainder of the air supply passes through perforations in the bottom of the annular air chamber to a second air chamber beneath it which is open at the lower periphery of the producer casing.

—A. T. L.

Water-gas producers; Heating of steam-generators in connection with ——, and prevention of smoke. F. Thuman, Evansville, Indiana, U.S.A. From C. S. Chrisman and J. H. Taussig, Philadelphia, U.S.A. Eng. Pat. 3024, Feb. 6, 1911.

In water-gas plant, the blast products are passed through boiler tubes and thence to the stack, and the carburetted water-gas, carrying tar particles, is passed through a separate set of boiler tubes. By this arrangement, the heat both of the waste gases and of the water-gas is utilised, whilst the gases passing to the stack are kept free from carbonaceous material.—A. T. L.

Suction gas-producers. F. H. Livens and H. V. Senior, Lincoln. Eng. Pat. 14,976, June 27, 1911.

The hopper containing the fresh fuel is extended downwardly into the body of the producer and is provided with air inlets in its upper part. The fuel in the lower part of the extended hopper undergoes combustion with the air passing downwards and the gas and tar are forced to pass at first downwards, then outwards and upwards through the mass of incandescent fuel in the body of the producer. Valves are provided for reversing the air current when starting the producer, and additional air and steam inlets, closed with screw plugs, and which may be used as poking holes, are provided round the lower part of the producer proper, to convey air and vapour from the ash-pit into the producer chamber.—W. H. C.

Gas producer. T. F. Fitzsimmons, Brooklyn, N.Y. U.S. Pat. 1,016,133, Jan. 30, 1912.

A wet-scrubber is mounted directly upon the top-plate of a producer working with an up-draught. The producer has a central vertical gas-outlet pipe leading from about the centre of the producer-chamber to the lower part of the scrubber. The coal is fed into the producer through charging tubes which extend through the lower part of the scrubber.—A. T. L.

Gas suitable for lighting, heating, and power; Manufacture of ——. F. Clauzel, E. Fournier and P. Vindrier. Fr. Pat. 433,553, Oct. 28, 1910.

Coal tar, petroleum, or other hydrocarbon substance is submitted to the action of superheated steam, either by admitting the steam to a gas retort, or by injecting it into a reservoir containing the tar, etc. The mixture of steam and gas, or the steam charged with hydrocarbons from the tar, etc., is passed through a bed of incandescent coke, and then over iron heated to redness, whereby carbon monoxide is converted into methane. The gas is again passed through incandescent coke, and if desired it may be again passed over the heated iron.—A. T. L.

Gasification of coking coal in a closed producer. P. Mallet. Fr. Pat. 433,675, Nov. 2, 1910.

The coal is heated to about 350° C. before it reaches the fuel bed of the producer, in order to render it no longer liable to cake together. For this purpose, the gases in the upper part of the producer may be caused to circulate around the lower part of the charging hopper which forms virtually a small vertical retort and is provided with a gas outlet connection. The heating of the fresh coal in this retort may be aided by admitting superheated steam. In another arrangement, the coal is discharged gradually from the feeding hopper on to the surface of a wide-angled rotating conical spreader arranged above the level of the gas outlet. The coal is thus heated before it falls on to the fuel bed, and fixed arms adjacent to the cone prevent it from adhering.—A. T. L.

Gas producer. A. Bèchevot. Fr. Pat. 433,874, Nov. 8, 1910.

The producer, which may be worked either by suction or with air under pressure, comprises a body-portion suspended from the top-plate of an outer casing which forms an annular jacket around the body of the producer. The suspended body-portion is left free at its lower end to permit of expansion. The annular jacket forms the vapouriser, water being admitted to a series of troughs cast on the body of the producer which is provided with the usual refractory lining. The gas outlet is by way of a central vertical pipe with a bell-mouth extending some way down below the top of the fuel chamber.—A. T. L.

Lighting gas; Process and apparatus for manufacturing liquefied —— without loss of condensable gases. Blangas-patentges. m. b. H. Fr. Pat. 433,948, Aug. 16, 1911. Under Int. Conv., Aug. 20, 1910.

The gas is compressed at the ordinary temperature into a reservoir, and the part which is not liquefied at this temperature passes through a refrigerating column arranged above the reservoir, whereby a further portion is liquefied and mixes with the liquid in the reservoir. The temperature of the liquefied gas in the reservoir must not be allowed to fall below that of the atmosphere, otherwise a part of the dissolved permanent gas will be liberated in the cylinders in which the liquid is stored for use, and these cylinders will not safely take the full charge of liquid. The liquefied gas in the reservoir is therefore kept at normal temperature by means of a coil through which the compressed crude gas is passed, the liquid condensed in this coil being added to that in the reservoir. The reservoir is provided with baffle plates in the upper part, which forms a rectifying column. The cooling of the compressed gas is effected in stages, and the liquid separated at different temperatures is added at different points in the height of the rectifying column. Part of the liquefied gas is rapidly evaporated and used to cool the refrigerators, and is returned to the compressors.—A. T. L.

Gas producer. W. Climie. Fr. Pat. 434,027, Sept. 7, 1911. Under Int. Conv., Aug. 1, 1911.

The producer comprises a metal casing surrounded by water in an outer casing provided with an outlet pipe for the steam. The grate consists of a series of parallel toothed rollers through which water is circulated, the rollers being continuously rotated for discharging the ashes. The cooling water from the rollers passes up through a central rotating shaft and is discharged at the upper end of the producer. A stirring device is mounted on this rotating shaft within the fuel bed, and is free to slide on the shaft so that it can be raised and lowered by a winch when necessary, in order to dislodge the fuel or clinkers. The rotating shaft is provided with two projecting lugs on which are pivoted a pair of arms, one at either side of the shaft. At one end these arms are curved upward, and at the other end they carry a bar with teeth formed on its lower surface. The whole rotates with the shaft so as to break up the fuel. The gases are drawn from the upper part of the producer by a steam-jet ejector and are passed into a separating chamber, and thence through a second ejector and separating chamber. The liquor from the separating chambers is pumped back to the gas-outlet pipe and is circulated in this way until too concentrated for further use in scrubbing the gas.—A.T.L.

Producer gas; Conversion of —— into a gas having no oxidising action at high temperatures. C. Kugel. Fr. Pat. 434,035, Sept. 7, 1911.

An inert gas in which metals may be heated to incandescence without becoming coated with oxide, is obtained by heating producer gas to a similar high temperature, and subsequently drying the gas. In this way free oxygen combines with part of the hydrogen, and is removed, and any steam which can be produced by the reaction: $CO_2+H_2=CO+H_2O$, is also removed from the gas. The heating may be effected by passing the gas through tubes formed in the furnace in which the metals are treated.—A. T. L.

Gas; Process and apparatus for purification of ——. C. Bomhard. Fr. Pat. 433,801, Aug. 31, 1911.

A method of separating suspended solid matter (soot, ashes, etc.) from flue gases in order to avoid discharging smoke from the stack, consists in passing the gases through a conduit at a speed not exceeding 1·5 m. per sec. The deposit is continuously removed from the conduit by scrapers carried on an endless band, so that the free section of the conduit may not be reduced and the speed of the gaseous current thereby increased. The upper part of the endless band moves in the contrary direction to the gaseous current, and the scraper blades meeting the gas tend to throw down the solid particles. When the gases contain acid vapours, the deposit from the conduit is continuously removed from the floor of the same by a conveyor arranged in a separate conduit below or at the side of the main conduit, and air may be blown through this separate conduit so as to exclude the acid vapours. The separation of the solid particles from the gas is aided in this case by low transverse walls rising from the floor of the main conduit, and projecting into the path of the gases. In another arrangement, a series of furnaces discharge their gases into a comparatively small conduit into which air is blown so as to obtain a current of a definite high velocity, and this current passes into a large separating chamber having baffle-plates, the deposit being continuously removed at the bottom of this chamber. —A. T. L.

Acetylene; Purifying material for ——. P. J. Granjon. Fr. Pat. 434,137, Sept. 12, 1911.

When acetylene is passed over a mixture of ferric chloride and ferric oxide, with mercuric chloride as catalytic agent, in order to remove hydrogen phosphide by converting it into phosphoric acid, the purified gas contains small quantities of chlorine compounds which give rise to hydrochloric acid when the gas is burned. According to the present invention, the presence of chlorine compounds in the gases is avoided by adding manganous acid to the purifying material. A suitable mixture consists of ferrous chloride (40° B.), 640 parts; mercuric chloride, 8 parts; precipitated manganous acid, 2 parts; dry infusorial earth, 350 parts. The mixture is exposed to the air until the ferrous salt is completely oxidised, when it forms a yellow powder which may be used until it becomes white.—A. T. L.

Peat; Process and apparatus for extracting and conveying ——. The Peat Coal Investment Co., Ltd. Fr. Pat. 433,527, Aug. 23, 1911.

See Eng. Pat. 13,391 of 1910; this J., 1911, 1200.—T.F.B.

Peat; Process for dehydrating raw —— by compression and addition of a porous substance. E. Abresch. Fr. Pat. 434,084, Sept. 9, 1911.

See Eng. Pat. 20,145 of 1911; this J., 1912, 63.—T. F. B.

Coke-oven; Regenerative ——. J. G. Kros, Essen-Ruhr, Germany. U.S. Pat. 1,015,964, Jan. 30, 1912.

See Addition of Jan. 27, 1910, to Fr. Pat. 391,228 of 1908; this J., 1910, 998.—T. F. B.

Gasification of fine grained or pulverulent fuel. A. von Kerpely. Eng. Pat. 13,093, May 31, 1911. Under Int. Conv., June 1, 1910.

See Ger. Pat. 235,488 of 1910; this J., 1911, 1105.—T.F.B.

Gas producers and regenerative furnaces. J. Stewart. Fr. Pat. 433,111, June 24, 1911.

See Eng. Pat. 21,737 of 1910; this J., 1911, 1200.—T. F. B.

Machine for treating gases in the production of ammonium sulphate. Eng. Pat. 14,440. *See* VII.

Recovery in the form of ammonium sulphate of the ammonia contained in distillation gases. Fr. Pat. 433,545. *See* VII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

Gas; Means for heating by high-pressure ——, and high-pressure gas-burners. E. W. Smith, Acocks Green, Warwick, and C. M. Walter, West Bromwich, Staffs. Eng. Pats. 1872 and 6719, Jan. 25, and Mar. 17, 1911.

(1). Gas at high pressure, for example 10 lb. per sq. in. is supplied to a burner comprising a central gas-nozzle discharging into a contracting conical orifice through which air is forced by the injector action of the gas. The walls of this orifice are inclined to one another at about 60 degrees. With this arrangement the gas and air are thoroughly mixed, and the air supply varies automatically with the gas pressure. The flame is formed at some distance from the burner. The air orifice may be formed in the walls of a crucible-furnace, or other furnace chamber. Two gas-nozzles may be arranged within one air orifice. (2) A blowpipe-burner comprises a central gas nozzle fed with high-pressure gas, surrounded by an annular gas-nozzle fed with gas at low pressure, the nozzles being arranged in a burner tube provided with air inlets. The low-pressure gas is obtained from a branch of the high-pressure gas pipe provided with a regulating cock. The supply of gas to the high-pressure nozzle is controlled by a cock adjacent to the nozzle. By regulating the two gas-cocks, an oxidising or reducing flame can be obtained. In a portable form of the blowpipe, the two cocks are controlled by a finger-trigger and a thumb lever.—A. T. L.

Filaments for incandescence lamps; Manufacture of ——. The Westinghouse Metal Filament Lamp Co., Ltd. Third Addition, dated July 17, 1911 (under Int. Conv., Aug. 6, 1910), to Fr. Pat. 414,257, March 30, 1910 (see this J., 1910, 1195; 1911, 530; 1912, 21).

Electric currents of different phases are passed simultaneously through different portions of the filament, thus heating the latter, whilst the total length of the filament remains approximately constant.—B. N.

Tungsten and uranium in the construction of electrodes of arc lamps; Employment of ——. Banque du Radium. Second Addition, dated Nov. 5, 1910, to Fr. Pat. 418,280, July 15, 1910 (see this J., 1911, 77 and 1305).

Instead of tungsten or uranium, the metals tantalum, molybdenum or vanadium may be employed. The arrangements for regulating may be electromagnetic, or may be based on the expansion of the wires, and may be placed in the circuit or in parallel.—B. N.

Tungsten wire of very small diameter, suitable for electric incandescence lamps, and its process of manufacture. La Lampe Osram. Fr. Pat. 433,596, Aug. 25, 1911. Under Int. Conv. March 2, 1911.

The crystalline structure of the wire is first destroyed by mechanical treatment of the metal, wires being formed of a diameter 0·05 to 0·03 mm. This is followed by a regular removal of a considerable portion, by weight, of the metal by chemical or electrochemical actions until the desired section is obtained. For this purpose alkaline oxidising agents are used, such as an alkaline solution of potassium ferricyanide, or electrolysis is employed, the wire being used as the anode, and the current brought to the wire during its passage through the bath by means of a series of contacts mounted in parallel. In each case the wire is passed through the liquid at a uniform speed. The wire may be mounted on its supports, for use in incandescence lamps, before being treated for the removal of metal by corrosion.—B. N.

Incandescent gas mantles; Manufacture of ——. W. Bruno, Berlin. Eng. Pat. 13,169, June 1, 1911. Under Int. Conv., June 4, 1910.

See Fr. Pat. 430,417 of 1911; this J., 1911, 1304.—T. F. B.

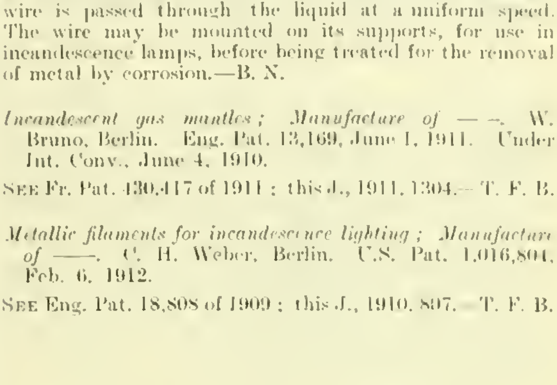
Metallic filaments for incandescence lighting; Manufacture of ——. C. H. Weber, Berlin. U.S. Pat. 1,016,804, Feb. 6, 1912.

See Eng. Pat. 18,808 of 1909; this J., 1910, 807.—T. F. B.

III.—TAR AND TAR PRODUCTS.

Carburetted water-gas tar; Centrifugal treatment of ——. J. M. Muller. J. Gas Lighting, 1912, **117**, 359—360.

The crude tar, consisting of a mixture of tar, water, emulsion, and finely divided carbon and coke dust, is fed into the bottom of the basket, A, of a centrifugal machine of the Burmeister and Wain type. The centrifugal force causes the mixture as it is driven outwards and upwards, to separate into two layers, D, E. The outer layer, D, consists of tar and solid matter, and the inner layer, E, of water. A steel ring, C, keeps the upper portions of the two layers separate, and by carefully adjusting the positions of the discharge pipes, G, F, the tar is obtained almost free from water. The solid impurities adhere to the inner surface of the basket and at intervals the machine is stopped and the solid deposit is removed. The machine is rotated at a speed of 2400 revolutions per minute and about 330 kilos. of tar per hour are treated. The tar originally contains about 17 per cent. of water and practically the whole of this is removed, in addition to which



solid impurities, amounting to 2·6 per cent. of the raw tar are also separated. Attempts are being made to reduce the amount of free carbon in ordinary coal-tar by mixing it with carburetted water-gas tar and passing it through the machine. These attempts have been so far successful that the amount of free carbon has been reduced to one third.—W. H. C.

Mixed phenolic oxides; Decomposition of —— in the presence of nickel and hydrogen. A. Mailhe and M. Murat. Bull. Soc. Chim., 1912, 11. 122—123.

In the presence of finely divided nickel at 250° C., phenyl oxide is converted by hydrogen, to a small extent, into benzene and phenol, which undergo hydrogenation with the production of cyclohexene and cyclohexane. At 350°—380° C., all the mixed phenolic oxides, as far as examined, are decomposed, anisole being the most readily attacked and phenyl oxide the least; the corresponding phenols are produced, but at this temperature hydrogenation of the nucleus is not observed.—F. Sodn.

Creosote oil in the United States. Chem. Tr. J., Feb. 24, 1912. [T.R.]

The importations of creosote oil into the United States during 1911 amounted to 49,311,223 gals., valued at $2,323,168. During 1910 the imports totalled 42,608,386 gals., valued at $2,331,884. It will be noted that while the 1911 imports were larger, the values were smaller than those of 1910. The imports during 1909 were 37,951,569 gals., valued at $2,250,569. During the past two years the trade has increased in volume by 11,360,000 gals.

Creosote oil is the largest item of import into the United States of the coal-tar classification. England and Scotland furnish about five-sevenths of the total imports, the balance being divided among Germany, Belgium, and a smaller amount from Canada, presumably from the coal-tar distilling plant in Nova Scotia.

Fractional distillation with steam. Golodetz. *See* I.

Volatilisation of various fractions of creosote after injection into wood. Teesdale. *See* IX.

Relation of modern road surfacings to fish life. Butterfield. *See* XIXb.

Patents.

Impregnating oil [for wood] which does not produce deposits in the cold; Process for preparing an ——. G. Krojanker. Ger. Pat. 240,919, June 1, 1910.

The solution obtained by extracting tar with benzol, is evaporated and the residue is dissolved in a suitable coal tar-oil. The resulting oil does not produce deposits even at low temperatures.—T. F. B.

Plastic masses from pitch; Process for making ——. Chem. Fabr. Lindenhof C. Weyl und Co. A.-G. Fr. Pat. 434,052, Sept. 8, 1911. Under Int. Conv., Sept. 27, 1910.

Plastic products which are resistant to water and to changes of temperature are obtained by incorporating with pitch, at a temperature of 150°—180° C., a mixture of a mineral substance and a vegetable substance. Thus, 1000 parts of pitch may be mixed with 200—300 parts of sawdust, wood meal, fibrous vegetable matter, etc., and 400—500 parts of sand, chalk, ashes, etc. The products are suitable for covering roads or roofs, and for similar purposes.—T. F. B.

p-Hydroxyaryl derivatives of 2-imino-3-ketodihydro(1)thionaphthene; Process for preparing ——. Kalle und Co. Ger. Pat. 241,623, June 28, 1910.

3-Oxy(1)thionaphthene or one of its substitution products, homologues, or analogues, including 3-oxy(1)thionaphthene-2-carboxylic acid, is oxidised in alkaline solution in presence of an equivalent quantity of a *p*-hydroxyarylamine. The resulting *p*-hydroxyaryl-2-imino-3-ketodihydro(1)thionaphthenes are available for use in preparing 2·3-diketodihydro(1)thionaphthene and the dyestuffs obtainable from it.—T. F. B.

Diarylamines; Process for preparing ——. Knoll und Co. Ger. Pat. 241,853, April 23, 1910.

Diarylamines are obtained by heating amines, or mixtures of amines, or mixtures of amines and phenols, with small quantities of suitable catalytic agents, whereby ammonia or water is eliminated. As catalytic agents, iodine, iodoform, mercuric chloride, mercuric iodide, mercurous chloride, mercuric sulphate, cobalt chloride, or antimony trichloride may be employed; zinc chloride may also be used in the preparation of diarylamines from amines and phenols, but it is not so active as iodine, whilst it is quite ineffective for the elimination of ammonia from amines alone.—T. F. B.

Organic sulphur compounds [sulphonic acids]; Process for preparing ——. Knoll und Co. Ger. Pat. 242,215, April 23, 1910.

Organic compounds are sulphonated by heating with concentrated or suitably diluted acid and sulphur, with or without addition of a catalytic agent. In many cases the products obtained in this way are the same as those produced by other sulphonating processes, but in some cases new products are formed.—T. F. B.

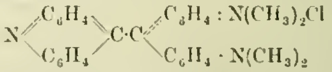
α-Hydroxyanthraquinone alkyl ethers; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 242,379, Aug. 28, 1910.

Alkyl ethers of α-hydroxyanthraquinone are produced by the action of dialkyl sulphates on alkali salts of α-hydroxyanthraquinone, with exclusion of water and in presence of substances which will combine with acid. The ordinary processes of alkylation either produce no result or very low yields.—T. F. B.

IV.—COLOURING MATTERS AND DYES.

Colouring matters; Influence of the acridine ring on the colour of certain ——. A. E. Porai-Koschitz, Y. I. Auschkap and N. K. Amsler. J. Russ. Phys.-Chem. Soc., 1911, 43, 1587—1603.

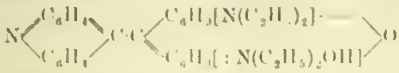
In order to decide between the chromophore and dynamic theories of the colour of triphenylmethane colouring matters, the authors have prepared and studied the acridyl compounds corresponding with Malachite Green and Pyronine. The results obtained are distinctly in favour of the latter of the two hypotheses, since the absorption spectra of the two colouring matters obtained scarcely differ from those of Malachite Green and Rosamine respectively, the absorption bands being displaced towards the red end of the spectrum to an extent approximately such as is usually observed with any appreciable increase in the molecular weight. The replacement of the benzene ring by an acridine nucleus produces a marked diminution in the permanency of the spectral bands, this being expressed in a decrease in the dyeing properties of the colouring matters. In the case of the acridyl derivative of Malachite Green, the quinonoid base was obtained in the pure state. The chloride of the leuco-base of Acridylmalachite Green,



$$\mathrm{N}\left\langle\begin{matrix}\mathrm{C_6H_4}\\\mathrm{C_6H_4}\end{matrix}\right\rangle\mathrm{C{\cdot}C}\left\langle\begin{matrix}\mathrm{C_6H_4:N(CH_3)_2Cl}\\\mathrm{C_6H_4\cdot N(CH_3)_2}\end{matrix}\right.$$

obtained by the action of 5-aldehydoacridine (meso-acridyl aldehyde) on dimethylaniline in presence of zinc chloride, is a green colouring matter with a bronzy lustre and dissolves slightly in water and readily in alcohol. It dyes cotton a somewhat bluer green than Malachite Green, while wool is dyed only very faintly in neutral solution but more strongly in presence of borax or ammonia. The first portions of wool immersed are coloured green with a slight blue tinge, but if successive portions are introduced into the same bath, the colour approaches more and more nearly to blue; this is found to be a result of the presence of alkali.

Acridylpyronine,



$$N\begin{cases}C_6H_4\\C_6H_4\end{cases}C{\cdot}C\begin{cases}C_6H_3[N(C_2H_5)_2]\text{—}\\C_6H_3[:N(C_2H_5)_2OH]\end{cases}O$$

obtained by condensing 5-aldehydoacridine with *m*-diethylaminophenol in presence of sulphuric acid, dissolves in very dilute acids giving a violet-red colour, changing to cherry-red on addition of concentrated acid. It dyes silk and wool reddish-violet, and cotton, blue with a red tinge, no mordant being necessary.—T. H. P.

Azo dyestuffs from substituted pyrroles. H. Fischer and E. Bartholomaus. Z. physiol. Chem., 1912, **76**, 478–485.

Diazobenzenesulphonic acid gives orange to dark red azo dyestuffs with 2 : 4-dimethyl-3-acetylpyrrole, 2 : 5-dimethylpyrrole-3-carboxylic ester, the acid itself and 2 : 5-dimethylpyrrole. Haemopyrrole, when prepared from the picrate, gives an orange yellow dyestuff with diazobenzenesulphonic acid.—J. C. C.

Azo dyestuffs; Fission of —— by halogens. M. P. Schmidt. J. prakt. Chem., 1912, **85**, 235—240.

Azo dyestuffs are decomposed by chlorine, bromine or hypochlorous acid into a diazonium salt and a halogenated component. Thus when a stream of chlorine is led into a paste of 1 part of precipitated hydroxyazobenzene and 10 parts of water, the mixture being cooled with ice, the hydroxyazobenzene is decomposed in about half-an-hour into benzenediazonium chloride and 2 : 4 : 6-trichlorophenol. The same products are obtained by the use of a solution of hypochlorous acid, and the corresponding bromine compounds when the latter halogen is employed. Diazobenzenesulphonic acid (in the form of its potassium salt) when treated with chlorine also yields benzenediazonium chloride. The author finds that several other azo dyestuffs behave similarly under the action of chlorine. —J. C. C.

Butin; Synthesis of ——. A. Göschke and J. Tambor. Ber., 1912, **45**, 186—188.

By heating a solution of synthetic butein (Ber., 1911, **44**, 3502) in 50 per cent. alcohol with a little sulphuric acid, the authors have obtained butin identical with the natural product. The triacetyl derivative melts at 123° C.—J.C.C.

Patents.

Vat dyestuffs of the anthraquinone series; Manufacture of ——. Farbwerke vorm. Meister, Lucius, und Bruning, Höchst on Maine, Germany. Eng. Pat. 29,031, Dec. 23, 1911. Under Int. Conv., Feb. 6, 1911.

A new series of vat dyestuffs is obtained by heating with caustic alkalis the acridones derived from dianthraquinonylamines. For example, 15 parts of 1-anthraquinonyl-4-aminoanthraquinone-1.2-acridone (obtained by condensing 4-aminoanthraquinone-1.2-acridone with 1-chloroanthraquinone) are gradually stirred into 150 parts of caustic potash heated to 170°—180° C., and the temperature is allowed to rise to 210° C.; the product which separates from the melt is dissolved in water, and the dyestuff is separated from the solution by treatment with air or other oxidising agent. It yields with alkali hydrosulphite a brown vat which dyes cotton fast olive-brown shades.—T. F. B.

Disazo dyestuffs and their use in dyeing. Badische Anilin und Soda Fabrik. Fr. Pat. 434,152, Sept. 12, 1911. Under Int. Conv., July 12, 1911.

The tetrazo compounds of *p*-diamines are combined on the one hand in acid solution with 1·8-aminonaphthol-mono- or disulphonic acid, and on the other hand with 1·8-naphthylenediamine or its acetone derivative. The dyestuffs thus produced can be combined on the fibre with diazo compounds, when good black shades are obtained, which are very readily discharged.—T. F. B.

Vat dyestuffs containing halogen; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 242,063, Jan. 8, 1911.

When naphthanthracridones are treated with halogenating agents, fast vat dyestuffs are obtained which dye orange-red or orange-yellow shades. The greater the halogenation, the yellower will be the shade of the dyestuff.—T. F. B.

Nitro-derivatives of the indigo series; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 242,149, Jan. 18, 1911.

Nitro-derivatives of indigo, etc., suitable for use in dyeing and printing, may be obtained by treating indigo or its substitution products or analogues, or the corresponding dehydroindigos or their salts, with nitrating agents, water being excluded as far as possible. The reaction may, for example, be carried out in presence of an organic acid or its anhydride.—T. F. B.

Alizarin; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 241,806, Jan. 7, 1911.

Anthraquinone is readily converted into alizarin when it is heated in presence of a sulphite and dilute alkali (*i.e.*, containing less than 50 per cent. of alkali), with or without addition of an oxidising agent.—T. F. B.

Vat dyestuffs; Process for preparing ——. Kalle und Co. Ger. Pat. 241,997, Nov. 18, 1910.

Pheno-hydroxynaphthocarbazoles, their substitution products, homologues, or analogues, are condensed with suitable isatin α-derivatives, or their substitution products, homologues, or analogues, especially the α-anilides or α-chlorides, and the resulting dyestuffs are treated with halogens if desired.—T. F. B.

Vat dyestuffs; Process for preparing ——. Kalle und Co. Ger. Pat. 242,220, July 3, 1910. Addition to Ger. Pat. 182,260, Nov. 14, 1905.

Reddish brown vat dyestuffs, which are converted into brown dyestuffs on bromination, are produced by the condensation of α- or β-indanone or their derivatives with 2(α)-derivatives (anilides, hydroxyanilides, dimethyl-*p*-amino-2-anilides, etc.) of 2.3-diketodihydro(1)thionaphthene or its substitution products. The shades produced by the halogenated dyestuffs can be rendered faster by soaping or souring the dyed fabrics.—T. F. B.

Disazo dyestuffs; Manufacture of ——. A. G. Bloxam, London. From Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 10,835, May 4, 1911.

See Fr. Pat. 430,962 of 1911; this J., 1911, 1372.—T. F. B.

Vat dyestuffs; Manufacture of ——. Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 13,550, June 6, 1911. Under Int. Conv., June 9, 1910.

See Fr. Pat. 430,002 of 1911; this J., 1911, 1305.—T. F. B.

Monoazo dyestuff and process of making same. H. Wagner and J. Erber, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,016,307, Feb. 6, 1912.

See Eng. Pat. 12,009 of 1911; this J., 1911, 1006.—T. F. B.

Anthracene dye and process of making same. O. Bally, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,016,604, Feb. 6, 1912.

See Addition of May 2, 1909, to Fr. Pat. 365,920 of 1908; this J., 1910, 267.—T. F. B.

Vat [anthracene] dye and process of making same. A. L. Laska, Offenbach. Assignor to Chem. Fabr. Griesheim-Elektron. Frankfort on Maine, Germany. U.S. Pat. 1,016,638, Feb. 6, 1912.

See Fr. Pat. 431,176 of 1911; this J., 1911, 1373.—T. F. B.

Colouring matters of the anthracene series; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 8294, April 3, 1911.

See Ger. Pat. 241,805 of 1911; this J., 1912, 119.—T. F. B.

Dyestuffs dyeing from the vat like indigo; Production of halogenated ——. Soc. pour l'Industrie Chimique à Bâle. Tenth Addition, dated Oct. 28, 1910, to Fr. Pat. 372,627, Dec. 17, 1906.

See Eng. Pat. 22,067 of 1911; this J., 1911, 1372.—T. F. B.

Oxazine dyestuffs: Process for producing mordant dyeing ——. Farbenfabr. vorm. F. Bayer und Co. First and Second Additions, dated Aug. 10 and 16, 1911, to Fr. Pat. 429,965, May 19, 1911. Under Int. Conv., Aug. 27, 1910.

See Eng. Pat. 20,096 of 1910; this J., 1911, 1109. T. F. B.

Azo dyestuffs; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. First Addition, dated Aug. 1, 1911, to Fr. Pat. 430,030, May 22, 1911. Under Int. Conv., Aug. 12, 1910.

See Eng. Pat. 21,201 of 1910; this J., 1911, 1109.—T. F. B.

Azo dyestuffs; Process for making ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 433,499, Aug. 21, 1911. Under Int. Conv., Oct. 8, 1910.

See Eng. Pat. 13,527 of 1911; this J., 1911, 1267.—T. F. B.

Indophenolic products derived from p-nitrosophenol and carbazolecarboxylic acid; Process for preparing —— and [sulphide] dyestuffs therefrom. L. Cassella und Co., G. m. b. H. Fr. Pat. 434,139, Nov. 16, 1910.

See Eng. Pat. 27,051 of 1910; this J., 1911, 1246.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Silk; Colloidal properties of natural ——. C. Foà. Z. Chem. Ind. Kolloide, 1912, 10, 7—12.

Whilst the properties and chemical composition of natural silk as it is taken from the cocoon of the silkworm (*Bombyx mori*) have been fully investigated, comparatively little is known of the changes which take place in the production of this silk from the viscous liquid secreted in the silk glands (seripteria) of the silkworm. The author took a number of silk glands from living silkworms, washed them rapidly in distilled water, cut them into small pieces, and after triturating with quartz sand, extracted the mass with distilled water. The tolerably transparent, viscous, orange yellow solution thus obtained was examined by colloid-chemical methods. The results obtained show that the silk is present in this liquid as an electro-negative colloid, which gives the biuret reaction, and coagulates spontaneously on standing or instantaneously and completely on addition of traces of acetic acid, to a tough gelatinous mass. The coagulation is accelerated by dilute acids, by heating, by freezing and re-melting, and by mechanical strain, and the solidification of the silk as it is spun by the silkworm is attributed to the mechanical strain exerted during the ejection of the viscous secretion of the silk glands through the fine spinning orifices. This effect of mechanical strain is made use of in the manufacture of so-called Florence thread, the silk glands being first dipped into acetic acid and then stretched out as far as possible by means of the hands. The solidification of the natural silk cannot be due to drying out on exposure to the air, for the author has drawn several metres of silk entirely under water from a silkworm. The hypothesis of Dubois (this J., 1890, 1163) that the coagulation is an enzymatic process, analogous to the coagulation of blood is also untenable, for coagulation is not retarded, but is accelerated by heating, and it takes place spontaneously even in presence of potassium cyanide, which is known to act as an enzyme-poison.—A. S.

Cellulase; Studies on ——. H. Euler. Z. angew. Chem., 1912, 25, 250—251.

A review of the literature on the cellulose-cleaving enzymes, cellulases or cytases, leads to the conclusion that, if the group of reserve-carbohydrates or "hemicelluloses" be excluded, no case of the fission of pure cellulose by the action of enzymes, secreted either by fungi or higher plants, has as yet been recorded. On the other hand there is abundant evidence of the breaking down of true cellulose under the action of living bacteria and fungi. The study of the action of enzymes upon cellulose is complicated owing to the insolubility of the substratum, and the author has therefore started his investigations with the soluble "cellulose-dextrins" derived from cellulose by the action of sulphuric acid. Filter paper was treated with 75 per cent. sulphuric acid at 30° C. for 6 hours. The solution was decanted off, diluted and the sulphuric acid precipitated by means of lime and barium hydroxide. The purified solution was dialysed against running water for a week to remove the sugar and ash, and finally concentrated *in vacuo* until it contained about 7 per cent. of dextrinous products. The cupric-reducing power of 1 grm. of the dry solids was equivalent to 0·15—0·19 grm. of cuprous oxide. Portions of this solution were then digested with the expressed juice of the mycelium of the dry-rot fungus, *Merulius lacrimans*, at a temperature of 25° C. for 3 days. The cupric-reducing powers of the test-mixtures were determined at intervals, due corrections being made by means of control-tests, and the author concludes that there was definite evidence of enzymatic action by the fungus juice, which consequently may be said to contain a cellulose-dextrinase. Further studies are being conducted with fractionated cellulose-dextrins separated according to the principles outlined by Yllner (this J., 1912, 122).—J. F. B.

Paper; Action of iodine vapours on the fibre material of ——. P. Klemm. Wochenbl. Papierfab., 1912, 48, 464—465.

In the examination of documents in order to detect erasures and alterations of the script, it is sometimes necessary to expose the paper to the action of iodine vapours. It has been suggested that such treatment might so seriously damage the structure of the fibres that it might be difficult or impossible accurately to determine the fibrous composition of the paper by microscopic tests. The author exposed paper for four days to the action of the vapours rising from a solution of iodine placed at the bottom of a closed vessel in which the paper was suspended. The paper had then become greyish-blue throughout, and this colouration remained only slightly faded for a month; after keeping the treated paper for that period, not the slightest difficulty was experienced in identifying the fibres under the microscope in the usual way. There appears to be no danger of any serious damage to the fibres by exposure to iodine vapours under normal conditions, and it is only conceivable that in exceptional circumstances such damage might ensue if considerable quantities of hydriodic acid were in some way generated. The author has also established that no damage to the fibres resulted when the paper was steeped in a solution of iodine for several hours, or when it was saturated with potassium iodide, dried and stored for a year, during which time it had become deeply coloured.—J. F. B.

Patents.

Fabric; Compound —— and process of manufacturing same. Soc. Anon. des Celluloses Planchon, Lyons, France. Eng. Pat. 7442, March 24, 1911. Under Int. Conv., May 23, 1910.

A film of a cellulose ester (*e.g.*, cellulose acetate) is formed by spreading the solution of the ester on a polished surface and allowing the solvent to evaporate. A suitable textile fabric such as tulle moistened with a solvent capable of dissolving the cellulose ester, is applied under pressure to the surface of the film so as to become incorporated with it. The compound fabric is then stripped from the polished surface. (Reference is directed to Eng. Pat. 4959 of 1910; this J., 1911, 19.)—P. F. C.

Cellulose esters [acetates]; Manufacture of new —— and their transformation products. H. Dreyfus. First Addition, dated July 7, 1911, to Fr. Pat. 432,046, July 5, 1911. Under Int. Conv., July 5, 1911.

This addition relates to the production of cellulose acetates which constitute stages of transition between those specified in the original patent (this J., 1912, 24), sparingly or not at all soluble in chloroform, and those acetates which are soluble in chloroform. It also provides for the production of esters which are more readily soluble in chloroform. The latter are produced by employing 10 per cent. or less of sulphuric acid calculated on the weight of the cellulose and a quantity of acetic anhydride equal to 3—3·5 times the weight of the cellulose. The intermediate stages of solubility are obtained by increasing the proportions of acetic anhydride specified in the original patent for the production of acetates insoluble in chloroform. Transformation products soluble in various media, *e.g.*, acetone, alcohol and benzene, dilute alcohol or lastly hot water, are obtained by digesting cellulose acetates soluble in chloroform with mineral or organic acids or acid salts. Example:—100 parts of cellulose acetate are digested with 500 parts of 12 per cent. nitric acid until the desired stage of solubility is reached.—J. F. B.

Cellulose esters [acetates]; Manufacture of —— and their transformation products. H. Dreyfus Second Addition, dated July 15, 1911, to Fr. Pat. 432,046, July 5, 1911 (this J., 1912, 24). Under Int. Conv., "July 17, 1911."

Certain modifications of cellulose acetate, prepared according to the original specification or the first addition (see preceding abstract), are soluble in hot dilute alcohol (about 75 per cent. concentration) giving clear solutions which set, on cooling, to transparent jellies. These solutions, with the addition of a little castor oil or other admixture, are particularly suitable for the manufacture of films, etc.
—J. F. B.

Plastic mass capable of being drawn into threads insoluble in water, artificial silk and horsehair; Manufacture of a ——. A. C. Fuchs. Fr. Pat. 433,956, Nov. 10, 1910.

The plastic mass is precipitated by mixing, at a temperature between 80° and 100° C., 7 litres of a 20 per cent. solution of ammonium sulphate and 5 litres of a 10 per cent. solution of gelatin, agitating well and drawing off the supernatant liquid. For the manufacture of artificial threads, the plastic mass is introduced in a vessel provided with stirring arms and means for keeping the mass hot and fluid. From this vessel the fluid is forced under air-pressure through a tube which is surrounded by a circulating bath of water designed to reduce the temperature to a definite degree depending on the speed of working. The orifice of the tube is not capillary, and the plastic material is drawn off in the form of a thread which solidifies as it emerges. The thread is conducted over rollers through baths which convert the gelatin into an insoluble form, *e.g.*, a 1 per cent. solution of potassium bichromate followed by 1 per cent. sodium bisulphite and 15 per cent. ammonium sulphate.—J. F. B.

Cellulosic films; Manufacture of continuous ——. J. E. Brandenberger. Fr. Pat. 434,104, Nov. 15, 1910. (See also this J., 1910, 83, 147.)

A solution of cellulose, *e.g.*, viscose, is poured at a suitable speed into a hopper, from which it issues freely and without support in the form of a thin sheet. This sheet is immediately coagulated by the action upon both its surfaces of a bath of ammonium salts. The film so produced is conducted by means of guide rolls through a series of baths, in which it is first washed with brine and then converted into cellulose by the action of a dilute mineral acid; lastly the film is washed by passing through vessels containing cold and hot water. The film next passes continuously to the drying apparatus, consisting of heated cylinders positively driven, against which it is pressed by means of an upper range of rollers simply resting with their own weight upon the driven cylinders. The dried product is finally reeled.—J. F. B.

Solvents of cellulose esters; Process for recovering volatile —— from gases containing their vapours. A. Wohl. Ger. Pat. 241,973, Nov. 13, 1910.

Gases containing the vapours of volatile solvents of cellulose esters are passed over fresh bodies of the esters, by which they are absorbed; the process is best carried out on the counter-current principle, the gases being passed over numerous layers of the material. It is advantageous to cool and to compress strongly the gases.—T. F. B.

Bleaching cellulose wood pulp; Method of and means for ——. F. W. Dobson, Tamworth, Staffs. Eng. Pat. 3181, Feb. 8, 1911.

A solution of chloride of lime is run into a suitably lined horizontal iron kier supported by trunnions rotating in fixed bearings. Cellulose in the dry sheet form is then added and the kier is slowly and continuously rotated for about three hours. The following quantities give satisfactory results:—(*a*) For 2 tons of sulphite cellulose, 435 galls. of bleaching liquor of 5·5°—6° Tw. and 1000 galls. of water. (*b*) For 1·5 tons of soda cellulose, 690 galls. of bleaching liquor of 5·5°—6° Tw. and 630 galls. of water.
—P. F. C.

Hydrating, pulping or reducing material in a wet or semi-liquid state; Apparatus for ——. Manufacture of pulp for paper-making. H. Jackson, Garstang, Lancs. Eng. Pats. 25,051, Oct. 28, 1910, and 6019*f*, 1911, dated Oct. 28, 1910.

The material mixed with water is circulated through a cylindrical casing and there subjected to the gentle hammering action of flexible beaters which are mounted on a rotating shaft. The fluted inner wall of the casing is fitted with internal projections set close together in the path of the beaters.—P. F. C.

Fibre-yielding materials; Process for treating ——. C. F. Sammet and J. L. Merrill, Washington, D.C. U.S. Pat. 1,016,178, Jan. 30, 1912. (Dedicated to the public.)

The fibrous material is treated under pressure with a gaseous mixture of sulphur dioxide, ammonia and steam.
—P. F. C.

Resinous wood; Manufacture of brown wood pulp and "half-cellulose" from ——. J. Aktchourine. Fr. Pat. 433,424, Aug. 11, 1911.

Resinous pine-wood is reduced to small chips by the ordinary methods current in the cellulose industry. The mass is then subjected to the action of alkali under a pressure of a few atmospheres but at a temperature below 100° C., the lye being circulated by means of an injector. In this way the resins are saponified and extracted without the lignin being attacked. The mass is cooled, the liquor is pressed out and the resins and resin soaps are recovered by filtration. The filtered lye is then returned to the exhausted chips and the latter are digested in the ordinary manner under a pressure of 5—6 atmospheres and a corresponding temperature for the preparation of a brown pulp or "half-cellulose."—J. F. B.

Coated blotting paper; Manufacture of ——. J. M. Burby. Long Island, N.Y., U.S.A. Eng. Pat. 13,553, June 6, 1911.

A compound sheet having a blotting layer and a lining layer is obtained by interfelting the fibres of the last web of the blotting layer with the first web of the lining layer. The composite paper is then dried and coated or sized on the lining layer. An arrangement of machines is described for carrying out these processes continuously. A modification of the process consists in interfelting the blotting and lining tibres with an intermediate layer composed of chemical wood pulp or pulped "broke."—P. F. C.

Paper: Manufacture of a strong, absorbent ——. G. Loebbecke. Fr. Pat. 433,736, Aug. 30, 1911.

ABSORBENT papers, blotting and the like, are characterised by a deficiency in strength which is related to their specific absorbent qualities. This lack of strength is particularly marked when such papers are damped in use. According to this invention, a web of unsized, absorbent paper is creped in the course of its production on the paper machine, whilst still in a very moist condition, and the creping is preserved as far as possible during the subsequent operation of drying. It is claimed that papers so treated present a remarkable resistance to tearing even when strongly damped.—J. F. B.

Paper; Manufacture of ——. P. Weston, Dalton, Mass., U.S.A. Eng. Pat. 24,815, Nov. 7, 1911.

IN order to prepare sheets of paper having one edge thinner than the other, part of the web, whilst still in the pulp is subjected either to air suction or to an air blast.
—P. F. C.

Paper, etc.; Process and apparatus for preparing raw and old materials [waste papers] for the manufacture of ——. A. Lietzenmayer. Fr. Pat. 433,467, Aug. 1, 1911. Under Int. Conv., Aug. 3, 1910.

A LIQUID for the treatment of waste papers and similar materials is composed of caustic soda and "antiformin," with or without the addition of petroleum soap or similar compounds. Another liquid is composed of sodium carbonate with or without the addition of an emulsion of borax, soap and carbon tetrachloride or other emulsified solvents. These reagents are employed in connection with an apparatus forming a closed cycle consisting of an agitating mechanism, a montejus, a specially designed piston-press, a second agitating mechanism connected with a filtering arrangement and an air-pump and reservoir. The material is treated with the chemical reagent in the first agitator-vessel, the scum and impurities are removed, the charge is then dropped into the montejus where the chemical action is completed and the heavy impurities are settled out. The material is raised by air pressure to the piston-press, which separates the pulp from the dirty lye: the latter is treated in the second agitator-vessel and discharged through the filters, purified, to be used again in a subsequent operation.—J. F. B.

Papers, fabrics, etc. Manufacture of gelatined —— *by coating*. S. Katz. Fr. Pat. 433,470, Oct. 27, 1910.

THE new method is intended to replace the ordinary method of first making a film of gelatin and then applying the paper thereto. It is suitable both for reels and sheets and consists in first coating the paper with two successive coats of barium sulphate composition and lastly applying a coat of gelatin containing one per cent. of potassium bromide. Each coat must be dried before the next one is applied.—J. F. B.

Paper; Manufacture of ——. A. J. Boult, London. From District of Columbia Paper Manufacturing Co., Washington, U.S.A. Eng. Pat. 11,814, May 16, 1911.

SEE U.S. Pat. 992,694 of 1911; this J., 1911, 740. Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 15,555 of 1909.—T. F. B.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Bleaching or fading of dyestuffs in the visible spectrum; Influence of the gas pressure on the ——. P. Lasareff. Z. physik. Chem., 1912, **78**, 657—660.

COLLODION films dyed with Cyanine, Pinachrome, and Lepidinecyanine respectively, were exposed in the visible spectrum of a source of light for periods of from five to seven minutes in a chamber in which a pressure ranging in different tests from 12 to 754 mm. of mercury was maintained, and the change of colour was observed spectrophotometrically in the manner described previously (Ann. d. Physik., 1907, [4], **24**, 661). The results show that the bleaching or decomposition of the colour is more pronounced the greater the air pressure, *i.e.*, the higher the concentration of oxygen. On plotting the values obtained, it was found that the lines representing the variation of the reaction velocity with the pressure did not pass through the junction of the co-ordinates, indicating that bleaching would proceed with measurable velocity even in an absolute vacuum. Experiments in which a vacuum was produced within the chamber by means of a Gaede pump confirmed this conclusion.—A. S.

Methylene Blue; Bleaching or fading of —— *in the visible spectrum*. P. Lasareff. Z. physik. Chem., 1912, **78**, 661—666.

WHILST with most dyestuffs fading is accompanied by oxidation (compare Ann. d. Physik, 1907, [4], **24**, 661; also Gros, this J., 1901, 888, 1104), the author has found that Methylene Blue fades on exposure to light even when oxygen (air) is excluded. The experiments were made with films of gelatin dyed with Methylene Blue which were exposed in the visible spectrum of a Nernst lamp. When the bleached films were kept in the dark for a few days in presence of air, the colour was restored. In absence of oxygen the bleaching was more rapid and the bleached films when kept in the dark did not regain their colour so long as oxygen was excluded. Spectrophotometric study of the phenomena showed that the destruction and reproduction of the colour do not represent a true reversible reaction: the coloured substance which is produced by oxidation of the colourless substance formed in the bleaching or fading, is not identical with Methylene Blue, the absorption of the two substances although identical for rays of shorter wave length ($\lambda = 620\mu\mu$) being different for rays of greater wave length.—A. S.

Magnesium chloride; Injurious properties of —— *in finishing [cotton goods]*. E. Ristenpart. Z. angew. Chem., 1912, **25**, 289—292. (See also this J., 1890, 472.)

THE author has investigated the tendering of cotton goods when finished with sizes containing magnesium chloride, owing to the liberation of free hydrochloric acid. His experiments lead to the following conclusions:—(I.) An aqueous solution of magnesium chloride does not suffer decomposition at temperatures below 106° C., even when heated in a current of air or steam or in the presence of cellulose and any ordinary ingredient of a size. (II.) Even when magnesium chloride is heated to 246° C., the free hydrochloric acid formed is only equal to about 2 per cent. of the weight of the salt taken. (III.) Tendering of cotton goods finished with a size containing magnesium chloride, cannot take place at temperatures below 106° C. Such goods can be exposed to the action of saturated steam and decatised with it. (IV.) At higher temperatures especially if long continued, the goods become tendered. 100° C. is regarded as the highest temperature at which such goods can be dried with safety in practice. (V.) Within this limit, magnesium chloride can be used with perfect safety, but such goods must not be subsequently subjected to severe hot pressing or calendering, nor exposed to superheated steam.—A. SELD.

PATENTS.

Bleaching fibrous materials, such as raw cotton; Process for ——. R. Müller. Ger. Pat. 242,296, April 2, 1910. Addition to Ger. Pat. 240,037, March 12, 1910 (see this J., 1910, 1200; 1911, 534).

THE alkaline solution in which the goods are to be bleached, is allowed to circulate first over manganese dioxide, or the dioxide is added to the solution: in this process, oxygen is evolved more slowly than when magnesium or zinc peroxide is used, and further, owing to the insolubility of manganese dioxide, metallic soaps or carbonates are not formed. The lower manganese oxide formed can be again converted into the dioxide.—T. F. B.

Brown to black shades on wool ; Production of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany Eng. Pat. 12,877, May 29, 1911.

Brown to black shades fast to potting can be dyed on wool by the one-bath method in the presence of a chrome mordant with the azo-dyestuffs obtained from diazotised nitro-2-aminophenols or their halogen- or nitro-substituted derivatives and β-naphthol.—P. F. C.

Dyeing, washing, cleansing and otherwise treating yarn in hank ; Process and apparatus for ——. J. Schlumpf. First Addition, dated July 21, 1911, to Fr. Pat. 421,183. Oct. 7, 1910 (this J., 1911, 486).

The mechanism which operates the levers for turning the yarn sticks is stationary whilst the dye-vat travels on rollers. (See Eng. Pat. 23,410 of 1909 ; this J., 1910, 1300.)—P. F. C.

Dye-liquors ; Process for preventing or removing froth in ——. A. Fürstenberg. Ger. Pat. 242,082, Sept. 7, 1910.

Artificially prepared emulsions of fats or oils are added to the dye-liquor.—T. F. B.

Printing machine for calico, silk, floorcloth, oilbaize, carpets, wall-paper and the like ; Intermittent ——. W. Pickup, Pendleton, Lancs. Eng. Pats. 7469 and 7470, Mar. 25, 1911.

A machine is figured and described specially adapted for printing cross borders at intervals on shawls, etc.—P. F. C.

Reserving silk in the raw or the hank form ; Process of ——. J. Besson. First Addition, dated Nov. 17, 1910, to Fr. Pat. 429,004, July 4, 1910 (this J., 1911, 1208).

The process described in the principal patent is also applicable to cotton and wool.—P. F. C.

Impermeable fabrics ; Process for rapidly producing ——. G. Rivat. Fr. Pat. 433,727, Nov. 3, 1910.

Spermaceti is heated with a concentrated solution of sodium carbonate and the product is diluted. The cloth is then impregnated in the solution, hydro-extracted, plunged into a 5 per cent. solution of aluminium acetate, and finally dried.—P. F. C.

Linen ; Process for rendering —— *washable by means of a dressing of nitrocellulose dissolved in an organic solvent of high boiling-point.* W. Brückner. Ger. Pat. 241,781, May 29, 1909. Addition to Ger. Pat. 238,361, Jan. 26, 1909.

Linen is treated with a mixture of an organic acid, zinc chloride, and amyl alcohol, and is then impregnated with a solution of nitrocellulose in an organic solvent of high boiling point, which may be first completely neutralised by means of sodium carbonate. The process may also be applied to the waterproofing of wood, fabrics, etc.—T. F. B.

Dyeing and bleaching machine. T. and T. Frusher, New York. Eng. Pat. 17,963, Aug. 8, 1911.

See U.S. Pat. 1,000,251 of 1911 ; this J., 1911, 1052.—T.F.B.

Dyeing apparatus. W. M. Rossiter and M. Siepermann. Fr. Pat. 433,254, Aug. 16, 1911.

See U.S. Pat. 1,006,502 of 1911 ; this J., 1912, 69.—T. F. B

Vat dyeing ; Machine for ——. A. Ashworth. Fr. Pat 434,254, Sept. 15, 1911. Under Int. Conv., Oct. 21, 1910.

See Eng. Pat. 24,434 of 1910 ; this J., 1911, 1310.—T. F. B.

Obtaining soluble starches of very high adhesive and thickening power for the manufacture of finishing materials. Fr. Pat. 433,726. *See* XVII.

VII.—ACIDS ; ALKALIS ; SALTS ; NON-METALLIC ELEMENTS.

Sulphur in pyrites ; Determination of ——. A. Heczko. Z. anal. Chem., 1912, **51**, 1—14.

In Dennstedt's method of determining sulphur in pyrites, etc. (see this J., 1911, 1378), an error is introduced by the considerable amount of alkali salts present in the solution in which the barium sulphate is precipitated. It is pointed out that this may be avoided, and the operation rendered more rapid, by the use of Raschig's volumetric benzidine method (this J., 1903, 883, 1066). Comparative determinations of the sulphur trioxide in ammonium sulphate. by precipitating with barium chloride on the one hand, and by the use of the Raschig method on the other, were found to give practically identical results, provided that the amount of sulphur trioxide present was not more than 0·3 grm. With less than this amount, the benzidine process gives too low results, which, however, may be corrected to some extent by the use of a large excess of the precipitant.—J. P. O.

Potash from the Pacific kelps. F. K. Cameron. J. Ind. Eng. Chem., 1912, **4**, 76—77.

A brief discussion of the prospects of obtaining potassium salts in large quantities from the kelps present along the Pacific Coast of the United States (compare Balch, this J., 1910, 150). According to analyses made by Turrentine, *Nereocystis luetkeana* contains about 30 per cent. of its dry weight of potassium chloride, and *Macrocystis pyrifera* not much less than this amount. It is stated that even on a moderate estimate, it should be possible to obtain annually at least 1,000,000 tons of potassium chloride from this source, whilst the value of the iodine compounds obtainable at the same time should to a great extent meet the cost of harvesting the kelp and extracting the potassium salts.—A. S.

Authorised German sale of potash during 1912. Bd. of Tr. J., Feb. 15, 1912. [T.R.]

The "Deutscher Reichsanzeiger" (Berlin) of 3rd February publishes the following table, fixed by the Potash Distributing Bureau, showing the amounts of potash authorised to be sold during the calendar year 1912 by the proprietors of potash works :—

Varieties.	For home consumption.	For export.
	100 kilos. of pure potash (K_2O).	100 kilos. of pure potash (K_2O).
Carnallite with 9 to 12 per cent. K_2O	82,900	800
Crude patash salts with 12 to 15 per cent. K_2O	2,970,800	1,442,400
Manure salts with 20 to 22 per cent. K_2O	19,000	338,500
,, ,, 30 to 32 per cent. K_2O	28,800	155,000
,, ,, 40 to 42 per cent. K_2O, including potash manure with 38 per cent. K_2O	1,341,100	439,400
Chloride of potassium	588,800	1,768,800
Potassium sulphate with more than 42 per cent. K_2O	13,000	549,800
Potassium magnesium sulphate	1,300	132,700
	5,045,700	4,827,400
	9,873,100	

French Customs duties on formic and lactic acids and their salts. Bd. of Tr. J., Feb. 15, 1912. [T.R.]

The French "Journal Officiel" for the 8th February, contains the text of a Law, dated the 5th February, fixing the Customs duties payable on formic and lactic acids, etc., as follows:—

Tariff No.	Tariff Classification.	Rates of Duty.	
		General Tariff.	Minimum Tariff.
—	—	Francs. Per 100 kilos.	Francs. Per 100 kilos.
238	Acids—		
	Formic—		
	Containing 60 per cent. or less, by weight, of free acid	22	15
	Containing more than 60 per cent., by weight, of free acid ..	25	18
	Lactic—		
	Containing 60 per cent. or less, by weight, of free acid	22	15
	Containing more than 60 per cent., by weight, of free acid......	25	18
269 *bis*	Lactates, other*	22	15
269 *ter*	Formates	22	15

* Tariff No. 269 provides for lactate *of iron.*

[*Note.*—Products of the United Kingdom enter under the Minimum Tariff.]

U.-V.-Filter-lamp; The —— as an aid in determining the purity of chemical products [potassium carbonate]. O. Wolff. Chem.-Zeit., 1912, **36**, 197—198.

Certain samples of calcined (dehydrated) potassium carbonate when examined by means of ultra-violet rays (see this J., 1911, 156) showed in places vivid red luminescence, whereas with the carefully purified salt this effect was not observed. The effect was traced to the presence of potassium sulphide, and exposure to ultra-violet rays affords a simple means of detecting even traces of this substance in commercial potassium carbonate. The salt must be dehydrated and cooled before examination.—A. S.

Bleaching powder; Researches on ——. Part II. Action of dilute acids on bleaching powder. R. Ll. Taylor and C. Bostock. Chem. Soc. Proc., 1912, **28**, 14—15. (See also this J., 1911, 1250.)

The authors have used Taylor's method of determining the proportion of hypochlorous acid and chlorine in a mixture of the two for investigating the action of (*a*) sulphuric, hydrochloric, and nitric acids; (*b*) acetic and phosphoric acids; (*c*) boric and carbonic acids, on a mixture of bleaching powder and water. When bleaching powder mixed with thirty times its weight of water is distilled with one of the three first acids, in quantity slightly greater than is required to neutralise the free lime, hypochlorous acid with a small amount of chlorine is evolved. When the acid is sufficient to decompose the whole of the hypochlorite present as well, the proportion of chlorine is greater. With larger quantities of acid the amount of hypochlorous acid rapidly diminishes until nothing but chlorine is evolved. There is not much difference in the action of the three acids. Acetic and phosphoric acids behave much in the same way, using small quantities of acid, but even with comparatively large amounts of acid the proportion of hypochlorous acid does not fall much below 50 per cent. When bleaching powder is distilled with once or twice its weight of boric acid and a sufficient amount of water, almost pure hypochlorous acid is obtained, and there is not much difference in the result if the boric acid used is as much as three times the weight of the bleaching powder. When carbon dioxide is bubbled through a mixture of bleaching powder and water at different temperatures, whilst at the ordinary temperature nothing but chlorine is evolved, as soon as the liquid becomes warm some hypochlorous acid is given off. As the temperature rises the proportion of hypochlorous acid increases, until, when the liquid is actively boiling, the distillate is a practically pure solution of hypochlorous acid, hardly any chlorine being evolved.

Copper salts; Reaction of alkali sulphites on ——. H. Baubigny. Comptes rend., 1912, **154**, 434—437.

The author confirms previous work in so far as he shows that the reaction of alkali sulphites on cupric salts produces double alkali-cuprous sulphites, cuproso-cupric sulphite ternary alkali-cuproso-cupric sulphites, and, especially on heating, cuprous sulphite, which on long boiling, and more completely on heating in a sealed tube with water, decomposes with precipitation of cuprous oxide. He has also found that the formation of the double sulphites is accompanied by that of dithionate, according to the following equations:—

$$2CuSO_4+4Na_2SO_3=2Na_2SO_4+(Cu_2SO_3,Na_2SO_3)+Na_2S_2O_6$$

$$3CuSO_4+4Na_2SO_3=3Na_2SO_4+(Cu_2SO_3,CuSO_3)+Na_2S_2O_6.$$

(Compare this J., 1909, 1195.)—J. T. D.

Silver oxybromide; Preparation and properties of a ——. A. Seyewetz. Comptes rend., 1912, **154**, 355—357.

Metallic silver in a very finely divided state was treated in the cold with a saturated aqueous solution of benzoquinone containing also about 2·5 per cent. of potassium bromide. After a time the odour of the quinone became imperceptible; the solution was then poured off from the powder and replaced by fresh, and this treatment was repeated until the quinone remained undecomposed. The powder, which had become reddish brown in colour, was washed with water and extracted with boiling ammonia. From the filtered extract crystals separated on cooling, which, after a further crystallisation from ammonia, possessed a composition corresponding to the formula Ag_5Br_7,Ag_2O. In the crude state the compound forms a reddish brown amorphous powder; but it crystallises from hot ammonia in colourless transparent crystals with a metallic lustre like that of iodine, which become brown in the light. It is insoluble in water and nitric acid but soluble in about 100 parts of boiling ammonia and in solutions of sodium thiosulphate. Potassium iodide in excess gives rise to an iodine compound of analogous composition.—J. H. L.

Tin tetrafluoride; Some reactions and compounds of ——. L. Wolter. Chem.-Zeit., 1912, **36**, 165.

Tin tetrafluoride (Ruff and Plato; this J., 1904, 322) forms two compounds with ammonia: a white powder, SnF_4,NH_3, and highly refractive crystals, $SnF_4,2NH_3$; it combines with pyridine, giving crystals of the composition, $SnF_4,2C_5H_5N$, and with quinoline and aniline, yielding crystalline products. With hydrogen sulphide (liquefied), it reacts to give stannic sulphide, and with phosphorus trichloride, pentachloride, or oxychloride, the corresponding fluoride or oxyfluoride is obtained. Metals, such as sodium, magnesium, and finely divided iron, reduce the tetrafluoride to metallic tin.—F. Sodn

Perchlorates [of nickel, cobalt, chromium, and didymium]; Preparation and properties of some ——. H. Goldblum and F. Terlikowski. Bull. Soc. Chim., 1912, 11, 103—111.

The perchlorates of nickel, cobalt, chromium, and didymium have been prepared by dissolving the carbonates or hydroxides in a solution of perchloric acid, expelling the excess of acid at 110° C., and evaporating to crystallisation, where necessary *in vacuo* over sulphuric acid. Nickel and cobalt perchlorates, when dried to constant weight over sulphuric acid, are of the type, $M''(ClO_4)_2.5H_2O$: they melt at 149° C. and 143° C. respectively, and the nickel salt, unlike that of cobalt, is readily hydrolysed. F. Sodn.

Vanadic acid; Volumetric determination of —— by potassium ferrocyanide. E. Muller and O. Diefenthäler. Z. anal. Chem., 1912, **51**, 21—23.

To the vanadium solution is added successively 60 c.c. of a molar solution of potassium ferrocyanide, 10 c.c. of a molar solution of sulphur dioxide, 3 grms. of potassium iodide, and 15 c.c. of a 15 per cent. solution of zinc sulphate. After diluting the liquid to about 200 c.c., the iodine liberated by the ferricyanic acid formed is titrated with *N*/20 thiosulphate solution, the reaction proceeding according to the following equation: $V_2O_5+2H_4Fe(CN)_6=V_2O_4+2H_3Fe(CN)_6+H_2O$. It is of importance to add the several reagents to the vanadic acid solution in the order given, otherwise too high results will be obtained. Figures are given indicating that the new method yields results that agree well with those found by reduction with sulphur dioxide and oxidation with permanganate. —J. P. O.

Trivalent vanadium; Electrolytic production of salts of ——. E. Renschler. Z. Elektrochem., 1912, **18**, 137.

The author has modified the method of Bültemann (Z. Elektrochem., 1904, **10**, 141) so as to obtain vanadium ammonium alum from ammonium metavanadate by a single electrolytic operation. The electrodes are lead cylinders separated by a porous pot. The catholyte in the porous cell consists of 100 c.c. of 50 per cent. sulphuric acid with 25 grms. of ammonium metavanadate. This is stirred vigorously and a current of 4 ampères is passed, the cathode being 5 cm. high and 18 cm. in circumference. The anolyte consists of 300 c.c. of 50 per cent. sulphuric acid. The colour at the cathode becomes first blue and then green, and after about three hours the solution may be removed and allowed to crystallise. In this way about 40 grms. of the alum may be obtained. If about 20 grms. of ammonium sulphate be added to 80 c.c. of the liquid after electrolysis, the yield is improved and better crystals obtained. If the electrolysis be prolonged the colour becomes violet owing to the formation of a divalent vanadium salt.—W. H. P.

Ozone; Behaviour of —— towards concentrated sulphuric acid. C. Harries. Z. Elektrochem., 1912, **18**, 129—130.

When a current of ozonised oxygen is passed through concentrated sulphuric acid a diminution in the ozone percentage takes place, if the oxygen has been thoroughly dried before ozonising. With moist ozone there is no such decomposition. A similar catalytic decomposition is observed when ozone is passed through a 5 per cent. solution of sodium hydroxide, and if the gas is next passed through concentrated sulphuric acid, a still further reduction is produced, and this occurs even when a wash-bottle containing water is interposed between the sodium hydroxide and the acid.—W. H. P.

Fusions of cuprous oxide and silica. Otin. *See* X.

Hydrolysis of sodium oxalate and its influence upon the test for neutrality. Blum. *See* XXIII.

Patents.

Hydrofluoric acid; Apparatus for absorbing ——. J. J. Dye, Atlanta, Ga. U.S. Pat. 1,016,219, Jan. 30, 1912.

Two columns, one shorter than the other, and communicating at their lower ends, rest side by side on a base, the top of which is hollowed out so as to form a pan. Both columns are packed with wooden chequer-work and have water spraying devices at the top. The vapours to be condensed are introduced near the closed upper end of the shorter column, and pass first downwards and then up through the taller column, escaping past a lattice-work baffle, from the open upper end of the latter. The water, with the condensed acid, collects in the pan and runs off through a pipe into an adjacent well.—A. S.

Carbonate of soda; Method of obtaining ——. N. Wrinkle and R. G. Paddock, San Francisco, Cal. U.S. Pat. 1,016,239, Jan. 30, 1912.

The patent relates to the production of sodium carbonate from a solution containing sodium carbonate, chloride, sulphate, and bicarbonate and other soluble matter, which may include organic matter, the combined quantity of sodium carbonate, bicarbonate, and sulphate being greater than that of the other soluble matter. The solution is concentrated by means of solar heat until it has the sp. gr. 1·14—1·30 at 60° F. and is then treated with carbon dioxide, whereby the sodium carbonate is converted into bicarbonate, which is precipitated. The bicarbonate is separated and converted into carbonate by the direct application of hot products of combustion of a gas or oil flame in a suitable furnace, the escaping gases being used to carbonate a further quantity of the solution.—A. S.

Sodium or potassium hydroxide; Process of manufacture of —— with simultaneous production of by-products. J. Braunschild and B. Chapiro. First Addition, dated Nov. 12, 1910, to Fr. Pat. 431,232, Sept. 5, 1910 (this J., 1911, 1381).

A mixture of sodium or potassium nitrate and an excess of manganese dioxide (*e.g.*, 1 pt. of nitrate to 6 pts. of peroxide) is heated in absence of air, and the mixed nitrous gases and oxygen evolved, to which air and steam may be added, are passed over the residual oxides of manganese from a previous operation (the sodium oxide or hydroxide having been extracted with water, as described in the original patent); the manganese is thus peroxidised for use again, and the gases (still hot) may then be passed over lime (suitably at 300°—400° C.) or into milk of lime, so as to form calcium nitrate. The heating of the nitrate with manganese dioxide may be carried out, if desired, in a current of superheated steam.—F. Sodn.

Lime; Apparatus for slaking ——. W. Schulthess, Paris. Eng. Pat. 2525, Jan. 31, 1911.

The steam, which is generated when lime is slaked, is conducted through a horizontal conduit, with the result that a considerable portion of the lime-dust which accompanies it, is deposited in the form of dry, hydrated lime. The steam, freed from the greater part of the dust, passes from the conduit up a vertical chimney containing water-spraying nozzles, whereby the water becomes heated and at the same time takes up the remainder of the lime carried by the steam; the milk of lime, which is produced, passes into an annular gutter at the base of the chimney, whence it is conducted by means of a pipe into the slaking apparatus.—O. R.

Ammoniacal liquors; Apparatus for distilling ——. P. Schwarz, Crook, Durham. Eng. Pat. 4680, Feb. 24, 1911.

The apparatus comprises a combination of a "liming" chamber, *i.e.*, a chamber in which liquors are heated with lime-water, and a superposed column still. The liming chamber is subdivided into a number of compartments, both vertical and horizontal, fitted with steam-supply pipes, and with a lime-water inlet and a waste-liquor outlet; a number of sludge valves are fixed at the base of the chamber and communicate with a common discharge pipe. To the upper, open end of the liming chamber are fixed a number of superposed trays, which constitute the distilling portion of the apparatus; each tray has a liquor-inlet at one corner and a liquor-outlet at the diagonally opposite corner, separated by division ribs, so that the liquor shall travel the longest possible distance in each tray; inlets at the base of each tray, enclosed by baffles, allow the passage of ammonia and steam, and each tray is fitted with a sludge valve connected with a common delivery pipe, which is coupled up to one of the sludge valves of the liming chamber. The uppermost tray is fitted with a liquor-inlet pipe, while the lowermost tray is provided with a liquor-outlet pipe terminating within the liming chamber; a filter containing flint pebbles surmounts the whole apparatus, and being fitted with a dome-shaped cover and a vapour-outlet, serves to dry the ammonia and render it suitable for condensation or absorption.—O. R.

Sulphate of ammonia; Machine for treating gases in the production of ——. F. W. Burstall, Birmingham. Eng. Pat. 14,440, June 19, 1911.

GAS issuing from a retort, coke-oven, producer or the like is passed into a chamber where heavy tars, dust, etc., are removed, then to a chamber in which it comes into contact with hot acid to produce ammonium sulphate and lastly to a chamber in which the last traces of sulphate and acid are washed out. A central shaft, with durable bearings outside the machine, passes through all three chambers and is made to rotate, and carries series of beaters which fill a large part of each chamber. After being freed from heavy tars and dust, by the action of the beaters, in the first chamber, the gas passes up through an annular passage surrounding the shaft into the acid chamber; the circular wall of this passage and the outer wall of the chamber form an annular trough at the bottom of the chamber, in which liquid and ammonium sulphate collect. Just above the annular passage, and immediately below the beaters a circular cap, larger than the passage, is attached to the shaft. In this way liquid is prevented from passing from one chamber to that below it through the gas openings. The third or final washing chamber is similarly constructed, and together with the acid chamber, and the caps and beaters is made of lead; the portions of the central shaft in these chambers are also covered with a sleeve of lead. The beaters, which ensure intimate mixing of the gas and liquid, are built up of a central part or core of durable metal covered with lead. The central shaft may be built up of two attached pieces, one of which is situated in the first washing chamber, and the other, covered with lead, is situated in the acid and final washing chambers.—W. C. H.

Ammonia contained in distillation gases; Recovery in the form of ammonium sulphate of the ——. M. Davicion. Fr. Pat. 433,545, Oct. 28, 1910.

DISTILLATION gases (from coal) are first cooled, and the condensed ammoniacal liquor and cooled gases are then separately treated for the recovery of the ammonia in the form of ammonium sulphate, the liquor being submitted to the usual distillation process and the gases (containing nearly four-fifths of the total ammonia) introduced directly into a separate saturator. By providing an additional saturator, the ordinary gasworks sulphate plant may be utilised for the process.—F. SODN.

Nitric acid; Process of electrolysis of —— [for the production of ammonium nitrate]. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 433,410, Aug. 19, 1911. Under Int. Conv., Dec. 24, 1910.

CATHODES of carbon or graphite, instead of metal, are employed in the electrolysis of nitric acid, a lower voltage being required and no hydrogen evolved. The carbon is not affected by the acid.—F. SODN.

Desulphurisation of zinc sulphate; Process of ——. H. Pape. Fr. Pat. 432,556, July 25, 1911.

THE process consists in heating an intimate mixture of zinc sulphate and zinc oxide, the mixture being preferably prepared as a paste with a strong solution of the sulphate, and then dried. Zinc oxide almost entirely free from sulphur is obtained.—F. SODN.

Metallic salts [zinc or copper]; Deposition of —— from solutions containing them. The Metals Extraction Corporation, Ltd. Fr. Pat. 433,477, Aug. 7, 1911.

SOLUTIONS of copper and zinc salts, especially those containing bisulphite and sulphate, as obtained by treating roasted minerals of copper or zinc with sulphurous acid, are made to pass in a thin film over heated plates, so that the salts are deposited in an insoluble and relatively basic state, sulphur dioxide being evolved. The plates are preferably arranged in a tower and are inclined downwards, from opposite sides alternately, so that the liquor may follow a zig-zag path, and hot gases from a furnace are admitted at the bottom of the tower, so as to heat the lowest plates to 300°—800° C. on their undersides, the liquor leaving the tower at a temperature of 80°—90° C. Very little evaporation takes place, but a portion of the salts is deposited on the plates, and this may be periodically removed through doors provided for the purpose. Where the zinc is present chiefly as sulphate, its precipitation is effected by adding a sufficient quantity of zinc oxide or sulphite to the solution, before it enters the tower, or by subsequently agitating the liquor with these reagents for a short time, at 80°—90° C.—F. SODN.

Nitrogen compounds of silicon; Process of manufacture of ——. O. Serpek. Fr. Pat. 433,995, Nov. 12, 1910.

NITROGENISED compounds of silicon are made by heating silica and carbon in the presence of nitrogen gas, purified from free or combined oxygen, to temperatures of 1600° C., or below.—W. C. H.

Cream of tartar; Process of manufacture of ——. Périgny, Chabert et Cie. Fr. Pat. 434,223, Nov. 19, 1910.

TARTARS, wine lees, or other materials containing potassium bitartrate are boiled with a solution of a salt (preferably the chloride or nitrate of aluminium) in which the solubility of the bitartrate at the boiling point is much increased whilst remaining in the cold as low as possible, and the solution thus obtained, which may be very concentrated, is decolourised, filtered by means of a press, and allowed to cool, when the potassium bitartrate is almost completely deposited in a pure state (99—100 per cent.), the mother liquor being used again in the process. An incidental advantage of the process is the prevention of fermentation by the antiseptic action of the aluminium salt.—F. SODN.

Oxygen; Apparatus for the production of ——. E. F. Aumont, Paris. Eng. Pat. 11,306, May 10, 1911. Under Int. Conv., May 23, 1910.

AIR is admitted to the liquefying apparatus by a single nest of tubes, arranged inside a double-walled jacket, divided by a partition into two parts, one of which serves as a vaporiser immersed in liquid oxygen and communicates with the bottom of the rectification column, and the other serves as a temperature exchanger and communicates with the exterior of the apparatus and with the top of the rectification column. The nest of tubes in which the air is liquefied terminates in a liquid air reservoir, connected by means of an expansion cock with a refrigerating apparatus, which allows the liquid air to be discharged at the upper part of the rectification column. The refrigerating apparatus is cooled by means of an independent hydrogen cycle, consisting of a compressor discharging into a temperature exchanger at the end of which is arranged an adiabatic expansion motor. The exhaust gases from the motor circulate round the tubes of the refrigerating apparatus, and are thence returned through a pipe to the temperature exchanger where they are again acted upon by the compressor.—W. C. H.

Oxy-hydrogen gas; Process for the preparation of ——. M. Boehm. Fr. Pat. 433,857, Sept. 2, 1911.

IN the preparation of oxy-hydrogen gas for cartridges, explosion motors, etc., additions are made to the water to be electrolysed of substances which yield compounds capable of extinguishing flame, or of bodies, for example, such as nitrogen compounds, carbonic acid, ammonia, etc., or organic compounds such as tartaric acid and ammonia. —W. C. H.

Hydrogen under pressure; Process and arrangements for the preparation by the wet method of ——. G. F. Jaubert. Fr. Pat. 433,400, Oct. 25, 1910.

The reaction by which the hydrogen is produced is carried out under a pressure above the vapour pressure of water at the temperature in question, the larger part of the heat produced is localised and stored in the reacting liquid, and by preventing the vaporisation of this liquid, dry hydrogen is obtained, the speed of manufacture increased, and the amount of liquid necessary for the reaction diminished. The pressure is produced automatically by working with an autoclave generator, in which the hydrogen produced is allowed to accumulate. The generator is a revolving cylinder, provided with an autoclave cover, a charging chamber which penetrates some distance into the interior of the cylinder, and a blow-off cock, so that complete mixing of the reagents can be prevented before the reaction is started and to allow the hydrogen formed to be drawn off. The cylinder is mounted upon a diagonal axis. The application of the process and plant is claimed for the inflation of balloons and for autogenous welding. W. C. H.

Drying of gases or vapours [concentration of nitric acid]. H. Pauling, Gelsenkirchen, Germany. Eng. Pat. 8533, April 5, 1911.

See Fr. Pat. 422,902 of 1910; this J., 1911, 541.—T. F. B.

Nitric acid; Process for making ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 433,502, Aug. 21, 1911. Under Int. Conv., April 6, 1911.

See Eng. Pat. 19,032 of 1911; this J., 1911, 1381.—T. F. B.

Ammonia; Manufacture of ——. L. P. Devaucelle, Paris. Eng. Pat. 2116, Jan. 27, 1911.

See Fr. Pat. 429,140 of 1911; this J., 1911, 1211.—T. F. B.

Ammonia or its compounds; Methods of producing ——. Elektrochemische Werke G. m. b. H., Berlin. Eng. Pat. 5282, March 2, 1911. Under Int. Conv., March 3, 1910.

See Fr. Pat. 426,307 of 1911; this J., 1911, 1012.—T. F. B.

Sulphite and sulphate of ammonia, Recovery of —— in the manufacture of gas. K. Burkheiser, Hamburg, Germany. Eng. Pat. 11,517, May 12, 1911.

See Addition of May 12, 1911, to Fr. Pat. 394,926 of 1908; this J., 1911, 1303.—T. F. B.

Aluminous material; Process of removing impurities from impure —— and producing nitrogen compounds therefrom. O. Serpek, Zürich, Switzerland. U.S. Pat. 1,016,526, Feb. 6, 1912.

See Eng. Pat. 7507 of 1909; this J., 1910, 277.—T. F. B.

Manganates; Process for the production of ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 433,980, Sept. 5, 1911. Under Int. Conv., Sept. 30, 1910.

See Eng. Pat. 11,701 of 1911; this J., 1911, 1252.—T. F. B.

Boron and zirconium; Method of and apparatus for producing ——. E. Weintraub, Lynn, Mass., U.S.A. Eng. Pat. 25,033, Oct. 27, 1910. Under Int. Conv., Oct. 27, 1909.

See Fr. Pat. 421,831 of 1910; this J., 1911, 488.—T. F. B.

Liquefying air and separating it into its elements; Process of ——. E. Jänecke, Hanover, Germany. U.S. Pat. 1,015,800, Jan. 30, 1912.

See Fr. Pat. 407,852 of 1909; this J., 1910, 627.—T. F. B.

Hydrogen; Process for producing ——. W. Näher and K. Müller. Fr. Pat. 433,686, Aug. 28, 1911.

See Ger. Pat. 237,283 of 1910; this J., 1911, 1116.—T. F. B.

VIII. GLASS; CERAMICS.

White enamels [for culinary vessels]; Use of antimony compounds in manufacture of ——. R. Rickmann. Sprechsaal; 1912, **45**, 115—116.

The high price of tin oxide makes a cheaper substitute desirable. Calcium phosphate, titania and zirconium oxide are useless in this respect and antimony oxide only can be seriously considered. Cloetta (Arch. exp. Path. u. Pharmakol., **64**, 352) by observations on dogs finds that antimony salts are seriously prejudicial to health, but that antimonates may be taken in larger doses for longer periods of time before giving rise to harmful symptoms. The author subjected the enamel of composition: borax 52, quartz 50, felspar 80, cryolite 28, sodium carbonate 9, sodium nitrate 6, antimony oxide 25 parts, to the action of 4 per cent. acetic acid and of 4 per cent. tartaric acid. The antimony dissolved and is therefore unsuitable for enamels when introduced as a base. But metantimonates were resistant to these solvents and are recommended as a substitute for tin oxide. "Leuconin" is a patented German preparation of sodium metantimonate —H. H. S.

PATENTS.

Quartz ware; Manufacture of ——. F. W. Burckhardt, Biebrich-on-Rhine, Germany. Eng. Pat. 1364, Jan. 18, 1911.

Quartz vapour produced as described in Eng. Pat. 25,886 of 1910 (this J., 1912, 189) is led into a receptacle and condensed. The fine powder obtained, may be added to the ordinary raw material for the production of quartz ware for the purpose of accelerating the fusion thereof.—A. S.

Glass; Process for the continuous manufacture of transparent plates of ——. Ges. für Elektrotechn. Ind. m. b. H. Fr. Pat. 433,740, Aug. 30, 1911.

The preliminary drawing and setting of the glass is effected by causing molten glass to flow out of the pot over an inclined plane, and over an endless surface (a large cylinder or an endless band) and by then conducting it between revolving cylinders. The glass is preferably turned sharply behind these cylinders, passed into a re-heating furnace, and between two bands which draw away the glass plates, and are run at such a speed that a pull is exerted on the plates as they are softened in the re-heating furnace, so that defects produced by the preliminary treatment are removed.—W. C. H.

Enamelling iron castings and the like; Apparatus for use in ——. C. D. McCourt, London, and H. F. Wilson, Leeds. Eng. Pat. 2448, Jan. 31, 1911.

In enamelling iron castings with poisonous or objectionable powders, the dusting operations are conducted in a cabinet, provided in front with a sliding door, in which openings are made for the operator's hands. Means are also provided for supporting and turning the casting inside the cabinet, and for tilting it by means of a fork which can be inserted through a notched slot. The dusting device may be either operated by hand inside the cabinet, or driven mechanically by a motor, and can be started or stopped at will. (See also this J., 1911, 424.) W. C. H.

Glass; Manufacture of ——. S. O. Richardson, Toledo. Ohio, U.S.A. Eng. Pat. 13,734, June 8, 1911.

See Fr. Pat. 429,485 of 1911; this J., 1911, 1212.—T. F. B.

Glass plates : Process and means for cooling ——. W. W. Pilkington. Fr. Pat. 434,247, Sept. 15, 1911. Under Int. Conv., Nov. 23, 1910.

See Eng. Pat. 27,280 of 1910 ; this J., 1912, 29.—T. F. B.

IX. BUILDING MATERIALS.

Puzzuolanas : Study of Italian ——. A puzzuolana from Sicily. E. Manzella. Gaz. chim. ital., 1912, **41**, II., 730—747.

The author has examined a puzzuolanic material of volcanic origin, found near Catania, and used there and elsewhere as sand for the preparation of lime mortar. The material, which is known as "red earth," has a chemical composition very similar to that of Roman puzzuolana. Its hydraulic properties, as determined by the author's method (see this J., 1906, 590) were equal to those of Bacoli puzzuolana, but somewhat inferior to those of Roman puzzuolana. Determinations were made of the tensile strength and resistance to compression of test pieces of lime mortar prepared with the "red earth" and with other Italian puzzuolanas, after keeping for 6 months in the air and under water. The test-pieces made with the "red earth" were equal to those made with other Italian puzzuolanas with respect to tensile strength but were somewhat deficient in resistance to compression.—A. S.

Plasters and cements ; Hardness of —— and a simple chronographic apparatus for recording set. C. F. McKenna. Met. and Chem. Eng., 1912, **10**, 82—85.

A row of glass pins (0·015 in. diam.) are pushed into the plaster or cement paste, at a distance apart of $\frac{1}{2}$in., and a moving finger mounted on a long screw operated by clockwork strikes each pin in succession, forcing it forward until it meets with a distinct resistance, when it breaks off. The pins bear against a smoked glass rod, on which the path of each is traced, and at the conclusion of the test, a complete record of the setting is left on the rod. It is stated that with all samples of normal Portland cement examined, indications were obtained of a relaxation of stiffness at about the third hour, corresponding with the reduction of temperature observed by Gary at about the same period in his thermal study of the setting of cement. It is probable that further work may demonstrate the necessity of determining for Portland cement, the "reverse set" (*i.e.* the relaxation of stiffening) as well as the initial and final set.—A. S.

Brick and sand-lime bricks in Holland ; Testing and properties of ——. B. Krieger. Tonind.-Zeit., 1912, **36**, 301—304.

The Committee appointed by the Dutch Minister of Industry and Commerce to inquire into the relative merits of building ware made from clay and from sand-lime mixtures has issued its report (264 pages, price M.3), of which this paper is a resumé. Some forty wares from different factories were tested for crushing and tensile strength, absorption and sweating, behaviour with frost, rain-water, sea-water, and mortar. The general conclusion is that for buildings intended to be permanent sand-lime brick is not sufficiently durable, nor does it lend itself to architectural treatment, but within these limitations it is a useful ware. Its fracture should be smooth and straight, its absorption not more than 15 per cent. The first quality should withstand a crushing force of 200 kilos per sq. cm. (approximately 2850 lb. per sq. in.) on an average of 10 samples, with a minimum of 180 kilos per sq. cm. (2560 lb. per sq. in.). The second quality should average 150 kilos (2130 lb. per sq. in.) with a minimum of 135 kilos per sq. cm. (1920 lb. per sq. in.).—H. H. S.

Creosote ; Volatilisation of various fractions of —— after injection into wood. C. H. Teesdale. U.S. Dept. Agric., Forest Service. Circular No. 188, Oct. 17, 1911.

Specimens of sap loblolly pine were treated with fractions of coal-tar creosote obtained by distilling a good commercial grade between the several limits 0°—205°, 205°—250°, 250°—295°, 295°—320° C. and the residue above 320° C. Others were treated with creosote similar in composition to that from which the fractions were distilled. The loss in weight, calculated in per cent. of the total amount of antiseptic injected, was obtained by weekly weighings for two months or longer. The results show that the lighter fractions of creosote, when separately injected, will volatilise much more rapidly than those combined in the original creosote. This might be explained by the supposition that when creosote containing both low-boiling and high-boiling oils is injected into wood, the light oils volatilise chiefly in the outer portions of the wood and leave oil that is much less volatile. The outer cells thus become more or less sealed and tend to prevent the volatilisation of the lighter oils in the interior of the wood. Hence creosote, to be of most value, should contain considerable quantities of high-boiling fractions, which appear to plug up the outer cells and so insure the retention of the lighter oils in the interior of the wood.—R. C. P.

Relation of modern road surfacings to fish life. Butterfield. *See* XIXb.

Patents.

Concrete, cement and the like ; Manufacture of products of ——. H. S. Owen, New York. Eng. Pat. 8087, March 31, 1911. Under Int. Conv., April 1, 1910.

The moulds referred to in Eng. Pat. 8085 of 1911 (this J., 1911, 1255), may be produced by dipping a wall-forming pattern into melted paraffin wax, and after withdrawing from the wax applying the wall frame or pattern, coated with wax, to a sheet of paraffin wax or to a plate or the like by means of wax so as to close the bottom of the mould. Moulds having side walls of rigid material coated with paraffin wax, and a bottom consisting of or connected with the side walls by paraffin wax are claimed as new articles of manufacture.—W. C. H.

Wood ; Process of preserving ——. F. Hasselmann, Munich-Nymphenburg, Germany. Eng. Pat. 26,268, Nov. 23, 1911. Addition to Eng. Pat. 12,587 of 1909, dated May 27, 1908 (this J., 1909, 1250).

Wood is preserved by steeping it in a lye containing approximately 1 per cent. of ferric chloride, 0·5 to 1·0 of zinc chloride, 2 of ammonia-alum or schoenite, and 1·5 to 2·0 per cent. of magnesium chloride.—W. C. H.

Wood ; Process of preserving ——. W. J. Watson, Ladysmith, Brit. Columbia. U.S. Pat. 1,015,862, Jan. 30, 1912.

"Wood containing an acid" is preserved by subjecting it to the action of a vacuum and then impregnating it with a concentrated solution of iron carbonate in water containing carbon dioxide under pressure.—A. S.

Asphalt industry ; Process of manufacture of a viscous, thread-like and closely adherent mass more especially designed for the ——. J. Goepper and O. Geiger. Fr. Pat. 434,065, Sept. 8, 1911.

A mixture of resin or resinous products is heated for an hour to a temperature of 200° C. with sulphuric acid, and the excess of acid neutralised, after cooling, with a predetermined amount of caustic soda solution.—W. C. H.

Plaster kiln with means for continuous charging and discharging. Établissements Poliet et Chausson. Fr. Pat. 434,252, Sept. 15, 1911.

The kiln is vertical and preferably cylindrical. It is heated by means of gases which enter through radial channels piercing the walls at about the middle region, and at this point also the descending charge is broken up by encountering a cylindrical cast iron ring, furnished with cross channels, which rests on brackets of masonry. The ring and cross channels are perforated laterally, and the gases, which first pass into an annular chamber formed between the ring and the kiln wall, penetrate these perforations and thus come into very intimate and uniform contact with the charge, which ultimately sinks into a cast iron hopper in the lower part of the kiln, whence it is discharged.—F. Sodn.

Wood ; Process of preserving and hardening —. E. Sucher, Versailles, France. U.S. Pat. 1,016,111, Jan. 30, 1912.

See Eng. Pat. 15,713 of 1910 ; this J., 1911, 361.—T. F. B.

Wood ; Process of preserving —. E. Marmetschke, Assignor to Hubertusmuhle m. b. H., Schöpfurth, Germany. U.S. Pat. 1,016,024, Jan. 30, 1912.

See Eng. Pat. 19,172 of 1910 ; this J., 1911, 1118. A. S.

Preparing an impregnating oil [for wood] which does not give deposits in the cold. Ger. Pat. 240,919. *See* III.

X. METALS ; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Carbon in iron ; Solubility of —. O. Ruff and O. Goecke. Metallurgie, 1911, **8**, 417—421.

The authors determined the solubility of carbon in iron at temperatures between about 1135° C. and 2620° C., by heating 25—30 grms. of iron in a graphite crucible in an electric vacuum furnace (compare this J., 1910, 886 ; 1911, 1066) at 2—10 mm. pressure until equilibrium was attained, then allowing the crucible to fall into ice-cold water, and subsequently determining the graphite and total carbon in the iron. The results are given in a table and a curve. The amount of total carbon increases with rise of temperature up to 2220° C. and then falls again, but in the ascending portion of the curve, there is a change of direction at 1837° C. The figures for total carbon and graphite at different temperatures are as follow : 1220° C., 4·58, 0·64 ; 1519° C., 5·46, 1·52 ; 1623° C., 5·77, 2·14 ; 1823° C., 6·62, 2·41 ; 2020° C., 6·96, 2·38 ; 2220° C., 9·64, 3·31 ; 2320° C., 8·58, 5·51 ; 2475° C., 7·81, 1·75 per cent. The amounts of total carbon dissolved at 1837° C. (change of direction of curve) and at 2220° C. (maximum on curve) correspond with the formulæ, Fe_3C and Fe_2C, respectively.—A. S.

Iron-carbon alloys ; Equilibrium-diagram of the — O. Ruff. Metallurgie, 1911, **8**, 456—464, and 497—508.

The author has extended the equilibrium diagram of the iron-carbon alloys up to the boiling-point of iron. He finds that besides triferrous carbide, a diferrous carbide also exists. The equilibrium-concentration of triferrous carbide is always below its saturation-concentration, for as the alloy takes up carbon to saturation, no separation of cementite occurs. Moreover, as the diferrous carbide is formed at a high temperture from cementite and graphite and dissociates again on cooling to form these two substances ($2Fe_3C+C \rightleftarrows 3Fe_2C$), it may reasonably be inferred that it is endothermic. The same reasoning applies to cementite, which, if kept during cooling for a sufficient length of time a little above 700° C., dissociates almost completely into graphite and γ-iron. As the temperature is raised, the diferrous carbide begins to dissociate (and at 2220° C. is considerably dissociated) into carbon and iron, possibly with intermediate formation of a monoferrous carbide. The boiling-point of iron, saturated with carbon (about 6·5 per cent.) is about 2700° C. at 10 mm. pressure. Below 1135° C. the solution begins to deposit (in stable condition, with very slow cooling) mixed crystals of cementite and iron, the effect of which is to raise the carbide-concentration of the fluid portion to saturation, which involves dissociation into graphite and iron, and the deposition of mixed crystals and of graphite goes on thus till all is solid, resembling, but not being in reality, a eutectic crystallisation. In the metastable system, the rate of solidification affects the extent to which carbide separates, and also determines the temperature of solidification and the rate of dissociation of the carbide. In the solid state this rate of dissociation is always much lower than in the liquid state, so that any quantity of separated carbide is the less dissociated on further cooling, the lower the temperature at which it separated. The state of division of the carbide is also of importance ; here, however, the more finely divided it is, the more easily will it continue in equilibrium with the surrounding solid solution. The carbide-eutectic line runs between 1123 and 1130 C., and at this temperature the equilibrium concentration is below the saturation-concentration by about 2·25 per cent. of carbide. The reaction-speed of the dissociation of carbide at 1135° C. is such that half of the carbide is decomposed in 2 seconds ; and, based on this, the author develops approximate formulæ for the composition of the reguli formed on cooling.—J. T. D.

Triferrous carbide (Cementite). O. Ruff and E. Gersten. Ber., 1912, **45**, 63—72.

Pure cementite was prepared by heating a pig-iron, containing 4 per cent. of carbon and very free from impurities, to whiteness for an hour with powdered carbon. Analysis showed it to contain 93·28 per cent. of iron and 6·69 per cent. of carbon (theory, 93·33 and 6·67). It was a dark-grey or bronze-coloured substance, consisting of sphærolithic aggregates of needle-like crystals, extremely brittle, and having a hardness slightly above that of calcite (whence it follows that the hardness of chilled irons is not due to cementite as such, but to its solid solution in γ-iron). Its specific gravity was 7·396, and specific volume 24·34, whilst that calculated from the specific volumes of its constituents is 27·84, showing that contraction occurs during its formation. To determine its heat of formation, it was burnt in oxygen in a bomb-calorimeter ($Fe_3C+3O_2=Fe_3O_4+CO_2$), the product analysed and allowance made for the amount of iron burnt only to ferrous oxide : the result per grm.-mol. was 375·1 cals. The heat of combustion of iron to ferrosoferric oxide was similarly determined for two specimens, with results agreeing closely among themselves and in good accord with Berthelot's figure obtained by a totally different method : per grm.-mol. 265·2 cals. Adding to this the heat evolved in the combustion of an atom of graphitic carbon to carbon dioxide, 94·8 cals., we get 360 cals. as the sum of the heats of combustion of the separate constituents of cementite. Hence cementite is endothermic, and the reaction Fe_3+C Fe_3C absorbs 15·1 cals. This is entirely at variance with the result of Campbell (this J., 1901, 721), which was confirmed by the calculations of Schenk, Semiller, and Falcke (this J., 1907, 693), but confirms a deduction of Ruff's from a study of the equilibrium-diagram of the iron-carbon alloys (see preceding abstract).—J. T. D.

[*Iron and steel*]. *Study of the gases evolved from carburising materials ("cements").* H. de Nolly and L. Veyret. Rev. de Mét. 1912, **9**, 53—60.

The authors have studied the action of heat upon various carburising materials, including wood charcoal alone and mixed with various proportions of barium carbonate, mixtures containing potassium ferrocyanide, and others containing animal or vegetable matter. A known weight of each material was heated to 1100° C. by regular stages, the volume of the gas evolved being measured, and its rate of evolution determined, at intervals of 100°. Analyses were made of the gaseous products obtained between 100 and 300° C., towards 850° C. and towards 1050° C., cementation tests upon samples of extra soft steel being also conducted to determine the influence of the composition of the gases upon the depth of carburisation of the metal at 850 and 1050° C. respectively. The authors conclude that the explosions which sometimes occur in the cementation process are caused either by the sudden evolution of gas occurring (with certain "cements") at comparatively low temperatures, or by the reaction of hydrogen (the evolution of which is very abundant towards 700° C. with many of the "cements") with the air expelled from the material at lower temperatures. Wood charcoal, carbonised at a fairly high temperature,

and mixed with from 30 to 50 per cent. of barium carbonate, is regarded as the best carburising material for ordinary purposes; the heating should be conducted very gradually as far as 700° C. so that the contained air may escape from the material before the more rapid evolution of hydrogen commences; mixtures containing animal or vegetable material should be avoided if possible. In the cementation tests it was found that the depth of carburisation of the metal was not appreciably affected by the proportion of hydrogen present in the gases. It has been frequently observed, however, that, before annealing or hardening, iron carburised by cementation is sometimes much more coarse-grained and brittle than iron of the same composition which has been similarly heated, but without carburising material. The authors consider that this brittleness and coarseness of grain is caused by hydrogen, since they have found that steel is energetically decarburised and rendered as brittle as glass by the action of hydrogen at temperatures between 800° and 900° C.; they are also of opinion that many of the apparently unaccountable defects occurring in steel forgings, etc., may be attributed to the presence of this gas in the metal.
—W. E. F. P.

Copper in steel; Simple method of determining ——. S. Zinberg. Z. anal. Chem., 1912, **51**, 19—20.

THE proposed method depends on the fact that on treatment with sulphuric acid in absence of air, iron is completely dissolved while copper remains unattacked. 3—5 grms. of the metal are treated with dilute sulphuric acid in an atmosphere of carbon dioxide, using a flask holding about 750 c.c., the contents of which are warmed until all the iron has gone into solution, and the copper remains as a dark graphitic mass. After allowing the liquid to cool in presence of carbon dioxide, it is filtered, and the residue well washed with water. Finally, the copper is pressed between filter paper, ignited to constant weight in a tared porcelain crucible, and the amount of copper originally present in the sample calculated from the weight of cupric oxide thus obtained. The iron solution may contain traces of copper, but the amount passing into solution is negligible for ordinary technical work.—J. P. O.

Vanadium; Determination of —— in ferro-vanadium. P. Slavik. Chem.-Zeit., 1912, **36**, 171.

THE following method, whilst sufficiently accurate for ordinary work, is very much more rapid than those requiring the previous removal of the iron and more convenient than the fusion methods. 0·5 grm. of the alloy is dissolved in 15—20 c.c. of nitric acid of sp. gr. 1·20, the solution is evaporated to dryness, the residue baked for a short time, taken up with a little strong hydrochloric acid, and evaporated to dryness again, these operations being repeated two or three times; after which the residue is taken up with hydrochloric acid, 30 c.c. of 1 : 2 sulphuric acid added, and the mixture evaporated till fumes of sulphuric acid escape. After cooling, adding water, and warming, the clear solution is transferred to a large beaker or conical flask, 30 c.c. of phosphoric acid of sp. gr. 1·30 added, the solution diluted to 500—700 c.c., and titrated with permanganate ($V_2O_4+O=V_2O_5$).—J. T. D.

Ferrosilicon explosions and their probable causes. A. von Gumberz. Stahl u. Eisen, 1912, **32**, 267—271.

Two cases of explosions following the addition of ferrosilicon to molten steel are given. The explosion in each case took place in the ladle at least 25 minutes after the addition of the ferrosilicon. In the second case, the ferrosilicon had been heated to a red heat, so that no paraffin could have been left adhering to the surface, and any free gases or moisture must have been expelled; also the ladle had previously been heated, so that all traces of moisture must have been expelled. Laboratory tests showed that copper oxide and ferrosilicon react at a red heat with considerable evolution of heat with formation of copper and silica. The author suggests that the explosions in question may have been due to a similar reaction having taken place between the ferrosilicon and oxides of iron present in the slag.—T. ST.

Gold; Absorption of —— by amalgamated copper plates, cast iron retorts and amalgam trays. G. H. Stanley and M. T. Murray. J. Chem. Met. and Min. Soc., S. Africa, 1911, **12**, 218—223.

Amalgamated copper.—A plate 0·13—0·14 in. thick, which had been discarded after 12 years' use and had then been "sweated" and scraped but not "scaled," was examined in layers 0·02 in. thick by assay and microscopically. The top layer contained 10·48 per cent. of gold; the other layers contained irregular quantities varying from 0·0018 to 0·0166 per cent. Mercury was present in all layers but was measurable only in the top (9·39 per cent.) and bottom (1·89 per cent.) layers. Lead was present throughout, varying irregularly from 0·053 to 0·104 per cent. Under the microscope gold and mercury were found together in the pores of the metal. The authors' conclusions are that gold is not really absorbed or passed through the plate in amounts of commercial importance, though it is possible for a rich surface scale to form which is too hard to be removed by an ordinary scraping treatment. The amalgamation of the bottom of the plate is considered to be due to creeping from the sides, while the lead may be an original constituent and is known to be subject to segregation. W. R. Dowling gave an account of the practical treatment of six tube-mill plates of a total area of 328·5 sq. ft. and 3318 lb. in weight which had been in use 2½ years. After a preliminary "steaming," which yielded 318·8 oz. of fine gold, the plates were "scaled" by heat, acid, etc.; the first "scaling" yielded 73·62 oz. and the second 2·25 oz., while the gold then remaining in the plate was 1·16 oz. *Cast iron retorts and trays.*—A retort 2¼ in. thick which had been in use for one or two years was examined in a similar manner; the content of gold was as follows:—Scrapings from inside surface, 75·3 per cent. of gold; 1st layer, 1/16 in. thick, 29·078 per cent.; 2nd layer, ⅛ in., 6·051 per cent.; 3rd layer, ¼ in., 0·0152 per cent.; 4th layer, ½ in., 0·00117 per cent.; remainder, *nil*, except for less than 0·001 per cent. on the outside surface. Under the microscope the inside surface was seen to be rough and deeply corroded. The gold was found in association with the graphite, hence had doubtless percolated into cracks left by oxidation of the graphite. Sections taken from cast iron amalgam trays showed a similar appearance.
—B. M. V.

Gold, silver, and platinum; Determination of ——. Trenkner. Metallurgie, 1912, **9**, 103—105.

THE following method gives results within 0·5 per thousand, or closer in experienced hands. 0·5 grm. of bullion, if finer than 250 per thousand, or 1 grm., if baser, is mixed with pure silver in the proportion of about 10 of silver to 1 of gold and platinum. 3 to 15 grms. of lead are added, and the whole cupelled. Allowing for added silver, the weight of the button gives silver, gold, and platinum together. The silver loss during cupellation is best determined by control assays. The addition of so much silver results in the entire removal of lead from the obtained button. No appreciable amount of gold or platinum is lost. The button is parted, without flattening, in 25 c.c. of concentrated sulphuric acid, nearly boiling, for 30 minutes. The residue is coherent, and is washed, and dissolved in *aqua regia*, and the solution evaporated to small bulk, diluted, and the silver chloride filtered off. To the filtrate is added 15 c.c. of hydrochloric acid, and 1 grm. of hydrazine hydrochloride. After one hour, with occasional stirring, the gold is filtered off, ignited, and weighed. As it often contains some platinum, it is cupelled with 5 to 8 parts of silver, and the button parted in nitric acid. Silver and platinum dissolve. The pure gold is weighed. Platinum is precipitated from solution by an excess of ammonia or potassium hydroxide, ignited, and weighed.—R. W. N.

Platinum, rhodium and hydrogen. A. Sieverts and E. Jurisch. Ber., 1912, **45**, 221—229.

HYDROGEN is much less soluble in compact platinum than in the same weight of iron, nickel, or even copper (see this J., 1910, 571, 1161). The solubility increases with rising temperature when the pressure is constant, and when the temperature is constant the quantity of hydrogen absorbed varies directly as the square root of the pressure. If platinum which has been saturated with hydrogen at high temperature is allowed to cool in the gas, all the hydrogen is given off, while at ordinary temperatures the amount of hydrogen absorbed by compact platinum is not measurable. It is noteworthy that, at temperatures (576° C.) where the rate of diffusion of hydrogen through platinum is already considerable, its actual solubility is too small to be measured with accuracy (less than 0·01 mgrm. in 100 grms. of platinum). Carbon dioxide and sulphur dioxide show no tendency to dissolve in platinum. Precipitated rhodium gives off large quantities of gas containing carbon dioxide, hydrogen, oxygen, and water vapour, when heated *in vacuo*. 4 grms. of the metal after this treatment do not dissolve measurable quantities of hydrogen or carbon dioxide between 420° C. and 1020° C. —W. H. P.

Cuprous oxide and silica; Fusions of ——. C. N. Otin. Metallurgie, 1912, 9, 92—99.

Cuprous oxide and silica were fused together in various proportions, and the cooling curves and micro-structure of the products observed. Some of the cooling curves show several arrests, indicating the presence of a ternary system, *i.e.*, the oxidation of some of the cuprous oxide to cupric oxide. The following compounds are formed: $5Cu_2O,SiO_2$; $3Cu_2O,SiO_2$; $2Cu_2O,SiO_2$; and Cu_2O,SiO_2. Sections show a separation of cuprous oxide from a eutectic. The cooling curves of the 3 : 1, 2 : 1, and 1 : 1 melts show long pauses at 1062°, 1042°, and 1048° C. respectively. The 4 : 1 and 4 : 3 melts also show transition points at 942° and 920° C. respectively.—R. W. N.

Copper-amalgam. A. Guntz and De Greift. Comptes rend., 1912, **154**, 357—358.

Copper-amalgam, prepared in the cold (*e.g.*, by electrolysis with a mercury cathode), and submitted to increasing pressures in chamois-leather, loses mercury until a residue corresponding in composition to the formula, HgCu, is obtained, from which mercury cannot be removed even by a pressure of 6250 kilos. per sq. cm. Amalgams of this composition prepared in the cold, melt at 135° C., and after cooling again, practically the whole of the mercury can be removed by pressure. Copper-amalgams, shortly after being heated above 135° C., possess densities equal to those calculated on the assumption that the two metals are simply mixed; but if the amalgams are prepared in the cold, or if after heating they have remained cold for several days, their densities are considerably higher than those calculated. The authors conclude that copper-amalgams formed in the cold contain a compound, HgCu, dissolved in excess of mercury which may be removed by pressure in chamois-leather. This compound is decomposed at 135° C., and on cooling again, is re-formed completely only after about 3 days.—J. H. L.

Bronzes [Bearings]; Wearing of ——. Portevin and Nusbaumer. Rev. de Mét., 1912, **9**, 61—77. (See this J., 1912, 190.)

The wearing away of the bronze when pressed against a rapidly rotating steel disc was found to be proportional to the percentage of tin—and more generally to the proportion of the constituent δ—present in the alloy. Of the bronzes free from phosphorus, those high in tin suffered more wear and those low in tin less wear than the bronzes containing phosphorus.—W. E. F. P.

Lead [in alloys]; Electrolytic determination of —— *using a gauze cylinder anode.* B. Woiciechowski. Met. and Chem. Eng., 1912, 10, 108.

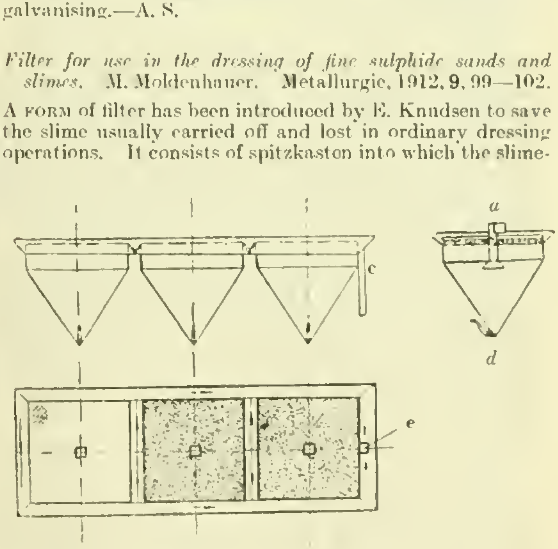
The following method has proved successful for obtaining good deposits of lead dioxide on gauze cylinder anodes, with agitation of the electrolyte. In the case of Babbitt metals with a lead base, the tin and antimony are separated from the lead and copper by means of sodium sulphide, and the copper and lead sulphides are dissolved in 10 c.c. of nitric acid, the solution filtered, the filter paper and precipitated sulphur burnt, and the residue dissolved in nitric acid and added to the main solution. Sufficient nitric acid is added to give an excess of about 45 c.c. of concentrated acid in 150 c.c. of solution, the solution is heated to boiling, and electrolysed for one or two minutes with 3 ampères and then for 20—30 minutes with 5 ampères. For calculating the amount of lead from that of the dioxide, Smith's factor, 0·8643, is used instead of the theoretical 0·8660. When large quantities of other metals are present, especially copper, and the lead content does not exceed 10—12 per cent., *e.g.* in the case of brasses, considerably less nitric acid may be used. For agitating the electrolyte, the author strongly recommends the magnetic rotating device known as the Frary solenoid. With this process and apparatus, quantities of lead dioxide ranging from 0·0005 grm. to 2 grms. can be deposited without difficulty.—A. S.

Galvanising wire in zinc dust. A. Sang. Trans. Amer. Electrochem. Soc., 1911, **20**, 259—263.

When zinc dust is heated uniformly, the rate of rise of temperature is much above the normal between about 390° and 470° C., the maximum rate being at about 420° C.; on subsequently cooling, an effect of opposite character is observed between 450° and 260° C., with a maximum at about 350° C. The exothermic effect with rising temperature occurs near the melting point of zinc (about 415° C.), and the author considers that galvanising in zinc dust at temperatures respectively below and above 420° C. are essentially different processes. Zinc dust is regarded as being in a physically unstable condition, and consisting of minute globules with a rigid spherical crust of oxidised zinc within which molten zinc has solidified. Above 420° C. it is composed of minute bags of molten zinc, which owing to their small size and closely packed condition will not coalesce unless subjected to considerable pressure. On introduction of a metal such as iron, electro-negative to zinc, however, the zinc oxide is reduced, the crust is ruptured, and the iron comes in contact with molten zinc. Hence the author's process of galvanising in zinc dust at high temperatures (this J., 1910, 29, 359) is considered to be quite distinct from "sherardising" (see this J., 1909, 399; 1910, 762) and to be in fact a form of hot galvanising.—A. S.

Filter for use in the dressing of fine sulphide sands and slimes. M. Moldenhauer. Metallurgie, 1912, 9, 99—102.

A form of filter has been introduced by E. Knudsen to save the slime usually carried off and lost in ordinary dressing operations. It consists of spitzkasten into which the slime-bearing water is introduced (at *a*) below a horizontal filter-bed which closes the spitzkasten near the top. The filtering layer consists of coarse jig material (about 5—10 mm.) on a perforated metal plate. The outflow can be regulated by the use of an arrangement at *d*, to increase or diminish the aperture as desired. It is claimed that practically all the slime is retained. The filter-bed becomes partly clogged after about 50 hours' working, and is cleaned in a few minutes by shovelling over and spraying.



One sq. meter of filter-bed deals effectively with 0·5 litre of water per second. The clarified water contained only 2·3 grms. of suspended matter in 10 litres.—R. W. N.

Erratum.

This J., 1912, 191, col. 1, second abstract. Insert authors' names:—S. J. Johnstone and T. Crook.

Determination of sulphur in pyrites. Heczko. *See* VII.

Aluminium fermentation vats: Wild. *See* XVIII.

Patents.

Iron ores; Concentration of oolitic silicious ——. R. Reich. Fr. Pat. 433,793, Aug. 31, 1911. Under Int. Conv., Aug. 31, 1910.

The ores in question consist of grains of iron oxide and quartz cemented together by a richly ferruginous gangue. The ore is heated to a temperature not exceeding 300° C. in rotary furnaces and is then quickly cooled in water and subjected to grinding. The fine cementitious material is washed away and recovered. The grains of quartz and iron oxide sink, and, after drying, are separated by electro-magnetic separators or by other means.—T. St.

Pig iron; Manufacture of ——, *using "raw" wood as fuel.* F. Prudhomme. Fr. Pat. 434,014, Sept. 6, 1911.

The blast-furnace is provided with a considerable number of inclined tuyères arranged in sets one above the other. In the example given there are five sets each containing 25 tuyères. Each tuyère is fitted with a damper to control the air supply. It is claimed by this arrangement that the gases produced by the distillation of the wood are completely burnt in the furnace, thus yielding a considerable amount of heat, and that the temperature in the different parts of the furnace is easily controlled, thereby ensuring that the wood is completely carbonised before it reaches the zone of fusion.—T. St.

Armour plates. Vickers, Ltd., Sheffield, and J. L. Benthall, Chesterfield, Derby. Eng. Pat. 14,060 of 1911; date of Appl., Oct. 14, 1910.

A nickel steel armour plate, which may contain either chromium, vanadium, tantalum, or molybdenum in addition is subjected to cementation on its face, bent to shape, oil hardened, and sprinkled after heating in the usual manner. It is then machined and drilled. The final hardening is carried out by heating the plate to 1100°—1250° F. (600°—660° C.) and whilst still hot placing it on supports on a base plate. After being bricked round to protect the edges, leaving a space between it and the base plate, it is placed in a furnace at 1850°—2050° F. (1010°—1120° C.) according to the thickness of the plate. The face having attained the desired temperature, the plate is quenched on the face and back in the usual manner. The quenching of the cemented face at the high temperature produces the desired glass hardness, whilst the quenching of the back at the temperature of the first furnace produces the requisite toughness and high tensile strength at the back.—A. H. C.

Steel castings; Process for hardening ——. J. W. Gebhard, Muncie, Ind., Assignor to Armor Steel and Foundry Co., Chicago. U.S. Pat. 1,015,554, Jan. 23, 1912.

The mould in which the steel is cast is faced with a paste made by mixing 20 lb. of finely powdered manganese and 8 oz. of finely powdered "chrome," with 5 oz. of a vegetable oil.—A. H. C.

Steel; Refining of ——. A. M. Chrétien. Fr. Pat. 433,808, Aug. 31, 1911.

The refining furnace (of any form) is provided with tuyères situated below the refining zone and so arranged that the blast may be caused to distribute through the steel any material, liquid or solid, which it is desired to add. The blast may be air, steam, or any other gas, oxidising, neutral, or reducing, to suit particular cases.—T. St.

Steel, iron, metals and alloys; Method of casting to obtain —— *sound and homogeneous.* M. Reymondier. Fr. Pat. 434,070, Nov. 14, 1910.

The object aimed at is to prevent the incorporation of bubbles of gas, oxides, slag or other foreign matter with the metal being poured. To prevent the formation of oxides the metal is kept out of contact with the air, the moulds and channels being filled with an inert gas such as carbon dioxide or nitrogen; also the whole front of the furnace may be covered by a movable, bell-shaped chamber filled with the inert gas. The same object is attained by filling the mould from the bottom by means of a pipe communicating with the bottom of the ladle, the mould and pipe having been previously filled with the inert gas. To prevent bubbles of gas from becoming admixed, the stream of metal should be kept nearly horizontal and flowing at a moderate speed. To this end the various vessels may be mounted on trunnions. Thus by placing the ingot-mould in a nearly horizontal position at the beginning of pouring, the metal may be made to run gently down the side.—T. St.

Ferro-manganese and other alloys of iron; Furnace for melting and keeping molten ——. Rombacher Hüttenwerke and J. I. Bronn. Fr. Pat. 434,120, Sept. 11, 1911. Under Int. Conv., Nov. 4, 1910.

In the melting of ferro-manganese in arc furnaces if the electrode is allowed just to touch the surface of the metal and so low a voltage is used that the fall of potential due to the resistance of contact is below 30 volts, there is no appreciable loss of manganese. Furnaces designed on this principle are described using single- and three-phase currents. If the metal be confined in channels constructed in the bed of the furnace, it may be heated chiefly by resistance whilst the slag is heated by the arc. The cross-section of the metal is preferably calculated to make the fall of potential from the two causes approximately equal. Such a furnace working with a three-phase current would have two channels joined at one end. At this common point would be the only movable electrode, thus effecting economy both in material and labour. In order to simplify the mounting and dismounting of the fixed electrodes, the following method of connection is used:—The cables from the transformer terminate in copper strips which are carried round a water-cooled metal body mounted on the carbon electrode and pressed hard down on the latter by means of a steel screw situated above. (See also this J., 1911, 1162.)—T. St.

Ore concentration. E. H. Nutter and Minerals Separation, Ltd., London. Eng. Pat. 2383, Jan. 30, 1911.

In the concentration of ores by agitation-aeration and froth flotation, the mixing of the ore with the necessary water and frothing agent is effected in vessels, provided with slow-speed agitators, from which the mixture is delivered to a high-speed centrifugal apparatus adapted for the admission of air. The air is beaten into the pulp under a pressure above that of the atmosphere and corresponding to the rate of rotation, the aerated material being finally discharged into the froth-separating apparatus.
—W. E. F. P.

Metals; Welding or cutting ——, *by means of the blowpipe flame.* A. E. Knowles, Wolverhampton. Eng. Pat. 4487, Feb. 22, 1911.

The combustible gas and the oxygen employed are dried by means of suitable desiccating agents before entering, or after leaving, the cylinders in which they are compressed. In the latter case the drying is effected, under pressure before the gas reaches the regulator of the cylinder.
—W. E. F. P.

Ores; Chlorinating roasting of ——. Helsingborgs Kopparverks Aktiebolag, Helsingborg, Sweden. Eng. Pat. 11,515, May 12, 1911. Under Int. Conv., May 25, 1910.

The air necessary for the roasting process is preheated by being brought into contact with the roasted material and then further heated by means of a separate heating apparatus before being introduced into the chlorinating furnace. The necessary heat for the process is obtained by the use of this heated air and the combustion of the sulphur in the ore. The air may also be heated indirectly by the gases produced by the combustion of fuel, the gases being subsequently used for preheating the raw ore.—A. H. C.

Metal plates; Composite ——. J. Liddle, Glasgow. From Hoyt Metal Co., St. Louis, U.S.A. Eng. Pat. 19,732, Sept. 5, 1911.

The plate consist of a face metal of lower specific gravity than the cheaper base metal which forms the back. The base metal (*e.g.*, lead or a lead alloy) is melted and poured into an open flat mould, and whilst still liquid a sheet of the facing metal (*e.g.*, Britannia metal) is placed upon it without itself being melted, and the whole allowed to solidify. The composite plate may then be rolled to the required thickness.—A. H. C.

Vanadiferous ores; Process of producing copper, lead, or iron vanadate from ——. W. F. Bleecker, Boulder, Colo., Assignor to The Rare Metals Mining and Milling Co. U.S. Pat. 1,015,469, Jan. 23, 1912.

The vanadiferous ores are roasted with sodium chloride and potassium hydroxide, leached with water and then with acid, the resulting solutions being neutralised and then precipitated by means of salts of either copper, lead, or iron.—A. H. C.

Metals [vanadium, molybdenum, tungsten]; Extraction of —— *the highest oxides of which are soluble in fused alkalis or alkali carbonates.* A. H. Perret. First Addition, dated Aug. 4, 1911, to Fr. Pat. 412,641, Jan. 26, 1910 (this J., 1910, 1016).

In the method as described in the original patent, the fused mass was poured into water. The improvement claimed is to pour the fused mass either on the ground, or better, into a pit 10 to 15 cm. deep. The mass, which thus cools slowly, is finally ground to a fine state of division and extracted with successive quantities of boiling water. The solution so obtained is evaporated till it has a density of about 40° Beaumé, and is then treated as described in the original patent for the recovery of the contained metals.—T. St.

Electroplating apparatus. T. A. Edison, Llewellyn Park, N.J. U.S. Pat. 1,016,875, Feb. 6, 1912.

The apparatus comprises separate electroplating baths containing nickel sulphate and copper sulphate, the cathode being successively plated with the two metals. After removal from each bath, the cathode is washed in a stationary receptacle, and by a suitable arrangement the wash water may be run into separate apparatus for the recovery of the nickel or copper salts respectively.—B. N.

Alloy; Acid-resisting ——. O. Delfosse. First Addition, dated Aug. 3, 1911, to Fr. Pat. 419,292, Aug. 10, 1910 (this J., 1911, 136).

The alloy consists of 1000 parts by weight of lead, 12 parts of ferro-silicon, 4 parts of ferro-chrome, and 40 parts of antimony. The ferro-silicon and the ferro-chrome are crushed and melted together. The antimony, after being crushed, is then added, and the whole well mixed. The melted mixture is then poured into the lead which has been melted separately, and the whole well mixed.—T. St.

Aluminium and its alloys; The soldering of —— *with aluminium or other metals.* L. Rudemann. Fr. Pat. 433,716, Aug. 29, 1911. Under Int. Conv., Aug. 31, 1910.

The soldering is accomplished by the use of a material which at a temperature well below the melting point of aluminium or its alloys will react chemically with aluminium producing suddenly a heat sufficiently intense to cause a film of the metal to melt at the surface of contact. An appropriate material for the purpose is a mixture in suitable proportions of zinc chloride, sodium chloride and ferric chloride.—T. St.

Aluminium; Improving the mechanical and chemical properties of ——. W. Borchers and H. Schirmeister. Ger. Pat. 242,313, May 28, 1911.

Alloys of the following composition are claimed:—(*a*), aluminium, 91—88·8; cobalt, 8—10; and tungsten, 0·8—1·2 per cent.; (*b*), aluminium, 90—89; cobalt, 9—10; and molybdenum, 0·6—1 per cent. (See also this J., 1911, 1318).—A. S.

Aluminium or alloys rich in the metal; Process for melting scrap consisting of ——. H. Weber. Ger. Pat. 242,347, Dec. 30, 1910.

Fluorides of heavy metals or mixtures of fluorides of light metals and compounds of heavy metals are added to the scrap. Fluorides of zinc, copper, and nickel or their double salts or mixtures with alkali fluorides are said to be specially suitable. The heavy metal is reduced and alloys with the aluminium, and the fluorine combines with aluminium to form aluminium fluoride, which alone or conjointly with alkali fluoride dissolves any alumina present, forming a slag which rises to the surface. A mixture of zinc chloride and sodium fluoride may also be used.—A. S.

Furnace; Gas-fired metallurgical —— *for the treatment of ores difficultly fusible.* D. Tschernoff and M. Sendzikowski. Fr. Pat. 433,738, Aug. 30, 1911.

The furnace is of the usual blast-furnace shape, and is designed for the treatment of metallic oxides such as iron ores. Reduction is brought about by the action of carbon monoxide supplied into the body of the furnace. As the temperature of reduction is too low to cause the reduced iron to melt, a supply of producer-gas is drawn from the generators and burnt with hot air in the hearth of the furnace, thus producing a very high temperature. The hot gases arising from this combustion are not allowed to rise through the furnace, but are drawn off at the upper portion of the hearth and are utilised for heating the air used in the formation of the producer-gas, and for mixing with the gas to burn in the hearth.—T. St.

Zinc ores [blende]; Oxidising roasting of sulphide —— *in combustion gases containing oxygen and water vapour.* W. Borchers, R. Schenck, and F. Thomas. Ger. Pat. 242,312, May 13, 1910.

A portion of the heat and water vapour used in the process is developed by the combustion of a suitable fuel (tar, pitch, caking coal, etc.), which is mixed with the pulverised ore and formed into briquettes therewith. The briquettes are roasted at 700°—800° C. on movable grates or in rotary kilns or other suitable apparatus, by means of an oxidising flame, the briquettes being caused to move slowly one against the other, so that the outer crust consisting mainly of zinc oxide is rubbed off. The residual pulverulent material finally falls into a chamber, nearer the furnace or fire, in which it attains the maximum temperature (somewhat above 800° C.), whereby any zinc sulphate present is decomposed, without any considerable amount of zinc being volatilised.—A. S.

Armour-plate and other steel article. F. Giolitti, Rome, Assignor to Soc. Anon. Italiano Gio Ansaldo Armstrong and Co., Genoa, Italy. U.S. Pat. 1,016,560, Feb. 6, 1912.

See Eng. Pat. 17,935 of 1906; this J., 1907, 1012.—T. F. B.

Iron and steel; Process of making ——. A. Boucher. Fr. Pat. 433,839, Nov. 7, 1910.

See Eng. Pat. 29,830 of 1910; this J., 1911, 961.—T. F. B.

Zinc furnaces; Recuperative ——. A. Folliet-Mieusset, Liege, Belgium. Eng. Pat. 2250, Jan. 28, 1911.

See Fr. Pat. 430,942 of 1911; this J., 1911, 1393.—T. F. B.

Ores; Mechanico-chemical process for the separation of ——. Comp. d'Enterprises de Lavage de Minerais, Paris. Eng. Pat. 8154, March 31, 1911. Under Int. Conv., April 8, 1910.

See Fr. Pat. 414,660 of 1910; this J., 1910, 1211.—T. F. B.

Ores, Apparatus for amalgamating and concentrating ——. R. Luckenbach. Fr. Pat. 432,681, July 27, 1911.

See Eng. Pat. 3124 of 1911; this J., 1911, 961.—T. F. B.

Cupriferous substances; Process for treating ——. Bradley Copper Process Co. Fr. Pat. 433,622, June 8, 1911. Under Int. Conv., June 23, 1910.

See U.S. Pat. 1,011,562 of 1911; this J., 1912, 78.—T. F. B.

Tungsten wire of very small diameter, suitable for electric incandescence lamps, and its process of manufacture. Fr. Pat. 433,596. *See* IIb.

XI.—ELECTRO-CHEMISTRY.

Electrolytic production of salts of trivalent vanadium. Renschler. *See* VII.

Electrical separation of carbon [lampblack] from flames. Thieme. *See* XIII.

Patents.

Separators and sheaths for electrodes of secondary batteries. V. de Karavodine. Eng. Pat. 2493, Jan. 31, 1911.

The separators and sheaths are constructed from pyroxylin threads, by winding the thread "around a flat mandrel so as to constitute two series of open convolutions extending at right angles to one another." The structure, whilst still supported on the mandrel, is dipped in a solvent in order to cause the threads to become autogenously cemented together at their points of mutual contact. The solvent is removed by washing in water, and the structure is removed from the mandrel by severing the "bights" of the threads, where they cross one edge, or all four edges, of the mandrel.—B. N.

Electrodes, Storage battery ——. H. C. Hubbell, Newark, N.J., U.S.A. Eng. Pat. 21,783, Oct. 2, 1911.

Ferrous hydroxide is precipitated from a solution of a salt of iron, filtered off, washed, and transferred without substantial exposure to air to a retort provided with a small vent hole. The retort is heated to drive off the free water from the precipitate, then raised to a red heat to convert the hydroxide into ferrous oxide, and the contents cooled with the vent closed. The oxide is briquetted, with or without admixture of nickelous or cobaltic hydroxide or cadmium oxide or their equivalents such as the finely-divided metals, and converted into tablets, suitable for insertion in the pockets of a conducting containing envelope of an alkaline storage battery electrode.—B. N.

Electrolyte [in a secondary cell]; Method for preventing depletion of ——. T. A. Edison, Llewellyn Park, N.J., Assignor to Edison Storage Battery Co., West Orange, N.J. U.S. Pat. 1,016,874, Feb. 6, 1912.

The cell consists of a closed containing vessel provided with an electrical connection across the terminals, this connection including a member mounted within the gas space of the cell, and adapted to be heated by passage of the current to a temperature above that at which hydrogen and oxygen combine to form water. The gases evolved during the charging thus recombine and prevent depletion of the electrolyte.—B. N.

Electro-osmosis; Treating substances by ——. Felten und Guilleaume Carlswerk A.-G., Mülheim-on-Rhine, Germany. Eng. Pat. 17,597, Aug. 2, 1911. Under Int. Conv., Aug. 2, 1910.

The substance is suspended or dissolved in a non-aqueous liquid in which it is not substantially dissociated.—B. N.

Electrically-conductive materials; Purifying ——. C. C. Ruprecht, Cleveland, Ohio. U.S. Pat. 1,016,097, Jan. 30, 1912.

The material is reduced to a molten or semi-plastic condition, and the molten mass rotated to subject it to centrifugal action. An electric current is passed through the rotating mass radially from the central part to the peripheral portion, so as to drive the impurities towards one of the electrodes used for the passage of the current.—B. N.

Hard vitreous substances; Method of hermetically sealing electrical conductors through or into ——. G. B. Burnside, Renfrew, Scotland. U.S. Pat. 1,016,320 Feb. 6, 1912.

The vitreous substance which surrounds the electrical conductor, and with it forms the seal, is first heated until perfect cohesion has been effected between the conductor and the vitreous substance, which is then allowed to cool to about a dull red heat. The seal is then suddenly cooled, or put through a process of hardening, by immersing it in an oleaginous substance, the vitreous substance being thus fixed round the electric conductor.—W. C. H.

Electrodes employed in electric furnaces; Utilisation of ends, residues or waste of ——. Stockholms Superfosfat Fabriks Aktiebolag. Fr. Pat. 433,594, Aug. 25, 1911. Under Int. Conv., May 17, 1911.

The ends or residues are united together by means of suitable junction pieces, and luted with a mass which in the furnace acquires the same physical properties, or nearly so, as the electrodes.—B. N.

Gaseous reactions in the voltaic arc; Production of ——. Dynamit A.-G. vorm. Nobel und Co. Fr. Pat. 433,836, Sept. 1, 1911.

The arc is completely surrounded by a series of hollow horizontal rings, placed a short distance apart, each ring supporting several horizontal aspirating tuyères directed towards the periphery of the arc. Each ring is supported above and below by refractory rings, spaces being left between adjacent refractory rings in order to admit the gas to the periphery of the arc. Each part of the arc is thus employed for the action, and the gas is rapidly aspirated, after contact with the arc, through the tuyères, which are cooled with water, into the hollow rings communicating with a common passage for leading off the gas.—B. N.

Electric arc lamps [for gas reactions]. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 1527, Jan. 20, 1911.

See Addition of Jan. 26, 1911, to Fr. Pat. 357,358 of 1905; this J., 1911, 905.—T. F. B.

Electrodes for electrical furnaces. Planiawerke Akt.-Ges. f. Kohlenfabrikation, Berlin. Eng. Pat. 18,733, Aug. 19, 1911. Under Int. Conv., Oct. 6, 1910.

See Fr. Pat. 433,204 of 1911; this J., 1912, 138.—T. F. B.

Electric furnace; Rotary —— *principally for making aluminium nitride.* O. Serpek. First Addition, dated Oct. 28, 1910, to Fr. Pat. 430,553, Aug. 11, 1910.

See Eng. Pat. 29,715 of 1910; this J., 1911, 1222.—T. F. B.

Ozone producer with treatment bottle attachment for destruction of tubercule bacilli. Eng. Pat. 18,626. *See* XIXb.

XII.—FATS; OILS; WAXES.

Lipase; Occurrence and permanence of —— *in the fat of the common fowl.* M. E. Pennington and J. S. Hepburn. J. Amer. Chem. Soc., 1912, 34, 210—218.

The post-mortem changes in chicken fat include a pronounced increase in acidity which is due to the presence of lipase in the crude fat. The fat of the fowl immediately after death shows almost no lipolytic activity. It is therefore probable that the lipase, during life, exists in its zymogenic form but after death the enzyme becomes active and the acidity of the fat increases. Lipase is less active at temperatures below than above 0° C. but the enzyme retains its activity even after exposure to a freezing temperature for over seven years.—J. A.

Fats; New method for determining melting points of ——. R. Prouzergue. Ann. Chim. Analyt., 1912, 17, 56—58.

A piece of thin glass tubing about 25 cm. long and 5 mm. in diameter is drawn out and cut off so as to leave a capillary opening. This is thrust into the fat, previously melted and cooled for 24 hours, so that a fine column of the fat penetrates for 2 or 3 mm. inside the capillary point. This is then cautiously passed through a flame, so as just to melt the fat and cause it to close the capillary opening. The upper part of the tube is then half filled with distilled water, to which a drop or two of phenolphthalein indicator has been added. The tube is attached to a thermometer, and warmed gradually in a test-tube about 20 cm. long and 15 mm. in diameter, containing a 1 : 10,000 solution of sodium hydroxide, the level of which must be 1 or 2 cm. above the level of the phenolphthalein in the smaller tube. As soon as the fat melts, the alkaline liquid enters the capillary tube and comes into contact with the phenolphthalein indicator, producing a pink colour. It is proposed to designate this temperature as the "nascent melting point," and to indicate it by the conventional sign Fn; to distinguish it from the ordinary melting point, read when the fat is entirely fluid and indicated as Fl.—J. O. B.

Fish oils; Viscosity of ——. G. F. White. J. Ind. Eng. Chem., 1912, 4, 106—110.

The author determined the viscosity of about twenty different fish oils at temperatures of 30°, 50°, 70° and 90° C., the apparatus used being a modification of one described previously (Biochem. Zeits., 1911, 37, 482), and of the type in which a constant amount of liquid is passed through a capillary tube of known diameter and length, the time of flow being regulated by a variable pressure adapted to the nature of the liquid. The results are given in tables and curves. Measurements at 30° C. before and after heating the oils to 90° C. and then cooling, showed that the viscosity was not affected by the heating. The separation of solid fats (on standing) from sand shark liver (*Carcharias littoralis*) oil had practically no effect on the viscosity of the oil. The fluidities of the oils are not linear functions of the temperature, the increase with rise of temperature being relatively greater at higher than at lower temperatures; and the author concludes that the oils are more or less associated at ordinary temperatures, and that this association is destroyed with rise of temperature.—A. S.

Cholesterol; Errors in the quantitative determination of —— by Ritter's method: influence of autolysis upon cholesterol. H. J. Corper. J. Biol. Chem. 1912, 11, 37—45.

The quantitative methods for cholesterol estimation practically all depend either on the saponification of the fat to be examined and the recovery of the cholesterol as such, or upon esterification of the cholesterol and the estimation of the iodine or saponification values. The author has tested Ritter's method (this J., 1901, 1147; 1902, 643) which is the one most commonly used, and finds that the presence of an excess of sodium ethoxide above that necessary for the saponification of the fats and esters prevents the complete extraction of cholesterol from the salt mixture by means of ether. This error may vary from 5 to 20 per cent. in the case of a normal tissue when there is an excess of from 1—3 c.c. of a 5 per cent. solution of sodium ethoxide used in the saponification of 1·5 grms. of the alcohol ether extract. In tissues it is impossible to know the exact amount of fats and esters present and hence the amount of sodium ethoxide required, and the Ritter method must therefore be used only with these restrictions and precautions in mind.—E. F. A.

Glycerin; Specific gravity and hygroscopicity of ——. A. Kailan. Z. anal. Chem., 1912, 51, 81—101.

On re-determining the specific gravity of anhydrous glycerin at temperatures between 14° and 20° C., values were obtained agreeing well with those found by other workers, namely 1·26114 at 15°/4° C., and 1·26082 at 20°/4° C., and the following equation representing the relation between temperature and specific gravity was deduced: sp. gr. at $t°/4°$ C. $= 1·26113 + (15 - t)\ 0·000632$. A series of boiling point determinations with anhydrous glycerin under diminished pressures (32—9 mm.) were carried out, and values corroborating those found by graphical interpolation of the vapour tensions determined by Richardson (J. Chem. Soc., 49, 764) obtained. Experiments on the hygroscopicity of anhydrous glycerin, and of aqueous solutions of glycerin, showed that in an atmosphere of average moisture content, equilibrium is reached with a mixture of about 80 per cent. of glycerin. Relative determinations of the hygroscopicity of concentrated alcohol and of concentrated glycerin indicated that the former absorbs water about four times more rapidly than the latter.—J. P. O.

Colorimetric detection of alcohol in presence of acetone. Colour reaction of certain organic groups in presence of mineral acids and potassium bichromate. Agulhon. *See* XX.

Patents.

Coal tar hydrocarbons soluble in water; Process for making —— and soaps obtained thereby. P. G. List, Tübingen and G. Schmidt, Offenbach on Maine, Germany. Eng. Pat. 2137, Jan. 27, 1911.

See Fr. Pat. 422,953 of 1910; this J., 1911, 610.—T. F. B.

Process and means for the complete transformation of soya beans. Fr. Pat. 433,986. *See* XIXa.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Carbon [lamp black]; Electrical separation of —— from flames. B. Thieme. B. Elektrochem., 1912, 18, 131.

The author's method depends on the fact that the soot is deposited on the negative pole when two electrodes are inserted into a hydrocarbon flame. A row of acetylene flames is traversed by a wire 3 mm. in diameter which acts as the positive pole. Above this is suspended a negative pole of wire gauze which is suspended so as to be free to swing in the direction of an electromagnet operated by the same circuit. When the deposited soot touches the positive wire and the current is thereby increased to a few milliamperes the magnetic circuit is closed and the negative gauze is quickly drawn out of the flame by the magnet and the soot shaken off by the impact. The magnetic circuit is thus opened and the gauze returns to its position in the flame. In this way soot of great fineness and free from hard lumps can be rapidly prepared. The current passing through the flame during the deposition is quite small, being of the order of less than one milliampere.
—W. H. P.

Pine oil in oil of turpentine; Detection of ——. C. Piest. Chem.-Zeit., 1912, 36, 198.

Five c.c. of the sample are shaken with 5 c.c. of acetic anhydride and then 10 drops of hydrochloric acid are added, with agitation and cooling. The mixture is next shaken with a further 5 drops of hydrochloric acid, whereupon it becomes hot. On allowing to cool, the solution remains clear and colourless or acquires a faint yellowish tinge in the case of oil of turpentine, but darkens if pine oil be present; 10 per cent. of the latter can be easily detected and even with 5 per cent. a faint darkening is produced. In the case of old samples of oil of turpentine, these are distilled and the distillate tested.—A. S.

PATENTS.

Adhesive ; Moisture proof ——. F. Rampichini, Trieste, Austria. Eng. Pat. 4253, Feb. 20, 1911.

A MIXTURE of about 20 kilos. of brown or yellow gum-lac and 100 litres of acetone is stirred six or seven times for two days at a temperature of 30° C. The solution, which is decanted, contains about 2 per cent. of a very elastic, soft substance, the properties of which are totally different from those of the gum-lac. To the solution are added about 10 to 20 per cent. of celluloid, a moisture-proof glue being thus obtained which is very suitable for application to cloth, leather, etc. Claim is also made for use of the adhesive in the manufacture of seamless shoes, and leather belting for power transmission. L. E.

Plastic compositions for linoleum, etc. Bremer Linoleumwerke Delmenhorst, Delmenhorst, Germany. Eng. Pat. 26,959, Dec. 1, 1911. Under Int. Conv., Dec. 27, 1910.

AN improved plastic composition is claimed, for making linoleum and the like material in which ground cork or wood is wholly or partially replaced by ground or pulverised rice husks.—H. E. P.

Betulin suitable for the production of coating compositions thereof ; Process of making ——. J. R. Köhler, Stockholm. U.S. Pat. 1,016,162, Jan. 30, 1912.

SEE Fr. Pat. 431,198 of 1911 ; this J., 1911, 1398.—T. F. B.

XIV.—INDIA-RUBBER ; GUTTA-PERCHA.

Rubber mixings ; Ceresin wax in ——. W. J. Britland and H. E. Potts. India Rubber J., 1912, 43, 333—337.

HINRICHSEN and Kindscher (this J., 1910, 439) have found that the resin content (acetone extract) of vulcanised rubber is increased by the presence of ceresin. The present paper deals with mixings containing less ceresin in quantities more near to technical practice, *i.e.* 3 per cent., and it was found that this amount of ceresin did not cause any increase in resins, in the case of two sets of rubber mixings very carefully made up under identical conditions with and without ceresin. If anything the resin content was somewhat less in the mixings containing ceresin. One set of mixings was examined again after 3 months, and it was found that in the mixing with ceresin, the acetone extract had increased by 0·87 per cent., while in that without ceresin it had risen by 1·17 per cent. Thus judged by the resin content, the ceresin exercised a slight beneficial effect rather than the reverse. It was found that the method of ceresin estimation described by Martens (this J., 1910, 99) gave results of 2·4 per cent. instead of 3 per cent., working with known amounts of ceresin. A correction was accordingly applied in the ceresin estimations required for the above comparison.—H. E. P.

Hevea ; Experimental tappings of ——. Gummi-Zeit., 1912, **26**, 732.

THE experiments were made on five 6½-year-old trees grown in the Belgian Congo from Malayan seed. About 25 per cent. of the trunk surface was tapped on the "half-herring-bone" system, tapping being commenced on March 6th, and continued until July 28, 1911. The wounds were re-opened daily, and figures are given for the yield of latex and of rubber from each tree after 1, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110 and 114 woundings. Great differences exist between the yields of the five trees, the lowest total yield being 80 grms. and the highest 826 grms., whilst the other three yields were 666, 476 and 526 grms. The trees were planted 6 metres apart, so that the total yield works out at 143 kilos. per hectare (126 lb. per acre). Of the total of 2574 grms. of rubber, 784 grms. were in the form of "scrap."—E. W. L.

Raw rubber ; The various methods of obtaining and preparing ——. A. Zimmermann. Gummi-Zeit., 1912, **26**, 721—722.

THE author in dealing with the two methods in use in the case of *Manihot* rubber, viz. : (1) coagulation on the tree trunk (Lewa method), and (2) collection of the latex and coagulation at the factory (Sandmann's method), points out that planters have still to reckon with the fact that raw rubber is, in commerce, generally valued by its outward appearance, colour, smell, extensibility and "nerve." Although, therefore, as shown by Frank and Marckwald, "Lewa" rubber may, both in the washed and in the unwashed state, give good results on vulcanisation, it does not follow that its market value will be in accordance with this fact, unless the method of preparation has been such as to secure to the raw product a good appearance and good mechanical properties. Special emphasis is laid upon the necessity of isolating "tacky" pieces of rubber, and of avoiding all undue crushing and mechanical treatment in the washing process where that is carried out on the plantations.—E. W. L.

Balloons ; Permeability to hydrogen of the envelopes of ——. Julhe. Comptes rend., 1912, **154**, 423.

THE author recommends that the rubber tissue which is permeable to hydrogen, be coated on the inside with a layer of fine unstarched cotton muslin, impregnated with a solution of gelatin in glycerin. This is exceedingly flexible, absorbs very little hydrogen, and thus prevents loss of gas and alteration of the rubber tissue.—J. T. D.

Exports of rubber from the Amazon Basin, via Pará, in 1911. Bd. of Tr. J., Feb. 22, 1912. [T.R.]

H.M. CONSUL at Pará furnishes the following statistics of the exports of rubber from Pará, Manaos, Iquitos, and Itacoatiara, *viâ* Pará, during the year 1911 :—

——	Fine.	Medium.	Coarse.	Caucho.	Total.
	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.
TO THE UNITED STATES FROM					
Pará	3,438,250	560,900	3,688,120	675,952	8,363,222
Manaos	4,156,353	1,015,991	1,426,902	964,768	7,564,014
Itacoatiara	1,120	840	—	—	1,960
Iquitos	91,785	15,408	27,719	41,799	176,711
Total	7,687,508	1,593,139	5,142,741	1,682,519	16,105,907
TO EUROPE FROM					
Pará	5,271,583	495,880	1,307,124	1,794,257	8,868,844
Manaos	5,161,902	921,868	911,919	1,922,567	8,918,256
Itacoatiara	76,557	10,273	46,175	2,665	135,670
Iquitos	642,106	93,426	267,929	1,009,548	2,013,009
Total	11,152,148	1,521,447	2,533,147	4,729,037	19,935,779
Grand Total	18,839,656	3,114,586	7,675,888	6,411,556	36,041,686

The total exports of rubber *viâ* Pará in 1910 amounted to 37,737,655 kilos., and in 1909 to 39,671,008 kilos.

Rubber exports from Federated Malay States in 1911. Bd. of Tr. J., Feb. 22, 1912. [T.R.]

The Federated Malay States "Government Gazette" of 19th January publishes the following particulars of the exports of cultivated rubber from the Federated Malay States during the twelve months ended December, 1910 and 1911:

—	1910.	1911.
	lb.	lb.
Perak	2,541,756	5,450,614
Selangor	8,241,388	11,737,386
Negri Sembilan	1,423,453	2,492,939
Pahang	5,929	14,361
Total	12,212,526	19,695,330

Patents.

Rubber or any substance; Apparatus for smoking ——. G. W. Sutton. Eng. Pat. 9190, Apr. 13, 1911.

Creosote passes from a tank through a tap into a branch pipe and through a number of jets controlled by needle-valves, drop by drop, on to a metal tray, heated from below by an oil lamp, where it is vaporised, any excess draining away through an overflow. The tap is controlled by a weighted lever which, when the tap is open, is supported horizontally by a chain from the storage tank. The chain is attached to the weighted lever by a soft metal link, which, in the event of the creosote becoming ignited, will fuse and allow the lever to fall, thus closing the tap and shutting off the supply of creosote to the vaporising tray.—E. W. L.

Caoutchouc; Producing —— from the latex of caoutchouc yielding plants. P. Freudweiler, Zurich, Switzerland. Eng. Pat. 19,784, Sept. 5, 1911.

The liquid latex is delivered on to the external surface of a rotating drum surrounded by a channel and a stream of dry air or smoke or a mixture of air and smoke is passed through this channel in a direction opposed to the direction of rotation of the drum. When the layer of dried coagulated rubber has become sufficiently thick, it is cut and detached from the drum.—H. E. P.

Caoutchouc substances; Manufacture of new ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 1125, Jan. 16, 1911.

New caoutchouc substances are produced from butadiene or its homologues or substitution products by submitting these substances to the action of alkali or alkaline-earth metals, or of mixtures, alloys or amalgams of these, including ammonium amalgam. The transformation can occur simply on standing at ordinary temperatures or can be accelerated by heat. (Reference is directed to Eng. Pat. 24,790 of 1910; this J., 1911, 1398.)—H. E. P.

Hydrocarbons; Process for the polymerisation of unsaturated ——. [*Artificial caoutchouc.*] Chem. Fabr. auf Actien (vorm. E. Schering). Fr. Pat. 433,825, Sept. 1, 1911. Under Int. Conv., Sept. 3, 1910.

Unsaturated hydrocarbons can be polymerised by heating with anhydrides of organic acids. For instance isoprene when heated to 150° C. with acetic anhydride gives a product possessing the properties of caoutchouc. —F. Shdn.

India-rubber substitutes or similar elastic material; Manufacture of ——. R. Desouches, A. Riasse, and A. Duron. Paris. Eng. Pat. 10,420, Apr. 29, 1911. Under Int. Conv., Nov. 28, 1910.

Powdered cellulose material, such as powdered cork, is heated with hydrocarbon oils in a closed vessel at about 130° C., freed from excess oil by pressure, and kept at a temperature not lower than 40° C. in order to protect it from moisture. 10—30 parts by weight of the oil-saturated material are then added to a mixture of say 50 parts by weight of gelatin and 50 of glycerin, contained in a jacketed heater provided with stirring blades attached to a vertical spindle, on which is arranged a heavy plunger which operates to discharge the mixed material through an outlet near the bottom of the vessel into moulds, and which is provided with recesses so as to clear the blades of the stirrer. Should the weight of the plunger be insufficient to cause the material to flow, a rack and pinion gear is brought into action to force it downwards. After the addition of the cellulose-material a suitable colouring matter and hardening agents such as formalin, chromic acid, trioxymethylene, etc., may be added in the proportion of 2 to 5 per cent. by weight. For the manufacture of an elastic substance from powdered india-rubber and resin oils, the powdered, oil-saturated, cork is added to the resin oils in the heater, and the powdered india rubber is afterwards added.—E. W. L.

XV. LEATHER; BONE; HORN; GLUE.

Tannins; Some reactions of the ——. W. Eitner. Gerber, 1912, **38**, 43—45.

Many extracts give characteristic precipitates on the addition of a 1 per cent. solution of potassium titanium oxalate to the filtrate from the precipitate obtained by boiling with formaldehyde and hydrochloric acid according to Stiasny's method (this J., 1911, 1172). Extracts of chestnut wood may be distinguished from those of oak wood by adding half the volume of yellow ammonium sulphide solution to the 2 per cent. extract solution. Chestnut wood gives a brownish precipitate, turning bluish-red, while oak-wood gives a yellow-brown precipitate; the solution in the former case is dark red, in the latter orange yellow. The reaction is most satisfactory when the ammonium sulphide contains some polysulphide but not too much and is of value for the differentiation of several other extracts. The use of tin oxychloride is of value in the testing of extracts. The reagent is made by dissolving 1 part of granulated tin in 6 parts of hydrochloric acid and 2 parts of nitric acid; the solution is diluted 25 times and added drop by drop to the tannin solution. The reaction is of most service in distinguishing mangrove from quebracho and for detecting mangrove in quebracho extract, also for distinguishing between real catechu and that made from mangrove. Quebracho gives a canary yellow precipitate, mangrove a red, becoming darker on standing. Myrobalans gives a stable white precipitate, mimosa a blood red, while imitation mimosas made from quebracho give the canary yellow precipitate of quebracho. Catechu gives a light brown precipitate easily distinguishable from that given by imitations, but not greatly different from that of oak- and chestnut-wood. Much information for the identification of single extracts may be obtained from the ratio of non-tannins to tannins in the extracts, of which the following examples are given: Galls, 1 : 6; sumac, 1 : 1·8; chestnut, 1 : 3; oak-wood, 1 : 2·3; pine-bark, 1 : 1; "Fichtenholz," 1 : 0·75; quebracho, 1 : 10; mangrove, 1 : 5; and catechu, 1 : 2. The estimation of the colouring effect of an extract, though not of much value for identification, may be of use in confirming the result arrived at by other tests. The test is of most value when made by Gansser's method on "animalised cotton" which has previously been treated in ½ per cent. formaldehyde solution followed by 6 per cent. gelatin. (See this J., 1909, 319.) The extract should be used at a strength of 3° Bé. The quantitative estimation of the tannin is often of use for its identification and an empirical method, similar to the official method of the I.A.L.T.C., is described.—D. J. L.

Tannins. A. W. Hoppenstedt. J. Amer. Leather Chem. Assoc., 1912, **7**, 87—91.

The author believes that the most valuable method of identifying the different tannins, will be by determining the solubilities of the tannins or their compounds in different solvents, and thinks that distinctive colour tests alone will not lead very far. One interesting line of investigation consists of solubility tests of the compounds of the tannins with alkaloids, and another one consists of solubility tests of the precipitates formed with gelatin and the tannins.—J. R. B.

Bisulphited quebracho extracts; Comparative tests of the official and the old filter-bell method with certain ——. E. Schell. Collegium, 1912, 25—29.

THE results of the analysis of certain sulphited cold-soluble quebracho extracts as obtained in different laboratories are liable to show considerable variations amounting to as much as 4 per cent. of tannin in some cases. Careful duplicate analyses were made of a carefully purified quebracho extract both by the "shake" and the filter-bell methods with the result that the figure for insoluble matter + absorbed matter was 43·55 per cent. by the former and 44·50 per cent. by the latter method. The extract was then transformed into a fully-soluble sulphited extract which was again analysed by the two methods. By the shake method the absorbed matter was then 41·65 per cent. while, by the filter-bell method, it amounted to 48·18 per cent. It is thus apparent that the shake method shows a loss in the tannin present in the original liquor while the filter-bell method shows a corresponding gain. The non-tannin solution from the shake method gives a green colour with iron alum while that from the filter bell does not, and the latter is unchanged by several other reagents which show a reaction with the filtrate obtained in the "shake" method. Neither solution gives a precipitate with gelatin or with strychnine nitrate. It is plain that, in the filter-bell method, substances are absorbed which are present in the filtrate from the "shake" method and that these substances although not showing the precipitating reaction of tannin, have some of the same colour and combining reactions. Lepetit has shown that, during the sulphiting of an extract, not only are unstable compounds of sulphite with tannin produced but also a greater or less quantity of organic sulpho-compounds of the tannins. Thus it is possible that the tannin molecule condenses on the sulpho-group and a part of the changed bisulphite does not appear as inorganic non-tannin while a corresponding increase of the absorbed matter results; this is shown by the filter method but on the contrary a loss is shown by the shake method. The tannin molecule, through sulphonation, loses certain of its precipitating reactions while still retaining some of its other colour reactions.
—D. J. L.

Sulphited and non-sulphited extracts. L. Pollak. Collegium, 1912, 29—31.

THE author has determined the solubility in ethyl acetate of quebracho extracts by Stiasny's process (this J., 1911, 1172). The solubility in ethyl acetate diminishes with increasing amounts of sulphurous acid and the solubility alters only very slightly after acidifying with phosphoric acid and boiling off the sulphur dioxide. A weakly sulphited extract gave a solubility of 28·4 per cent., while a strongly sulphited extract gave 2·4 per cent. The solubility of "Triumph" extract was 65—72 per cent., thus approaching very nearly that found by Stiasny for pure quebracho extract. From this it seems that even a weak sulphiting process produces a strong chemical change in the tannin molecule. The use of a sulphite-free extract is much more desirable for leather that is to be dyed, especially in light shades, as the sulphite in the extract has a bleaching effect on the dyestuff.—D. J. L.

Acids in chestnut wood and tannery liquors; Determination of ——. G. A. Kerr and W. F. Wilson. J. Amer. Leather Chem. Assoc., 1912, 7, 77—87.

EMPHASIS is laid on the necessity for methods of determining acids in liquors, which will give not only the total amounts of acids but also the actual nature of the acids present with regard to swelling and lime-neutralising properties. The present methods give merely the total amounts without differentiating and estimating the constituent acids. The authors give figures to show that the usual interpretation of the results of acid determinations in tan liquors may be unsatisfactory and erroneous.
—J. R. B.

Tannery waste; Purification of liquid ——, *by forced oxidation.* E. C. Alsop. J. Amer. Leather Chem. Assoc., 1912, 7, 72—77.

THE author deals with the question of the purification of tannery effluents by means of direct contact with oxygen. From the results of practical experiments, he concludes that if oxygen be brought into intimate contact with animal or vegetable materials in solution or in a very finely divided condition in suspension in water, the result is the conversion of the substances into gaseous products. The use of ozone as oxidising agent is advocated. The liquid waste, after removal of the solids, either by precipitation tanks or by centrifugal separators, is run through ozone atomisers in a spray tower, falling on coke filters, through which currents of ozonised air are continually passing. The effluent from this treatment is colourless and odourless and free from bacteria. The cost of the treatment is estimated to be less than 10 cents (5d.) per 1,000 gallons of effluent.—J. R. B.

PATENTS.

Vegetable extracts containing tannin; Process for decolourising ——. Gesellschaft Tamnum m. b. H. Ger. Pat. 242,483, Sept. 16, 1909.

TANNIN extracts are treated with aluminates of alkaline-earth metals, especially barium aluminates (*e.g.*, barium *meta*-aluminate, $BaAl_2O_4.4H_2O$), whereupon the colouring matters are precipitated in the form of their barium and aluminium lakes: the excess of barium is then precipitated by adding dilute sulphuric acid or a sulphate in quantity determined by previous experiment. By igniting the coloured precipitate, preferably with exclusion of air, the greater portion of the barium aluminate may be regenerated.—T. F. B.

Leather substitutes; Manufacture of ——. O. Silberrad, Buckhurst Hill, Essex. Eng. Pat. 5,006, Feb. 28, 1911.

FELTED sheets are prepared, by methods analogous to those used in paper-making, from a pulp formed from waste leather, cellulose, or the like, and either gelatin or tanning materials or both. During the formation of the sheet sufficient gelatin or tanning material is sprayed on to it (if both these materials have not been previously added to the pulp) to bring about the complete precipitation of the gelatin as a leather-like binding mass among the fibres. The sheets may also be formed by building them up from sheets separately prepared from two different pulps, one containing gelatin, size, etc., and the other tanning materials, the proportions being regulated with a view to complete precipitation of the gelatin among the fibres. As an example of a suitable solution for mixing with the pulp the following is given:—size, 100; glycerin, 10; acetic acid, 0 to 5; and water 100 parts. To every 100 parts of fibre 135 parts each of gelatin and tanning material are added. A useful and durable product is obtained by using a fibre of the following composition:—chrome-tanned leather waste, 10; bark-tanned leather waste, 20; and paper pulp, 70 per cent.—E. W. L.

Casein; Process for preparing elastic, horn-like masses from ——. K. P. Boerma. Ger. Pat. 241,887, Jan. 16, 1910.

POWDERED casein is mixed with a small quantity of water, to produce a mixture containing 20 to 42 per cent. of water; when this is heated under a high pressure, it is transformed into homogeneous masses, which may be pressed into any desired shape.—T. F. B.

Animal skins; Process of hardening and waterproofing ——. K. Hartmann, Berlin. U.S. Pat. 1,016,407, Feb. 6, 1912.

SEE Eng. Pat. 16,810 of 1911; this J., 1912, 82.—T. F. B

Skins; Process for unhairing and cleaning ——. O. Röhm. Fr. Pat. 434,158, Sept. 13, 1911. Under Int. Conv., Dec. 22, 1910.

See Eng. Pat. 18,770 of 1911; this J., 1911, 1221.—T. F. B.

XVI.—SOILS; FERTILISERS.

Protozoa of the soil. T. Goodey. Proc. Roy. Soc., 1911, **84**, 165.

Various protozoa which have been isolated from soils are described and figured. When an electric current is applied to a medium containing living protozoa they travel with the current to the cathode. Ciliated protozoa were not obtained active till the cultures had been incubated from two to four hours. It is concluded that in normal soils the protozoa are not active but encysted and therefore cannot be effective in limiting the number of bacteria as has been suggested by Russell and Hutchinson (this J., 1909, 1213).—E. F. A.

Soils; Adsorptive power of arable ——. J. H. Aberson. Z. Chem. Ind. Kolloide, 1912, **10**, 13—22.

The results of numerous experiments are tabulated and it is shown that the absorption of salts (or rather the cations thereof) by soils is an adsorption process which can be represented by the usual exponential formula. If the ionic end-concentration of the solution be constant, the adsorption is proportional to the surface (*i.e.* to the quantity) of soil. There appears to be a relation between the adsorptive power and the hygroscopicity of a soil (Mitscherlich), although the one is not strictly proportional to the other.—A. S.

Phosphate; Use of ground crude —— as a substitute for Thomas phosphate. T. Remy. Landwirtsch. Jahrbuch., 1911, **40**, 559. Biedermann's Zentr., 1912, **41**, 88—91.

Experiments were made on a large scale in a variety of localities during three years to compare the fertilising value on grass of Thomas phosphate and finely ground Algerian phosphate. The latter was almost invariably without effect. Its constituents are rendered soluble by treatment with sodium bisulphate and water, when it contains 12·7 per cent. of total phosphoric acid of which 8·29 per cent. are soluble in citric acid. Used in this form it has valuable manurial properties. The raw Algerian phosphate was very much inferior to Thomas meal when used with rye, barley, oats, peas, grass, with clover and mustard. Only with lupins did it appear to have an appreciable value. Lahn and Florida crude phosphates were also without manurial value. These materials were not rendered of use by mixing them with decaying organic matter.—E. F. A.

Phonolith; Fertilising value of the potassium silicate in ——. M. Geldmacher. Z. angew. Chem., 1912, **25**, 292—293.

Reference is made to the contradictory statements made about the fertilising value of phonolith and to the objections to its use owing to its insolubility (this J., 1910, 581). The author finds this fertiliser to give very good results which he ascribes not merely to the potash but also to the silica contained in it. It is recommended as a top dressing, the atmospheric carbon dioxide assisting materially in its decomposition and solution.—A. Sald.

Sulphur; Influence of flowers of —— on vegetation. E. Boullanger. Comptes rend., 1912, **154**, 369—370.

The growth of various plants, viz., carrots, beans, celery, lettuce, sorrel, endive, potatoes, onions and spinach, was found to be considerably improved by addition of small quantities of flowers of sulphur (0·023 grm. per kilo.) to the soil. The weight of the various vegetable products was thereby increased by about 10—40 per cent. The influence of the sulphur was, however, very slight when the soil was first sterilised and the plants were grown under sterile conditions. It appears therefore that the sulphur only acts indirectly by modifying the development of the bacteria of the soil.—J. H. L.

Von Lorenz's method of phosphoric acid determination. Neubauer and Lücker. *See* XXIII.

Patent.

Phosphate [fertiliser] and the method of making same. C. N. Meriwether, Clarksville, Tenn. U.S. Pat. 1,016,352, Feb. 6, 1912.

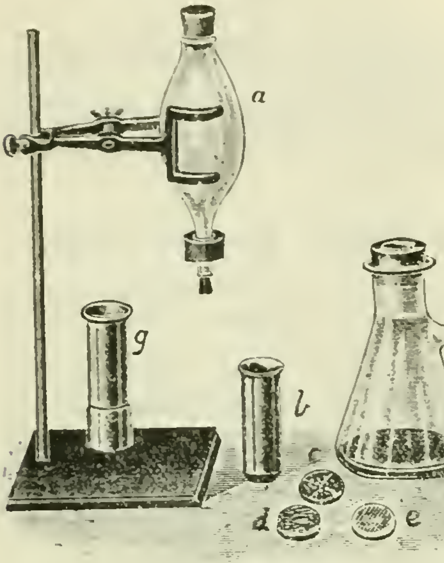
A fertiliser composed of phosphatic material having an excess of lime, an alkaline substance and magnesia fused together and reduced to a powdered condition is claimed.—W. C. H.

XVII.—SUGARS; STARCHES; GUMS.

Evaporation [of sugar juices] with moderately superheated steam. V. Jakš. Z. Zuckerind. Böhm., 1912, **36**, 259—269.

During the 1910–11 campaign some comparative evaporation experiments were carried out in the Dymokur beet sugar factory in Bohemia, using (*a*) moderately superheated steam, and (*b*) saturated steam. For the moderately superheated steam, steam heated to 203·7° C. was introduced into the exhaust steam pipes leading to the evaporator, giving a mixture of superheated and exhaust steam at a temperature of 111·6° C.; while in the case of the saturated steam, direct steam at 154·5° C. was mixed with exhaust steam to produce a heating steam at a temperature of 110·4° C. In both series of experiments the same quintuple effect apparatus, having in the respective five bodies a heating surface of 461·8, 503·0, 273·5, 295·0, and 305·0 sq. m., and a surface of evaporation of 513·0, 488·0, 250·0, 270·0 and 281·8 sq. m., was used. For (*a*) the superheated steam, and (*b*) the saturated steam, the results obtained for the relative efficiency of the evaporating plant were as follows: Water evaporated in kilos. per quintal (100 kilos.) of roots, (*a*) 31·81, 16·76, 14·43, 15·10, and 16·01; (*b*) 32·78, 17·44, 15·13, 15·86, and 16·59. Total water evaporated in kilos. per hour, (*a*) 9325·9, 4909·0, 4226·5, 4422·8, and 4689·3; (*b*) 9539·0, 5075·0, 4402·8, 4615·3, and 4827·7. Water evaporated in kilos. per sq. m. of heating surface per hour, (*a*) 18·18, 9·57, 15·85, 15·49, and 15·26; (*b*) 18·59, 9·92, 16·47, 16·15, and 15·96. Water evaporated in kilos. per sq. m. with a fall of temperature of 1° C., (*a*) 5·19, 1·84, 2·14, 1·78, and 0·55; (*b*) 4·52, 1·96, 2·06, 1·74, and 0·67. Coefficient of transmission in calories per minute, (*a*) 19·5, 16·5, 19·4, 16·3, and 5·2; (*b*) 43·2, 17·8, 18·6, 15·9, and 6·3. Difference of temperature between heating steam and boiling juice, (*a*) 3·5, 5·2, 7·4, 8·7, and 27·6; (*b*) 4·1, 5·0, 8·0, 9·3, and 23·8. Density of the juice in degrees Brix, (*a*) 19·62, 24·04, 29·83, 39·87 and 62·02; (*b*) 18·91, 23·13, 28·89, 39·09, and 61·99. Other data relative to the transmission of heat in the first body are: Heat passing through the heating walls in calories per quintal (100 kilos.) of roots, (*a*) 18,217·4; (*b*) 18,724·1. Heat passing through 1 sq. m. of heating surface in calories per hour, (*a*) 10.401·3; (*b*) 10,621·3. Heat passing through 1 sq. m. of heating surface in calories with a fall of temperature of 1° C., (*a*) 2971·8; (*b*) 2590·5. The author points out that highly superheated steam demands either more time or a greater heating surface than saturated steam, since it must first give up its excess heat to the walls before condensation can commence. With, however, moderately superheated steam, good and even better results may be obtained than by the use of saturated steam alone. In saturated steam there is always a greater or smaller amount of moisture in the form of fine drops which are precipitated on the walls of the evaporator, the result being that such vapour does not come into full contact with the heating surface. By mixing superheated steam with the moist saturated steam ordinarily used, the moisture is converted into steam by the excess heat being thus converted into dry saturated steam.—J. P. O.

Crystal sugar; Method for the determination of the —— obtainable from raw sugar. A. Herzfeld and H. Zimmermann. Z. Ver. deut. Zuckerind., 1912, 166—183.



In order to obtain a more certain indication of the yield of refined sugar obtainable from a raw sugar than is afforded by indirect methods of calculation from the amount of non-sugars present, numerous workers, including Payen, Schreibler, and Koydl (this J., 1910, 167), have proposed direct methods of determining the crystal sugar. In these, a definite amount of the raw sugar is washed free from adhering molasses with a saturated solution of sucrose in alcohol, or acid-alcohol, and the remaining white crystals weighed, but none has been found to give reliable results in practice. In a modification of the washing process now proposed by the authors, it is claimed that the three sources of error possessed by previous methods are avoided as follows:—(1) By using an exactly saturated aqueous solution of sucrose, at a definite temperature, and in large excess, no sugar is precipitated from the molasses adhering to the raw sugar. (2) By obviating the use of acid-alcohol, and by keeping the solutions sterile, the wash-liquors remain of constant composition and degree of saturation for a reasonable time. (3) By centrifugalising after the washing process, and drying, the use of concentrated alcohol, as recommended by Scheibler, or of a series of wash-liquors each increasing in alcoholic content, as proposed by Koydl (*loc. cit.*), is rendered unnecessary. In carrying out the method, 50 grms. of the raw sugar are placed in the pear-shaped vessel, (*a*), holding about 500 c.c., the bottom opening of which is closed. 200 c.c. of a saturated aqueous solution of sucrose are added, the top opening closed, and the vessel strongly shaken until all the adhering molasses is dissolved, care being taken not to heat the vessel by holding it with the naked hand. For the preparation of the saturated sucrose solution, the amount of sugar necessary for the preparation of a saturated solution at the selected temperature (near 20° C.) is ascertained from a special table. Solution is effected in a closed flask, and the resulting liquor after cooling is stored in a suitable reservoir provided with a thermometer. After removing the bottom stopper, the pear-shaped vessel, *a*, is connected with the tared nickel-plated brass filtering cylinder (*b*), which contains discs of perforated metal (*c*), of felt (*d*), and of wire gauze (*e*), and is attached to a filter flask (*f*), and an aspirator. The top stopper of the pear-shaped vessel being removed, and replaced by a capillary tube, the whole of the sugar mass is drawn into the filtering cylinder, the last traces of crystal remaining on the sides of the pear-shaped vessel being rinsed with 50 c.c. of the saturated wash-liquor. Aspiration is not continued until air is drawn through the crystals, but the filtering vessel is disconnected while the crystals are still covered with wash-liquor, placed in the flanged cup (*g*), which fixes into the centrifugal, and machined, taking 2 minutes to raise the speed to 2000—2500, and keeping for 1 min. at 2500, and 2 mins. at 2700 revs. per min., *i.e.*, 5 mins. in all. From the filtering cylinder, the sugar is pressed out on a glass plate with the metal and felt discs and dried *in vacuo* at 105°—110° C. From the water content found, the amount of wash-liquor remaining is ascertained from a table, and from this the actual crystal content of the raw sugar is calculated. From the tabulated results obtained by this procedure it appears that in the cases of four samples of raw beet sugars the figures were respectively: direct polarisation, 91·80, 89·90, 91·20, 92·00; ash, 2·05, 2·86, 2·44, 2·19; ash of the crystal sugar, 0·11, 0·70, 0·37, 0·18; amount of crystal sugar, 82·52, 80·60, 82·10, 81·96; rendement of the raw sugar, calculated by deducting five times the ash from the direct polarisation, 81·55, 75·60, 79·00, 81·05; rendement of the crystal sugar, obtained by deducting five times the ash from it, 81·97, 77·1, 80·25, 81·06. It is thus seen that the new direct method always gives a somewhat higher value than is indicated by the indirect method of calculating the rendement.—J. P. O.

Refined sugar; Indications of the alteration of —— during storage. K. Wassilieff. Centr. Zuckerind., 1911, **20**, 1734—1736.

When refined sugar is stored in warehouses, in which no arrangement is made for the regulation of the temperature and humidity, it may undergo alteration, the nature and extent of which will depend upon the season of the year. In winter, and especially when severe frosts prevail, damp patches or streaks on the inner white paper of the wrapping, accompanied by a marked moistening of the under part of the loaf, may occur. If the paper used be well glazed, between it and the sugar, drops of syrup can be detected, whilst in the case of inferior paper hollow patches form. After this so-called "moistening," irregular blistered protuberances, that gradually increase in size, and considerably disfigure the loaf, may appear, and if the weather be frosty these may assume the form of protruding rosettes. Such deterioration is most frequently noticed in the assorted sugar packed in sacks, and generally only in those sacks against one of the air channels of the store. In spring, moistening occurs to a more marked extent, and may then be so considerable as to cause a large amount of syrup to flow from the loaf. Decomposition then usually sets in, after which yellow spots will be noticed owing to the action of the weighting or sizing materials of the paper on the reducing sugars formed. In the summer months, sugar in store gradually loses moisture, especially in the case of cubes packed in sacks. This occurs to the greatest extent in the top, and to the least in the bottom of the sack. According to the experience of the author, such loss in weight in the top, middle, and bottom portions of the sack amounts to 241, 214, and 185 grms. per metric centner (100 kilos.) respectively.—J. P. O.

Sucrose; Determination of —— in cane molasses by the double polarisation method, using invertase and acid as hydrolysts. J. P. Ogilvie. Intern. Sugar J., 1912, **14**, 89—93.

In a previous paper on the double polarisation method of determining sucrose in beet molasses (this J., 1911, 62), it was shown by the author that, if the selective hydrolyst invertase be used to effect inversion, the results are distinctly higher than by the ordinary procedure, in which acid is used to effect hydrolysis, and the direct polarisation is taken in a solution strongly alkaline with the basic lead acetate used for clarification. When, however, in the acid hydrolysis method, the direct polarisation is taken in a solution containing the same amount of acid as that used to carry out the inversion, the results were then found to be in accordance with those given by the invertase process. On now extending the same method of investigation to the examination of cane molasses, the results obtained by

means of invertase as hydrolyst show: (1) that if in the acid hydrolysis method, the generally employed procedure of using the alkaline direct polarisation be adopted, the results may be too high to the extent of 0·4 –1·3 per cent., according to the impurity of the product; (2) that if in the acid hydrolysis method, the neutral direct polarisation, in place of the alkaline, be used, the results are nearer the truth, but may again be too high, especially when much reducing sugars are present; and (*c*) that if in the acid hydrolysis method, the acid direct polarisation, as recommended by Andrlik or Pellet, be used, then correct results are obtained. It is pointed out that, whereas in the case of beet molasses it is the optically active amino-acids that vitiate the polarimetric readings, with cane molasses it is the reducing sugars, that are always present to a greater or less extent. In the presence of basic lead acetate the dextro-rotation of a cane molasses solution is considerably increased, owing to the effect of the reagent on the rotation of the lævulose; while, after inversion, the solution then being acid, this action is eliminated, and the opposite effect obtains, namely, the lævo-rotation is increased. Thus, the difference between the direct and the inversion readings is not due solely to hydrolysed sucrose, and an important source of error is introduced. Concluding, the author points out that both readings must be made under the same conditions of acidity by employing the Andrlik or Pellet method. When this is done, the agreement with the invertase process is very close, and well within the limit of experimental error.
—J. P. O.

Starch; Conversion of —— into dextrins by desiccation. G. Malfitano and A. Moschkoff. Comptes rend., 1912, 154, 443—446.

Starch, thoroughly desiccated, *e.g.* by drying *in vacuo* over phosphoric anhydride, or by heating, becomes soluble in cold water, through formation of dextrins. More dextrin is obtained in this way than by heating the starch to 100°—130° C. When the desiccation is carried so far that not only water of hydration is evolved, but also water of constitution, proceeding from the decomposition of the molecules, the solubility diminishes. The author supposes that in starch the $C_6H_{10}O_5$ molecules are linked together into complexes by water OH·H, and that the disappearance of this water on desiccation involves the breaking up of these complexes with formation of simpler and more soluble molecules. When starch is heated with water the breaking up of the complexes is a result of electrolytic dissociation, and is not so complete.—J. T. D.

Comparison of results obtained by maceration and diffusion in beetroot distilleries. Ammann. *See* XVIII.

Velocity of saccharification of starch. Van Laer. *See* XVIII.

Comparative influence of water and vinasse [as extracting liquors] on the composition of [beet] pulp from sugar factories and distilleries. Ammann. *See* XIXa.

Specific rotatory power of glutamine, and observations on ammonium glutamate. Schulze and Trier. *See* XX.

Determination of furfural by means of Fehling's solution. [Determination of pentoses and pentosans.] Eynon and Lane. *See* XXIII.

Patents.

Sugar crystallizer. F. Lafeuille, Charmes, France. U.S. Pat. 1,016,019, Jan. 30, 1912.

A rotary drum, mounted on a horizontal axis, is provided with a number of internal cooling or heating tubes arranged in a series of spirals through the drum, one spiral extending into the area defined by another, so as to act as a stirring device for the contents of the drum.—W. P. S.

Starches; Process for obtaining, in a fresh condition, soluble —— of very high adhesive and thickening power, for the manufacture of finishing materials. G. Rivat. Fr. Pat. 433,726, Nov. 3, 1910.

The process consists in the restricted hydrolysis of amylaceous material. The hydrolysis may be effected by treating ordinary starch with dilute solutions of phosphoric acid (3 parts of acid per 100 parts of starch) or hydrofluoric acid (2 parts of acid per 1000 parts of prepared starch paste) at 100° C., or by treating starch with dilute solutions of salts such as potassium hydrogen oxalate or potassium hydrogen tartrate (2—6 parts of salt per 100 parts of dry starch) at 90°—100° C., or by treating starch with 2—3 per cent. solutions of aromatic sulphonic acids at 100° C.—L. E.

Saccharine substances; Process for the extraction of ——. C. L. Corcuera, Guadalajara, Mexico. U.S. Pat. 1,015,941, Jan. 30, 1912.

See Fr. Pat. 381,538 of 1907; this J., 1908, 171.—T. F. B.

Starch and glucose; Process of making ——. Process of treating cassava and products thereof. C. C. Moore, Lexington, Ky., and Washington. U.S. Pats. 1,016,761 and 1,016,762, Feb. 6, 1912.

See Eng. Pat. 22,655 of 1909; this J., 1910, 1123.—T.F.B.

Dextrin; Manufacture of ——. J. Verity, Stretford, Assignor to C. F. de Angeli, Milan, Italy. U.S. Pat. 1,016,803, Feb. 6, 1912.

See Eng. Pat. 16,666 of 1910; this J., 1911, 761.—T. F. B.

XVIII.—FERMENTATION INDUSTRIES.

Saccharification of starch; Velocity of ——. H. Van Laer. Bull. Acad. roy. Belg., Classe des sci., 1911, 795—830. Chem. Zentr., 1912, 1, 483—484. (See also this J. 1911, 1165; 1912, 197.)

In the action of a diastase solution on a starch solution, the first step consists in absorption of the enzyme by the starch, after which saccharification of the starch by the absorbed diastase proceeds as a unimolecular reaction. Kjeldahl has shewn that using equal quantities of starch, at equal temperatures, and for equal periods of time, the quantity of cupric-reducing substances produced is proportional to the quantity of diastase up to a certain stage, after which the activity of the diastase is diminished by the maltose produced, which absorbs a part of the enzyme. Kjeldahl's law is, however, restricted by other factors, besides the effect of the maltose produced. In solutions having a high concentration of diastase, the starch disappears more rapidly than corresponds with the logarithmic unimolecular equation. The influence of the diastase concentration (F) on the velocity of saccharification is represented by the equation: $K=n.F^m$, where n is a constant and m is a number somewhat larger than 1; when $m=1$, K is the unimolecular constant. Whilst in the saccharification of starch by acids, the velocity depends upon the number of ions in unit volume, in saccharification by diastase, the ratio between the amount of absorbed enzyme and that of maltose yet to be produced is a dominant factor. All irregularities which have been observed in the coefficient of velocity of saccharification can be explained by the formation of absorption compounds of the diastase with starch and its conversion products (maltose and dextrins).—A. S.

Yeast; Formation of invertase in ——. H. Euler and D. Johansson. Z. physiol. Chem., 1912, **76**, 388—395.

The author has carried out studies on the variations of the invertase-content of yeast. The inverting activity of the yeast was measured by the changes produced in the optical rotatory power of sucrose solutions in presence of chloroform. It was found that by cultivation in nutrient solutions containing magnesium sulphate, asparagin, and potassium phosphate, besides sucrose or dextrose, the inverting activity of yeast was increased. The rate of increase was the same whether the sugar present in the nutrient liquid was sucrose or dextrose; during the first 24 hours the activity increased about threefold, but after several days approached a maximum. The rate of increase at any moment was proportional to the difference between the activity at that moment and the maximum activity finally attained after several days growth in the nutrient liquid.—J. H. L.

Yeast cell; Formation of glycogen in the ——. D. Bruschi. Atti R. Accad. dei Lincei, Roma, 1912, **21**, 1., 54—60.

AN experiment of Cremer (this J., 1899, 777), who on adding a solution of lævulose to expressed yeast juice, obtained after 12 hours a substance which gave a brown colouration with iodine, indicates that the formation of glycogen in yeast is due to a synthetic enzyme. The author after a large number of experiments succeeded in inducing the formation of glycogen in yeast independent of the vital activity of the latter in the following manner. A culture of wine yeast in grape must in vigorous fermentation was treated with so much alcohol that fermentation was strongly retarded. No glycogen was formed and when fermentation had ceased (after 12—13 days), the liquid was withdrawn and replaced by a quantity of fresh grape must to which 2 c.c. of ether per 100 c.c. had been added. No fermentation took place and the yeast cells did not multiply, but after three days granules of glycogen appeared in different cells. It is known (see Pantanelli and Bruschi, Ann. di Bot., 1910, **8**, 133) that whilst the formation of zymogens (pro-invertase, pro-amylase) takes place in the living protoplasm, the transformation of the zymogen into the active enzyme is possible in the absence of vital activity. It is probable therefore that in the first stage of the experiment, the alcohol prevented the transformation of the zymogen (pro-synthease) into the active glycogen-forming enzyme, which transformation took place gradually after the substitution of fresh must for the original culture liquid. In order to observe the formation of glycogen in yeast-cells which have been rendered inactive by treatment with an anæsthetic (ether, chloroform) or a mild antiseptic (alcohol, potassium bisulphite), the period of fermentation at which the yeast is subjected to the treatment is a matter of importance. In a number of yeast cultures in which the glycogen had disappeared, the liquid was replaced by fresh, neutralised must, and then individual cultures were treated at intervals of two hours with ether. It was found that glycogen was formed in the old yeast cells but not in new cells in those tests in which fermentation had not yet commenced, but in the tests in which fermentation had commenced, glycogen was formed in both old and new cells. In the tests in which vigorous fermentation had set in, the treatment with ether impeded the formation of glycogen parallel with its action in arresting fermentation. From these results the author concludes that whilst the formation of the synthetic pro-enzyme takes place in the protoplasm immediately after the absorption of sugar, the actual condensation of glycogen is effected by the synthease either only after fermentation has taken place or after it has just commenced. The fact that in cells in vigorous fermentation, treatment with an anæsthetic impedes the action of the synthease indicates that the glycogen is produced by the condensation of some intermediate product of the fermentation, *i.e.*, the formation of glycogen represents a partial reversion of a single process in the series of processes which together make up alcoholic fermentation. The formation of glycogen may be likened to the production of asparagine from amino-acids and ammonia during the digestion of proteins in green plants. This recognition of the secondary character of the process explains why: (1) the formation of glycogen is of no special utility for yeast in normal fermentations (compare Henneberg, this J., 1902, 1289), although glycogen may serve as a reserve material for yeast placed under starvation conditions; (2) glycogen disappears from yeast before the sugar is completely fermented (Henneberg, this J., 1910, 1125); (3) glycogen is formed in greater quantity in well aerated yeast; (4) glycogen is formed preferably from fermentable sugars, but its formation from non-fermentable substances (glycerin, lactic acid, succinic acid), which are produced in the fermentation of sugar, is not impossible. —A. S.

Yeast; Action of dissolved substances upon the autofermentation of ——. A. Harden and S. G. Paine. Roy. Soc. Proc., 1912, B, **84**, 448—459.

WHEN immersed in a molar (1 grm.-mol. per litre) solution of sodium chloride, yeast produces considerably more carbon dioxide by autofermentation in the early stages than when immersed in water. A similar effect is produced by other salts both of inorganic and organic acids and by toluene. It cannot be due to stimulation of the enzymes of the yeast, for the activity of these is inhibited rather than enhanced by sodium chloride. All of the substances which cause acceleration of the autofermentation also produce plasmolysis (*i.e.*, removal of water from the yeast cells), and the effect is probably due to concentration of the cell contents in consequence of the plasmolysis, although in the case of toluene, disorganisation of the cell or hormone action (see H. E. and E. F. Armstrong, this J., 1911, 822) may also play a part. On comparing different salts, it was found that approximately equal effects were produced by solutions of equal osmotic pressure. Moreover urea which does not cause plasmolysis of the yeast cell has no accelerating effect on the autofermentation, nor has sodium chloride solutions of concentrations (decimolar) too low to cause plasmolysis. Alcohol in concentrations (above 10 per cent.), which produce plasmolysis, causes a considerable increase in the rate of autofermentation, whilst in weaker concentrations it has only a slight effect, inhibitory at first, but later accelerating. The rate of autofermentation is also considerably increased by partial drying of the yeast by a current of air or in a vacuum desiccator.—A. S.

Alcoholic fermentation; Transformation of sugar and formation of carbon dioxide in ——. H. Euler and D. Johansson. Z. physiol. Chem., 1912, **76**, 347—354.

IN the fermentation of a solution of dextrose by living yeast (*S. cerevisiæ*) the quantity of sugar decomposed at any instant, as measured by the fall in the optical rotatory power of the solution, exceeds that calculated from the amount of carbon dioxide produced, by an amount which, in the course of fermentation, rises to a maximum and then remains fairly constant. The magnitude of this maximum depends on the temperature (being greater, for example at 12° than at 30° C.), on the concentration of the sugar solution, and on the quantity of yeast present and its previous treatment. In some cases the authors found that the quantity of sugar apparently fermented and yet unaccounted for by the carbon dioxide formed, exceeded 12 per cent. of the quantity originally present. Such discrepancies, which are probably due to the formation of intermediate products of fermentation, must be considered in all exact measurements of fermentation-velocity. —J. H. L.

Tartaric acids; Fermentation of the different ——. L. Karczag. Biochem. Zeits., 1912, **38**, 516—518

IN continuation of the previous work on yeast fermentations without sugar (this J., 1911, 379, 705, 1179, 1465), the author determined the relative velocities of fermentation of the different tartaric acids and of their potassium salts by yeast and permanent yeast preparations. Experiments at 37° C. with 1·5 per cent. solutions of the free acids and yeast races D and K showed that *d*-tartaric acid gives a more vigorous evolution of carbon dioxide, especially at the beginning, than *l*-tartaric acid does. Mesotartaric acid or *i*-tartaric acid gives, on the whole, similar results to those obtained with *d*-tartaric acid, whilst the amount of carbon dioxide yielded by *d,l*-tartaric acid in a given time is intermediate between the amounts yielded by *d*- and *l*-tartaric acid respectively. Using "Hefanol" instead of yeast, both *d*- and *l*-tartaric acid and the potassium salt of *l*-tartaric acid were only slightly acted upon, but the potassium salt of *d*-tartaric acid was decomposed comparatively readily (8 c.c. of carbon dioxide after 14 hours).—A. S.

Lactic acid bacillus; Influence of putrid gases on ——. A. Trillat. Comptes rend., 1912, **154**, 372—374.

Strips of paper moistened with suspensions of various cultures of the lactic acid bacillus were exposed, under similar conditions, to the gases arising from decomposing meat broth. After several hours' exposure the papers were transferred to vessels containing sterilised milk. The quantities of acid formed after six hours were in many cases 2—3 times those found in control tests carried out with bacilli which had been exposed only under ordinary atmospheric conditions. The air in proximity to soil containing humus was found to have a similar invigorating influence on the bacillus. Carbon dioxide or ammonia is not responsible for this action, but probably other volatile substances produced by the decomposition of organic matters are concerned. Prolonged exposure to the putrid gases destroys the bacillus.—J. H. L.

Lactic acid fermentation; The chief phases of —— and their practical importance. M. Grimm. Zentr. Bakt. u. Parasitenk., 1911, II. Abt., **32**, 65—70. Chem. Zentr., 1912, **1**, 511.

Lactic acid fermentation with pure cultures of *Bact. acidi lactis* at 35° C. can be divided into four distinct phases. In the first phase, that of habituation, which lasts about 4½ hours, a great increase of the number of organisms takes place, but no production of acid. The second phase lasts about 12 hours and is characterised by a progressively increasing vital activity of the bacteria, the optimum being attained at about the fourteenth hour from the beginning of the first phase. The third phase which lasts about 16 hours is characterised by decreasing vital activity or acid-producing power. In the last phase the bacteria lose their power of producing lactic acid. If the physiological power of pure cultures of *Bact. acidi lactis* is to be maintained, they must be re-inoculated during the second phase mentioned above.—A. S.

Acetylmethylcarbinol and 2.3-butyleneglycol; Bacterial production of —— from various substances. A. Harden and D. Norris. Roy. Soc. Proc., 1912, B, **84**, 492—499.

It has been shown previously that by the action of *B. aërogenes lactis* on dextrose, mannitol, and fructose, acetylmethylcarbinol, $CH_3.CH(OH).CO.CH_3$, and 2.3-butyleneglycol, $CH_3(CHOH)_2CH_3$, are formed (see this J., 1906, 490; 1911, 380). It is now shown that these substances are also produced by the action of *B. cloacæ* on the carbohydrates mentioned, and further by the action of either of the organisms on mannose, galactose, arabinose, isodulcitol, or adonitol. Similar experiments with *B. coli communis* gave negative results. 2·3-Butyleneglycol is also produced by the action, of *B. aërogenes lactis* on glycerol, ethyleneglycol, and acetaldehyde, but no acetylmethylcarbinol is formed. In these cases a "carbon synthesis" is effected, analogous to that which occurs in the butyric fermentation of glycerol and lactic acid (see this J., 1908, 585). Neither acetylmethylcarbinol nor butyleneglycol is produced by the action of *B. aërogenes lactis* or *B. cloacæ* on citric and malic acids, or dihydroxyacetone, or on the peptone water used as culture medium.—A. S.

Aspergillus niger; Effect of the absence of zinc from the culture medium, on the secretion of sucrase by ——. M. Javillier. Comptes rend., 1912, **154**, 383—386.

When *Aspergillus niger* is grown in culture liquids completely free from zinc, the liquids at no time contain any measurable quantity of sucrase. In presence of as little as 1 part of zinc in 10,000,000 parts of solution, however, the organism gives up to the latter relatively large quantities of sucrase. Yet the quantity of sucrase actually secreted by the mould, as measured by the assimilation of sucrose present in the culture medium, is only about 30 per cent. more in presence than in absence of zinc. In the latter case therefore the enzyme must be debarred from diffusing from the cells of the organism into the surrounding liquid.—J. H. L.

Fermentation vats; Aluminium ——. J. Wild. Z. ges. Brauw., 1912, **35**, 61—65.

The author finds that very satisfactory results may be obtained both with cylindrical and rectangular fermentation vats constructed of autogenously welded sheet aluminium. The cylindrical vats employed were of 380 hectolitres capacity, the thickness of the metal being 7 mm. These vats were lacquered externally, and were insulated from the supports on which they rested by a coating of tar; the attemperator coils, made of tinned copper, were insulated from the surface of the vats by rubber tubing. The rectangular vats employed were of 250—350 hl. capacity, the thickness of the metal being 3 mm. These vats also were lacquered externally, and were encased in cement, being insulated from the latter by a coating of tar. The vats soon become incrusted with beer scale, and, in the course of a year's continuous working, the scale becomes sufficiently thick to be removed by suitable means; for this purpose, alkalis must not be used, but certain acid solutions may be safely employed (see Bleisch, this J., 1912, 199). Aluminium attemperator coils are not to be recommended owing to the danger of corrosion by the electrolytic action of iron-containing cooling water. (See also this J., 1912, 87.)—L. E.

Beetroot distilleries; Comparison of the results obtained by maceration and diffusion in ——. L. Ammann. Comptes rend., 1912, **154**, 294—295.

For the extraction of the juice from the beetroot, maceration is used in the smaller and diffusion in the larger distilleries. In order to determine which method is the more advantageous, a number of figures have been collected during the past two campaigns, the average of which are as follows: for maceration: sugar in the roots worked, 13·76—16·80; sugar left in the pulp, 0·19—0·41 per cent.; extraction, 98·32—99·28 per cent.; and for diffusion: sugar in the roots, 10·42—15·19; sugar left in the pulp, 0·22—0·71 per cent.; and extraction, 96·31—99·13 per cent. It is concluded that practically identical results are obtainable by these two processes of extraction. It is, however, pointed out that maceration is a slower operation and gives a more dilute juice than diffusion. Whereas in the macerators the cossettes must remain four hours, and the juice drawn off is about 200 litres, in the diffusers the time is 2 hours, and the juice drawn off is only 135—170 litres per 100 kilos. of roots.—J. P. O.

Extract determination; Indirect methods of —— [in wines liqueurs, fruit juices, etc.]. W. Fresenius and L. Grunhut. Z. anal. Chem., 1912, **51**, 23—52, 104—123.

Tabarié's formula based on specific gravity determinations cannot be applied to products having either a high alcohol or extract content, such as liqueurs, spirit essences, fruit syrups, etc., too high results being obtained in the case of the alcohol, and too low ones in that of the extract determination. In products that contain much sucrose, and are acid, a source of error is introduced by inversion, and under these conditions the liquid should either be neutralised before the distillation of the alcohol, and a correction made for the amount of alkali added, or the alcohol may be eliminated without previous neutralisation, and both extract and invert sugar determined, one-twentieth of the percentage of invert sugar found being deducted from the number of grms. of extract present in 100 c.c. In determining the extract of wine musts, Windisch's sucrose table should always be used, for the values given by that of Halenke and Möslinger (Z. anal. Chem., 1895, **34**, 270) are appreciably lower than the truth.—J. P. O.

Comparative influence of water and vinasse [as extracting liquors] on the composition of [beet] pulp from sugar factories and distilleries. Ammann. *See* XIXa.

Determination of furfural by means of Fehling's solution. [Determination of pentoses and pentosans]. Eynon and Lane. *See* XXIII.

PATENTS.

Lactic acid ; Art of manufacturing fermentation ——. O. Friedberger, Giessen, Germany. Eng. Pat. 2507, Jan. 31, 1911.

THE following process for making lactic acid by fermentation is said to furnish a product free from oily and albuminous matter and from other fatty acids. *Bacillus Delbrücki* is brought to a healthy development in a solution of maltose for two days at a temperature of 120°—125° F.: it is then gradually habituated to dextrose by daily additions, for three days, of about one-fourth of its volume of ten per cent. dextrose solution, which it can then ferment completely to lactic acid. The solution thus prepared is now added to the 10 per cent. solution of dextrose to be fermented; this solution is first sterilised by boiling for one hour and then cooling to 120° F., at which temperature the fermentation is allowed to proceed, with or without stirring, for two days, milk of lime being added to combine with the lactic acid. To effect a quantitative conversion of the dextrose, it is necessary now to add two further species of bacteria, *viz.*, *Bac. bulgaricus* and *Bac. acidi lactici*, which are allowed to act for six days at 110°—115° F. As food for the bacteria, 0·5 per cent. (on the weight of dextrose) each of asparagine and peptone, or other suitable nitrogenous substances, are employed. The solution obtained after the final fermentation is filtered through bone-black, concentrated *in vacuo*, and treated with sulphuric acid to liberate the lactic acid.—T. F. B.

Lactic acid ; Art of manufacturing fermentation ——. O. Friedberger, Giessen, Germany. Eng. Pat. 17,275, Jan. 31, 1911.

A CARBOHYDRATE consisting essentially of pure soluble starch (produced by treating starch with hydrochloric acid according to Eng. Pat. 2242 of 1906; this J., 1906, 1229) is saccharified by means of malt at a temperature of 155° F.; saccharification of such carbohydrates is complete and practically instantaneous. The mass is concentrated, sterilised, cooled to 120° F., and inoculated with a pure culture of *Bacillus Delbrücki*; fermentation is complete after six days at 112°—120° F. After the first 24 hours sterilised "chalk liquor" is added, sufficient to react with all the lactic acid which can theoretically be formed. As food for the bacilli about 3 per cent. of corn (maize) oil cake in which the starch has been saccharified is added. When fermentation is complete the product is filtered, and the filtrate heated to 100° F. and treated with 0·3 to 0·5 per cent. of tannin, calculated on the amount of carbohydrate used. The liquor is now heated to 140°—150° F. and filtered through a bone-black filter containing in its lower part a layer of slaked lime, separated by filter-cloth from the bone black. The alkaline calcium lactate solution thus obtained is concentrated *in vacuo* and decomposed by means of sulphuric acid.—T. F. B.

Spirits ; Process for maturation of —— F Pinasseau, First Addition, dated Aug. 21, 1911, to Fr. Pat. 419,591, Aug. 22, 1910 (this J., 1911, 148).

THE process is so modified that loss of alcohol only occurs when the apparatus is being discharged. The liquid to be treated is introduced into the artificially cooled vessel mentioned in the original patent. This vessel is kept at a temperature of —10° to —15° C. by a refrigerating machine, which may consist of a cooling drum partly immersed in the liquid under treatment, and connected with a rotary compresser contained in a spherical vessel which is partly immersed in a water-cistern kept at about 25° C. The liquid in the cooled vessel is kept at the level requisite to insure the efficient action of the cooling drum by a plunger operated by a screw. The liquid is pumped from the cooled vessel, through a coil in the water-cistern, to the reservoir previously mentioned, from whence it descends through the column, being returned from the lower compartment of the latter to the cooled vessel. The air, charged with vapour, is passed from the top of the column through the coil contained in the cooled vessel as previously described, and after being thus freed from the bulk of the alcohol, it is aspirated through a coil in the water-cistern and returned to the column.—L. E.

Grape musts and other saccharine liquids ; Pressure bath for concentrating, sterilising, and preserving ——. G. Talbot. Fr. Pat. 433,788, Aug. 21, 1911.

A CLOSED vessel heated in an autoclave by water under pressure, contains the must to be treated. A pipe passes through the cover of the closed vessel and through the wall of the autoclave, and is fitted with a tap and with a manometer, the latter serving as a control for the temperature of the must. A second pipe passes upward from the bottom of the closed vessel, through the cover thereof, and through the wall of the autoclave, to a second closed vessel, and delivers the hot must to a filter in this vessel, the latter being immersed in a vat of boiling water. The filter is adapted for filtering under pressure, and the filtered must which collects at the bottom of the second closed vessel, is drawn off, by a pipe passing through the wall of the vat of boiling water, to a sterile, heated cask. The cask is completely filled with must, and the vacuous space which is formed in the cask as the hot must cools and contracts, is advantageous in respect of the preservation of the must.—L. E.

Yeast ; Preparation of worts for the manufacture of bakers' ——. C. F. E. Piot. Fr. Pat. 433,841, Nov. 7, 1910.

BOILED, liquefied, and sterile amylaceous material is saccharified with *mucedinae* at a temperature of 30°—40° C. When the culture has developed sufficiently, the temperature may be raised to a degree (not exceeding 65° C.) which, though fatal to the growth of the mould, accelerates the action of the diastase formed by the mould. When saccharification is complete, the wort is acidified with lactic ferments at a temperature of 50°—55° C.—L. E.

Brewers' slops ; Process of treating ——. C. S. Robinson Chicago, Ill. U.S. Pat. 1,016,291, Feb. 6, 1912.

THE fluid portion is withdrawn from brewers' slops and then centrifuged immediately, the solid, suspended material removed thereby, being dried.—L. E.

Manufacture of cream of tartar. Fr. Pat. 434,223. *See* VII.

XIXA.—FOODS.

Bread ; Salt-rising —— *and some comparisons with bread made with yeast.* H. A. Kohman. J. Ind. Eng. Chem., 1912, 4, 20—30, 100—106.

THE author gives a detailed account of an investigation dealing mainly with salt-rising bread, but also incidentally with "Sauerteig" bread and with bread made with yeast. In making salt-rising bread, corn (maize) meal, common salt, and sodium carbonate are mixed together and stirred into hot or boiling water or milk to give a "batter" ("emptyings") of the consistence of corn meal "mush." This is kept in a warm place for 15—20 hours until evolution of gas is observed, when it is mixed with wheat flour and water to form a sponge. The sponge after standing for 1—3 hours is used in the ordinary way to make a dough, and the latter after standing for not longer than 1 hour, but usually immediately after mixing, is formed into loaves. For "Sauerteig" bread, a portion of dough prepared by mixing together flour and water, and which has been allowed to become sour, is used to set up fermentation in freshly-made dough. The author finds that in the manufacture of salt-rising bread, the fermentation is not caused by yeasts, as has been frequently stated, but by bacteria, which are introduced mainly by the corn meal. These bacteria decompose certain constituents of the dough, principally sugars, with evolution of gas, which consists essentially of nearly two-thirds of hydrogen and rather more than one-third of carbon dioxide by volume, and is free from hydrocarbons. One organism, apparently a member of the coli group, and probably belonging to the same group as the *Bacillus levans* of Wolffin and Lehmann (Centr. Bakt., 1894, 350) could be isolated in pure culture, and then propagated in liquid media, such as milk, or grown in "batter" and subsequently dried, so as to be available for the preparation of bread. No pure liquid cultures capable of retaining their gas-producing power could be obtained from "batter" which had been heated to 75° C., but a dry product composed mainly of starchy material could be prepared, suitable for use in making bread. In bread made by the "Sauerteig" process, the aeration of the bread is produced mainly by fermentation set up by yeasts. Losses due to decomposition with formation of volatile products are considerably smaller in the manufacture of salt-rising bread than in ordinary bread-making with yeast.—A. S.

Preservatives for milk, cream, etc.; Analyses and methods of detection of certain proprietary substances sold as ——. G. W. Monier-Williams. Report to the Local Gov. Board, 1912, Food Report No. 17.

A new preservative, sold under the name of "Mystin," for preserving milk and cream has recently been advertised as possessing the advantage that its presence cannot be detected by analysis. The substance was found to have the following composition:—sodium nitrite, 9·85; formaldehyde, 0·30; and water, 89·85 per cent. Milk treated with "mystin" in the proportion directed (3 oz. per 17 imperial galls.) does not yield a reaction with Hehner's test for formaldehyde, the sodium nitrite preventing the formation of the blue coloration. It is probable that the sodium nitrite reacts with the tryptophane which is present among the products of hydrolysis of casein, with the result that the tryptophane is rendered incapable of condensing with formaldehyde. If, however, the nitrous acid is first destroyed by urea, the milk will give the formaldehyde reaction. Five c.c. of the milk, to which "mystin" has been added, should be treated with 0·05 grm. of urea and 1 c.c. of $N/1$ sulphuric acid and heated in a boiling water-bath for 2 minutes; after cooling, the liquid gives a reaction with Hehner's test, and the quantity of formaldehyde may be estimated by Shrewsbury and Knapp's method (this J., 1909, 156). Milk containing "mystin" yields a pink coloration almost immediately when treated with the Griess-Ilosvay reagent for the detection of nitrites, and it would appear advisable to include this test among the routine tests applied to milk and cream. The addition of sodium nitrite to milk is open to serious objection owing to the powerful action of this substance on the heart; one quart of milk, to which "mystin" has been added in the proportion mentioned above, will contain 2 grains of sodium nitrite, which is the maximum pharmacopoeal dose of the salt. Another preservative, sold under the name of "Accoine," consisted of an aqueous solution of sodium benzoate (13·97 per cent.) and sodium carbonate (1·94 per cent.); although it is claimed that this preservative cannot be detected by analysis, the benzoic acid can be detected by means of the test described by Richmond (this J., 1907, 631). A preservative for margarine was found to consist almost entirely of sodium fluoride, whilst another substance examined consisted of a mixture of sodium metabisulphite and sodium sulphate.—W. P. S.

Butter. Aldehyde figure of ——. [Determination of protein.] E. H. Miller. Analyst, 1912, **37**, 50—51.

The method of determining the protein-content of milk by aldehyde titration (see Richmond and Miller, Analyst 1906, **31**, 224; Richmond, this J., 1911, 148), has been applied to the analysis of butter. Ten grms. of butter are weighed into a tared beaker and melted in a water bath at 60°—70° C.; 25 c.c. of water at 65° C. are then added and afterwards 1 c.c. of a 0·5 per cent. solution of phenolphthalein. The mixture is well agitated and approximately $N/20$ alkali is run in until a faint permanent pink tint is formed. If the end point is masked by the yellow colour of the butter-fat, the contents of the beaker should be allowed to settle and the bottom aqueous layer observed. After neutralisation 5 c.c. of strong formaldehyde solution are added, and the mixture is well agitated and titrated with $N/20$ strontium hydroxide solution until the faint pink tint is again formed in the aqueous portion. The number of c.c. of $N/20$ alkali used in the second titration less the number equivalent to the acidity of the formaldehyde added, is proportional to the quantity of protein present, each c.c. representing 0·01355 grm. of protein-nitrogen, assuming the proportion of casein to albumin to be 7 : 1 (see Richmond and Miller, *loc. cit.*). Thus, when 10 grms. of butter are taken, the number of degrees of acidity produced, when multiplied by 0·170, gives the percentage of protein. The extreme errors in the percentage of protein determined in six samples of butter by this method were +0·020 and −0·025, comparison being made with determinations by the Kjeldahl method using the protein-factor 6·38.—J. H. L.

Cheese; Methods and results of paraffining ——. C. F. Doane. U.S. Dept. Agric., Bureau of Animal Ind., Circular No. 181, Nov. 1, 1911.

Cheeses are treated by immersion in paraffin to prevent mould and loss of weight by drying; also to improve their appearance. Experiments lead to the conclusions that paraffining is an effective method of preventing such loss of weight and the growth of mould, if temperatures of 220° F. and above be used, and that the length of time (from 1 to 10 seconds) of immersion of the cheese is immaterial. Satisfactory results could not be obtained at a temperature of 190° F. Paraffining the cheese three days after its removal from the press gave the best results. Cheese should not be allowed to remain in a warm curing-room for more than one day after paraffining.—R. C. P.

Meat; Determination of potassium nitrate in ——. J. Tillmans and A. Splittgerber. Z. Unters. Nahr. Genussm., 1912, **23**, 49—56.

When the quantity of potassium nitrate (saltpetre) present in meat does not exceed 1·5 per cent., it may be determined by means of either the brucine-sulphuric acid method or the diphenylamine-sulphuric acid method. Fifty grms. of the finely-divided meat are extracted with 500 c.c. of cold water for 3 hours, and the filtered extract is diluted to 1 litre. Fifty c.c. of this solution are treated with an equal volume of mercuric chloride solution (equal volumes of a 5 per cent. mercuric chloride solution and of 2 per cent. hydrochloric acid), the mixture is filtered, and the nitrate is determined by the brucine method, using as a standard a solution containing 0·1 grm. of potassium nitrate per litre, or by the diphenylamine method. The latter process is carried out in same way as described previously (this J., 1911, 44) for the determination of nitrates in milk; sodium chloride must be present both in the solution under examination and in the standard nitrate solution, and the latter should contain acetic acid in order to make it stable (see this J., 1911, 919). For single determinations the brucine method is the more convenient, whilst for a series the diphenylamine method is preferable. In the case of large quantities of nitrate, Schloesing's method should be employed.—W. P. S.

[Beet] pulp; Comparative influence of water and vinasse [as extracting liquors] on the composition of —— from sugar factories and distilleries. L. Ammann. Comptes rend., 1912, **154**, 366—369.

The extraction of beets with pure water in sugar factories produces exhausted pulp much inferior for use as fodder to that from distilleries where the extraction is commonly carried out with the residues from distillation (vinasses) which, as they already contain a high percentage of non-sugar matters, remove very little of these from the beets. Samples of distillery-pulp produced as above were found to contain 11—13 per cent. of proteins (calculated on the dry solids) as compared with 7—9 per cent. in pulp from sugar factories, 0·7—1·1 per cent. of phosphoric acid as compared with about 0·2 per cent., 0·7—1 per cent. of fatty matters as compared with 0·1—0·2 per cent., 11—15 per cent. of matters extractable by alcohol as compared with 0·5—1·7 per cent., and 17—20 per cent. of saccharifiable cellulose as compared with 26—33 per cent. The high proportion of matters extractable by alcohol in distillery-pulp is due to decomposition of cellulose effected by sulphuric acid added to the extracting liquor to prevent the development of undesirable organisms; the result of this addition is therefore to increase still further the nutritive value of distillery-pulp.—J. H. L.

Phosphorus-content; Incineration of foodstuffs and other organic substances prior to the determination of their ——. A. Vozárik. Z. physiol. Chem., 1912, **76**, 426—432.

The phosphorus in foodstuffs is in part present in the form of phosphatides which are more or less volatile below 100° C. For the incineration of such products, as a first step in the determination of the phosphorus, the author proposes the following modification of Eschka's method. One grm. of the finely ground sample, if of animal origin, or 3 grms. if vegetable, is well mixed with 0·2 grm. of magnesia in a platinum crucible. The magnesia employed should be as light and voluminous as possible and free from lumps. The open crucible is laid obliquely, and at first warmed carefully near the edge until all volatile matters have been expelled. The burner is then moved towards the base of the crucible, the cover is placed obliquely in the mouth, and the heating is continued until incineration is complete. The whole operation may require ½—2 hours in the case of animal matters and 2—3½ hours with vegetable matters. The ash is obtained as a powder which does not adhere to the crucible.—J. H. L.

Phosphorus; Determination of —— in foodstuffs and other organic substances by titration with uranyl solutions, and the errors of the method. A. Vozárik. Z. physiol. Chem., 1912, **76**, 433—456.

In the determination of phosphorus in incinerated organic products (see preceding abstract) by titration with uranyl nitrate solutions, errors may arise from the presence of mineral acids, large quantities of acetic acid, various dissolved salts, especially the acetates of the alkali- and alkaline earth metals, and the phosphates of iron and aluminium. The liquid to be titrated should contain no phosphates acid towards phenolphthalein and no aluminium iron phosphate. The disturbing influence of free acetic acid begins to be appreciable at a concentration of 0·36 per cent. when cochineal is used as indicator, and 0·6 per cent. when potassium ferrocyanide is used. Errors are introduced by sodium, ammonium and magnesium acetates at concentrations exceeding 4, 2 and 0·75 per cent. respectively. The presence of strong acids leads to high results with cochineal as indicator but to low results with ferrocyanide. If both are used at the same time the divergence of the results gives an indication of the magnitude of the error. When the liquid titrated contains a large quantity of foreign salts the influence of the latter on the result must be determined and a corresponding correction made. A certain small volume of uranyl solution is required to produce the indicator-reaction: if allowance is made for this, there is strict proportionality between the volume of uranyl solution required and the quantity of phosphorus present, irrespective of the concentration of the latter. The author gives full details for carrying out the determination of phosphorus in incinerated organic substances by this method: the results obtained agree well with those found by the gravimetric citrate-method.—J. H. L.

Importation of articles of food containing poisonous substances into Sweden. Bd. of Tr. J., Feb. 29, 1912. [T.R.]

The Swedish Poisons Code of 1906, as amended by subsequent Decrees, provides that articles of food may not be imported into or sold in Sweden if they contain substances specified in two lists denominated, respectively, poisons of the 1st class and poisons of the 2nd class; they are also prohibited if they contain any of the undermentioned substances:—

(*a*) For all articles for use as food—
    Boric acid and its salts (borax, etc.).
    Hexamethylentetramine.
    Chlorates.
    Oxide of zinc.
    Preparations of the above.

Note.—Preserved vegetables may, however, contain copper to an extent of not more than 10 milligrammes per 100 grammes of the preserved article as weighed after the liquid has been poured off. If the amount of copper exceeds 2 milligrammes per 100 grammes of the preserve, there must, however, be a ticket on the jar stating that the article is coloured with copper.

(*b*) As regards meat and bacon, fresh or preserved—
    Aluminium salts.
    Benzoic acid and its salts.
    Oxides, hydroxides, carbonates, phosphates, silicates, acetates, and basic salts of alkalis and alkaline minerals.
    Salicylic acid and its salts.
    Sulphurous acid and its salts (sulphites), also hyposulphites.
    Colouring matters, all kinds.
    Preparations of the above.

(*c*) As regards fish products, fresh or preserved—
    The substances included under (*b*), with the exception of oxides, hydroxides, and carbonates of alkalis.

Note.—Uncooked fish, preserved in hermetically closed vessels, may have an addition of boric acid not exceeding 1 gramme, and salicylic acid not exceeding ½ gramme, to every 100 grammes of the article.

Denaturation of egg yolks. Bd. of Tr. J., Feb. 29, 1912. [T.R.]

Under No. 34 of the French Customs Tariff, yolks of eggs, unsweetened, not fit for alimentary purposes, are admitted free of duty, subject to denaturation at the expense of the importer by processes determined by the Administration. It has been decided that an effective denaturation may be carried out by the addition of crude oil of camphor, to the extent of 2 per cent. of the weight of the egg yolk. Egg yolks imported from foreign countries in a denatured condition may be admitted free of duty, provided that the Customs laboratories, which are to be consulted on the occasion of each importation, are satisfied that the denaturation has been effected in the manner described above.

Influence of putrid gases on lactic acid bacillus. Trillat. *See* XVIII.

Determination of furfural by means of Fehling's solution. [*Determination of pentoses and pentosans.*] Eynon and Lane. *See* XXIII.

Patents.

Eggs; Conservation of ——. H. Jerne, London. Eng. Pat. 2145, Jan. 27, 1911.

Eggs are coated with gelatin and then with a mixture of nitrocellulose (100 parts) and camphor (40 parts) dissolved in amyl acetate.—W. P. S.

Fodder; Process for making sugary ——. G. C. Dymond, Liverpool. From A. Huillard, Suresnes, France. Eng. Pat. 16,823, July 22, 1911.

An absorptive food material, such as straw, spent grain, or pulp, is mixed with the juice as extracted directly from beetroot, or with the same juice concentrated to a degree not exceeding saturation. The product, which may be dried if desired, is preferable to molasses fodder in that it contains a much smaller proportion of salts, and more particularly, of potassium salts.—L. E.

Persimmons; Process of treating ——. H. C. Gore, Washington, D.C. U.S. Pat. 1,015,950, Jan. 30, 1912. (Dedicated to the public.)

In order to remove the astringency of the fruits the latter are packed in air-tight receptacles from which the air is displaced by carbon dioxide. (See also this J., 1912, 147.) —W. P. S.

Coffee; De-caffeinated ——. N. Rosewater, Cleveland, Ohio. U.S. Pats. 1,016,293 and 1,016,294, Feb. 6, 1912.

(1). The unbroken coffee beans are macerated in hot water, whereby a large proportion of the caffeine is extracted, and then separated from the extract, and dried. The extract is evaporated to dryness, the residue being treated with very cold water in order to obtain a solution free from caffeine. The dried beans are caused to absorb this cold water extract, and finally dried again. Claim is also made for the product obtained by this process. (2) Beans containing caffeine and other xanthine alkaloids are repeatedly macerated in very cold water, and are subsequently repeatedly macerated in hot water (whereby caffeine and other xanthine alkaloids are extracted) until they have been denuded of their external skin. The beans are then dried and immersed in part of the cold water extracts previously concentrated to about the consistence of honey, whereby the substances soluble in cold water are absorbed into, and deposited upon the denuded surface of the beans to form a sealing glaze. The beans are finally dried again. Claim is also made for the product obtained by this process.—L. E.

Milk product and process. C. H. Campbell, New York, and P. T. Campbell, Hackensack, N.J. U.S. Pat. 1,016,548, Feb. 6, 1912.

A portion of the cream is removed from milk and the partially skimmed milk is evaporated at a low temperature to about one-fourth its volume; it is then cooled, the separated lactose is removed, the liquid portion is heated to a temperature of about 210° F., and the cream is added to it.—W. P. S.

Meat; Process of curing ——. C. B. Trescott, Assignor to J. Allerdice, Indianapolis, Ind. U.S. Pat. 1,016,656, Feb. 6, 1912.

Meat is placed in a closed receptacle from which the air is exhausted. Carbon dioxide is then admitted and the meat is afterwards transferred to a relatively dilute brine solution in which it is maintained at a temperature above 40° F. until cured.—W. P. S.

Soya beans; Processes and means for the complete transformation of ——. Y. Y. Li. Fr. Pat. 433,986, Sept. 6, 1911.

The beans, freed from stones and decorticated, are passed into a pipe from which they are withdrawn, through a number of branch-pipes, to be converted into flour (by dry grinding and bolting) suitable for bread-making, etc., or into oil and press-cake, or into "milk" (by wet grinding and pressing) and press-cake, or into sauce (Fr. Pat. 424,125 of 1910; this J., 1911, 827) or into "coffee" or into "chocolate." The "milk" may be concentrated or reduced to powder, or converted into "cheese," or into sauce, or it may be used for the preparation of casein. The cake obtained on expressing the "milk" may also be used for the preparation of casein, and the cake obtained on expressing the oil from the bean serves for the preparation of "milk" or meal.—L. E.

Flour and bread; Manufacture of ——. C. W. Chitty, Dover, and W. Jago, London. Eng. Pat. 2778, Feb. 3, 1911.

See Fr. Pat. 432,606 of 1911; this J., 1912, 148.—T. F. B.

Cattle food; Manufacture of ——. A. Roberti, Waremme, Belgium. U.S. Pat. 1,015,838, Jan. 30, 1912.

See Eng. Pat. 12,895 of 1911; this J., 1911, 1467.—T. F. B.

Protein; Production of soluble —— from insoluble protein matter. S. A. Vasey, Bromley. U.S. Pat. 1,015,857, Jan. 30, 1912.

See Eng. Pat. 20,766 of 1909; this J., 1910, 1224.—T.F.B.

Vegetable proteins; Process for rendering —— soluble. H. Walland, Brünn, Assignor to Erste Triester Reisschäl-Fabriks A.-G., Trieste. U.S. Pat. 1,016,115, Jan. 30, 1912.

See Eng. Pat. 8203 of 1910; this J., 1910, 1103.—T. F. B.

Milk sugar, casein, fat, albumin, and phosphates [from milk]; Process for producing ——. F. C. Harold. Fr. Pat. 433,612, Aug. 25, 1911.

See Eng. Pat. 12,855 of 1910; this J., 1911, 1182.—T. F. B.

Preparing worts for the manufacture of bakers' yeast. Fr. Pat. 433,841. *See* XVIII.

Automatic machine for extracting simultaneously the juice and oil of lemons, oranges, etc., without mixing them. Fr. Pat. 434,276. *See* XX.

XIXb.—WATER PURIFICATION; SANITATION.

Drinking waters; Sterilisation of —— by the action of ozonised oxygen and of chlorine compounds in the nascent state. E. Rouquette. Comptes rend., 1912, **154**, 447—450.

A most efficient steriliser and bactericide consists of a mixture of ten parts of "sodium peranhydrosulphate," $Na_2S_2O_8$, and one part of "chloride of peroxide of sodium," Na_2O_2Cl. The former is prepared by the action on one another of concentrated solutions of sodium bisulphate and hydrogen peroxide, and is stable in slightly acid solution; the latter is obtained by reacting on sodium sulphate with calcium hypochlorite, and is stable even in concentrated solution if slightly alkaline. One part of the mixed steriliser to five million parts of water will usually be sufficient, and only chlorides and sulphates are left in the water as products of its decomposition. It can be used either on the large or small scale, and on account of the ease of its application is most useful in dealing with cases of emergency, such as outbreaks of cholera, typhoid, etc.—J. T. D.

Ventilation; Influence of ozone in ——. L. Hill and M. Flack. J. Roy. Soc. Arts, 1912, **60**, 344—354.

The authors point out that for efficient ventilation, the chemical purity of the air is of relatively little importance, what is required being air of the proper degree of coolness and humidity, and movement of the air so as to vary continually the cutaneous condition of the body. The impulsion of hot air into a room is regarded as the most objectionable of all systems of ventilation. There is no trustworthy evidence of the presence of poisonous substances in normal exhaled breath, whilst there is a large amount of evidence against this view. Further, direct experiments on men placed in closed chambers showed that increased percentages of carbon dioxide and diminished percentages of oxygen of 2—3 per cent., or even 4—5 per cent. have little effect, and concentrations of carbon dioxide and oxygen such as occur in the worst-ventilated rooms or factories are without the slightest influence on health or comfort. In discussing the use of ozone in ventilation, the authors consider that its chief value lies in its effect on the olfactory nerves and those of the skin and respiratory tract. A great advantage is that the ozoniser can be readily put into and out of operation, thus permitting of that lack of uniformity which is essential to successful ventilation. The concentration of ozone must be very low (less than 1 part per million), so that the characteristic smell is barely perceptible.—A. S.

Road surfacings; Relation of modern —— to fish life. W. J. A. Butterfield. Surveyor, 1912, **41**, 277—284. J. Gas Lighting, 1912, **118**, 427.

From observations of the effects on fish life of various solutions and extracts it is concluded (1) that ammonia and many of its salts are highly toxic to fish; (2) that a gas liquor solution is nearly as toxic as clean water containing the same proportion of free ammonia; (3) that phenols and tars containing high proportions thereof are toxic to fish: (4) that light tar oils capable of forming a film on the surface of the water are deleterious; (5) that naphthalene, coal-tar pitch, and some asphaltums are not distinctly harmful to fish life; (6) that the use of salt water or calcium chloride for dust abating is not harmful; (7) that films of gasoline or heavy automobile mineral oil on the surface of water are not harmful. To ensure safety to fish life it is recommended that tar for road-surfacing should consist of coal tar or a mixture of coal tar and carburetted water-gas tar having a specific gravity not lower than 1·18 at 15° C., and containing not more than 1 per cent. of water or gas liquor (the ammonia in which should not exceed 5 grains per gallon of tar), 1 per cent. of light oils, and 3 per cent. by volume of crude tar acids, provided that the area of tarred surface is not greater than one-twentieth of the total area of ground draining into the watercourse. It is also observed that there is a remote risk of injury to fish life from washings from accumulations of horse droppings, or stable manure, and that the use of ammonium sulphate as a fertilizer is attended by appreciably greater risk of injury to fish life than the use of sodium nitrate.—H. H.

Industrial poisoning and accidents. Factory and Workshops Acts and Notice of Accidents Act. [T.R.]

A Parliamentary paper [Cd. 6072] giving preliminary tables of cases of industrial poisoning, fatal and non-fatal accidents, and dangerous occurrences in factories and workshops during the year 1911 has been issued by the Home Office. The following table gives the number of cases of poisoning reported, and also the fatal accidents occurring during the last two years, in some of the chemical and allied trades :—

	1911.		1910.	
	Cases	Fatalities	Cases	Fatalities
Lead poisoning.......	669	37	505	38
White lead	41	2	34	1
Red lead	13	1	10	0
Mercury poisoning ..	12	0	10	1
Barometer and thermometer making .	2	0	2	0
Phosphorus poisoning	0	0	0	0
Arsenic poisoning	10	1	7	0
Paints, colours and extraction of arsenic	7	0	5	0
Anthrax	64	11	51	9

There were 86 fatal accidents reported during the year (55 in 1910) in connection with the manufacture of chemicals and allied products (36 of these being due to an explosion in an oilcake mill at Liverpool in November) and two are recorded as occuring in the production of aerated waters, the same number as in the previous year. There was a decrease in the number of fatal accidents among workers in explosives factories. Electricity caused 9 fatal accidents, the other causes being molten metal or hot liquid 36, explosives 72, and escape of gas or steam 37.

Patents.

Refuse ; Process and apparatus for the combustion of ——. O. Uhde, Hamburg. Eng. Pat. 16,781, July 21, 1911.

The refuse is delivered into the top of a combustion chamber by means of a double-bell supply mechanism, the finer particles being thus separated partially from the coarser part. An air-blast enters the chamber below the grate and carries the finer particles towards the upper part of the chamber whence they are blown into a separate combustion chamber, a second air-blast being employed for this purpose. Both the fine and coarse particles are then burnt in the respective chambers. The grate in the first chamber is surrounded by water-cooled plates.
—W. P. S.

Ozone producer with treatment bottle attachment for the destruction of tubercle bacilli. H. A. Thomson, Glasgow. Eng. Pat. 18,626, Aug. 18, 1911.

Glass cylinders or tubes, provided internally and externally with electrodes of hollander wire cloth, are supported at each end by boards provided with openings lined with felt to allow for expansion of the glass. Holes in the boards also allow of a free passage of air around the tubes, thus keeping the latter cool. By means of a semi-circular blade switch any number of the tubes may be put in the circuit. The air, after ozonisation, passes through a chamber provided with a conical inlet and similar outlet, "where an oxidising process takes place."—B. N.

Water ; Apparatus for the sterilisation of —— by ultra-violet rays. M. P. Otto. First Addition, dated Nov. 8, 1910, to Fr. Pat. 421,296, Oct. 10, 1910 (this J., 1911, 442).

The lamps are mounted in quartz tubes reaching from side to side of the lamp chamber (*loc. cit.*) and an arrangement is provided for starting the lamps. The lamp chamber is movable and its sides fit closely into the narrow portion of the cylinder through which the water flows.—W. P. S.

Liquids ; Process for extracting dissolved salts from —— by means of volcanic tufa. Halvor Breda Ges. m. b. H. Fr. Pat. 434,007, Sept. 6, 1911. Under Int. Conv. Sept. 8, 1910.

For the removal of calcium and magnesium salts and iron and manganese compounds from water, the latter is passed through a mass of volcanic tufa, or a definite quantity of the tufa is added to the water.—W. P. S.

Waste-water ; General installation for the purification of ——, with suppression of obnoxious odours at the purifying stations. A. L. Valabrègue. Fr. Pat. 434,124, Sept. 7, 1911.

The floating substances and sediment are separated from the water in a specially constructed settling tank and conducted to covered septic tanks, the substances being removed from the settling tank at intervals of not more than 5 hours. The water is passed upwards through a filter, and the gases evolved in the septic tanks are conducted to a purifying tower containing slaked lime and iron oxide.—W. P. S.

Briquettes ; Composition for —— intended for use in securing the complete oxidation of solid particles or gases contained in liquids. L. Queunié and M. Andreson. Fr. Pat. 434,266, Sept. 16, 1911.

A mixture of washed coke (in grains of from 1 to 2 mm.), 50 parts, manganese dioxide, 30 parts, and calcium carbonate, 25 parts, is made into a dry paste by the addition of a sufficient quantity of sodium silicate of 45° B. The paste is then pressed in moulds and dried, the resulting briquettes being used to form an oxidising filter bed over which the liquid to be treated is distributed.—W. P. S.

Waste-water and sewage ; Purifying apparatus for ——. L. Queunié and M. Andreson. Fr. Pat. 434,267, Sept. 16, 1911.

Waste-water from factories, etc., is led into the upper part of a cylindrical chamber, provided with conical baffle-plates, where sedimentation takes place and any oil present rises to the surface. The liquid is then run off through a siphon, which also acts as a water-pump, and is distributed over the surface of a coke filter in the lower part of the cylinder. The air drawn into the water-pump is separated from the liquid and is employed to aerate a filter used for the sewage at a later part of the process. The separated oily portion and the sediment are run off as required into a second chamber which also receives ordinary sewage ; fermentation takes place in this chamber and the liquid then passes into the bottom of a third chamber from the top of which it passes into the top of a fourth chamber, the upper part of which is packed with iron shavings and the lower part with coke. After leaving this chamber the liquid is distributed over the surface of layers of filtering or oxidising material arranged in a fifth chamber and is at the same time aerated by the air received from the water-pump mentioned previously. The oxidising material (see preceding abstract) is aerated separately from time to time by means of a blast of air.
—W. P. S.

Liquor cresoli saponatus containing inorganic colloids ; Process for preparing ——. K. Roth. Ger. Pat. 242,776, Oct. 30, 1909.

Liquor cresoli saponatus (lysol) or other cresol soap solution is mixed with metallic salts, alkali hydroxide is added and the products are heated and dialysed.—T. F. B.

Liquids ; Apparatus for treating —— with ultra-violet rays. V. Henri, A. Helbronner, and M. von Recklinghausen. Second Addition, dated Aug. 31, 1911, to Fr. Pat. 425,406, Jan. 30, 1911. Under Int. Conv., Sept. 1, 1910.

See Eng. Pat. 20,436 of 1910 ; this J., 1911, 1229.—T. F. B.

Water, Apparatus for the industrial sterilisation of —— by means of mercury electric lamps with quartz tubes, immersed in the water. P. G. Triquet. Fr. Pat. 434,069, Nov. 14, 1910.

See Eng. Pat. 9047 of 1911; this J., 1912, 43.—T. F. B.

Sewage effluents; Treatment of ——. J. S. Waddington. Fr. Pat. 433,883, Sept. 4, 1911. Under Int. Conv., Sept. 26, 1910.

See Eng. Pat. 22,251 of 1910; this J., 1911, 615.—T. F. B.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Alkaloids; Microchemical examination of some ——. A. Grutterink. Z. anal. Chem., 1912, **51**, 175—234.

The behaviour of solutions of certain alkaloids and artificial bases with the ammonium salts of various organic acids has been examined with a view to ascertaining those acids which give crystalline products of characteristic form. Figures of the crystals are given in many cases, and the results obtained are summarised in the form of tables. The following have been found specially suitable for the detection (microchemically) of the corresponding bases:—*m*-nitrobenzoic acid for strychnine and hydrastimide; *p*-nitrobenzoic acid for strychnine and tropacocaine; dinitrobenzoic acid for hydrastine, novocaine, brucine, and strychnine; trinitrobenzoic acid for novocaine, tropacocaine, strychnine, brucine, and conine; dinitroanisic acid for hydrastimide; dihydroxybenzoic acid for cinchonine; trihydroxybenzoic acid for quinidine; opianic acid for brucine; meconic acid for quinidine; mellitic acid for quinidine and cinchonidine; naphthalenesulphonic acid for cocaine and strychnine; *p*-nitrophenylpropiolic acid for hydrastine, hydrastinine, strychnine, tropacocaine, cinchonidine, nicotine, and hydrastimide; and *o*-cresotinic acid for hydrastimide. For the microchemical detection of hydrastinine, hydrastine, tropacocaine, and cotarnine, potassium permanganate has been found a valuable reagent, giving characteristic crystalline products.—F. Sodn.

Calabar beans; Alkaloidal assay of ——. A. H. Salway. Amer. J. Pharm., 1912, **84**, 49—51. (See this J., 1911, 1408.)

The total alkaloid in Calabar beans is determined by the following process: 20 grms. of the powdered material (No. 60 powder) are shaken well with 200 c.c. of ether, then 10 c.c. of an aqueous solution of sodium carbonate (1 in 10) are added, and the mixture shaken vigorously at intervals for 4 hours. The powder is allowed to settle and 100 c.c. of the ethereal liquid transferred to a separator and made acid with *N*/10 sulphuric acid. The liquid is shaken well and extracted twice, using each time 10 c.c. of acid of the same strength. The combined acid extracts are made alkaline with sodium carbonate solution (1 in 10) and shaken 10 times successively with 20 c.c. of ether. The combined ethereal extracts are next washed with 5 c.c. of water and the ether removed. The residue is dissolved in 5 c.c. of *N*/10 sulphuric acid and the excess of acid titrated with *N*/50 alkali, using iodeosin as indicator.—F. Sodn.

β-Gnoscopine. (Prelim. note.) E. Hope and R. Robinson. Chem. Soc. Proc., 1912, **28**, 16—17.

The condensation of cotarnine with nitromeconine, resulting in the production of a base, $CH_2:O_2:C_{18}H_{11}O_2(OCH_3)_3 \cdot NO_2$, has already been briefly described (Hope and Robinson, Chem. Soc. Proc., 1910, **26**, 228; also this J., 1910, 371, 784), and the substance so synthesised was termed nitrognoscopine. The amino derivative, obtained on reduction, has now been converted into the hydrazine, which, on oxidation, yields not gnoscopine, but a stereoisomeride. It is proposed that *r*-narcotine shall be termed α-gnoscopine, whilst the new stereoisomeride is β-gnoscopine. In consequence, the nitro- and amino-derivatives are nitro-β-gnoscopine and amino-β-gnoscopine respectively. *Hydrazino-β-gnoscopine*, $CH_2:O_2:C_{18}H_{11}O_2(OCH_3)_3 \cdot NH \cdot NH_2$, is prepared by the reduction of diazotised amino-β-gnoscopine with stannous chloride in concentrated hydrochloric acid solution. It crystallises from ethyl alcohol in prisms melting at 205°—206° C. Copper acetate oxidises it in cold dilute acetic acid solution, and yields β-gnoscopine, $CH_2:O_2:C_{18}H_{12}O_2(OCH_3)_3$. This substance crystallises in well defined prisms from methyl or ethyl alcohol, or ethyl acetate. It melts at 180° C., and the melting point is depressed when the substance is mixed with a small quantity of α-gnoscopine. It forms a sparingly soluble hydrochloride and nitrate, but is in most respects similar to α-gnoscopine and narcotine. On oxidation with dilute nitric acid it yields cotarnine and opianic acid. Its methosulphate is changed on boiling with dilute potassium hydroxide into the potassium salt of narceine, from which pure narceine, identical with the natural product, was isolated. In view of the large rotation of narcotine and the pronouncedly racemic character of α-gnoscopine, it is provisionally suggested that the α-modification corresponds with racemic acid, and the β-form with *i*-tartaric acid. Experiments are in progress having for their object the resolution of β-gnoscopine and also its conversion into α-gnoscopine.

Anhydrohydrastininemeconine. (Prelim. note.) E. Hope and R. Robinson. Chem. Soc. Proc., 1912, **28**, 17.

The methods employed for the synthesis of β-gnoscopine (see preceding abstract) have been applied to the synthesis of anhydrohydrastininemeconine, [*dl*(or *r*)-β(or α) hydrastine]. The various processes give excellent yields so far as the preparation of the hydrazine, and the oxidation of this compound also gives a good yield of crude material, of which only about 50 per cent. is obtained in a pure condition. *Nitro*-dl-β(or α)-*hydrastine* $CH_2:O_2:C_{18}H_{12}O_2(OCH_3)_2 \cdot NO_2$, is produced by boiling an alcoholic solution of hydrastinine with nitromeconine. It crystallises from trichloroethylene in orange-yellow prisms, which melt at 173° C., and decompose a few degrees higher. Its salts resemble those of 2-nitro-β-gnoscopine. On boiling with glacial acetic acid, hydrastinine and nitromeconine are regenerated. *Amino*-dl-β(or α) *hydrastine*, $CH_2:O_2:C_{18}H_{12}O_2(OCH_3)_2 \cdot NH_2$, is readily produced by the reduction of the foregoing nitro-compound with tin and stannous chloride in glacial acetic and concentrated hydrochloric acid solution. The substance is best crystallised from chloroform and methyl alcohol, and occurs in rosette-shaped aggregates of prismatic needles. It melts at 214° C., and decomposes at a slightly higher temperature. Characteristic of this substance is the very small solubility of the hydrochloride. The amine is very sparingly soluble in ether, and the solution exhibits an intense bluish-violet fluorescence. *Hydrazino*-dl-β(or α)-*hydrastine*, $CH_2:O_2:C_{18}H_{12}O_2(OCH_3)_2 \cdot NH \cdot NH_2$, obtained in the usual way, crystallises from ethyl alcohol in colourless, hexagonal prisms, and melts at 174°—175° C., with evolution of gas at 180° C. On oxidation with copper acetate in faintly acid solution, it is changed into *anhydrohydrastininemeconine*, $CH_2:O_2:C_{18}H_{13}O_2(OCH_3)_2$. This isomeride of hydrastine crystallises from methyl alcohol or ethyl acetate. It melts at 137° C., a fact which, combined with the known melting points of narcotine, α- and β-gnoscopines, and hydrastine, would seem to indicate that it is the β- and not the α-form of inactive hydrastine. The methosulphate of the synthesised base yields, on treatment with alkali, methylhydrastine, which crystallises from alcohol in yellow needles melting at 156° C., and is identical with methylhydrastine derived from the natural product.

Chrysarobin; Constituents of commercial ——. F. Tutin and H. W. B. Clewer. Chem. Soc. Proc., 1912, **28**, 13—14.

Three samples of commercial chrysarobin and one of Araroba powder have been very fully examined. Chrysarobin was found to vary considerably in the relative proportions of its constituents, but what may be considered a typical sample had the following approximate composition: Chrysophanic acid (5 per cent.); emodin monomethyl ether (2 per cent.); the anthranol of chrysophanic acid (46 per cent.); the anthranol of emodin monomethyl ether (a small amount); *monomethyl ether* of *dehydroemodinanthranol*, $C_{16}H_{12}O_4$ (18 per cent.); *ararobinol*, $C_{23}H_{16}O_5$ (4 per cent.); and an inseparable mixture of substances, together with amorphous material (about 25 per cent.). One specimen of chrysarobin was devoid of ararobinol, whilst another contained a little emodin. The Araroba powder, in addition to the above-mentioned constituents of the chrysarobin, contained an appreciable amount of emodin, a small amount of a sugar which yielded *d*-phenylglucosazone, and traces of the higher fatty acids, also a substance which appeared to be a hydrocarbon.

Glycyrrhizic acid; Determination of —— in commercial ammonium glycyrrhizate. H. Cormimboeuf. Ann. Chim. analyt., 1912, **17**, 47—50.

Two grms. of the material are dissolved in 500 c.c. of hot water; the solution is filtered through a filter, treated with 5 c.c. of *N*/1 sulphuric acid, and set aside for 12 hours. The clear liquid is then decanted on to a filter, and the precipitated glycyrrhizic acid, a part of which adheres to the bottom of the vessel, is washed with several small portions of water, as far as possible by decantation, until the filtrate is no longer acid. The glycyrrhizic acid thus collected on the filter, and that remaining in the precipitating flask, is then dissolved in ammonia solution. The resulting solution contains the greater part of the glycyrrhizic acid present. The united mother liquor and washings are evaporated almost to dryness, when a further quantity of glycyrrhizic acid separates as a pasty mass. This is kneaded with 10, 10, and 5 c.c. of water. The washings are passed through a small filter, and the precipitate is dissolved in ammonia, as above. The two ammoniacal solutions are united, evaporated to dryness, and the residue dried at 100° C., and weighed. The result is the amount of real ammonium glycyrrhizate present.

Determination of gum.—The filtrate and washings from the glycyrrhizic acid separated by evaporation in the above process are treated with excess of ammonia, evaporated to dryness, and heated at 100° C. until constant in weight. This weight gives the gummy matter plus the ammonium sulphate present, and by deducting 0·330 grm. (the weight of ammonium sulphate equivalent to 5 c.c. of *N*/1 sulphuric acid) the weight of gum is obtained. The amount of ammonium glycyrrhizate present in this, as an impurity, should be very small, not exceeding 10 mgrms.—J. O. B.

Peppermint; Analytical characters of the essential oils from ordinary and from so-called red ——. Roure-Bertrand Fils. Wiss. u. ind. Ber. von Roure-Bertrand Fils, 1911, [3], 4, 38—40. Chem. Zentr., 1912, **1**, 489—490.

A DETAILED description of the botanical characters of the different cultivated species of *Mentha* is first given, and then a comparison of the analytical characters of the oils from ordinary (I.) and from so-called red peppermint (II.).

	I.		II.	
	1908.	1911.	1908.	1911.
Sp. gr. at 15° C.	0·9191	0·9184	0·9170	0·9136
Optical rotation in 100 mm. tube	—10°54′	—8°2′	—16°38′	—13°44′
Acid value	0·8	0·8	1·0	1·2
Ester value	40·5	31·7	18·9	17·5
Esters, as menthyl acetate	14·3%	11·2%	6·7%	6·2%
Combined menthol	11·3%	8·8%	5·2%	4·9%
Saponif. value of acetylated oil	160·8	169·1	180·2	185·6
Total menthol	50·9%	53·9%	58·0%	60·0%
Saponif. value of reduced and acetylated oil	188·0	—	221·7	—
Menthone	7·3%	—	16·8%	—

Both oils are soluble in 1 vol. of 80 per cent. alcohol, and the solutions become turbid on addition of more alcohol. The leaves of the red peppermint yield about 0·33 and those of ordinary peppermint 0·25 per cent. of oil; the latter has the finer odour.—A. S.

Asafetida; Oil of ——, and the valuation of the drug. E. F. Harrison and P. A. W. Self. Pharm. J., 1912, **88**, 205—208.

A NUMBER of samples of asafetida were examined, including fine large "tears," mixtures of "tears" with agglutinated binding material, and soft masses. The loss on drying varied between 9·8 and 22·3 per cent., the resin between 36·9 and 64·0 per cent., the essential oil between 5·8 and 16·4 per cent., and the ash between 1·4 and 32·6 per cent. These results were obtained from 15 different samples. Most methods for determining the sulphur in the oil give results which are too low. Satisfactory results were obtained by the following method. About 0·5 grm. of the oil is weighed into a flask of 150 c.c. capacity fitted with a ground-in condenser; 5 c.c. of water are then added followed by 5 c.c. of nitric acid of sp. gr. 1·42. The flask is gently warmed in order to start the reaction. 3 grms. of powdered potassium bromide are then added, the whole boiled for 10 minutes, cooled, and treated with 5 grms. of caustic soda dissolved in a little water. The contents of the flask are evaporated to dryness and ignited in a platinum crucible. After dissolving in water, the nitric and nitrous acids are removed and the sulphate determined in the usual way. The percentage of sulphur in the oil varied between 17·5 and 37·8 per cent. The sulphur content should be reckoned on the amount of real gum resin in the drug. Calculated in this way, its amount should not be below 1·5 per cent. Adulterants such as olibanum, galbanum, and ammoniacum can be readily recognised as the oils yielded by them contain no sulphur. Galbanum contains umbelliferone which can be detected by the blue fluorescence produced with alcoholic ammonia. Asafetida yields the same substance after heating with hydrochloric acid, whilst olibanum and ammoniacum do not. Sulphuric acid applied to the fresh surface of asafetida produces a bright red or brownish red colour, which suddenly becomes a fine violet changing to rose red on washing off.—F. SHDN.

Essential oils; Constituents of ——. Further derivatives of natural cedrene. F. W. Semmler and F. Risse. Ber., 1912, **45**, 355—360.

THE ketonic acid, $C_{15}H_{24}O_3$, obtained by the oxidation of natural cedrene with permanganate (this J., 1907, 1161), or with ozone, is a methyl ketonic acid. It can be further oxidised by means of nitric acid or an alkaline solution of bromine to a cedrenedicarboxylic acid, $C_{14}H_{22}O_4$. This can be crystallised from water or dilute nitric acid and melts at 182·5° C. This acid may be used to identify cedrene. For this purpose the sesquiterpene is oxidised by means of permanganate or ozone, and the acid thereby produced which boils at 200°—220° C. at 10 mm., is oxidised as above to the acid melting at 182·5° C.—F. SHDN.

Washington cedar (Thuja plicata); The leaf oil of the ——. R. E. Rose and C. Livingston. J. Amer. Chem. Soc., 1912, **34**, 201—202.

ON steam distillation at 100° C. the leaves and twigs of *Thuja plicata* yield about 1 per cent. of a clear, light yellow oil which has the characteristic odour of cedar boughs. The oil has the following characters: sp. gr. 0·913 at 20° C.; $n_D^{20} = 1·4552$; $[\alpha]_D = -4·77°$ at 20° C.; acid value, 0·518; saponification value, 2·8; acetyl value, 8·8. The authors were unable to confirm the statement of Brandel (this J., 1909, 39) that fenchone is a constituent of the oil; they find that it is composed of 80—85 per cent. of thujone, 3—5 of pinene, 1—2 of tanacetyl acetate, and 1—3 per cent. of tanacetyl alcohol, leaving about 10 per cent. to be accounted for by the formation of resin during distillation and experimental losses.—J. A.

Camphor with naphthalene; A supposed compound of ——. Jonniaux. Bull. Soc. Chim., 1912, 11, 129—132.

When a fused mixture of camphor and naphthalene is allowed to cool, the separation of camphor or of mixed crystals is observed, according as the molecular content of the former is above or below 58 per cent. (the eutectic concentration). The supposed compound of camphor and naphthalene obtained by J. Girard (J. Pharm. Chim., 1891, **24**, 105), is the eutectic mixture, melting at 32·5° C. —F. Soux.

Vanillin and its ethers; Chemical action of light on ——. E. Puxeddu. Atti R. Accad. dei Lincei. Roma, 1911, **20**, II., 717—723.

When solutions of vanillin in alcohol benzene, toluene, or ethyl acetate are exposed to the light, whether in presence of air or in an atmosphere of carbon dioxide, decomposition rapidly takes place and small quantities of dehydrovanillin, $(CHO)(OCH_3)(OH)C_6H_2.C_6H_2(OH)(OCH_3)(CHO)$, are deposited. The decomposition is not proportional to the duration of the action of the light, but is produced mainly in the earlier stages of the exposure. When a solution of the methyl or ethyl ether of vanillin in benzene is similarly exposed to the light, methyl- or ethyl-vanillic acid, $C_6H_3(OCH_3)(OCH_3 \text{ or } OC_2H_5)(COOH)$ is produced.—A. S.

Phenyl sodium carbonate as intermediate product in Kolbe's synthesis of salicylic acid. C. H. Sluiter. Ber., 1912, **45**, 59—62.

The view that in Kolbe's synthesis of salicylic acid, phenylsodium carbonate is formed as an intermediate product which undergoes transformation into sodium salicylate has been contestsd by Lobry de Bruyn (Rec. trav. chim. Pays-Bas, 1904, **23**, 385) and by Tiemstra (Ber., 1905, **38**, 1375). The author has investigated the interaction of diphenyl carbonate and pure dry sodium hydroxide, and finds that when molecular proportions of these substances are heated together at 160° C. in a current of nitrogen, sodium salicylate, phenol, carbon dioxide, sodium phenolate, and sodium carbonate are formed, and a portion of the diphenyl carbonate remains unaltered. The possible reactions are discussed and it is concluded that the two following occur:—

$$(1)\ (C_6H_5)_2CO_3 + 2NaOH = Na_2CO_3 + 2C_6H_5OH.$$
$$(2)\ (C_6H_5)_2CO_3 + NaOH = C_6H_5NaCO_3 + C_6H_5OH.$$

The sodium phenolate and carbon dioxide in the reaction products are evidently produced by decomposition of phenyl sodium carbonate, and quantitative experiments showed that under atmospheric pressure at 160° C., about 60 per cent. of the phenyl sodium carbonate decomposes in this way, whilst 40 per cent. undergoes transformation into sodium salicylate. The results of these experiments show that phenyl sodium carbonate is a possible intermediate product in Kolbe's synthesis of salicylic acid. The melting point of diphenyl carbonate was found to be 78·2°—78·4° C., not 88° C. as stated in many text-books. —A. S.

Alcohols of the aromatic series; Method of preparation of —— [from the corresponding aldehydes]. G. Vavon. Comptes rend., 1912, **154**, 359—361.

The aromatic aldehyde is dissolved in 2—3 times its weight of a suitable solvent (ether, ethyl acetate, methyl or ethyl alcohol, etc.), and treated with a few grms. of platinum black prepared by reducing platinic chloride with formaldehyde in alkaline solution (see Bull. Soc. Chim., 1911, **9**, 255). The mixture is agitated in presence of hydrogen maintained at a pressure of about 1 atm. Ten grms. of platinum black effect the complete reduction of 1 grm.-mol. of aldehyde in the cold within a few hours. Details are given of the reduction of benzoic, salicylic, methyl- and benzoyl salicylic, anisic and cinnamic aldehydes, vanillin, methyl-, ethyl-, acetyl- and benzoyl-vanillin and piperonal. The yield of alcohol is often quantitative and always excellent. The platinum black may be used for a number of successive operations. —J. H. L.

Glutamine; Specific rotatory power of —— and observations on ammonium glutamate. E. Schulze and G. Trier. Ber., 1912, **45**, 257—262.

It has previously been observed (Ber., 1906, **39**, 2933) that the optical activity of preparations of glutamine obtained by precipitating plant extracts with mercuric nitrate, varies very greatly. It is now found that on converting the glutamine into the crystalline copper compound, decomposing the latter with hydrogen sulphide, and recrystallising the recovered glutamine, the specific rotatory power of the product only varies within the limits of experimental error ($[\alpha]_D = +6·0°$ to $+7·0°$). The high rotatory power of some preparations of glutamine is ascribed to the presence of glutamic acid; this substance is more dextro-rotatory than glutamine, and, as the authors show, it also increases the rotation of glutamine itself. The low rotatory power of other preparations of glutamine may be due to the presence of Levo-rotatory or racemic glutamine.

Glutamic acid is neutralised by one molecule of ammonia. The salt slowly loses ammonia on standing over sulphuric acid, and if a solution of the salt is repeatedly evaporated on the water-bath, the ammonia is completely expelled; in 5 per cent. aqueous solution the salt has a specific rotatory power, $[\alpha]_D = -3·6°$ approximately.—L. E.

Alcohol; Colorimetric detection of —— in presence of acetone. Colour reactions of certain organic groups in presence of mineral acids and potassium bichromate. H. Agulhon. Ann. Chim. analyt., 1912, **17**, 50—51.

A reagent is prepared by dissolving 0·5 grm. of potassium bichromate in 100 c.c. of pure nitric acid of sp. gr. 1·310. This gives a blue colour at once, in the cold, with alcohols and aldehydes, even in dilute solutions, but does not react with ketones until after contact for some hours. One c.c. of pure acetone with 3 c.c. of the reagent develops an olive green colour only after 3 hours; a 1 : 5 solution of acetone requires 24 hours to form the colour. With ethyl alcohol, and with formaldehyde solution, a blue colour appears in 1 or 2 minutes even at a dilution of 1 : 200. No colour is given at a dilution of 1 : 400. The depth of tint is sufficiently definite, in relation to the amount of alcohol present, to allow it to be used for the approximate determination of the latter colorimetrically. In the cold, this reaction is a general one for all compounds possessing alcoholic or aldehydic functions. On heating, its range is less restricted. It is given by ketones, by oxalic acid, by esters, oils and fats, and by anthracene. Quinone gives a red colour; anthraquinone gives no reaction. Saturated acids and carbides also give negative results. A reagent giving green colours in a similar manner may be obtained by mixing 1 part of phosphoric acid and 3 parts of a 1 : 50 aqueous solution of potassium bichromate. This is less sensitive than the above nitric acid reagent. Another reagent may be obtained by dissolving 50 grms. of potassium hydrogen sulphate in 50 c.c. of a 1 : 100 solution of potassium bichromate. It gives a green colour, on boiling, with all substances containing a free alcoholic or aldehydic function, with ordinary ether, with ethyl acetate, and with the cyclohexanones. It gives no reaction, even on prolonged boiling, with fatty or aromatic ketones nor with unsaturated fatty acids, such as oleic and linolic acids. Although its range is more restricted than the nitric acid test, it is less sensitive. It may however be applied to the differentiation of oils. Olive, linseed and arachis oils do not react with it: castor oil gives a very marked reaction, due to its ricinoleic acid. Although the nitric acid reagent gives a reaction with oleic acid, it does not react within an hour with olive oil. With castor oil, it gives a blue colour in a few seconds, on agitation.—J. O. B.

Fractional distillation with steam. Golodetz. *See* I.

Patents.

Aromatic arseno-compounds; Manufacture of asymmetrical ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 11.709, May 15. 1911.

Asymmetric arseno compounds (arsines) are obtained by reducing a mixture containing two arsinic acids or two arsenoxides or an arsinic acid and an arsenoxide in equal molecular proportions. For example, 4-aminobenzene-arseno-3-amino-4-hydroxybenzene is obtained by reducing with stannous chloride and hydriodic acid a mixture of 217 parts of *p*-aminobenzenearsinic acid and 233 parts of *m*-amino-*p*-hydroxybenzenearsinic acid. Phenylglycine arseno-aminohydroxybenzene and dichlorohydroxybenzene-arseno-aminohydroxybenzene are obtained by analogous means.—T. F. B.

Arseno-compounds: Manufacture of ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 11,901, May 17, 1911.

Arsenobenzene and its derivatives may be obtained by the action of primary aromatic arsines on arylarsenoxides or their hydrates or on arylarsine dichlorides, $Ar.AsCl_2$, or their substitution products. By this method it is possible to prepare the hitherto unknown asymmetrical arseno compounds, Ar.As : As.Ar′. For example, 4·4′-diaminoarsenobenzene is produced by the interaction of *p*-aminophenylarsine and *p*-aminophenylarsenoxide, and 4-aminophenylarseno-4-hydroxybenzene results from the action of *p*-hydroxyphenylarsenoxide on *p*-aminophenylarsine. In addition to these two compounds, the preparation of 4·4′-dihydroxy-3·3′-diaminoarsenobenzene and of phenylglycine-arseno-3-amino-4-hydroxybenzene is described.—T. F. B.

5-Nitro-2-aminobenzene-1-arsinic acid; Manufacture of ——. Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 29,196. Dec. 28, 1911. Under Int. Conv., Dec. 28, 1910.

Whilst it is not generally possible to convert into arsinic acids derivatives of aniline substituted in the *para*-position, yet 5-nitro-2-aminobenzene-1-arsinic acid may be obtained by heating *p*-nitraniline with arsenic acid to about 210° C. The new compound crystallises from boiling water in yellow needles of m.pt. 235°—236° C. with decomposition; it is readily soluble in hot methyl and ethyl alcohols and in alkalis. When treated with sodium nitrite it yields a diazo compound which readily combines with the usual azo components.—T. F. B.

Bromodiethylacetylurea: Manufacture of ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 18.812, Aug. 21, 1911. Under Int. Conv., Aug. 31, 1910.

The ethers of bromodiethylacetylisourea (see Ger. Pat. 240.353 of 1910; this J., 1911, 1409) can be readily converted into the urea derivatives described in Eng. Pat. 2888 of 1910 (this J., 1910, 1332) by heating the ethers or their salts to higher temperatures, with or without addition of solvents or acids. The elimination of the bromodiethylacetyl residue does not occur when acids are used. *Example.* A mixture of 50 parts of bromodiethylacetylisourea methyl ether and 150 parts of hydrochloric acid is heated for some time on the water-bath; methyl chloride is eliminated and bromodiethylacetylurea separates, and can be recrystallised from dilute alcohol.—T. F. B.

Compounds containing iron, albumin, phosphorus, and arsenic; Manufacture of ——. Dr. W. Wolff und Co., G. m. b. H., Elberfeld, Germany. Eng Pat. 21,610, Sept. 30, 1911. Under Int. Conv., Jan. 13, 1911. Addition to Eng. Pat. 16,048 of 1910, dated July 23, 1909.

In the process described in Eng. Pat. 16,048 of 1910 (this J., 1911, 508) for making compounds of iron and albumin rich in phosphorus, part of the metaphosphoric acid or its salts may be replaced by arsenic acid or arsenic anhydride or one of its hydrates, whereby products containing arsenic are produced. The compounds have properties similar to those of the iron-albumin-phosphorus compounds, especially as regards their insolubility in pepsin and hydrochloric acid and their solubility in dilute sodium carbonate solution. *Example.* 5 kilos. of casein are dissolved in a solution of 1 kilo. of caustic soda lye (38° B.) and 200 litres of water. 0·75 kilo. of dissolved metaphosphoric acid is added and then a solution of 0·25 kilo. of arsenic acid: 5 litres of 50 per cent. ferric chloride solution are now added, followed by dilute ammonia. When the solution thus produced is treated with dilute hydrochloric acid, a compound is obtained which, when dry, contains about 1·5 per cent. of arsenic. Similar products are obtained from halogen derivatives of albumins.—T. F. B.

Nicotine from tobacco; Process for the production of —— N. T. Everard, Randlestown, Meath, Ireland. Eng. Pat. 26.234, Nov. 23, 1911.

Green tobacco leaves, stalks, etc., are reduced to small pieces and heated to 100° C. by steam or otherwise, with a small quantity (*e.g.*, 3 per cent.) of water until all the cells are ruptured. The juice is then removed by pressure or centrifugal action, and concentrated.—T. F. B

Glucoside from digitalis (foxglove); Manufacture of a new ——. F. Kraft, Brugg, Switzerland. Eng. Pat. 28,739, Dec. 20, 1911. Under Int. Conv., Dec. 20, 1910.

A new glucoside may be extracted from digitalis leaves by treatment with water at a temperature below 30° C., or with an indifferent organic solvent. For example, 1000 parts of *Digitalis purpurea* leaves are extracted twice with cold water and the extract is purified by treatment with a lead salt; after removing the excess of lead, the glucoside is extracted from the solution by 1000 parts of chloroform; the chloroform extract is freed from digitalic acid and water by means of sodium carbonate and anhydrous sodium sulphate, respectively, and is then concentrated to 100 parts and added to 150 parts of petroleum spirit. The glucoside which separates is dried and rapidly recrystallised from cold dilute alcohol, dissolved in chloroform, and re-precipitated by petroleum spirit. The new glucoside has a melting point of 150° C., and dissolves in about 600 parts of water at 15° C. It is stated to possess the properties of cardiac stimulation possessed by digitaline. When it is allowed to remain in contact with alcohol or acetone for some time it is converted into another glucoside, of m.pt. 255° C., and quite insoluble in water, which is also formed when the aqueous solution is heated. It is converted by aqueous alcohol into a hydrate, of m.pt. 75° C., which dissolves in 3000 parts of water.—T. F. B.

Glutamic acid and other products of hydrolysis of albuminous substances; Process of separating —— from one another by electrolysis. K. Ikeda and S. Suzuki, Tokyo, Japan. U.S. Pat. 1,015,891, Jan. 30, 1912.

Albuminous substances are hydrolysed by treatment with sulphuric acid, the liquid is filtered, and sulphuric acid and sulphates are removed. The liquid is then subjected to electrolysis in a cell divided into three compartments and containing a corrodible anode; three groups of compounds are thus separated, namely, acid compounds in the anode chamber, basic compounds in the cathode chamber, and neutral bodies in the intermediate chamber. The group of acid compounds together with metallic salts of glutamic acid, are removed from the anode chamber, treated with hydrogen sulphide, filtered, and the filtrate is concentrated. Hydrochloric acid is added to the concentrated liquid and the mixture set aside for several days; the hydrochloride of glutamic acid is thus obtained, from which glutamic acid may be separated.—W. P. S.

Organic iodine compounds; Process of preparing ——. J. L. Turner, Assignor to The H. K. Mulford Co., Philadelphia. U.S. Pat. 1,016,799, Feb. 6, 1912.

Iodo-anhydromethylene-proteids are obtained by treating 50 lb. of a proteid with 20 lb. of iodine, treating

50 lbs. of the product with 8 pints of 40 per cent. formaldehyde, and separating the precipitated product.—T. F. B.

Urea; Process for the manufacture of ——. H. Immendorff and H. Kappen. Fr. Pat. 433,457, July 17, 1911.

A solution of cyanamide when heated to about 70° C. in the presence of a catalyser, such as manganese dioxide, gives a good yield of urea provided that the mixture is kept in a neutral condition by the gradual addition of an acid. Solutions of calcium or sodium cyanamide can be used in this way. In case the calcium cyanamide is mixed with calcium chloride, the latter interferes with the separation of the urea from the products of the reaction. Salts such as sulphates or carbonates must then be added, which can convert the calcium chloride into salts insoluble in alcohol. —F. Shdn.

Terpin hydrate; Production of —— by the action of ultra-violet rays. J. J. B. Pougnet. Fr. Pat. 433,710, Aug. 29, 1911.

The formation of terpin hydrate from a mixture of oil of turpentine, nitric acid and alcohol is greatly accelerated by exposure to ultra-violet rays, especially when the mixture is kept in movement. For this purpose the liquid can be placed in a U-tube constructed of material transparent to the rays and mounted on a pendulum which is continually oscillated.—F. Shdn.

Terpene hydrocarbons; Process for the production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 434,285, Sept. 16, 1911. Under Int. Conv., March 8, 1911.

Substances such as terpineol, terpin hydrate, and the like can be readily converted into unsaturated terpene hydrocarbons by heating them in the presence of a catalyser of a non-acidic nature. The reaction can take place at a reduced pressure or in the presence of an indifferent gas.—F. Shdn.

Lemons, oranges, and the like; Automatic machine for extracting simultaneously the juice and oil of —— without mixing them. L. L. Grandin. Fr. Pat. 434,276, Sept. 16, 1911.

The machine is adapted for extracting the juice and oil from lemons, oranges, and the like. The fruits are cut in half and placed in hemispherical receptacles where they are held in position. The pulp is then pressed by a tool provided with a central passage for the exit of the juice. That part of the receptacle in contact with the cortex of the fruit is perforated. The oil expressed can then be collected separately from the juice of the pulp. Arrangements are provided for regulating the pressure.—F. Shdn.

Hydrastinine and analogous bases from berberine; Process for preparing ——. M. Freund. Ger. Pat. 241,136, Nov. 13, 1910.

α-Aryl, α-alkaryl-, or α-alkyl-derivatives of dihydroberberine are reduced to the tetrahydro bases, which are alkylated and then converted into the quaternary ammonium bases; when these are boiled with alkalis and the products oxidised, the corresponding hydrastinine derivatives are produced.—T. F. B.

Tetrahydroberberine derivatives; Process for preparing ——. M. Freund. Ger. Pat. 242,217, Oct. 15, 1910.

Tetrahydroberberine derivatives which have hydrocarbon radicles as substituents in the α-position, are treated with alkylating agents, the addition products are converted into the corresponding ammonium bases, and water is eliminated from these by heating with alkalis. The base obtained from α-alkyltetrahydroberberine and methyl iodide, for example, has the composition $C_{20}H_{19}R(CH_3)O_4N$, where R is the α-alkyl group. The products are of therapeutic value or are suitable for the preparation of hydrastinine and other derivatives. The new bases from α-benzyltetrahydroberberine and α-ethyltetrahydroberberine with methyl iodide melt at 121°—122° and 130°—131° C., respectively.—T. F. B.

Berberine derivatives; Process for preparing ——. M. Freund. Ger. Pat. 242,573, Dec. 25, 1910.

α-Alkyl, α-alkaryl-, or α-aryl-derivatives of dihydroberberine are treated with alkylating agents, and the products are decomposed by ammonia, sodium carbonate, or other alkali and the resulting bases reduced. Various new bases, which are of therapeutic value, are thus obtained.—T. F. B.

Adipic acid diamide and β-alkyladipic acid diamides; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 241,897, Jan. 11, 1911.

The amides of adipic acid or of the β-alkyladipic acids are produced by heating the free acids or their salts in presence of ammonia; for example, a stream of ammonia may be passed through the heated acid until elimination of water is effected.—T. F. B.

Mercury compounds of sulphaminobenzoic acid; Process for preparing ——. J. Kerb. Ger. Pats. 242,571 and 242,572, Oct. 23 and Nov. 26, 1910.

(1) By the action of mercuric oxide or carbonate on sulphaminobenzoic acid salts, feebly basic compounds are obtained, possessing powerful antiseptic properties. The mercury compounds of *o*- and *m*-sulphaminobenzoic acid are very readily soluble in water, but that of the *p*-acid is decomposed in the cold. For this reason the presence of the *p*-acid with the *o*-acid is not objectionable in the preparation of the pure *o*-compound. (2) A dihydroxydimercury compound, of the formula, $C_6H_3COOM(SO_2.NH.HgOH)_2$, is obtained by the action of mercuric oxide or carbonate on a salt of 2.4-disulphaminobenzoic acid.—T. F. B.

Butylene glycol; Method of producing ——. W. Fairweather, London. From E. I. du Pont de Nemours Powder Co., Wilmington, Del., U.S.A. Eng. Pat. 17,259, July 28, 1911.

See U.S. Pat. 1,008,333 of 1911; this J., 1911, 1470.—T.F.B.

Tubercle bacilli; Manufacture of therapeutically efficacious preparations of ——. Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 23,022, Oct. 18, 1911. Under Int. Conv., Oct. 19, 1910.

See Ger. Pat. 239,560 of 1910; this J., 1911, 1410.—T.F.B.

Fatty acids from their esters; Process for the manufacture of ——. W. Connstein, Assignor to Verein. Chemische Werke A.-G., Charlottenburg, Germany. U.S. Pat. 1,015,994, Jan. 30, 1912.

See Addition of Dec. 11, 1905, to Fr. Pat. 328,101 of 1902; this J., 1906, 654.—T. F. B.

ω-Para-alkyloxyphenylethylamines and their N-alkyl derivatives; Process of producing ——. G. Reinicke, Schöneberg, Assignor to Act.-Ges. f. Anilinfabr., Berlin. U.S. Pat. 1,016,092, Jan. 30, 1912.

See Eng. Pat. 26,645 of 1910; this J., 1911, 508.—T. F. B.

Organic mercury compounds. H. Schott, Charlottenburg, Assignor to Act.-Ges. f. Anilinfabr., Berlin. U.S. Pat. 1,016,784, Feb. 6, 1912.

See Eng. Pat. 28,583 of 1910; this J., 1911, 1409.—T.F.B.

Bromodiethylacetylurea; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. First Addition, dated Aug. 11, 1911, to Fr. Pat. 417,803, July 2, 1910. Under Int. Conv., Aug. 31, 1910.

See Eng. Pat. 18,812 of 1911; preceding.—T. F. B.

Nitrophenylnitromethane, its homologues and derivatives; Process for preparing ——. Soc. Chimique des Usines du Rhône. First Addition, dated July 24, 1911, to Fr. Pat. 426,635, Feb. 27, 1911. Under Int. Conv., April 27, 1911.

See Eng. Pat. 17,985 of 1911; this J., 1911, 1280.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Patents.

Films for coloured kinematography. J. Campbell, Wimbledon Park, and T. Thompson, Middlesbrough. Eng. Pat. 23,386, Oct. 23, 1911.

The colours used in preparing coloured cinematograph films, are applied in the form of concentrated solutions containing some quick-drying adhesive substance; by this means the colour remains on the surface of the film in a separate layer, and does not stain the film itself. A solution of collodion may serve as solvent for the colour.—T. F. B.

Photographic negative and method of producing the same. A. W. McCurdy, Baddeck, N.S., Canada. U.S. Pat. 1,014,970, Jan. 16, 1912.

A negative having light-reflecting high lights and transparent shadows of such contrast as to produce a well-defined positive when viewed by reflected light, is produced by subjecting the negative, after development and fixation, to the action of the fumes or vapours of a bleaching agent: the negative may be "cleared" by treatment with dilute acid before and after the bleaching treatment.—T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Powder and firework factories; Use of vessels, etc., made of tin alloys in ——. Will. Chem. Ind., 1912, **35**, 93—95.

The author reports on an investigation undertaken in the "*Zentralstelle für wiss.-techn. Unters. in Neubabelsberg*" to ascertain whether special danger attended the use of alloys containing tin in powder and firework factories. Weber in 1882 (this J., 1882, 505) showed that basic stannous nitrate is explosive, and this is confirmed. This substance is insoluble in organic solvents and is so unstable that it decomposes on contact with water, and it was not found possible to determine directly whether it is produced under conditions likely to obtain in powder and firework factories. The sensitiveness or explosibility of gunpowder and similar mixtures is increased by addition of small quantities of basic stannous nitrate or of finely divided tin, zinc, or lead. Experiments in which the conditions obtaining in factories were imitated, for instance, by prolonged friction of moist powder ingredients against tin alloys, showed that although the metal was attacked, the sensitiveness of the dried powder was not increased unless fine particles of metal were removed from the alloy. The results of the experiments are held to lend no support to the view that by the use of tin alloys under the conditions obtaining in powder and firework factories, the sensitiveness of the powder may be notably increased by formation of basic stannous nitrate or otherwise.—A.S.

Composition of some mine gases and a simple methane [determination] apparatus. Burrell. *See* IIa.

Patents.

Blasting charges. M. Mallet, St. Etienne, and J. H. Puthod, Ternand, France. Eng. Pat. 2164, Jan. 27, 1911.

After the explosive charge is placed in the borehole, the cartridge primed with the detonator is covered with a protecting plug of paper, clay, etc., and alternate plugs of soft and hard clay are rammed into the borehole.
—G. W. McD.

Explosive charges; Process of casting ——. W. Fairweather, London. From Dynamit-A.-G. vorm. Alfred Nobel und Co., Hamburg, Germany. Eng. Pat. 16,673, July 20, 1911.

A rod of cast or compressed explosive is introduced into the molten charge, in the shell, almost at the moment of its solidification. If the rod is previously enclosed in a metal or celluloid sheath, it can be used as a priming charge. This process, owing to the rapid cooling from inside and outside, gives a bursting charge free from air bubbles, of maximum density, and completely filling the shell. The rod may be of different composition from the main bursting charge, *e.g.* a rod of tetranitromethylaniline may be used with a trinitrotoluene bursting charge.
—G. W. McD.

Explosive charge for ordnance. H. Maxim, Hopatcong, N.J., Assignor to E. I. du Pont de Nemours Powder Co. U.S. Pat. 1,015,814, Jan. 30, 1912.

Grains of smokeless powder are mixed with grains of a heat-absorbing material and an explosive agglutinating agent is added.—G. W. McD.

Smokeless powders containing nitrocellulose and nitroglycerin; Process for the manufacture of ——. C. Claessen. Fr. Pat. 434,112, Sept. 11, 1911. Under Int. Conv., May 26, 1911.

In manufacturing propellents by means of heat and pressure from nitrocellulose and nitroglycerin, without the aid of solvents (see this J., 1911, 448; 1910, 842, 1229) any acid produced during the process of manufacture is neutralised by the addition of not more than 5 per cent. of a double salt, *e.g.* the double oxalate of ammonium and sodium.—G. W. McD.

XXIII.—ANALYTICAL PROCESSES.

Sodium oxalate; Hydrolysis of —— and its influence upon the test for neutrality. W. Blum. J. Amer. Chem. Soc., 1912, **34**, 123—136.

Solutions of sodium oxalate in water are alkaline to phenolphthalein but, contrary to the belief of Sörensen who proposed the use of this salt as a standard for acidimetry (this J., 1898, 72; 1899, 74; 1900, 1041; 1905, 513), the alkalinity is not increased by boiling the solution unless this is done in glass vessels which are appreciably attacked by the liquid, "Durax" glass being the least affected of the kinds tested. Commercial samples of sodium oxalate, dried at 240° C., may contain sodium bicarbonate or even occluded carbon dioxide, since several samples examined were colourless or nearly so when dissolved in pure water containing phenolphthalein but after being boiled for a few minutes became strongly pink and remained pink on cooling. Such samples evolved carbon dioxide upon boiling the aqueous solution and upon boiling with acid evolved a total amount of carbon dioxide which corresponded with the total alkalinity calculated to sodium bicarbonate and in one case was in excess of this. The following method for testing the neutrality of sodium oxalate is recommended to replace that given by Sörensen. 200 c.c. of water are evaporated in a quartz or "Durax" glass flask to 150 c.c. in a current of pure air, free from carbon dioxide. Exactly 0·2 c.c. of phenolphthalein solution (1 per cent. solution in alcohol), and 4 grms. of sodium oxalate are added and the boiling continued for ten minutes, after which the solution is cooled to room temperature while maintaining the air current. If pure, the solution should have a pink colour equal to that of a standard prepared by adding 0·2 c.c. of phenolphthalein to 150 c.c. of water containing 10 c.c. of *N*/10 sodium hydroxide, and diluting 9 c.c. of this solution to 150 c.c. Each c.c. of *N*/100 acid or alkali required to titrate to the standard colour indicates the presence respectively of approximately 0·04 per cent. of sodium bicarbonate or 0·03 per cent. of acid sodium oxalate. One or two recrystallizations in platinum will usually be sufficient for the preparation of the pure salt from materials containing a moderate excess of alkali or acid.—J. A.

Sulphuric acid; Determination of ——. K. K. Järvinen. Ann. acad. scient. Fennicae, Serie A, 2, 1910, No. 4 1911 No. 16. Chem. Zentr., 1912, 1, 526—527.

The author has studied the occlusion of substances by precipitated barium sulphate and from his experiments concludes that accurate results in the determination of sulphuric acid as barium sulphate can be obtained only if the solution be first freed from all metal ions, so that precipitation is effected in a solution of pure sulphuric acid. This method is however too tedious for practical purposes, and the author recommends precipitation as benzidine sulphate and titration of the precipitate with sodium hydroxide (see Raschig, this J., 1903, 883, 1066). Full details of the procedure found to yield the most accurate results are given. A. S.

Phosphoric acid determination ; Von Lorenz' method of ——. H. Neubauer and F. Lucker. Z. anal. Chem., 1912, **51**, 161—175.

In the determination of phosphoric acid by the method of Lorenz (weighing as ammonium phosphomolybdate, after precipitating in the presence of fixed quantities of nitric and sulphuric acids and ammonium sulphate, washing successively with ammonium nitrate solution, alcohol, and ether, and drying *in vacuo* ; Landw. Versuchs-Stat., 1901, **55**, 183), the authors prefer to use a Neubauer crucible of platinum (or of gold with 10 per cent. of platinum), in place of a Gooch crucible, and commercially pure acetone (free from aldehyde), instead of alcohol and ether. The precipitate is dried under reduced pressure, and weighed at once or kept until required in a desiccator containing sulphuric acid and water in equal volumes ; it contains 3·295 per cent. of phosphoric oxide, as in the original process. By the introduction of these modifications and of more convenient forms of apparatus, which are described, it is claimed that the process has been simplified and cheapened, so as to be of use in agricultural laboratories. The acetone used is readily recovered.—F. Sodn.

Fluorine ; Determination of —— as calcium fluoride. G. Starck and E. Thorin. Z. anal. Chem., 1912, **51**, 14—18 (Cf. also this J., 1904, 1046.)

In precipitating fluorine as calcium fluoride by the method recommended by Berzelius, the tedious filtration of the gelatinous precipitate, and the subsequent separation of the calcium carbonate from the mixed precipitate, may be avoided by carrying out the precipitation in the presence of a known amount of oxalate ions. It is shown that when known amounts of pure sodium fluoride in solutions slightly acid to acetic acid were treated in the presence of a known quantity of sodium oxalate with calcium chloride solution, the precipitate separated by passing through a filter-tube packed with asbestos, washed, dried at 210° C., and weighed, the results obtained were in accordance with the theoretical values. A known volume of sodium oxalate solution, the titre of which has previously been ascertained against permanganate, is added, and the necessary deduction made from the weight of the mixed precipitate of calcium oxalate and fluoride.—J. P. O.

Furfural ; Determination of —— by means of Fehling's solution. [Determination of pentoses and pentosans]. L. Eynon and J. H. Lane. Analyst, 1912, **37**, 41—45.

Following a method suggested by Flohil (this J., 1911, 242) for the estimation of furfural in the distillates obtained in determining pentosans, the authors recommend the following procedure :—An aliquot part of the acid distillate, containing not more than 0·05 grm. of furfural, is neutralised with pure solid sodium carbonate, mixed with 20 c.c. of Fehling's solution (10 c.c. of a solution of 69·26 grms. of crystallised copper sulphate per litre, and 10 c.c. of a solution containing 348 grms. of Rochelle salt and 100 grms. of caustic soda per litre), and made up with water to a total volume of 100 c.c. in a flask of about 200 c.c. capacity. The flask, fitted with a vertical reflux condenser, is placed upright on an asbestos card over a burner. The flame of the burner is so adjusted that the liquid comes to boiling in 12—15 minutes, and ebullition is continued for 35 minutes, after which the precipitated cuprous oxide is at once filtered off on a Soxhlet tube, washed, dried at 100°—110° C., and weighed. There is no necessity to reduce the cuprous oxide and weigh the copper formed. The weight of cuprous oxide obtained must be corrected by subtracting from it the amount precipitated in a blank experiment without furfural but with the same quantity of sodium chloride as was present in the actual experiment. In a series of such blanks the authors found that for quantities of sodium chloride of 0·0, 5·6, 8·0 and 10·4 grms. in the 100 c.c. of reaction-mixture the corresponding quantities of cuprous oxide precipitated were 5·5, 9·3, 10·5 and 11·7 mgrms. From the quantity of copper corresponding to the corrected weight of cuprous oxide obtained, the amount of furfural present in the 100 c.c. of reaction-mixture may be found by help of the following table :—

Wt. of furfural : grm.	Wt. of cuprous oxide (corrected) : mgrms.	Wt. of copper (corrected) mgrms.	Ratio $\frac{\text{furfural}}{\text{copper}}$
0·0100	30·0	26·6	0·376
0·0200	57·0	50·6	0·395
0·0300	81·0	71·9	0·417
0·0400	103·5	91·9	0·435
0·0500	125·0	111·0	0·450

It will be seen that the factor to be used in calculating the furfural from the weight of copper varies according to the concentration of the furfural. The authors confirmed Flohil's statement that the unreduced copper in the reaction-mixture after boiling may be determined by Schoorl's method (this J., 1899, 791). For this purpose the contents of the flask are cooled, treated with 10 c.c. of a 20 per cent. solution of potassium iodide and 10 c.c. of 25 per cent. solution of sulphuric acid (1·5 parts of concentrated acid to 8·5 parts of water by volume) and then titrated with $N/10$ sodium thiosulphate solution.—J. H. L.

Hydroxy-, amino-, and imino-derivatives of organic compounds ; Quantitative estimation of —— by means of the Grignard reagent, and the nature of the changes taking place in solution. H. Hibbert. Chem. Soc. Proc., 1912, **28**, 15—16.

The author finds that the lower fatty alcohols when treated with magnesium methyl iodide in phenetole or amyl ether solution react quite abnormally, the amount of methane evolved falling much below that demanded by theory ; thus with methyl, ethyl, and propyl alcohols the methane evolved amounts to only 43, 71, and 83 per cent. respectively. The lower fatty amines also behave abnormally in these solvents, in certain cases no evolution of gas whatever taking place at the ordinary temperature when such derivatives are mixed with the Grignard reagent. Experiments carried out in phenetole solution with fatty and aromatic hydroxy-, amino-, and imino-derivatives always gave too low values. The conclusion was drawn that the method originally proposed by Hibbert and Sudborough (this J., 1904, 77) for the estimation of hydroxyl groups in organic compounds is not generally applicable ; only in the case of the aromatic derivatives and where amyl ether (not phenetole) is employed as the solvent, are the results of value. Pyridine (Zerewitinoff, this J., 1907, 646 ; and 1911, 1233) appears accordingly to be the most suitable solvent for this purpose, but as no experiments have as yet been carried out on the lower fatty alcohols and amines in this solvent, no decisive answer can as yet be given regarding this substance. The use of dimethylaniline was suggested as a possible substitute for pyridine.

Composition of some mines gases and a simple methane [determination] apparatus. Burrell. *See* IIa.

Determination of sulphur in pyrites. Heczko. *See* VII.

The U.-V.-filter-lamp as an aid in determining the purity of chemical products [potassium carbonate] Wolff. *See* VII.

Volumetric determination of vanadic acid by potassium ferrocyanide. Müller and Diefenthäler. *See* VII.

Determining copper in steel. Zinberg. *See* X.

Determination of vanadium in ferro-vanadium. Slawik. *See* X.

Determination of gold, silver, and platinum. Trenkner. *See* X.

Electrolytic determination of lead using a gauze cylinder anode. Woiciechowski. *See* X.

Determining melting points of fats. Prouzergue. *See* XII.

Errors in the determination of cholesterol by Ritter's method. Corper. *See* XII.

Detection of pine oil in oil of turpentine. Piest. *See* XIII.

Ceresin wax in rubber mixings. Britland and Potts. *See* XIV.

Reactions of the tannins. Eitner. *See* XV.

Tannins. Hoppenstedt. *See* XV.

Comparative tests of the official and the old filter-bell method with certain bisulphited quebracho extracts. Sebell. *See* XV.

Determination of acids in chestnut wood and tannery liquors. Kerr and Wilson. *See* XV.

Determination of the crystal sugar obtainable from raw sugar. Herzfeld and Zimmermann. *See* XVII.

Determination of sucrose in cane molasses by the double polarisation method, using invertase and acid as hydrolyst. Ogilvie. *See* XVII.

Indirect methods of extract determination [in wines, liqueurs, fruit juices, etc.]. Fresenius and Grünhut. *See* XVIII.

Analyses and methods of detection of certain proprietary substances sold as preservatives for milk, cream, etc. Monier-Williams. *See* XIXA.

Aldehyde figure of butter. [Determination of protein.] Miller. *See* XIXA.

Determination of potassium nitrate in meat. Tillmans and Splittgerber. *See* XIXA.

Incineration of foodstuffs and other organic substances prior to the determination of their phosphorus content. Vozarik. *See* XIXA.

Determination of phosphorus in foodstaffs and other organic substances. Vozarik. *See* XIXA.

Microchemical examination of some alkaloids. Grutterink. *See* XX.

Alkaloidal assay of Calabar beans. Salway. *See* XX.

Determination of glycyrrhizic acid in commercial ammonium glycyrrhizate. Cormimbœuf. *See* XX.

Oil of asafetida and the valuation of the drug. Harrison and Self. *See* XX.

Colorimetric detection of alcohol in presence of acetone. Colour reactions of certain organic groups in presence of mineral acids and potassium bichromate. Agulhon. *See* XX.

PATENTS.

Inflammable gases; Apparatus for detecting the presence of ——. F. Schröter. Fr. Pat. 433,412, Aug. 19, 1911.

THE gas being tested is passed through a combustion tube over red hot copper oxide. At the exit end of the tube two contact points of an electric circuit are kept apart by a piece of calcium chloride or other hygroscopic material. Should inflammable gas be present, the water produced liquefies the calcium chloride and the springs of the contact pieces bring them together, close the electric circuit, and sound an alarm.—G. W. McD.

Dangerous gases; Apparatus for the detection of ——. F. J. Turquand and W. E. Gray, London. U.S. Pat. 1,016,305, Feb. 6, 1912.

SEE Eng. Pats. 8582 and 17,146 of 1910; this J., 1911, 1031.
—T. F. B.

Separating glutamic acid and other products of hydrolysis of albuminous substances by electrolysis. U.S. Pat. 1,015,891. *See* XX.

XXIV.—MISCELLANEOUS ABSTRACTS.

Mineral metamorphosis; Supposed chemical actions of pressure in ——. G. Spezia. Atti R. Acc. Sci. Torino, **46**; N. Jahrb. Mineral., 1911, II., 167—168. Chem. Zentr., 1912, **1**, 516—517.

FURTHER experiments are described on the lines previously laid down (see this J., 1911, 550). The results show the incorrectness of the view expressed by Van Hise (U.S. Geol. Survey, **47**,) that at depths of 10,000—12,000 m., silicifying, dehydrating, and deoxidising actions might be produced by mere pressure. The author using uniformly applied pressures of from 6000 to 9500 atmospheres could effect no reaction between silica and calcspar, no dehydration of alabaster, alum, limonite, or goethite (embedded in anhydrous quartz powder), and no deoxidation of copper oxide by magnesium. As showing the immense difference between the effects of temperature and of pressure, it is mentioned that goethite can be dehydrated even when surrounded by water by heating for 7 days at 330° C. in a closed steel cylinder.—A. S.

Coagulation; Fractional ——. *Relations between the size of particles and stability of disperse systems.* S. Odén. Z. physik. Chem., 1912, **78**, 682—707.

A SILVER hydrosol of coffee-brown colour was prepared by Carey Lea's method of reducing silver nitrate by ferrous sulphate in presence of sodium citrate. By fractional coagulation with ammonium nitrate, in a manner analogous to that previously adopted for the fractional coagulation of sulphur hydrosols by sodium chloride (see this J., 1911, 540), this brown hydrosol was separated into fractions the colour of which by transmitted light ranged from yellow through red and lilac to greyish green as the degree of dispersion diminished. The properties of the several fractions, including their ultramicroscopic appearance, are described. On allowing a few drops of one of the fractions to evaporate on a glass plate, a silver mirror is formed. The colours (viewed by transmitted light) of the mirrors from the several fractions do not agree with those of the fractions themselves, but vary in the same order as that given above from rose red through sky blue, and dark blue to black.—A. S.

PATENTS.

Liquid films; Methods of, and means for demonstrating certain properties of ——. C. V. Boys, London. Eng. Pat. 16,732, July 20, 1911.

A WATER-TIGHT box, with an inturned rim, is mounted on a spindle. The box is partly filled with a soap-resin solution with or without the addition of glycerin, and is rotated until the sides are wetted up to the rim and a bubble is then blown and attaches itself to the rim. A hole in the rim, or a corrugated edge, allows of the equalisation of the air pressure, on both sides of the film, during rotation. A transparent cover is put on the box and a mirror for reflecting light can also be employed. Bands, rings and spirals of very varying colour and brilliancy can thus be produced.—G. W. McD.

Tobacco; Artificial — and process of making the same. A. Moonelis, New York. U.S. Pat. 1,016,811, Feb. 6, 1912.

A TOBACCO paper is made from tobacco fibre free from water-soluble constituents and the paper is then treated with an aqueous extract of a good grade of tobacco leaves.

—W. P. S.

Books Received.

CHAUX, CIMENTS, PLÂTRES. Par E. LEDUC et G. CHENU. Libraire Polytechnique Ch. Béranger. Editeur Successeur de Baudry et Cie., 15, rue des Saints-Pères, Paris; 21, rue de la Régence, Liège. 1912. Price 6 francs.

SMALL 8vo volume, containing 246 pages of subject matter with 33 illustrations, and 20 tables. A table of contents acts as index. The text is classified as follows:—I. Calcareous substances, rich limestones, and hydraulic limes. II. Cements. III. Puzzuolana. IV. Sands and mortars. V. Plasters. VI. Appendix: (i.), Conditions of French contracts of supply; (ii.). Conditions of foreign contracts of supply. In each of the foregoing chapters are also given the methods of chemical analysis, and of physical and mechanical testing.

THE USES OF PEAT FOR FUEL AND OTHER PURPOSES. By C. A. DAVIS. Department of the Interior. Bureau of Mines, U.S.A. Bulletin 16. Government Printing Office. Washington, 1911.

8vo volume, containing 207 pages of subject matter, including a list of publications on fuel testing, and an alphabetical index. There are two illustrations. The text is subdivided as follows:—I. Definition of peat. II. Brief history, as a fuel. III. Deposits in the United States. IV. Origin and formation. V. Peat formation on poorly drained, flat-land surfaces, etc. VI. Physical and chemical properties of peat as related to its fuel value. VII. Comparative fuel value of peat in differing conditions. VIII. Use of peat fuel in Europe. IX. Chemical effects of artificial drying. X. Calorific value and evaporative effect. XI. Preparation and manufacture of peat fuel. XII. Chemical and mechanical tests. XIII. Cut peat. Machine peat. XIV. Fuel products derived from the distillation of peat. XV. Manufacture of gas from peat. XVI. General conclusions on peat fuel. XVII. Peat as raw material for products other than fuel. XVIII. Agricultural uses. XIX. Tables of analyses. XX. Selected bibliography of peat.

LECTURES ON CEMENT. By BERTRAM BLOUNT. The Institute of Chemistry, 30, Bloomsbury Square, W.C. Price 2s. 6d. net.

8vo volume, containing 67 pages of text, together with three diagrams and three photographs. Following the lectures are four appendixes dealing with cement analysis, experimental preparation of cement, and the British standard specifications for Portland cement.

BULLETIN OF THE IMPERIAL INSTITUTE. Vol. IX. No. 4. Price 1s.

THIS issue of the Bulletin contains the result of investigations in connection with the aromatic grass oils (Part 2), the "Ibean camphor" tree of the East Africa Protectorate, Para rubber from Seychelles, the causation of Molteno, Pictou or Winton disease in cattle and horses, the irritant action of satinwood, and strüverite (a rare tantalum mineral from the Federated Malay States); also notices respecting the cultivation, preparation, and production of flax and linseed, the agricultural development of Nyasaland, etc.

REPORT ON THE MOLYBDENUM ORES OF CANADA. By T. L. WALKER. Canadian Department of Mines, Ottawa. No. 93.

8vo volume containing 58 pages of text, with an index and bibliography, together with 14 photographs and 10 figures (see this J., 1912, 76).

REPORT ON THE GYPSUM DEPOSITS OF THE MARITIME PROVINCES. By WILLIAM F. JENNISON. Canadian Department of Mines, Ottawa. No. 84.

THIS report consists of 165 pages of text and an alphabetical index. There are also 36 photographs, 19 drawings, and 3 maps, showing the location of the deposits.

COMMERCIAL FERTILISERS. Kentucky Agricultural Experiment Station. Lexington, Ky. Bulletin No. 152.

THIS Bulletin, which consists of 128 octavo pages, contains analyses of 555 commercial fertilisers, including 325 "complete fertilisers," 62 acid phosphates or superphosphates, 7 nitrogenous superphosphates, 72 acid phosphates and potash mixtures, 81 bones, tankage, and non-acidulated bones and potash mixtures, and 3 samples of potash salts only.

FARBSTOFFTABELLEN. Von GUSTAV SCHULTZ, Professor der Chemischen Technologie an d. Tech. Hochschule zu München. Fünfte, vollständig umgearbeitete und stark vermehrte Auflage der Tabellarischen Uebersicht der im Handel befindlichen künstlichen organischen Farbstoffe. Von Gustav Schultz und Paul Julius. II und III Lieferungen. Weidmannsche Buchhandl. Zimmerstr. 94, Berlin, S.W. 68. 1912. Price M. 3 net, each part.

THE present issues form parts II. and III. of the new edition of the Schultz and Julius Tables. Part II. contains pages 41—80, commencing with "Sudan Brown" $C_{20}H_{14}N_2O$, and ending with "Tuchrot 3B extra." Part III. contains pages 81—120, commencing with "Sudan IV." or "Ponceau 3B," and ending with "Rosazurin G."

HANDBUCH DER MINERALCHEMIE. Herausgegeben von Prof. Dr. C. DOELTER. Vier Bände. Mit vielen Abbildungen, Tabellen und Diagrammen. Bd. I. 5. Theodor Steinkopff's Verlag. Dresden. 1911. Price M. 6.50 (For Bd. I. 4, see this J., 1912, 94).

CONTAINS pages 641—800, and is a continuation by C. Doelter of silicate fusions (*loc. cit.*).

PRACTICAL CHEMISTRY FOR ENGINEERING STUDENTS. By ARTHUR J. HALE, B.Sc., Lecturer and Demonstrator in Chemistry at the City and Guilds Technical College, Finsbury. With an Introductory Note by Professor R. MELDOLA, D.Sc., LL.D., F.R.S. Longmans, Green and Co., 39, Paternoster Row, London. New York, Bombay, and Calcutta. 1912. Price 3s. net.

8vo volume, containing 187 pages of subject matter, with 58 illustrations, including an Appendix containing 25 tables, and an alphabetical index of subjects. It is stated in the introduction that whilst intended primarily for engineering students, the work includes a complete course for builders and others interested in the chemistry of building materials. The text is subdivided as follows:—I. Physical change and chemical change. II. Composition of air and water. Oxidation and reduction. III. Oxides and hydroxides, etc. IV. Determination of chemical equivalents. V. Sulphides. VI. Chlorine and its compounds. VII. Carbon dioxide, carbonates and carbides. VIII. Carbon and carbonaceous substances. IX. Sulphites and sulphates. X. Phosphorus, arsenic, silicon, and boron compounds, etc. Mineral substances used as pigments. XI. Qualitative analysis. XII. Volumetric analysis. XIII. Quantitative analysis for engineers. XIV. Tables of useful data.

*New Books.

Alkohol Export-Zeitschrift f. das gesamte gärungstechn. Gewerbe der Branntwein- u. Spiritus-Industrie, Rektifikation, Presshefe- u. Likör-Fabrikation u. Handel. (In deutscher, französ. u. russ. Sprache.) Red.: H. Nehbel. 21. Jahrg. Dezbr. 1911—Novbr. 1912. 12 Nrn. (Nr. 1. 8 S.) 49,5×33 cm. Berlin. Maetzig and Co. M. 6.

Baumann, R.: Versuche m. Aluminium, geschweisst. bei gewöhnlicher u. bei höherer Temperatur. Hrsg. vom Ver. deutscher Ingenieure. Lex 8°. Berlin, J. Springer. 1911. M. 1.

Beckurts, Prof. H.: Die Methoden der Massanalyse. Unter Mitwirkg. v. Dr. O. Lüning. Zugleich 8. völlig umgearb. Aufl. v. Fr. Mohr's Lehrbuch der chemischanalyt. Titriermethode. 2. Abtlg. (IX u. S. 483—842 m. 111 Abbildgn.) gr. 8°. Braunschweig, F. Vieweg u. Sohn. 1912. M. 10.

Biège, H.: Le gaz d'éclairage et ses applications modernes. 28 fig., in 8°. Paris, H. Desforges. 1912. 4 fr.

Erban, Dr. F.: Die Anwendung v. Fettstoffen u. daraus hergestellten Produkten in der Textil-Industrie. (XII, 365 S.) 1911. gr. 8°. Halle, W. Knapp. M. 18; cloth M.19.

Gary, Prof. M.: Versuche üb. den Einfluss v. Kälte u. Wärme auf die Erhärtungsfähigkeit v. Beton, ausgeführt im königl. Materialprüfungsamt zu Gross Lichterfelde-West im J. 1911. Bericht. (III, 27 S. m. 15 Abbildgn.) 1912. Lex. 8°. Berlin, W. Ernst and Sohn. M. 1.60.

Häntzschel, W.: Beiträge zur Praxis des Formens u. Giessens. 8°. Berlin, O. Elsner. 2. Bd. Die Eisen- u. Metallgattierungen u. ihre Festigkeitswerte. In kurzgefasster, gemeinverständl. Darstellg. zusammengestellt. (128 S.) 1912. M. 1.75.

Herzinger, E.: Appreturmittelkunde. (IV, 123 S. m. Fig.) 8°. Leipzig, M. Koch. 1911. M. 3.20; cloth M. 3.60.

—— Die Technik der Merzerisation. Mit vielen Abbildgn. u. Stoffmustern. (IX, 254 S.) 8°. Gera. 1911. Leipzig, M. Koch. M. 5; cloth M. 6.

Heyn, E., and O. *Bauer*: Untersuchung e. gerissenen Flammrohrschusses. Hrsg. vom. Verein deutscher Ingenieure. Lex. 8°. Berlin, J. Springer. 1911. M. 1.

Jahrbuch, Volkswirtschaftliches, der Stahl- u. Eisen-Industrie, einschliesslich der verwandten Industriezweige 1912. 1. Jahrg. Hrsg. Dr. H. E. Krueger. (279 S.) kl. 8°. Berlin (SW., Blücherstr. 41), Verlags-Industrie-Gesellschaft. Cloth M. 3.

Lange, Dr. O.: Die Schwefelfarbstoffe, ihre Herstellung u. Verwendung. (XII, 497 S. m. 26 Fig.) gr. 8°. Leipzig, O. Spamer. 1912. M. 22; cloth M. 24.

Lexikon der Spirituosen- u. alkoholfreien Getränke-Industrie sowie der verwandten Branchen. Unter Mitwirkg. hervorrag. Fachmänner hrsg. v. Dr. H. Goettler. 2 Bde. (VI, 1088 S. m. Fig.) gr. 8°. Leipzig, O. Born. 1911. half mor. M. 20.

Neave, G. B., and I. M. *Heilbron*: The identification of organic compounds. N.Y., Van Nostrand. 1911. 8+103 p. D. $1.25.

Norton, C.: Modern blending and rectification: containing recipes and directions for producing gins, cordials, all types of bitters, drinking specials, all kinds of punches, as well as following subjects: tests, mycology, alcoholimetry, the care, handling and clarification of wines, the study of essential oils, the manufacture of essences, special treatise on manufacturing to comply with the Food and Drug Act, June 30, 1906. [Rev. ed.] Chic., [The Author]. 1911. c. 106 p. 8°. $8.

Photographie, Enzyklopädie der. 8°. Halle, W. Knapp. 78. Heft. Lüppo-Cramer, Dr.: Das latente Bild. (VII, 66 S. m. 2 Abbildgn.). 1911. M. 3.60. —— dasselbe. (Neue Aufl.) 8°. Ebd. 17. Heft, Stolze, Prof. F.: Handbuch des Vergrösserns auf Papieren u. Platten. 3., neu bearb. Aufl. Hrsg. v. A. Streissler. (VII, 206 S. m. 98 Abbildgn.) 1911. M. 6; cloth M. 6.60.

Randall, J. A.: Heat, a manual for technical and industrial students. N.Y., Wiley. 1911. c. 127 p. il. tabs., diagrs. 12°. 50 c.

Refrigeration, Second internat. congress of. Vienna 1910. English ed. of the reports and proceedings. Ed. by the "General commissariat." (1167 S. m. Fig.) Lex. 8°. Wien. W. Frick. 1911. M. 25.20.

Ristenpart, Dr. E.: Abwässer- u. Entnebelungsfrage in der Textil-Industrie. (79 S. m. 18 Abbildgn.) gr. 8°. Leipzig, M. v. Criegern. 1912. 80 Pf.

Robertson, Prof. T.B.: Die physikalische Chemie der Proteine. Übers. v. F. A. Wyncken. (XVII, 447 S.) gr. 8°. Dresden, Th. Steinkopff. 1912. M. 14; cloth M. 15.50.

Samter, Dr. V.: Analytische Schnellmethoden. (X, 237 S. m. 14 Abbildgn.) Halle, W. Knapp. 1911. M. 10; cloth M. 11.

Schwenn, R.: Elektrische Temperatur-Messapparate. [Aus: "Helios."] (68 S. m. 64 Abbildgn.) gr. 8°. Leipzig, Hachmeister and Thal. 1912. M. 1.50.

Sievers, A. F.: On the addition of organic acids to unsaturated hydrocarbons. Madison, Wis., Univ. of Wis. 1911. 42 p. figs. O. (Univ. of Wis. bull., Science ser.) pap., 20 c.

Stohmann's Handbuch der Zuckerfabrikation. 5. Aufl., vollständig neubearb. v. Dr. A. Schander. (XIX, 810 S. m. 384 Abbildgn. u. 3 [2 farb.] Taf.) gr. 8°. Berlin, P. Parey. 1912. Cloth M. 26

Sussmann, L.: Oelfeuerung f. Lokomotiven m. besond. Berücksicht. der Versuche m. Teerölzusatzfeuerung bei den preussischen Staatsbahnen. Nach e. Vortrage. (Berichtigter u. erweit. Abdr. aus Annalen f. Gewerbe u. Bauwesen.) (78 S. m. 41 Fig.) gr. 8°. Berlin, J. Springer. 1912. M. 3.

Taffanel, J., et A. *Durr*: Essais sur les inflammations de poussières exécutés à la station d'essais de Liévin, 5 série. Essais d'inflammabilité, fig. et pl., in-4°. Paris, Dunod et Pinat. 1912. 3 fr.

Warburg, Prof. E.: Lehrbuch der Experimentalphysik f. Studierende. Mit 437 Orig.-Abbildgn. im Text. 12. u. 13. verb. u. verm. Aufl. (XXIII, 459 S.) gr. 8°. Tübingen, J. C. B. Mohr. 1912. M. 7; cloth M. 8.20.

Weber, R. H.: Ueber die Bedeutung des absoluten Nullpunktes der Temperatur. [Aus: "Sitzungsber. u. Abhandlgn. d. naturforsch. Gesellsch zu Rostock."] (8 S. m. 2 eingedr. Kurven.) gr. 8°. Rostock, H. Warkentien. 1911. 40 Pf.

Wood, F. C.: Chemical and microscopical diagnosis. 3rd. ed. N.Y., Appleton. 1911. c. 24+791 p. il. 8°. $5.

[*]Dissertations.

[Prices vary, ranging from two to three shillings.]

Gollmann, F. A.: Zur Kenntnis des Cynamids. Berlin 1911. 43 S. 8°.

Haberle, R.: Zur Kenntnis der Heteropolywolframate. Berlin. 1911. 51 S. IV. Taf. 8°.

Houben, H.: Ueber die halbseitige Reduktion aromatischer Polynitroverbindungen mit Zinnchlorür und mit Schwefelammonium. Bonn. 1911. 41 S. 8°.

Kuntze, F.: Beitrag zur Kenntnis der Corydalisalkaloide. Die Konstitution des Bulbocapnins. Breslau. 1911. 48 S. 8°.

Lewin, J.: Zur Kenntnis des Catechins. Bern. 1910. 37 S. 8°.

Loewenstein, R.: Beiträge zur Kenntnis der Vanadylverbindungen. Bern. 1911. 51 S. 8°.

Ochsner, P.: Ueber Anthrachinonacridone. Zürich. 1911. 52 S. 8°.

Rosenthal, H.: Ueber das 1-Phenyl-3-methyl-5-cyanpyrazol und einige Derivate des Antipyrinchlorids. Rostock. 1910. 94 S. Fig. i. T. 8°.

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[*] Compiled by H. Grevel and Co., 33, King Street, Covent Garden, London, W.C., from whom all the works in the preceding lists can be obtained.

Journal of the Society of Chemical Industry.

No. 6, Vol. XXXI. MARCH 30, 1912. No. 6, Vol. XXXI.

Canadian Section.

Meeting held at Toronto on Thursday, February 8th, 1912.

PROF. W. P. COHOE IN THE CHAIR.

MANUFACTURE OF SOFT STEEL TUBES IN RELATION TO CORROSION.

BY F. N. SPELLER.

Before discussing the influence of manufacture on corrosion it may be well to touch briefly on certain theories of corrosion and adopt that one which best explains the phenomena observed. For this purpose we may confine our attention to what has been called the "carbonic acid" and the "electrolytic" theory. Since it has been proved by Whitney, Cushman, Walker and others, that iron is slightly soluble in very pure water, we need not argue whether this is due to the presence of a few molecules of carbonic acid or whether in absolutely pure water the iron would have been insoluble, both propositions being extremely difficult to prove experimentally. It will suffice to explain the known facts regarding this initial reaction of corrosion by a broad application of the electrolytic theory on the basis that the purest water known contains hydrogen ions and has the power to dissolve nearly anything with which it comes into contact, including iron. Following the solution of iron, which in itself is so slight as to be of no practical concern, we find some very important reactions, all of which have to do with continuous corrosion and which if not checked cause great damage. The cyclical effect of carbonic acid, the oxidation and precipitation of iron as ferric hydroxide, and the depolarization caused by the combination of oxygen in solution with the hydrogen set free during the solution of iron, are the main secondary reactions, particularly the two last.

When the electrolytic theory was first generally discussed several years ago, some of its prominent advocates laid special stress on the "attack by hydrogen ions" and insisted that by greatly increasing the concentration of hydrogen ions a comparison of the relative durability of various irons under corrosion would probably be determined in an hour or so. This became generally known as the "acid test," the use of which, in the light of experiment and experience, was properly discouraged

Committee A 5 (on corrosion) of the American Society for Testing Materials, in their annual report (Proc. A.S.T.M., 1909, p. 300) concluded that "the results so far obtained show that this test is not generally applicable and in some cases may be very misleading."

There is a great deal of work bearing on this matter, but some tests made by the Bureau of Steam Engineering U.S. Navy Department and the Research Laboratory of the National Tube Company serve to illustrate the inconsistency found between tests made in aerated water and in 20 per cent. sulphuric acid. (See Table I and Ia.)

For some purposes where acid waters must be dealt with or where the air is excessively laden with sulphurous acid from coal, acid-resisting steels doubtless have a useful field, but even here the metals should not be compared by a quick test made in strong acid, as the damage may be different when the combined reactions are met with in service.

The purer the iron is made, the more resistant it becomes to acids. A very highly refined open-hearth steel (ingot iron) is made with this in view. The addition of 0·1 per cent. of phosphorus as found in soft Bessemer steel renders the metal much more soluble, but if to the same iron about 0·1 per cent. copper is added, the solubility in acid is reduced to that of low phosphorus steel and by increasing the copper to 0·35 per cent. the solubility of Bessemer steel under the same acid test is less than highly refined iron, and the same amount of copper in soft open-hearth steel low in phosphorus is still more marked (see table II. for a comparison of various grades of these materials).

Natural corrosion, however, as has been shown by tests in the atmosphere, in water, and in pipes buried in the ground, has about the same effect on commercial iron and steel made with equal care, regardless of the composition or method of manufacture*: in fact there is good practical evidence in tests now in progress which indicates that Bessemer steel well made is better in this respect than the purer commercial irons, provided, of course, the environment is not decidedly acid. The same seems to be true of the newer copper-steels which, however, have not yet been in service sufficiently long to determine their value under natural corrosion. There is this to be said, however, in favour of the use of a small percentage of copper in soft steels; the quality of the metal can be regulated according to requirements, the strength is slightly increased without loss of ductility, and the copper is readily dissolved by the iron and shows little tendency to segregate. Moreover, the cost is low compared with making extremely pure iron produced in an open-hearth or electric furnace.

If the electrolytic theory be correct, why is there no clear relation between tests made in strong acid and those under corrosion? Two explanations suggest themselves. First, the impurities and irregularities which occur on the surface of commercial iron and steel, such as mill scale, rust, carbon deposits from the atmosphere, etc., have a much greater difference of potential with the metal than is usually found between adjacent points on the clean surface of the metal. This explains the local corrosion known as pitting, which is apparently equally liable to occur in the purest or crudest of commercially rolled iron or steel, provided the latter is uniform enough to pass the ordinary qualifications as regards quality. Or, in the second place, considering that in nearly all natural corrosion a large excess of oxygen is present in solution (the internal corrosion of hot water piping is a good example), it seems remarkable that the different rates of solubility do not have free sway and cause the less soluble iron to corrode at a proportionately slower rate. This is, as we have shown, not according to observed facts, and suggests that possibly the speed of the secondary oxygen reactions is not rapid enough to keep up with the solution of even the slower dissolving irons, so that (within the limits) the relative rate of solution of irons in water is not a determining factor.

Considering, then, the influence of manufacture on corrosion, it must not be inferred that the composition and method of manufacture of the steel are immaterial. On the other hand, the question of uniformity in chemical composition and physical properties between different points on the surface must be carefully looked to, this, we believe, being much more important as a rule than the composition of the metal. The best made iron or steel will corrode unevenly when outside forces are allowed to exert their predominating influence, as is usually the case in service when no preventative measures are taken. Nor should it be assumed, because the ordinary elements usually present in steel are low, that such metal is less liable to be irregular, for under such conditions the iron is particularly sensitive to oxygen and absorbs this, probably the most injurious of all elements, under certain conditions of heating, much more readily than would a less pure steel made by the same process.

The influence of composition in soft steel may be referred to under the commonly occurring foreign elements;

Carbon, owing to the various forms it takes in steel, has a variety of effects on corrosion which are not as well understood as could be wished. The small amount present in soft steel probably has little influence one way or the other.

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* See footnote references, a, b, c, d, page 264.

Manganese has been held responsible for more unexplainable failures than perhaps any other element, but, as a matter of fact, it is one of the easiest of all foreign elements for the iron to take up; there being very little segregation, and with reasonable precautions a homogeneous mixture is easy to obtain. Moreover, according to recent researches most of the manganese compounds are either neutral or electro-positive to iron.* According to the investigations of Prof. W. H. Walker (a), Ira H. Woolson (b), Henry M. Howe (c), and others, based on many comparisons of wrought iron pipes (practically free from manganese) with soft steel (carrying 0·3 per cent to 0·4 per cent. manganese) under the same conditions, no difference in quality or general character of the corrosion could be found (d).

Phosphorus does not appear to be objectionable as regards natural corrosion; in fact, there seems to be reason for believing that it protects the iron to some extent. Careful experiments by Diegel (e) and our experience of many years with Bessemer and open-hearth steel tubing seem to support this view.

Sulphur in amounts over 0·06 per cent. is undesirable, but modern methods control the amount of sulphur within narrow limits and it will rarely exceed this amount in American steels, the general average being much lower.

Nickel in the usual proportion used (3·5) protects the iron and increases its resistance to corrosion about 20 per cent.

Oxides and cinder, whether included in the metal or on the surface are objectionable, being more strongly electro-negative than other foreign matter. It is one of the most important points having to do with general quality and durability and requires more vigilance to control the lower the carbon content of the iron. The use of a large mixer, means for controlling the temperature of the bath in refining, and fine crushing of the ferromanganese are obvious necessities. The steel should be poured into the ladle as cold as possible and should exhibit a thorough reaction with the additions in the ladle, after which three or four minutes should be allowed for the blanket of slag to take up the oxidized products before teeming into moulds. The uniformity of the steel may be easily checked by comparing the analyses of tests taken from the first ingot with the last few pounds of steel out of the ladle. Such check analyses are made regularly where a specially homogeneous metal is desired.

Physical irregularities are just as much to be avoided as are chemical variations and require intelligent heat treatment of the metal and sufficient work. Steel which is spongey or honey-combed requires several times as much work to reach its maximum strength as steel which is solid in the ingot (a).

COMPARISONS OF CORROSION OF BOILER TUBE MATERIALS IN AERATED WATER AND ACID.

Samples were first immersed in aerated water at normal temperature for 64 weeks: test pieces 2" × $\frac{1}{2}$" × $\frac{1}{16}$" were cleaned thoroughly and placed in a 20 per cent. solution of sulphuric acid for one hour. Loss is shewn in grams per sq. in. under test.

TABLE I.

	Loss in aerated water.	Loss of same piece in 20 per cent. sulphuric acid.		
		Lap Weld Bessemer Steel.		
Least	1·479	0·1307		
Greatest	2·031	0·1290	Test piece showing:	
Average of 23 pieces	1·729	0·1322	Least loss in 20 per cent. acid gave	0·1249
			Greatest loss in 20 per cent. acid	0·1388
		Cold Drawn Seamless, Open-hearth Steel.		
Least	1·512	0·0423		
Greatest	2·262	0·0379		
Average of 21 pieces	1·926	0·0354	Least loss in 20 per cent. acid	0·0308
			Greatest loss in 20 per cent. acid	0·0439
		Lap Weld Charcoal Iron.		
Least	1·540	0·1116		
Greatest	1·988	0·1009		
Average of 22 pieces	1·753	0·1098	Least loss in 20 per cent. acid	0·0969
			Greatest loss in 20 per cent. acid	0·1250
		Hot Drawn Seamless, Open-hearth Steel.		
Least	1·384	0·0354		
Greatest	1·881	0·0362		
Average of 24 pieces	1·662	0·0330	Least loss in 20 per cent. acid	0·0279
			Greatest loss in 20 per cent. acid	0·0376

TABLE IA.

SUMMARY.—*Average results of Corrosion in grams per sq. in.*

	Series I.		Series II.	
	In aerated water 64 wks.	In 20 per cent. acid on smooth pcs.	In aerated water 64 wks.	In 20 per cent. acid on pitted pcs.
Charcoal iron	1·752	0·1098	1·772	0·0823
Bessemer steel 0·07 carbon	1·729	0·1322	1·734	0·0897
Cold drawn seamless steel } Bessemer open-hearth	1·926	0·0354	1·871	0·0121
Hot ,, ,, ,, } steel, 0·15 per cent. carbon	1·652	0·0330	1·759	0·0120

NOTE.—Series I. was made on test pieces machined and ground to size as in Table I. Series II. includes tests made on samples cut from sections of tubes after exposure in aerated water without grinding down the pitted or corroded surface, as was done in Series I.

Following is a summary of tests on various materials made by submerging in 25 per cent. (by weight) sulphuric acid for three hours. The pieces were 2" × $\frac{1}{2}$" × $\frac{1}{8}$", cut from 2 in. pipe. Temperature at start, 35° C.

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* J. W. Cobb, J. Iron and Steel Institute, Vol. I., 1911.
(a) Journal of Engineering, and Industrial Chemistry, Amer. Chem. Soc., 1912.
(b) Engineering News, December 3, 1910.
(c) Proceedings Amer. Society for Testing Materials, 1908.
(d) J. N. Friend, "Corrosion of Iron," 1911, p. 269.
(e) Diegel, "Verhandlungen des Vereins zur Beförderung des Gewerbefleisses," 1903, 5, 157.

(a) Report on Tests of Metals, United States Watertown Arsenal 1909.

Table II.

Accelerated corrosion tests.

	Average loss. Grms. per sq. in. of surface.
Regular Bessemer pipe steel	0·6120
0·35% Copper Bessemer pipe steel ...	0·0088
1·00% ,, ,, ,, ,, ..	0·0035
Regular open-hearth ,, ,, ..	0·2112
0·20% Copper ,, ,, ,, ..	0·0061
3·25% ,, ,, tube ,, ..	0·0148
Ingot iron	0·0138
0·40% Copper open-hearth pipe steel .	0·0038
1·00% ,, ,, ,, ,, ,, .	0·0023

London Section.

Meeting held at Burlington House, on Monday, 8th January, 1912.

MR. E. GRANT HOOPER IN THE CHAIR.

THE PRODUCTION OF FORMIC AND ACETIC ACIDS BY THE ATMOSPHERIC OXIDATION OF TURPENTINE.

BY C. T. KINGZETT, F.I.C., AND R. C. WOODCOCK, F.I.C.

In a previous paper (this J., July 15th, 1910, 791) we gave an account of our investigation of the production of formic acid by the atmospheric oxidation of turpentine, in the course of which it was definitely ascertained that acetic acid is also simultaneously produced.

The original experiments were made with turpentine as found in commerce—American, Swedish, and Russian severally—but with the object of determining, if possible, the precise manner in which these acids are formed in the process,* this later investigation has been extended to the inclusion of pinene and sylvestrene, as obtained respectively from commercial American and Russian turpentine, and the results of the oxidation of these products are now given in comparison with those of the turpentines from which they were derived.

The American turpentine from which the pinene was prepared distilled as follows: between 155° C. and 165° C., 70 per cent.; 165° C. and 175° C., 25 per cent.; residue 5 per cent. It had a rotation, as determined in a 200 mm. tube, of +3·5. 2½ litres were distilled, and the fraction, boiling between 155° C. and 160° C., amounting to 1 litre, was collected separately. This fraction after being allowed to stand in contact with previously ignited calcium chloride, so as to entirely free it from water, was again distilled, the fraction boiling between 156° C. and 158° C. being specially reserved and again fractionated some six times, using a Glinsky fractionating column—the thermometer being in the vapour and not in the liquid itself. By this means a final product of 250 c.c. was obtained which was quite colourless and boiled at from 155° C. to 156° C., which is in accordance with Wallach's determination, and it was found to conform in other particulars with the theoretical requirements of pinene. It had a sp. gr. of 0·859 at 16° C. (0·858 according to Wallach at 20° C.), and the rotation as determined in a 200 mm. tube was +6·3. Although this is less than that given for *d*-pinene, it is not to be regarded as a definite criterion as the product is probably a mixture of *d*- and *l*-pinene. A sample of the nitrosochloride was prepared by acting upon the pinene with ethyl nitrite in the presence of hydrochloric acid in a freezing mixture, and the resulting crystals melted at 102° C., as compared with 103° C., which is the temperature usually given as the correct melting point.

The sylvestrene was prepared from a quantity of the same Russian turpentine as is subsequently referred to in experiment No. 3, in a generally similar way to that employed in preparing pinene, already described. The Russian turpentine yielded the following data: distilling between 160° C. and 170° C., 19 per cent.; between 170° C. and 180° C., 68 per cent.; between 180° C. and 190° C., 10 per cent., and gave a residue of 3 per cent. The turpentine had been first washed with a 5 per cent. solution of caustic soda, to free it from pyroligneous acid, etc., and the fraction which came over between 170° C. and 180° C. was further fractionated eight times until a colourless product of 150 c.c., boiling at 175° C. to 177° C., was obtained. It had a sp. gr., at 16° C., of 0·849, and the rotation in a 200 mm. tube was + 20. According to Wallach, sylvestrene boils at 176° C. to 177° C., and its sp. gr. should be 0·851 at 16° C.

Experiment No. 1.—*American turpentine.* 250 c.c. of American turpentine, in admixture with 250 c.c. of water, was oxidised at 65° C. by a current of air during 24 hours, and after the aqueous solution resulting from the oxidation had been separated and shaken up with benzene to free it from turpentine, the total acidity was determined, as also the formic acid contributing to it, by the method described in our previous paper.

Experiment No. 2.—*Pinene.* 150 c.c. of the pinene, prepared as above, together with 150 c.c. of water, were oxidised as described in experiment No. 1.

Experiment No. 3.—*Russian turpentine.* 250 c.c. of Russian turpentine, together with 250 c.c. of water, were subjected to oxidation as in the two previous experiments.

Experiment No. 4.—*Sylvestrene.* 150 c.c. of sylvestrene, prepared as described, in association with the same quantity of water, was subjected to oxidation as before.

The results of these four experiments may be tabulated as follows:—

Table No. I.

Found in aqueous solution.

Substances oxidised.	Formic acid.	Acetic acid (calculated by difference).
	per cent.	per cent.
(1) American turpentine ..	0·017	0·038
(2) Pinene	0·14	0·057
(3) Russian turpentine ...	0·026	0·108
(4) Sylvestrene	0·16	0·086

An examination of the aqueous liquid also showed that a trace of formaldehyde was apparently present in solution, as evidenced by the phloroglucinol test and also by the production of the characteristic carmine red colour produced by the addition of phenylhydrazine in hydrochloric solution, ferric chloride, and sulphuric acid.

Acetaldehyde was searched for in the several watery solutions without result, as might be expected, bearing in mind the ready oxidation of that substance into acetic acid; possibly, however, acetaldehyde and formaldehyde are formed intermediately, the two substances being converted into the corresponding acids by subsequent oxidation. This conjecture is supported by evidence that follows.

Experiments No. 5 *and No.* 6.—In further experiments 400 c.c. of pinene and sylvestrene, respectively, obtained as previously described, and after drying over ignited calcium chloride were subjected to *dry* oxidation (the air being dried over sulphuric acid and calcium chloride) at about 68° C. to 69° C., using an apparatus consisting of a flask connected with a long length of glass tubing so as to act as a condenser. The process was continued for some weeks and until the substances had attained, in the case of sylvestrene, a sp. gr. of 0·958, and in the case of pinene 0·962. After oxidation, the oxidised oils were shaken up from time to time during three hours with half their volumes of water and the aqueous solutions examined for formic and acetic acids and hydrogen peroxide, with the results shown in the following table :—

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* For records of Kingzett's previous investigations of the aerial oxidation of terpenes, etc., see J. Chem. Soc. 1874, 511; 1875, 210; 1880, 800; 1884, 93—99. Chem. News, 32, 138; 34, 127; 39, 279; J. Soc. Chem. Ind., 1886, 7; 1888, 549; 1890, 3; and Chem. Trade Journal, vol. XIV., p. 115.

TABLE No. 2.

Showing contents of 100 *c.c. of the water washings of the dry oxidised pinene and sylvestrene.*

Substance.	Washing.	Formic acid determined.	Acetic acid (by difference).	Hydrogen peroxide.
		per cent.	per cent.	vol.
Pinene	First ...	0·054	0·186	0·348
,, ...	Second .	None	None	0·04
Sylvestrene ...	First ...	0·059	0·264	0·532
,, ..	Second .	None	0·12	0·073

Experiment No. 7.—In connection with the foregoing results it may be mentioned that a sample of highly air-oxidised Russian turpentine (which had, however, been made in the presence of water), having a sp. gr. of 0·995, gave the following results when washed with further three successive quantities of water, 100 c.c. of the oil being employed and successive washings, each of 100 c.c. of water, during a period of four hours.

TABLE No. 3.

Showing contents of 100 *c.c. of the water washings of the* (*wet*) *oxidised Russian turpentine.*

Washing.	Total acidity c.c. $N/10$ soda.	Hydrogen peroxide c.c. $N/10$ sodium thiosulphate.
First	45 c.c.	17 c.c.
Second	22 c.c.	12 c.c.
Third	3 c.c.	6 c.c.

It would be expected from what has been described that aged turpentine of commerce would show the presence of formic acid as resulting from spontaneous oxidation by air in the presence of atmospheric moisture, and direct evidence of this fact was again obtained experimentally by washing some old Russian turpentine with caustic soda and an examination of the soda solution. It was also ascertained that Russian turpentine which had been previously washed with soda yielded further quantities of formic acid when again oxidised by air in the presence of water.*

Experiments No. 8 *and No.* 9.—Further experiments were next made with American and Russian turpentine as oxidised in the dry. The turpentine in both cases was dried over ignited calcium chloride, and in addition, the Russian turpentine was first washed with a 5 per cent. solution of caustic soda to remove pyroligneous material. In each instance 500 c.c. of these prepared turpentines were oxidised by air previously dried over sulphuric acid and calcium chloride, the air, after passing through the turpentine being subsequently washed in a flask containing 150 c.c. of water. The oxidation was conducted during 80 hours at 65° C. and during 200 hours at the ordinary temperature. When finished the American turpentine had a sp. gr. at 16° C. of 0·931, and the Russian turpentine a sp. gr. at 16° C. of 0·940. In the water from the wash bottles the following was found:—

Water from wash bottles.

Substance oxidised.	Formic acid.	Acetic acid.	Hydrogen peroxide.
	per cent.	per cent.	vol.
American turpentine .	0·22	0·05	0·90
Russian turpentine ..	0·13	0·10	0·69

The acetic acid in both cases was calculated by difference, by subtracting the amount of soda neutralised by the formic acid (which was quantitatively determined) from the total soda required.

The dry oxidised oils were afterwards shaken with half their volumes of water for about three hours, the liquids being then allowed to separate, and the water layer clarified by shaking with benzene.

An examination of this aqueous extract gave the following results :—

Substance oxidised.	Formic acid.	Acetic acid.	Hydrogen peroxide.
	per cent.	per cent.	vols.
American turpentine .	0·055	0·024	0·71
Russian turpentine ..	0·13	0·08	1·06

Experiments 10 *and* 11.—Some experiments were also made concerning the direct action of hydrogen peroxide upon American and Russian turpentine. In the case of the American turpentine 40 c.c. was placed in a stoppered bottle with 100 c.c. of hydrogen peroxide of 19·75 vols. strength and kept in a water-bath at 65° C., with repeated shaking during three hours and left standing overnight at the ordinary temperature. The mixture was then heated and again shaken during some five hours, and the contents thereafter examined. Originally the acidity of the peroxide was such that 100 c.c. required 14 c.c. $N/10$ soda, whereas 100 c.c. of the aqueous solution after the experiment required 27 c.c. $N/10$ soda. The peroxide had been reduced in strength to 17·64 vols. Acetic acid was found present in the solution and a trace of formic acid.

A similar experiment made with Russian turpentine (which had been previously washed with a 5 per cent. solution of caustic soda) gave the following figures : The acidity of the peroxide before the experiment was the same as in the previous experiment and the acidity of the aqueous solution after the experiment was such that 100 c.c. required 36 c.c. of $N/10$ soda. The peroxide was reduced in strength from 19·75 vols. to 17·04 vols. Acetic acid was shewn to be present together with a trace of formic acid.

Experiment 12.—It was shewn by direct experiment that a 40 per cent. solution of formaldehyde yields formic acid by treatment with hydrogen peroxide, and particularly so in the presence of caustic soda, and this would of course account for the fact that formaldehyde is not found substantially present when Russian turpentine is oxidised by means of hydrogen peroxide. It also explains why only indications of formaldehyde are found associated with formic acid when that substance results from the oxidation of turpentine and terpenes as described in this investigation.

Experiment 13.—It was subsequently ascertained that when acetaldehyde and formaldehyde are added to a mixture of water and turpentine and subjected to a current of air, the aldehydes are oxidised completely in course of time into the corresponding acids. In one case 250 c.c. of Russian turpentine (which had been previously washed with soda) was placed in a flask with 125 c.c. of 0·25 per cent. solution of formaldehyde and 125 c.c. of 0·25 per cent. solution of acetaldehyde, and the mixture subjected to a current of air at 65° C. during a period of three days, the exhaust air being passed through a water wash bottle. The aqueous solution remaining in the oxidiser was afterwards examined, and whereas before oxidation its acidity was equal to 0·4 c.c. of $N/10$ soda per 100 c.c., it increased by the end of the experiment to 58·4 c.c. of $N/10$ soda per 100 c.c., and was found to contain hydrogen peroxide, requiring 70 c.c. of $N/10$ thiosulphate per 100 c.c. A trace of formaldehyde was also detectable, but acetaldehyde could not be found. The acidity was found to be due to the presence of formic and acetic acids. The water in the wash bottle contained a mere trace of formic acid, but acetic acid could not be detected.

Experiment 14. Upon careful consideration of the results so far recorded, it appeared necessary to ascertain definitely whether or not the acetic and formic acids, also the hydrogen peroxide, found in the wash water, as described in some of the preceding experiments, resulted from what may be described as subsidiary oxidation of the unchanged turpentine carried over by volatilisation, or as the products of the inter-action of water upon some organic peroxide carried over in the vaporous form. Accordingly, after some preliminary experiments a quantitative experiment was conducted as follows: 500 c.c. of dried Russian turpentine (which had been previously washed with a 5 per cent. solution of soda) was oxidised by means of air (which was also dried by passage through sulphuric acid and over calcium chloride) during 42 hours at 65° C. to 68° C., and during 102 hours at the ordinary temperature. After passage through the turpentine the air was passed through two flasks packed with glass wool and cooled externally with blotting paper kept wet; then through a small flask containing 50 c.c. of water, followed by passage through Liebig's bulbs containing water and finally through a series of three calcium chloride tubes, all of which had been previously weighed. In the course of the experiment it was observed that the first calcium chloride tube had to be changed daily owing to the quantity of water absorbed.

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* See this J., 1910, 791.

After oxidation the oil had a sp. gr. at 17° C. of 0·923 and measured 442 c.c. There was an increase in weight of the first flask packed with glass wool of 14·2 grms. and of the second one to the extent of 2·31 grms., these increases in weight being due to condensed oil. The total contents of these two vessels were shaken up with 50 c.c. of distilled water, and after separation the aqueous solution was examined and found to contain hydrogen peroxide equal to 0·053 volume (=0·016 grm. H_2O_2), 0·013 grm. of formic acid, and 0·008 grm. of acetic acid (as calculated by difference between the total acidity and the amount of formic acid determined). The flask and bulbs containing water lost in all 32·64 grms., while the chloride of calcium tubes increased in weight by 35·97 grms., showing a gain resulting from the oxidation of the turpentine equal to 3·3 grms

The water in the wash vessels just referred to was found to contain a total of 0·078 grm. of hydrogen peroxide, 0·038 grm. of formic acid and 0·084 grm. of acetic acid. Added together, these three amounts equal a total of 0·2 grm. and deducting this from 3·3 grms., being the total gain of the calcium chloride tubes, shows that the real amount of water formed was 3·13 grms., which incidentally indicates a chemical splitting up of the terpene molecule.

This experiment also affords direct evidence that acetic acid and formic acids and hydrogen peroxide* result from an interaction between water and an organic peroxide which is at least to some extent carried over as vapour from the oxidised turpentine; further small quantities of these products being found in the following water wash bottle. Doubtless this organic peroxide is associated with condensed turpentine, so that no profitable figures could be expected from organic combustion of the liquefied product, and of course the bulk of it remains dissolved in the oxidised turpentine.

When dry oxidised Russian turpentine is subjected to careful distillation there can be obtained a distillate of the same general character, but the decomposition is so rapid and violent that the process cannot be usefully employed for preparing any considerable quantity of the product.

The full interpretation of the results obtained in this investigation is still left in some doubt, for it is not yet definitely ascertained whether the hydrogen peroxide, the formic acid and acetic acid, severally depend for their production upon the inter-action of water on one organic peroxide only or more than one, and whether or not the two acids result from the oxidation of formaldehyde and acetaldehyde as produced in association with the said organic peroxide or peroxides. It is not probable that the formic and acetic acids result entirely from the subsequent action of the hydrogen peroxide (first produced) on the terpene molecule in view of the results obtained and because time is obviously required for this change to take place.

We favour the view that one organic peroxide alone is formed, and at the same time either acetic and formic acids, or rather acetaldehyde and formaldehyde, the two latter substances being resolved into their corresponding acids, when the organic peroxide yields hydrogen peroxide, as it does by being placed in contact with water.

Experiment 15.—As when turpentine or any terpene is oxidised by air in the presence of water there passes into solution, amongst other products, a substance which can be collected upon distillation as an oil having a composition corresponding to thymol, it was surmised that this might conceivably be derived from the action of water upon an organic peroxide by some such action as is here represented:—

$$C_{10}H_{14}O_2 + H_2O = C_{10}H_{14}O + H_2O_2.$$

To test this surmise a quantity of the substance was isolated and exposed to prolonged oxidation in the dry state upon the chance that it might thus be converted into an active peroxide capable of regenerating hydrogen peroxide when placed in contact with water, but negative results were obtained; for although acetic and formic acids, and also hydrogen peroxide, were found present in the aqueous extract, they were so minute in quantity as to make it highly probable that they were derived from the oxidation of a small quantity of terpene unavoidably associated with the $C_{10}H_{14}O$ body.

In conclusion, we have pleasure in acknowledging the services rendered to us in this investigation by our assistants, Mr. H. F. Bottomley and Mr. J. E. Brimley, B.Sc.

DISCUSSION.

The **Chairman** asked if the authors had made any determinations from the point of view of time. In other words, was the production of formic and acetic acids a simple time function, or was there at different stages a varying rate of formation? Also, were the authors in a position to state what was the ultimate specific gravity obtainable by the atmospheric oxidation of these terpenes? In the four cases mentioned by the authors, starting with specific gravities of about 0·868, they ultimately reached specific gravities of 0·931 in the case of turpentine, 0·962 in the case of pinene, 0·940 in the case of Russian turpentine and 0·958 in the case of sylvestrine. It would be interesting to know whether the authors had followed the question of specific gravity further, and what points were finally reached.

Mr. W. P. **Dreaper** asked the authors how, in separating formic acid from acetic acid in such small proportions, they definitely estimated one in the presence of the other?

Dr. M. O. **Forster** asked whether the authors had studied the further action of air on the hydrocarbon which had been subjected to this treatment. It would really affect the question of the influence of time. If they had recovered and subjected the hydrocarbon to further treatment, and the figures were roughly the same as those on the board, that would indicate a specific action of the turpentine. What the chemist wanted to know was: what happened to the turpentine? Knowing that pinene was a very sensitive molecule, and that a number of derivatives were obtained from it by simple processes, one would like to know whether the authors had attempted to isolate any product arrived at in that way. He would ask the authors further, had they freed the air from carbon dioxide? One knew that carbon dioxide was reducible to formaldehyde, and it was therefore just conceivable that the small quantities of fatty acids produced in the manner described by the authors originated in the atmospheric carbon dioxide.

Dr. E. J. **Mills** asked whether the proportion between the formic acid and acetic acid remained constant from first to last during the blowing.

Mr. A. H. **Dewar** asked whether the authors had done anything towards trying to ascertain the degree of acidity of the insoluble portion, that was the portion left after washing with water, and also whether they could give any idea of what the end point of the oxidation was.

Mr. **Kingzett**, in reply, said it would appear that the production of acid was constant so long as there was any terpene present in the mixture undergoing oxidation. As to the utmost specific gravity which might be obtained, they could go on in all cases until the specific gravity became greater than water and the oxidised oil was deposited at the bottom. They had not continued their investigations beyond that point. The method of determining the relative amounts of formic and acetic acid present in the mixtures was communicated in the earlier paper, to which reference had been made. They had not freed the air from carbon dioxide as the point had never occurred to them, but he would go so far as to say that operating with pure oxygen the results would be identical; and he thought they could eliminate carbon dioxide as a possible factor in the process. The proportion of the acids produced at any given stage during the conduct of the process had not been determined. They had had to deal with the ultimate products obtained, and it would be very difficult to determine any definite arithmetical relations between them. One could only say that there was absolute evidence that the terpene molecule was split up directly by the process of oxidation, and that the two acids were found in association with peroxide of hydrogen as a direct result of that process. The time employed in the respective experiments was definitely stated in the paper, and the process could be indefinitely continued so long as any terpene remained amenable. Where the process was conducted in the presence of water the acetic acid was no doubt arrested; but in the case of the formic acid it was quite reasonable to suppose some might be carried over, and particularly so when the oils were oxidised in the dry state, and when the details of the experiments were studied, it would be found that provision was made to test that point, and that as a fact formic acid was found in the washing water. In the case of oils oxidised dry, the results given in Table B expressed those which were found in the aqueous solution resulting from the agitation of water with the oxidised oils.

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* In another experiment the strength of the hydrogen peroxide obtained in this way (although from a considerably smaller quantity of turpentine) was as high as 0·4 volume.

Mr. Woodcock said, with regard to the time of oxidation, he thought it would be a valueless statement on which to base comparative results, for the reason that the air was drawn over by a water pump, and the pressure constantly varied; there was no direct measurement of the amount of air that had been passed through, and as the operation frequently went on during the night the temperature was allowed to drop. To get any quantitative results from the time ratio would require an absolute knowledge of the amount of air that was passed through, and in addition, the temperature, the size of the bubbles, &c., &c., would make a great difference.

Meeting held at Burlington House on Monday, March 4th, 1912.

MR. E. GRANT HOOPER IN THE CHAIR.

NOTES ON THE ESTIMATION OF GLUCOSE IN LEATHER.

BY DR. J. GORDON PARKER AND J. R. BLOCKEY, M.SC.

The estimation of glucose in leather is usually a *bête noir* to the leather trades chemist, for it involves so many operations; and, although it is possible to obtain fairly close duplicates in one solution, the results of a second complete analysis do not always agree very well with the first.

Various simplifications of the original Von Schroeder method have been advanced from time to time, and in the co-operative work on leather analysis for the American Leather Chemists' Association for 1911, part of the work consisted in comparing the effect of normal and basic lead acetates for the detannisation of the water soluble matter solution. In the experiments of one of us, it was found in every case that, when normal lead acetate was used for the detannisation, a higher result for the percentage of glucose was obtained than when basic lead acetate was used. The following experiments were undertaken to discover if possible, what the cause of this divergence was, and also which of the two results, that obtained by using normal lead acetate and that by using basic lead acetate, was the more correct one.

In a large number of experiments the average percentage of glucose found in a sample of weighted leather was 8·7 when normal lead acetate was used, and 7·8 when basic lead acetate was used for the detannisation of the water soluble matter solution. The same sort of result was obtained with other leathers containing glucose, the percentage always being higher when the normal acetate was used. It was thought that the discrepancy between these two results might arise in the following way:—The water soluble matter solution from a leather containing glucose would consist of uncombined tannins, glucose, a certain amount of free organic acids such as acetic, and non-tannin matters like gallic acid.

A typical analysis of such a solution is:—

	per cent.
Tanning matters	11·1
Glucose	7·2
Other non-tanning matter	3·7
Total soluble matter	22·0

Some of these other non-tanning matters, such as gallic acid, reduce Fehling's solution, and hence would be reckoned as glucose if they were not removed in the detannisation process. (Procter states* that gallic acid does not reduce Fehling's solution, but we find that it does.) Since gallic acid will reduce Fehling's solution, it is essential that, for accurate work, it should be removed before the actual reduction operation takes place. Gallic acid is precipitated by normal and by basic lead acetate, so that in the ordinary process of detannisation the gallic acid should be removed. Gallic acid is, however, not completely precipitated by lead acetate in acid solution. If acetic acid be added to a solution of gallic acid, and lead acetate added, then no precipitation takes place, and it was thought that herein lay the cause of the aforementioned discrepancy.

If the water soluble matter solution contains some organic acid, such as acetic or lactic, as it almost undoubtedly would in the case of a vegetable tanned leather, then the addition of lead acetate would not remove the whole of the gallic acid, the amount left in solution depending on the amount of acetic or other acid present. It is here that the difference between normal and basic lead acetates arises.

The amount of free acetic acid would be less when the basic salt is added than when the normal salt is added, because, in the former case, some of the acid would be neutralised in forming the normal acetate from the basic. Hence, with the use of basic lead acetate there is less free acid, a more complete removal of gallic acid and a lower result for the percentage of glucose. Both basic and normal lead acetates are liable to the same sort of error, but to a less extent in the case of basic than normal.

Experiments were performed on standard solutions of chemically pure glucose. The first series was made on a solution containing 0·5 per cent. of glucose and 1 per cent. of gallotannic acid. This solution was treated in the same way as a water soluble matter solution would be treated. It was detannised, in one case with normal lead acetate, and in another with basic lead acetate, and the succeeding operations were as usual. The percentage of glucose found was the same in both cases, 0·51 per cent. (actually present, 0·50 per cent.). From this it was concluded that the method of analysis was sufficiently exact, and that the lead acetates and the gallotannic acid did not contribute anything to the amount of glucose actually present.

The second series was made on a solution containing glucose, 0·5 per cent., pure gallic acid, 1·0 per cent., and pure gallotannic acid, 1·0 per cent. By the ordinary methods of detannisation, in one case using normal and in the other case basic acetate, the result for the percentage of glucose came out the same in both cases, 0·52 per cent.

This bears out the previous statement that gallic acid is precipitated by both normal and basic lead acetates in neutral solution, and the error is practically negligible.

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* Leather Industries Laboratory Book, p. 121.

The next experiments were made on a similar solution to the above, with the addition of acetic acid. This artificial solution would correspond to an actual water soluble matter solution :—Glucose, 0·5 per cent., gallotannic acid, 1·0 per cent., gallic acid, 1·0 per cent., acetic acid, 0·5 per cent. This solution was detannised, and the subsequent operations were carried out as before. The percentage of glucose found when normal acetate was used for detannising was 0·57 per cent., and with basic acetate 0·54 per cent.

It will be seen that the above is the sort of result that was obtained with actual water soluble matter solutions, the normal giving higher figures than the basic, and both giving too high results. It is evident that the acetic acid prevents the complete precipitation of gallic acid, and that with normal acetate the precipitation is less complete than with basic acetate.

To confirm the above conclusion, the same solution was neutralised by adding caustic potash solution until neutral to phenolphthalein. (The phenolphthalein was used as external indicator and spotted on to a white tile, and the caustic potash solution added to the solution until a drop gave a violet colouration). It is essential that the solution should not stand when once it has been neutralised by the alkali, otherwise it quickly becomes dark coloured and oxidises. The detannisation must take place immediately after neutralisation. The results were :—Normal acetate, 0·52 per cent. glucose, basic acetate, 0·51 per cent. glucose. It will be seen that this brings down the result to the correct figure. The acid has been neutralised, and it can no longer keep in solution the gallic acid. The gallic acid is precipitated by the acetate, and the correct figures for the glucose are obtained.

The following table shows the results in a condensed form :—

Actual solution.	Normal lead acetate.	Basic lead acetate.
	Percentage of glucose found.	Percentage of glucose found.
A. 0·50 % glucose . 1·00% gallotannic acid ..	0·51	0·51
B. A + 1·00% gallic acid	0·52	0·52
C. B + ·50% acetic acid	0·57	0·54
D. C neutralised before detannisation	0·52	0·51

In applying these considerations to actual leathers containing glucose, the same kind of result was obtained, but not to such a marked extent. Normal acetate gave higher results than basic, and the neutralisation of the solution before detannisation lowered the figures for glucose, but not so much as with the artificial solution : *e.g.*, one weighted leather gave the figures :—

	Normal acetate.		Basic acetate.	
	Alone.	Neutralised before detannisation.	Alone.	Neutralised before detannisation.
Percentage of glucose	8·7	8·1	7·8	7·3

Since the above experiments were carried out, Stiasny and Wilkinson have published a comprehensive paper on the qualitative detection of the different tannins (Collegium, 1911, 318—332 ; this J., 1911, 1172). One of the most important reactions therein described is the precipitation with normal and basic lead acetates, and it was found that whereas all tannins are completely precipitated by lead acetate in the absence of acid, the precipitation is not complete in presence of acetic acid. The catechol tannins differ in this respect from the pyrogallol tannins ; in presence of excess of acetic acid the catechol tannins are not precipitated at all, whilst most of the pyrogallol tannins are precipitated. The important point in the present consideration is that all tannins are not completely precipitated by normal lead acetate in presence of free acid. In a leather analysis, therefore, it may arise, with the use of normal lead acetate, that all the tannin will not be removed in the detannisation, and the unprecipitated tannin may reduce the Fehling's solution and produce a higher figure for the glucose. This should be additional argument against the proposed use of the normal lead acetate.

Newcastle Section.

Meeting held at Armstrong College on Wednesday, February 14th, 1912.

MR. E. F. HOOPER IN THE CHAIR.

THE PRODUCTION OF AMMONIUM SULPHATE IN THE SATURATOR.

BY G. P. LISHMAN, D.SC., F.I.C.

Although the neutralisation of sulphuric acid by ammonia is an apparently simple process, the resultant salt will differ in appearance and consistency from one works to the next, and even in the same works from day to day. The differences are brought about by the various conditions of working, such as : varied strength of acid in the saturator ; varied temperature of the bath ; varied percentage of ammonia in the ingoing gases ; varied temperature and dryness of the ingoing gases ; varied amount of water, acid, and mother liquor in the bath as made up. Other conditions, such as varied back pressure on the saturator, also have their effect. Continuously worked saturators may be less liable to variation, especially where the liquor strength is fairly constant, but even then there are differences, as it is impossible to keep all the conditions constant.

For the purpose of getting a clearer idea of what happens in the saturator, some series of analyses and observations have been made during the progress of a "bath," as the manufacture of a batch of salt is termed. There is obviously much difficulty about sampling a saturated liquor, containing salt crystals in suspension, and often results were obtained where the percentage of ammonia was clearly much too high ; these high results, however, soon came to be easily recognisable and discounted, as it is chiefly at one stage of the bath where they interfere.

The saturator in which the tests were made was a Walker's semi-closed type, with an outlet valve for the salt at the bottom. In taking the samples the twaddell pot was let down twice, and about 100 c.c. of the second lot quickly poured into a weighed beaker. The net weight of liquor being obtained, it was diluted to the extent that 10 c.c. contained one gram of the original liquor. 10 c.c. of this diluted liquor were used for each determination of acid or ammonia. The temperature of the inlet gases was read off from a thermometer fixed in the ammonia pipe, just over the saturator. These were accurate enough, but the bath temperatures are approximate only. The latter were obtained by placing the thermometer in the full twaddell pot, and allowing the whole to remain immersed in the bath five minutes : the pot was then withdrawn, and the reading taken as quickly as possible without removing the thermometer from the liquor.

Before giving the results from the saturator, it will be as well to notice the solubility of ammonium sulphate in boiling sulphuric acid, as ascertained in the laboratory. The results are given in the table :—

TABLE I.

Tw. : Hot.	B.-pt. °C.	Per cent. ammon. sulph.	Per cent. sulph. acid.	Per cent. water.
52	106°	51·2	none added	48·8
63	110°	52·0	8·8	39·2
—	114°	53·1	12·0	34·9
—	115°	53·1	14·7	32·2
—	115°	54·3	16·1	29·6
—	—	56·7	22·0	21·3
—	140°	60·5	30·4	9·1

Boiling neutral ammonium sulphate solution has a density of 52 Tw. I am not at all clear why a bath should be usually neutral at 54. There is, as a rule, not much trouble in taking the density in the neighbourhood of 54; at the same time probably most of those with sulphate plants to deal with have noticed baths acid down to 51 or 52. It is noticed too from the table that the sulphate is more soluble in the stronger acid. The fourth sample containing 14·7 per cent. acid would have a density of about 68 or 69 Tw., and the 53 per cent. of sulphate it contains represents about the strongest solution that would be got in a saturator.

The way in which a bath behaves after being made up appears to be curious. It is made up, say, to a density of 66 Tw. by mixing acid of 140 Tw. with mother liquor of 50 Tw. and probably a certain amount of water. As ammonia and steam are passed in, the density for some hours rises and may go up to 70 Tw. After remaining for some time at this figure it will commence to go down, at the same time salt begins to separate and floats about in the boiling liquor, giving it a whiter colour; what the men call "on the turn." It is just as well that, provided a good boil is maintained, the salt will not settle at this stage, as if it did it would be too acid to dry well. Quite conveniently it remains suspended in the acid liquor till the density falls to 60 or 62 Tw., which means that there will now be only some 6 or 8 per cent. of acid present. After this the salt settles and its extraction can be proceeded with till the acid, which is being reduced all the time, is nearly all gone. It is a common practice to run in a little acid all the time fishing is proceeding. This, however, was purposely avoided during most of the tests of which tables are given here.

The following table of figures shows the variation in the composition of a bath during the whole process :—

TABLE II.

Bath made up to 66 at 9 a.m.

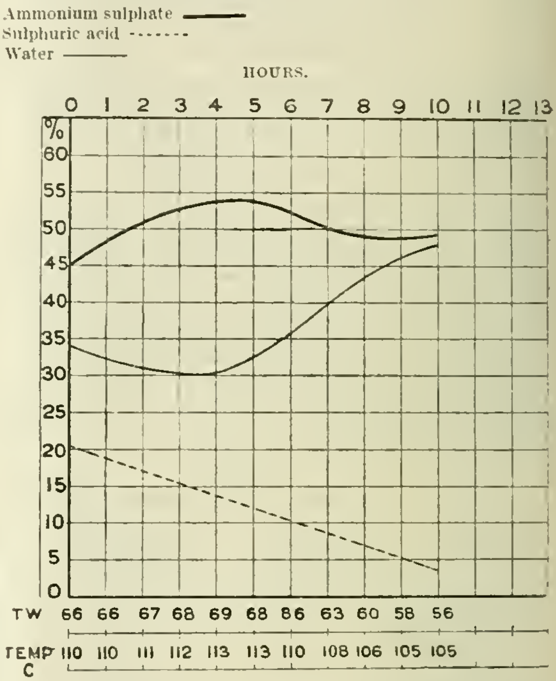
Time.	Tw.	Inlet temp. °C.	Bath temp. °C.	Ammon. sulphate	Sulphuric acid.	Water.
A.M.				per cent.	per cent.	per cent.
10.45	68	98·5	110	41·2	23·0	35·8
12·0	70	100	110	43·5	19·5	37·0
P.M.						
2·0	70·5	100·2	110·5	51·3	15·5	33·2
3·30	71·5	100·2	113	52·1	13·8	34·1
4·45	70·5	100·2	112	54·5	11·7	33·8
6·15	67*	100	110	48·2	9·7	42·1
7·30	60	99·6	108	49·0	5·3	45·7
8·40	56	99	107	48·6	2·1	49·3
9·25	54	99	105	49·3	2·0	48·5

* Tw. difficult to take.

NOTES—Began to fish at 6.15. Put acid in after taking sample at 8.40. Liquor feed increased at 4 o'clock. Mother liquor from this bath sampled when making up the next was 55 Tw., contained 8 per cent. acid and 50·4 per cent. sulphate.

It is noticeable in the first place that the temperature, density, and percentage of sulphate are all highest about the middle stages of the bath, that the acid is gradually reduced, and that the sulphate first rises to a maximum in the neighbourhood of 54 per cent. and then falls to 49. The percentage of water, taken by difference, varies a good deal more than it should do, probably owing to the ammonia determinations being affected by solid salt in the sampling. The interference in this case is quite inadequate to obscure the main lines of variation in the bath composition. The water after remaining for a while about the middle thirties, suddenly begins to increase up to a maximum near 49 per cent. Several baths have been followed through in this way, and while almost every one of them shows some irregularity, by taking a broad view of them, I am led to the following diagram as representing in the case of a normal bath its varying composition :—

TABLE III.



The density rises in the early stages because the increase in density, due to increase of ammonium sulphate, more than counterbalances the decrease due to loss of sulphuric acid, and this is accentuated by the fact that the sulphate is more soluble in strong sulphuric acid than in weak. Once the bath becomes saturated the salt crystallises out all the more rapidly because as the acid becomes weaker the temperature gradually falls. The rapid rise of the water curve in the later stages of the bath is interesting, and follows as a necessary consequence of the fall of the other two curves concerned.

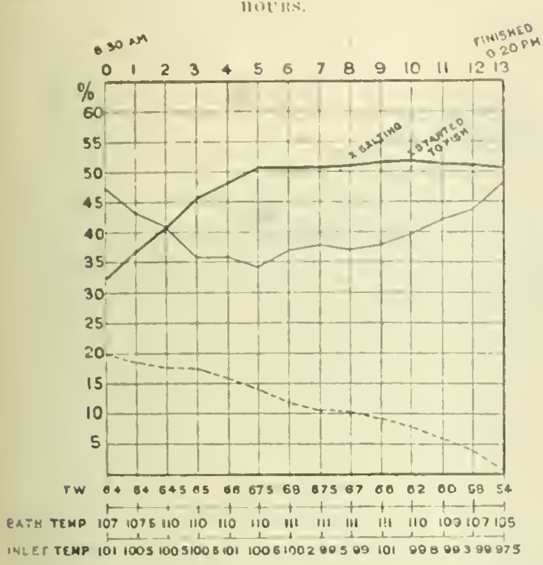
Table IV. is the diagram of another bath followed through.

TABLE IV.

Made up to 64 at 7 a.m.

Strength of liquor 0·8 per cent.

Sulphate ——
Acid -------
Water ———



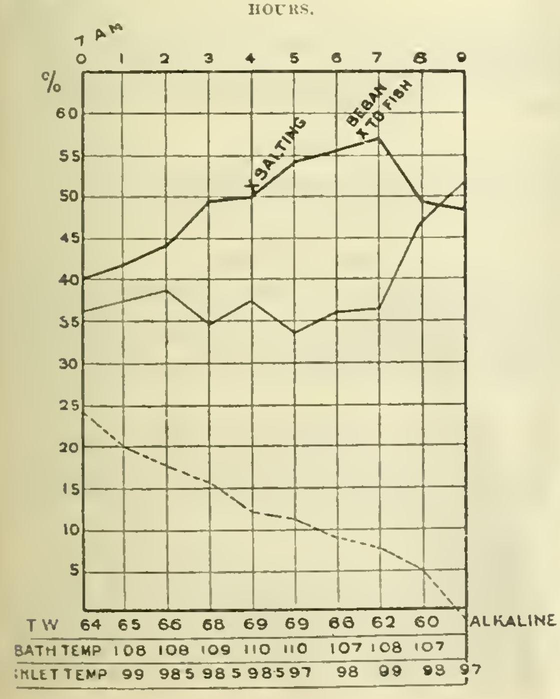
In this case the saturator was filled rather higher than usual, and a good deal of water was used in making it up. This becomes rapidly reduced in the early steps but the bath was rather a watery one all through. There was never any difficulty in sampling or taking the density.

TABLE V.

Made up to 64 Tw. at 6 a.m.

Strength of liquor 0·86 per cent.

Sulphate ——
Acid -------
Water ———



The percentage of sulphate never rose above 52, the saturation point of 9 per cent. acid as ascertained in the laboratory. The gas liquor was being used straight from the works, just as made, and must have been very weak between the 6th and 9th hours, as the composition of the bath alters very little during that time.

Another bath followed out was finished much more quickly, having been made up with good mother liquor. It soon became very salty, and continued so almost to the end, consequently the curves for sulphate and water (which is taken by difference) are rather irregular.

In the early stages of a bath, while the density is rising, the hydrometer can give no indication of the composition, as the gravity may be due to either acid or salt; but when the density begins to fall, the solution is saturated for the particular strength of acid, and the hydrometer gives some notion of the composition. The following is a list of compositions at 66 falling Twaddell, and gives an idea of the limits of accuracy of the instrument for this purpose. Obviously, where the sulphate is over 53 per cent., the excess is due to solid salt in the sample.

66 *falling* Twaddell.

Ammonium sulphate. per cent.	Sulphuric acid. per cent.
55·4	9·0
52·8	10·9
52·0	9·8
58·2	11·6
54·4	12·0

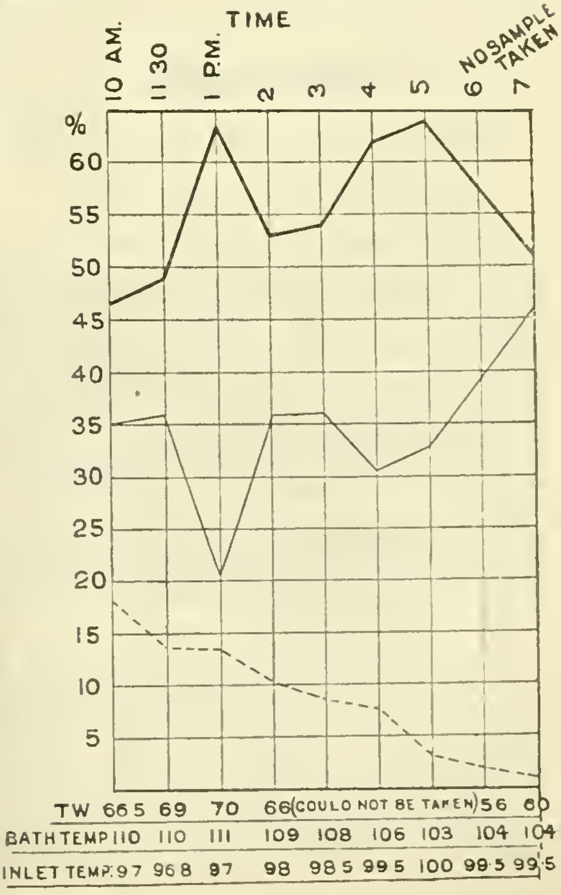
This means that at 66 falling Twaddell there is between 9 and 12 per cent. of acid in the bath. Similarly it is

TABLE VI.

Bath made up to 65 at 7.30 a.m.

Some acid ran in after 5.10.

Sulphate ——
Acid -----
Water ———



found that at 60 Twaddell (falling) there is between 4·9 and 6·7 per cent. of acid. Seeing, too, that the bath temperature falls while the density is falling, it would be possible to judge approximately both the density and composition from the temperature, where a thermometer can be fixed in the saturator with the scale showing outside it would advantageously replace the hydrometer.

Another diagram is given which will need little explanation. It was altogether too salty for testing purposes, and is the only one of all those followed through which was a complete failure. It is given as an example of what may sometimes be obtained. But it is not without interest as indicating (at certain points) the composition of the saturator fluid, solid and liquid, as a whole. This has a different but an important bearing in the making of good salt.

It seems to be important for the making of good salt, that the percentage of water in the mother liquor at the commencement of fishing should not be less than 40. This makes for a free boil, and means that the acid in the mother liquor does not exceed 5 or 6 per cent. If a bath be made up too low in density, say with 10 per cent. acid, it will never make salt, but only mother liquor, as the acid will all be gone before saturation takes place. If it be made up too high, the salt will separate out in quantity, while the acid is still perhaps 12 or 14 per cent. In this case the liquor is too heavy for the salt to settle, and the whole thing becomes nearly solid. The result is local neutralisation, and blue salt.

In what has been said little account has been taken of the solid salt present. The percentage of water on the whole saturator contents, or rather on the whole *floating* contents, has a bearing on the resultant product which must not be overlooked. The solid salt must have room to sink. As is seen from Table VI., this percentage may be as low as 20 without harm resulting, but that is about the minimum.

Yorkshire Section.

Meeting held at Leeds on February 19th, 1912.

SOME NOTES ON THE GUM RESINS.

BY HARRY INGLE, PH.D., D.SC., F.I.C.

In the examination of kauri gum for varnish and linoleum making, the question as to whether exposure to air had any effect on the analytical constants was of importance in view of the fact that many varieties of kauri, such as "swamp gum," have been subjected to very different atmospheric and other conditions than the pure fossil gum or than bush or new kauri. Indeed, some specimens of swamp gum are quite white and very friable.

In the following tables the iodine value, the acid value, and gain in weight of a sample of kauri on exposure to air are given, as are similar numbers for naturally weathered kauri.

The gum was finely ground and exposed to light and air on a loosely covered clock glass and weighed at intervals and its acid value and iodine value determined (Hübl's solution as modified by the writer was used).

Kauri gum, fossil or "bold."

	Fresh.	After 78 days.	13 months.	2 years.
	per cent.	per cent.	per cent.	per cent.
Iodine value ...	177	131	117	95
Acid value	51·7	59·5	69	74
Gain in weight .	—	4·93	7·0	—

The white friable portion of a natural weathered kauri had an iodine value of 140 and an acid value of 50. Another sample of the naturally weathered gum gave an acid value of 62·5, while a piece of clear glass-like gum "Dial kauri" gave an acid value of 46·0.

Manila copal.—Treated in the same way a sample of this gum gave the following results :—

	Freshly ground.	After exposure for		
		78 days.	13 months.	2 years.
	per cent.	per cent.	per cent.	per cent.
Iodine value ...	134	106	94·5	88
Acid value	156	142	150	153
Gain in weight .	—	4·85	5·95	—

The chief general conclusions that are to be drawn from the above figures are that ageing by oxidation lowers the iodine value and tends to increase the acid value of both kauri and manila copal. This is of importance in examining the lower qualities of the gums such as chips, smalls, and dust, and the analyst must bear in mind that in these a higher acid value is to be expected than in the bold gum. The writer is by no means sure that a weathered gum is not as useful to the varnish maker or linoleum manufacturer as a bold gum although the general opinion of the trade in this would be against him. A test which he has applied to such gums is performed as follows :—One part of ordinary American rosin is melted with one part of the gum and then one part of castor oil is added ; when a homogeneous mixture has been obtained it is allowed to cool and is then tested as to its tenacity. The writer has found that even badly weathered gums are as tenacious as the pure bold gums when subjected to this test. He further thinks that the very fact of weathering means that the gum has already been so oxidised that any varnish prepared from it will not get so brittle on exposure to air as one made from a bold sample.

Estimation of kauri, Manila, and dammar in a mixture.—As the acid values of kauri (50—70), Manila (107—156) and dammar (Herrol) (30—32) are so different, it was thought possible that a method of separation of these gums might well be based upon the action of sodium carbonate solution upon such a mixture. First of all a 10 per cent. solution of sodium carbonate was tried and the following results were obtained :—

Kauri.

	per cent.
Insoluble	14·8
Soluble in soda ; acids precipitated from solution by hydrochloric acid	4·9
Insoluble in soda solution, but soluble in warm water and precipitated with hydrochloric acid	46·9
Insoluble in soda and warm water	33·3

Manila.

Soluble 10 per cent. soda solution acids precipitated	59·0
After washing with warm water and precipitating with hydrochloric acids	41·2

Dammar (Herrol).

Acids from soda solution (10 per cent.) by precipitating with hydrochloric acid	0·4
Acids from water washings	1·8
Insoluble in soda, water, and carbon bisulphide, but soluble in alcohol-benzol	11·4
Insoluble in soda and water but soluble in carbon bisulphide	82·5

A five per cent. solution was then tried. Ten grms. of the gum was finely ground and treated with 300—400 c.c. of the solution, boiled, filtered, and washed with the sodium carbonate solution, the filtrate was then acidulated and the precipitate filtered off on to a tared filter paper.

Kauri gave	6·1 per cent. acids.
Manila gave	92·9 per cent. ,,
Dammar gave	2·5 per cent. ,,

This method seemed promising and so a mixture of 50 parts of kauri, 25 parts dammar, and 25 parts of Manila was made and treated with such a solution and the acids liberated and weighed, a yield of 24 per cent was obtained.

Calculating 93 per cent for Manila, 6 per cent for kauri, and 2.5 per cent. for the dammar, theory demands 26.5 per cent. which is in fair agreement with what was found.

Estimation of dammar.—S. Stewart (this Journal, 1909, 348) has published a method of determining the amount of dammar resin present in a sample of kauri. Independently and at the same time the writer was working on the same problem and devised the method described below, which, though based upon the estimation of the same ingredient, is carried out in a different and, as he thinks, a simpler manner.

The sample is ground to powder, and one or more grams are treated in a beaker or flask with a mixture of 3 parts of alcohol and one part of benzol. The white residue is filtered off, washed with the same mixture and then dissolved in carbon bisulphide, the filter being washed three times with this and the solution collected in a tared flask; after the evaporation of the solvent and drying to constant weight the amount of residue is determined. With this solvent (alcohol-benzol) kauri and Manila leave no residue soluble in carbon bisulphide. Herrol dammar gives from 36 to 44 per cent. of matter insoluble in this mixture but soluble in carbon bisulphide. It is best to make a preliminary examination of the uncrushed gum and to select as far as possible, either by the smell of the pieces or by testing them in the manner described by Stewart, samples of the dammar and then to determine in these the amount insoluble in alcohol-benzol but soluble in carbon bisulphide; thus a more reliable guide is obtained.

In order to test the methods above described I had prepared for me by an independent person several mixtures, the composition of which I did not know. The kauri and Manila were determined by acid value method sodium carbonate soluble and the dammar by the carbon bisulphide method.

The following table gives the results.

Samples as mixed.			Analytical results.		As calculated found—		
Kauri.	Manila.	Dammar.	Acid value.	Carbon bisulph. sol.	Kauri.	Manila.	Dammer.
				per cent.			per cent.
—	—	100	32	43·3	—	—	98·2
34	—	66	41	29·0	33·2	—	66·8
—	50	50	87	21·0	—	53	47·0
50	50	—	105·5	—	50	50	—

The above results it will be seen are in fair agreement with the actual figures.

Gum solvents.

Solvent.	Kauri.	Manila.	Dammar.
Acetone	Insoluble	Partially soluble	Insoluble
Alcohol	Partially soluble	Soluble	,,
Alcohol and American turps.	Soluble	Soluble	Partially soluble
Benzol	Insoluble	Insoluble	,, ,,
American turps.	95·5 per cent. insoluble	104 per cent. insoluble	—
Amyl acetate	5·3 ,, ,,	11·5 ,, ,,	26·7 per cent. insoluble
Ethyl acetate	Soluble	Nearly soluble	Insoluble
Petroleum ether	18·6 per cent. soluble	12·1 per cent. soluble	—

The result with American turpentine in the case of the Manila gum must be ascribed to the oxidation of this solvent.

Discussion.

Mr. G. Ward said he had expected to hear something about gum animi which was a form of kauri. Kauri gum was usually dissolved in turpentine but Manila was insoluble in turpentine and alcohol was used. This gave rather a soft varnish which was extensively used because of its cheapness. Was the acid value determined on the original gum or on the precipitate? Had the relative fusing points of weathered and ordinary kauri been determined? It was extremely difficult to melt these weathered gums. They floated about in the vessel. Good kauri had a very high and gum animi a still higher melting point.

Mr. J. W. Cobb pointed out that a certain analogy existed between gums and substances forming varnishes on the one hand and glazes on the other, since in each case the coverings had to become practically solid without crystallization. He supposed that the same indefiniteness would attach to the observed melting point in the one case as in the other, and asked whether the cooling curve for a gum was of any use or whether the mixed composition of the material and its non-crystallizing character rendered such determinations valueless. Were the colloidal solutions or suspensions of gums very sensitive to the influences of foreign substances in solution such as metallic salts? Did small quantities of the latter cause great differences in physical properties and were variations so induced to any extent deliberately in large scale operations.

Dr. L. L. Lloyd said he had tested some dental mould preparations and had always found them to contain kauri gum, stearine or stearic acid, and chalk or a mixture of chalk, French chalk, and talc. Since Manila gum was cheaper than kauri gum, would the former be suitable to replace kauri in these preparations or was it probable that the amount of free fatty acids present in the gum played an important part in the properties of these preparations?

Dr. H. Ingle, in reply, said the acid value was determined on the original gum. He had tried to find out if any method could be devised to determine the amount of weathered kauri in a mixture. The iodine value, acid value, &c., were not satisfactory. He had melted kauri with rosin and added castor oil, and then determined the tenacity of the resulting product by inspection. He found that a mixture of weathered kauri with rosin and castor oil gave a tenacity equal to that of a similar mixture in which ordinary kauri was used. Oxidised kauri was quite friable and he concluded that in making varnish it might be an advantage to use the weathered kauri, as it was already oxidised. It was however, more difficult to melt. The melting points of gums were an exceedingly difficult problem. Little notice was taken of this figure in making varnishes, although it was necessary to melt the gum before it was dissolved in turpentine. Fatty acids had been proposed as solvents and acids from linseed oil had been tried but the results were not satisfactory and he had never heard of any commercial success. Manila copal was cheap and would, he thought, answer the purpose Dr. Lloyd suggested.

Journal and Patent Literature.

Patent specifications may be obtained by post by remitting as follows:—
English.—8*d.* each, to the Comptroller of the Patent Office, W. Temple Franks, Esq., Southampton Buildings, Chancery Lane, London, W.C.
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I.—GENERAL PLANT; MACHINERY.

Multiple effect evaporators; Relative efficiency of long and short tubes for ——. C. E. Newbold. Amer. Sugar Ind., 1911, 13, 456—458.

It is generally known that long calandria tubes are less efficient than short ones on account of the higher temperature of the boiling mass in the former, due to the greater depth of the point where ebullition occurs, but no exact results have been published showing this. In general the length may vary from 3 to 6 ft., although some makers rarely make the tubes longer than 4 ft. 6 in., except under special circumstances. Figures are given indicating that the increase of temperature with the depth, is far more rapid with low than with high pressures, which suggests that the decreased efficiency due to long tubes will be more pronounced in the first body of an effect in which low pressures are used, than in the last body, in which the pressure is near that of the atmosphere. It is also shown that for tubes of different lengths in the case of a double effect taking steam at 225° F., the relative percentage efficiency for tubes of 2, 4, and 6 ft. long are 100, 86, and 75 respectively. Similar results were obtained in the case of a triple effect the figures for tubes of the same length, being 100, 85, and 70, while for a quadruple effect for the same length of tube the figures found were 100, 80, and 65 respectively. From these results, the following conclusions are drawn: (1) That the length of the tubes is an important factor in determining the evaporative power of multiple effects. (2) That working at a poor vacuum has an even more harmful effect on the capacity than the length of the tubes. (3) That the last bodies should always have short tubes, even if the tubes in the first bodies are longer for some special reason. (4) That the bad effect of long tubes increases with the number of vessels in series in the apparatus.—J. P. O.

Aluminium furnace for sealed tubes. A. Stock. Z. Elektrochem., 1912, 18, 153—154.

The furnace consists essentially of a large block of aluminium weighing 18 kilos, provided with two holes to carry ordinary cylindrical sealed tubes. The furnace is heated from below by three rows of small Bunsen burners, and may be closed at the ends by iron shutters. The advantages of the furnace are that it can be used up to 550° C., it is quickly heated up, there is great uniformity of temperature, and great economy in gas consumption.—W. H. P.

Patents.

Furnace. F. Siemens, Berlin. U.S. Pat. 1,017,181, Feb. 13, 1912.

See Eng. Pat. 23,534 of 1909; this J., 1910, 701.—T. F. B.

Gases; Apparatus for extracting or separating suspended matter from ——. F. W. Burstall, Birmingham. U.S. Pat. 1,018,235, Feb. 20, 1912.

See Eng. Pat. 24,261 of 1909; this J., 1910, 932.—T. F. B.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Mineral gels used for decolourising purposes; Determining the relative decolourising power of some ——. E. Pyhälä. Z. Chem. Ind. Kolloide, 1912, 10, 80—82.

The author determined the relative adsorptive (decolourising) power of a number of mineral gels used technically for decolourising mineral and fatty oils. 0·5 grm. of the gel was titrated with a solution of a red dyestuff (Puntswaja B) in pyronaphtha (0·001 grm. per c.c.), the mixture being shaken after each addition, and the titration continued until the dye solution was no longer decolourised. In some cases the gel was stained red, whilst in others it acquired a dark bluish green colour, indicating that a secondary chemical reaction took place after adsorption. Subsequent experiments with different kinds of mineral oils indicated that the decolourising powers of the several gels varied in the same manner as the quantities of dyestuff adsorbed in the titration test. The secondary chemical reaction appeared to have little influence, except that in the case of pale-coloured oils, those gels in which the chemical reaction occurred were relatively more efficacious than the others. Chemical analysis of the gels showed that the chief constituents were silica, alumina, lime, and magnesia, together with iron; one sample also contained wood charcoal.—A. S.

International Petroleum Commission; General meeting of —— *at Vienna.* Petroleum, 1912, 7, 468—474.

At the general meeting of the International Petroleum Commission in Vienna on Jan. 16—22, 1912, the following countries were represented: Austria, Bulgaria, England, France, Germany, Holland, Hungary, Italy, Norway, Roumania, Russia, Servia, Spain, Sweden, and United States. The results of investigations carried out at the Physik.-Techn. Reichsanstalt, Berlin, and the National Physical Laboratory (England) on the German type and the two English types of apparatus for the determination of the flash-point, were presented, and a special committee was appointed. The report of this committee was accepted by the Commission, namely, that the German type, the Abel-Pensky ("Abel-P.") apparatus be adopted as an international standard apparatus for the determination of the flash-point of petroleum. The reports on standard methods for the examination of petroleum (lamp oil) and benzine (Meissner), and lubricating oil (Metzis) were adopted, with the exception of a few points referred back for further consideration. With regard to the standardisation of viscosity determinations, it was resolved that the work of constructing international comparison tables be continued. The question of the transport of petroleum products was discussed, and proposals for a revision of the classification of the different products with respect to danger and of the methods of control were embodied for presentation to the next conference for the revision of international agreements on railway goods traffic. It was resolved that the determination of the flash point be recommended as a means of control instead of the determination of the specific gravity. The questions of the definitions and nomenclature of petroleum products and of regulations for the storage of petroleum were referred to the national sections.—A. S.

Patents.

Peat; Machines for treating [drying, etc.] ——. A. Kesson, Prestwick, Ayrshire. Eng. Pat. 15,326, July 1, 1911.

The peat is delivered into a pulverizer from a hopper fitted with a series of toothed cutting discs, of which alternate members are rotated. The pulverizer itself comprises a horizontal cylindrical casing with four longitudinal shafts extending through it. These shafts carry inclined arms which feed the peat towards one end of the casing, and the arms have spikes to disintegrate the peat. The peat is discharged spikes to disintegrate the peat. The peat is discharged through rectangular apertures in the end of the casing on to "vacuum trays" where it is supported on sheets of hair-cloth and dried by drawing air through it by means of a vacuum pump. The peat is then cut into blocks by vertically-moving knives as it passes to the elevator which raises it to the drying shed.—A. T. L.

Fuel briquettes, ovoids and the like; Manufacture of —— from waste products. A. D. Furse, Beckenham, Kent. Eng. Pat. 21,192, Sept. 26, 1911.

Waste material, such as house refuse, or sewage sludge, is first sorted in order to remove incombustible substances, then reduced to the consistence of a coarse mould by means of a disintegrator and passed through a magnetic separator to recover any small pieces of iron such as nails or wire. The material is then dried and ground to fine powder, mixed with a binding material, and briquetted. —A. T. L.

Briquettes; Process for manufacture of ——. F. O. Gripp, Bremen, Germany. U.S. Pat. 1,016,939, Feb. 13, 1912.

The patent relates to a process for briquetting substances such as close-burning coal or coke, which do not bind under pressure alone. A quantity of coking coal is mixed with water, and a binding material liquefied by heat is added in the proportion of 1 part to 4 parts of the mixture of coal and water. This mass is added to the close-burning coal or coke and the whole is briquetted under pressure. —A. T. L.

Burning coal and gas produced therefrom; Apparatus and process for ——. E. A. Kunze, Aussig, Bohemia. Eng. Pat. 15,030, June 27, 1911.

Coal dust is burnt in a rotating drum having an opening at one end for the admission of the coal dust and the exit of hot gases, and adjustable openings at the other end for the admission of air and the exit of ashes.—H. H.

Hydraulic main; Process for cleaning the —— during work. Stettiner Chamotte-Fabrik Akt.-Ges. vorm. Didier. Ger. Pat. 241,632, Jan. 14, 1911.

The end of the hydraulic main is connected with a receptacle, the end wall of the main dipping below the surface of the tar covering the bottom of the receptacle and of the main. A shaft is mounted in the receptacle and carries three or more wheels of different diameter, round each of which runs an endless rope or chain. These chains extend through the hydraulic main, and a guide roller is provided so that the returning halves of the chains travel on the bottom of the main alongside the outgoing halves. In this way deposits on the bottom of the hydraulic main are removed and carried forward into the receptacle, which is provided with a discharge opening for the tar.—A. S.

Gas producers. F. G. Smith and J. S. Atkinson, London. Eng. Pat. 4566, Feb. 23, 1911.

A charging hopper for gas producers delivers the fuel continuously by means of a chambered plug which closes the lower end of the hopper and is rotated by gearing. The whole is rotated about a vertical axis in order to distribute the fuel over the whole area of the producer, or the body of the producer may be rotated beneath the fixed hopper.—A. T. L.

Gas producers. E. R. Royston, Liverpool. From A. J. Rickie, Calcutta. Eng. Pat. 16,512, July 18, 1911.

A gas producer for bituminous material, of the type in which the gases from the upper part are re-introduced into the incandescent fuel at the bottom of the producer, is constructed with a deep and narrow retort or chamber surrounding the central part of the producer and separated therefrom by a thin wall having openings through which the gases from the producer enter, whereby the tarry materials become converted into gases.—H. H.

Gas purifying apparatus. R. Lessing and Gibbons Brothers, Ltd., London. Eng. Pat. 3109, Feb. 7, 1911.

A gas purifier for continuous working comprises a vertical casing fitted with a number of stationary horizontal grids the bars of which are sufficiently close together to afford support to the purifying material, which practically fills the interior of the casing, without interfering sensibly with the downward progression of the material under the action of rotary stirrers within the casing or with the upward passage of the gas to be purified. The spent purifying material such as iron oxide, is discharged at the bottom through an air-lock and conveyed to an elevator enclosed in a vertical shaft through which a flow of air is maintained for the purpose of revivifying the material prior to its being returned to the charging hopper at the top of the gas purifier. To prevent the formation of an explosive mixture the spent material may be subjected to a blast of non-combustible gas on its passage from the discharge outlet to the elevator.—H. H.

Gas purifier. R. Robinson, Pittsburg, Pa. U.S. Pat. 1,016,290, Feb. 6, 1912.

Furnace gases are conveyed to a chimney stack through an inclined flue containing a number of receptacles or vats fitted with stirrers and means for producing a shower or spray of fluid within the flue. A receiving well is arranged at the bottom of the chimney stack, and a continuous flow of fluid to the well and vats is maintained. —H. H.

Paraffin or the like; Apparatus for cooling ——. P. Porges, Vienna, and R. Neumann, Brünn, Austria-Hungary. U.S. Pat. 1,017,587, Feb. 13, 1912.

The paraffin is cooled in a horizontal cylindrical vessel containing a series of hollow vertical baffles which are alternately annular and circular so as to form a circuitous passage between them. These baffles are cooled by a current of liquid flowing in a circuitous path through their interior. The vessel is fitted with an axial shaft carrying rotating scraper arms which bear against the interior wall of the vessel and the sides of the cooling baffles.—A. T. L.

Hydrocarbons solid at the ordinary temperature, especially paraffin, and heavy oils; Process for obtaining ——. L. Landsberg and K. Wolter. Ger. Pat. 241,528, June 24, 1910.

Heavy non-asphaltic mineral oils, mineral oil residues or distillates, or mineral wax are mixed with from two to three times their volume of ethyl acetate or a homologue of the same, such as propyl acetate, the mixture is cooled, and the paraffin which separates is recovered by filtration. The ester can easily be recovered from the filtrate, leaving an oil of high viscosity and low freezing point.—A. S.

Lubricating oil; Process for the purification of —— after use. J. Donat and D. Höber. Ger. Pat. 241,998, Nov. 3, 1910.

The oil is introduced into a receptacle closed by a hollow cover which is heated by means of steam or the like and carries a tube extending downwards into the oil and upwards into an overflow device surrounded by a funnel, which is connected with a spiral gutter or tube supported on the heated hollow cover. The upper layer of oil in the receptacle becomes heated, thus facilitating the separation of water, and the oil gradually rises through the tube mentioned, overflows into the funnel, and then flows along the spiral gutter or tube, where the last traces of water are vaporised, being delivered finally to a filter. —A. S.

Steam for gas generators; Process for the production of ——. H. Främbs, and Bender und Främbs, G. m. b. H., Hagen, Germany. Eng. Pat. 17,770, Aug. 4, 1911.

See Fr. Pat. 432,950 of 1911; this J., 1912, 117.—T.F.B.

Gasifying apparatus for the production of combustible gas. A. W. Southey. Fr. Pat. 434,888, Oct. 4, 1911. Under Int. Conv., Dec. 19, 1910.

See Eng. Pat. 29,501 of 1910; this J., 1912, 116.—T.F.B.

Paraffin and similar mixtures of substances having different melting points; Process and apparatus for the continuous separation by heat of ——. E. D. Pyzel. Fr. Pat. 434,811, Sept. 8, 1911. Under Int. Conv., Sept. 8, 1910.

See Eng. Pat. 22,313 of 1910; this J., 1911, 795.—T.F.B.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

Gases from the distillation of wood, etc.; Process for separating —— into their constituents. F. Baertling. Ger. Pat. 242,083, April 13, 1911.

The distillation gases, coming from the retorts at increasing temperatures, are passed through a heat accumulator, where they are deprived of their excess of heat, whence they are brought to the separating apparatus, which is raised to a suitable temperature by heat drawn from the accumulator. The heat accumulator may consist of a boiler, heated by the heating gases from the retort, and containing a system of horizontal tubes through which the distillation gases are passed.—T. F. B.

Arc-light; Electrode or pencil, for the ——. J. Ladoff, Cleveland, Ohio, Assignor to P. C. Peck, New York. U. S. Pat. 1,017,005, Feb. 13, 1912.

The electrode is composed of a titanium alloy and the fluotitanate of an alkali metal, for example, potassium. —A. T. L.

Arc-light electrode. E. R. Berry, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,017,497, Feb. 13, 1912.

See Eng. Pat. 13,518 of 1910; this J., 1911, 736.—T. F. B.

III.—TAR AND TAR PRODUCTS.

Nitrobenzene; Reduction of —— by means of ferrous hydroxide. H. C. Allen. J. phys. Chem., 1912, **16**, 131—169.

The author has shown that by use of a single reducing agent (ferrous sulphate and sodium hydroxide) it is possible to obtain fair yields of the various reduction products of nitrobenzene (aniline, hydrazobenzene, azoxybenzene, and azobenzene). A scheme of analysis for a benzene extract containing these products in varying quantities has been worked out as follows. The benzene extract is divided into three equal portions. The first portion is treated with very dilute sulphuric acid in not great excess. This extracts the aniline which is then determined volumetrically by the bromate method. The benzene extract from which the aniline has been removed is allowed to evaporate under constant conditions and a time-weight curve constructed. This shows a pronounced break corresponding to complete removal of the benzene and the weight at this point is that of the reduction products other than aniline. The second portion is extracted with ordinary dilute sulphuric acid (1 : 3), which removes both hydrazobenzene and aniline. In the residue from this extraction azobenzene may be determined colorimetrically, and the total reduction products less aniline and hydrazobenzene may be got by a process of evaporation similar to that of the first portion. The third portion is shaken out with dilute sulphuric acid (removing aniline and hydrazobenzene) and the residue containing nitrobenzene, azobenzene, and azoxybenzene is reduced in the cold by a large excess of reducing agent in alkaline solution. Under these conditions the nitrobenzene is reduced to aniline quantitatively, the azobenzene and azoxybenzene being unaffected. After extracting with benzene the aniline corresponding to the nitrobenzene may be determined as above. In this way only the azoxybenzene remains to be determined and this is obtained by difference. Such an analysis gave the following results with a known mixture:—

	Taken.	Found.
Aniline	0·270	0·270
Hydrazobenzene	0·133	0·141
Azobenzene	0·312	0·318
Azoxybenzene	0·209	0·196
Nitrobenzene	0·210	0·206

In the actual reduction of nitrobenzene, the same results are obtained by (1), adding nitrobenzene to a mixture of ferrous sulphate and caustic soda, (2), adding caustic soda to a mixture of nitrobenzene and ferrous sulphate solution and (3), adding all together, stirring well in each case. Each of these methods gives with an excess of reducing agent 100 per cent. of aniline at boiling temperature, and 80 per cent. at room temperature with only traces of other products. By (4) adding the ferrous sulphate solution to a mixture of nitrobenzene and caustic soda, various products may be obtained. Excess of ferrous sulphate very quickly added at room temperature gives 99 per cent. of aniline. Excess of ferrous sulphate dropped in rapidly at boiling temperature gives 58 per cent. of aniline. Excess of ferrous sulphate very slowly added at 75° C. gives 21 per cent. of aniline, 60 per cent. of hydrazobenzene, 14 per cent. of azoxybenzene. A slight excess of ferrous sulphate over the amount required to reduce to hydrazobenzene, added slowly to the boiling mixture gives 33 per cent. of aniline and 58 per cent. of hydrazobenzene. A slight excess over the amount calculated to reduce to azoxybenzene added in the same way gives 18 per cent. of aniline and 76 per cent. of azoxybenzene. Azobenzene can be formed by the oxidation of hydrazobenzene with nitrobenzene. In Elbs' method of electrolytic preparation of azobenzene, there is an undoubted azoxybenzene stage which can easily be shown if the electrolyte be stirred and low current densities be used; increasing the current density decreases the amount of azoxybenzene found in solution.—W. H. P.

Nitropyridine; Preparation of ——. F. Friedl. Ber., 1912, **45**, 428—430.

At a high temperature, the difficulty of introducing a nitro-group into the pyridine molecule can be overcome. Into a tubulated retort with a well-cooled condenser is introduced a solution of 20 grms. of pyridine in 120 grms. of 18 per cent. fuming sulphuric acid, and the temperature is raised to 330° C. Cautiously and in small quantities, 110 grms. of potassium nitrate are added, and a stream of air is drawn through the retort and condenser. The distillate is evaporated to dryness on the water-bath, the residue taken up with sodium carbonate solution, and thoroughly extracted with ether. After distilling the ether and pyridine from the ethereal extract, the oily residue is dissolved in nitric acid, and the solution gradually deposits crystals of nitropyridine nitrate, which are purified by recrystallisation. From the solution of the crystals sodium hydroxide separates the base in colourless needles, which when purified melt at 41° and boil at 216° C. Its reactions show it to be a β-derivative.—J. T. D.

Hydrogenation and dehydrogenation. H. Wieland. Ber., 1912, **45**, 484—493.

Using palladium black quite free from oxygen and working with exclusion of air, the author finds that the conversion of quinone into hydroquinone by means of hydrogen in presence of palladium black at the ordinary temperature is a reversible reaction, for hydroquinone in aqueous solution is partially converted into quinone when shaken with palladium black, the amount so converted increasing with the quantity of palladium used. Dehydrogenation under these conditions proceeds more readily with dihydroanthracene than with hydroquinone, and still more readily with hydrazobenzene and dihydronaphthalene. Hydrazobenzene in benzene solution is dehydrogenised to azobenzene and simultaneously hydrogenised to aniline; the azobenzene is not hydrogenised under the experimental conditions. Dihydronaphthalene yields naphthalene and tetrahydronaphthalene. It is pointed out that the hydrogenation in these experiments cannot be due to nascent (atomic) hydrogen, for dihydronaphthalene, for instance, is not affected by sodium and alcohol. Indeed it may be stated as a general rule that unsaturated ethylenic compounds which decolourise permanganate can also in general be hydrogenised in presence of palladium black, but not by sodium and alcohol, whilst on the other hand, aromatic hydrocarbons (naphthalene, anthracene) are reduced by sodium and alcohol, but not in presence of palladium black. The author considers that in the action of palladium-hydrogen (probably a solid solution with a small quantity of combined hydrogen in equilibrium with a relatively large quantity of dissolved hydrogen) on hydrocarbons, an unstable addition compound is first formed, which then decomposes into palladium and a hydrogenised derivative of the hydrocarbon. In support of this view it is pointed out that methyl and ethyl alcohols are absorbed by palladium black, with considerable evolution of heat; after prolonged shaking in presence of excess of the alcohol, the corresponding aldehyde is formed, more rapidly with ethyl than with methyl alcohol, and at the same time hydrogen can be detected in the palladium. A freshly-prepared suspension of palladium black in one of the alcohols, however, before a trace of aldehyde can be detected, is capable of reducing quinone to hydroquinone, and this is ascribed to the production of an unstable compound of the palladium and the alcohol, in which the hydrogen of the alcoholic hydroxyl group is in a peculiarly active condition. The ignition of alcohol vapour in presence of platinum or palladium is explained in a similar manner, as being due to the heat developed by the atmospheric oxidation of the "activated" hydrogen of the alcoholic hydroxyl group. The decomposition of the unstable addition compound proceeds more rapidly with the higher alcohols. With propyl alcohol in presence of palladium black, aldehyde can be detected after 14 hours, whilst benzyl alcohol is reduced immediately to benzaldehyde.—A. S.

PATENTS.

Tar; Instrument and method for testing the viscosity of ——. J. Hutchinson, Westminster. Eng. Pat. 22,042, Oct. 6, 1911.

The instrument is designed to afford a means for determining the relative viscosity of tars by observing the time occupied by it in sinking from one defined mark to another without losing its perpendicularity; the weight of the instrument may be so adjusted as to eliminate as far as possible the influence of variations in specific gravity of the materials to be tested. The instrument may consist of a stem with a bulb near the centre and a movable counterpoise at the bottom; on the portion of the stem above the bulb are two rings to serve as marks for the test. For use in testing coal tars three counterpoises may be used, *viz.*, one for tars of sp. gr. 1·170 to 1·195, another for those of sp. gr. 1·195 to 1·215, and the third for those of sp. gr. 1·215 to 1·240.—T. F. B.

Cresols; Process for separating m- and p- ——. F. Hoffmann-Laroche und Co. Fr. Pat. 434,534, Sept. 25, 1911. Under Int. Conv., Jan. 25, 1911.

The mixture of *m*- and *p*-cresol is treated at the ordinary temperature or moderately heated with concentrated or fuming sulphuric acid in quantity insufficient to completely convert the cresols into their monosulphonic acids; under such conditions the *p*-cresol is only partially sulphonated. The *m*-cresolsulphonic acid may be separated directly from the sulphonation product by crystallisation, preferably after addition of water or dilute sulphuric acid. The *p*-cresol is separated from the liquid, before or after crystallisation, by extraction with benzene or other organic solvent, and any *p*-cresolsulphonic acid formed remains in the solution. The sulphonic acids may be re-converted into the cresols by distillation with superheated steam or by other known means.—T. F. B.

Halogenated phenols; Preparation of complex alkali salts of ——. P. Flemming. Fr. Pat. 434,518, Sept. 25, 1911. Under Int. Conv., May 3, 1911.

A new series of complex compounds, stable, easily soluble in water, and having an alkaline reaction, is obtained by treating halogen derivatives of phenols or their homologues with alkalis or salts of alkaline reaction, an organic solvent being present if necessary. The potassium salts have the composition, ROK,2ROH, or ROK,ROH, whilst the sodium salts correspond to the formula, 2RONa,ROH.—T. F. B.

a-Naphthalides of isatin or its homologues or substitution products; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 242,614, Jan. 20, 1911.

By the action of α- or β-naphthylamine on the oxygen ethers of isatin or its derivatives, the corresponding α-naphthalides are produced.—T. F. B.

Condensation products of the pyridine, quinoline, isoquinoline, and acridine series; Process for preparing ——. A. Kaufmann. Ger. Pat. 243,078, Jan. 4, 1911.

p-Nitroso-compounds of tertiary aromatic amines are heated with cyclic ammonium bases or their derivatives which contain a methyl group in the α- or γ-position to the cyclic nitrogen atom, with or without addition of an indifferent solvent or an alkaline condensing agent; the products are azomethine derivatives, which are readily saponified into aldehydes and amines. Quinaldine, lepidine, α-methylisoquinoline, and α- and γ-picolines are suitable bases for use in the reaction.—T. F. B.

IV.—COLOURING MATTERS AND DYES.

PATENTS.

Derivative of ortho-aminophenol and of monoazo dyestuffs therefrom; Production of a ——. M. Wyler, H. Levinstein, and Levinstein, Ltd., Blackley. Eng. Pat. 3457, Feb. 11, 1911.

Diacetyl-*o*-aminophenol (19·3 parts) is dissolved in sulphuric acid monohydrate (70 parts) and nitrated at a temperature of 0°—5° C. with a mixture of 63 per cent. nitric acid (21 parts) and sulphuric acid monohydrate (21 parts). When the new acetyldinitro compound (m. pt. 193° C.) is hydrolysed, a new dinitro-*o*-aminophenol (m. pt. 163° C.) is produced, from which a series of dyestuffs may be obtained after diazotising and combining with a suitable component. Thus, the dyestuff obtained by combining with 2·5-phenylaminonaphthol-7-sulphonic acid dyes wool from an acid bath red-brown shades, changed to black by treatment with bichromate; when *m*-toluylenediamine, resorcinol, β-naphtholdisulphonic acid R, 1·5-dihydroxynaphthalene, or 1-phenyl-3-methyl-5-pyrazolone is used as end component, dyestuffs giving various shades of brown are produced.—T. F. B.

Indigo and its homologues and substitution products; Production of condensation products from —— and their use for dyeing and printing textiles. Soc. pour l'Industrie Chimique à Bâle. Fr. Pat. 434,828, Dec. 7, 1910.

See U.S. Pat. 994,988 of 1911; this J., 1911, 886. The products are converted by reducing agents into leuco compounds, which can be applied to the fibre and oxidised to develop the dyestuff.—T. F. B.

Alizarin or hydroxyanthraquinones; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 435,118, Oct. 10, 1911. Under Int. Conv., Dec. 31, 1910, Jan. 6, June 9 and 14, and July 19, 1911.

See Ger. Pat. 241,806 of 1911; this J., 1912, 223. When alkaline earths are employed, and the fusion is less energetic, β-hydroxyanthraquinones are formed, whilst with more energetic fusion trihydroxyanthraquinones are produced.—T. F. B.

Indigo and thioindigo dyestuffs in finely divided condition; Process for producing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 242,532, Sept. 21, 1910. Addition to Ger. Pat. 237,368, Sept. 28, 1909.

Indigo and other indigoid dyestuffs, as well as thioindigo dyestuffs, are obtained in a finely divided condition by oxidation of their leuco-compounds or by dissociation of their mineral acid solutions or suspensions by means of water, in each case in presence of aldehydes of the aromatic, terpenic, or fatty series (see also this J., 1911, 1047, 1110, 1372).—T. F. B.

Vat dyestuff of the anthracene series; Process for preparing a ——. Badische Anilin und Soda Fabrik. Ger. Pat. 242,621, March 8, 1911.

When a nitro group is introduced into the methylbenzanthrone of m. pt. 199° C., a mononitro derivative of m. pt. 243° C. is obtained; when this is heated with sulphur it is converted into a vat dyestuff which dyes vegetable fibres very fast blue-green shades.—T. F. B.

Anthracene dyestuffs; Production of vat-dyeing —— Badische Anilin und Soda Fabrik. Fr. Pat. 434,831, Sept. 25, 1911. Under Int. Conv., March 7 and June 15, 1911.

See Ger. Pat. 242,621 of 1911: preceding. By using a polysulphide or a mixture of a sulphide and sulphur (in place of sulphur alone) grey to black dyestuffs are obtained. —T. F. B.

Acid dyes of the anthracene series; Process of making ——. M. Iljinsky, and R. Wedekind und Co. m. b. H., Uerdingen on Rhine, Germany. Eng. Pat. 2831, Feb. 3, 1911.

See U.S. Pat. 996,487 of 1911; this J., 1911, 947.—T. F. B.

Azo dyestuffs for wool; Manufacture of ——. A. G. Bloxam, London. From Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 10,907, May 5, 1911.

See Fr. Pat. 429,529 of 1911; this J., 1911, 1205.—T. F. B.

[*Azo*] *dye.* G. Holste, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,012,853, Dec. 26, 1911.

See Fr. Pat. 426,201 of 1911; this J., 1911, 948.—T. F. B.

Azo dyestuffs of the anthraquinone series; Process for making ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 434,464, Sept. 20, 1911. Under Int. Conv., Oct. 6, 1910.

See Eng. Pat. 21,727 of 1911; this J., 1912, 119.—T. F. B.

Condensation products of the anthraquinone series. Badische Anilin und Soda Fabrik. Fr. Pat. 434,999, Oct. 7, 1911. Under Int. Conv., Feb. 23, 1911.

See Ger. Pat. 241,805 of 1911; this J., 1912, 119.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Cotton-wax. C. Piest. Z. angew. Chem., 1912, 25, 396—399. (See also this J., 1911, 813, 1007.)

A sample of raw American cotton (linters) gave the following results on examination: wood-gum, 1·32; ash 2·44 per cent.; copper-number by Schwalbe's method, (this J., 1907, 548), 3·57; viscosity of cuprammonium solution after 5 days by Ost's method (this J., 1911, 1247) 10·2, 9·57 and 9·35. There was extracted by ether 0·74, by benzene 0·87, by petroleum ether 0·5 and by absolute alcohol 1·235 per cent. respectively (compare also this J., 1909, 904). The alcohol extract had a saponification value of 159 and the iodine value 22·1. The following average figures were found on examining nine different samples of normal purified cotton for nitration:—wood-gum 0·65 per cent., ash 0·11, ether-extract 0·18, carbon tetrachloride extract 0·19, alcohol extract 0·35; copper number 0·94. By successive extraction of a sample of the cotton with different solvents, half of the total extracted matter was removed by alcohol, the other half being divided almost equally between ether and carbon tetrachloride. The extract approximated to Japan wax in its melting point, saponification and iodine values. Further experiments indicated that the copper number is increased by the presence of cotton-wax.—J. A.

Cellulose; The action of ozone on ——. M. Cunningham and C. Dorée. Chem. Soc. Proc., 1912, 28, 38.

Ozone (concentration 1 to 2 per cent.) rapidly attacks cotton, forming a cellulose peroxide and an acid derivative, together with some carbon dioxide. The peroxide is decomposed at 80° C. The acid may be removed by boiling with water or digestion with $N/10$-alkali; the neutral fibre residue then obtained is an oxycellulose. The acidity and the amount of carbon dioxide produced during treatments varying from one to twenty hours have been measured, and the constants of the oxycellulose determined and compared with typical oxycelluloses. The lignocellulose jute is not appreciably affected unless water is present. In that case it is oxidised, giving carbon dioxide, acetic and formic acids, and complex non-volatile acids which yield furfural. Quantitative measurements of the progressive action of the ozone show that the lignone group is rapidly attacked in the first three hours, after which the action becomes slower, the residue being then oxidised uniformly. The lignin reactions cease when the loss of weight is about 33 per cent. Direct evidence of ozonide formation has not been obtained, although the formation of acetic and formic acids appears to be due to the decomposition of some product formed, in the first instance, by the action of ozone.

Soda wood pulp; Heavy oil obtained in the manufacture of ——. H. Bergström. Papierfabrikant, 1912, 10, 251—253.

In the recovery of methyl alcohol as a by-product of the digestion of wood by the soda process, there is obtained at the end of the rectification of the spirit, a pale yellow oil having a specific gravity above 0·9. This oil yielded on fractional distillation 14 per cent. boiling below 190° C., 73 per cent. boiling between 190° and 218° C., and 13 per cent. of residue. The first fraction contained chiefly the ordinary constituents of the oil of turpentine obtained from sulphate wood pulp liquors. The main fraction was further sub-divided, yielding 21·5 per cent. distilling between 202° and 206° C., having the maximum sp. gr. of 1·0 and $\alpha_D = +10°$; this fraction has not been fully investigated. The principal fraction, equal to 38 per cent., distilled at 216°—218° C. and possessed the lowest sp. gr. of 0·950, with the highest rotatory power, $\alpha_D = +23{\cdot}5°$. On purification it boiled at 217·5° C. and had the sp. gr. 0·943. Both fractions were capable of acetylation, yielding results equivalent to 50 per cent. of terpene alcohol, $C_{10}H_{18}O$. The heavy oil, the subject of this investigation, was obtained by the digestion of pine wood and a little spruce wood by the sodium sulphate process, and contains liquid terpineol, as well as a body of higher specific gravity, which appears to be concentrated in the fraction boiling at about 205° C. In this fraction terpineol appears to be accompanied by another terpene alcohol. Similar terpene alcohols are obtained also in the rectification of wood spirit produced by destructive distillation, and are partly the cause of the turbidity which is formed on diluting crude wood spirit with water.—J.F.B.

Asbestos cement boards. Weniger. *See* IX.

PATENTS.

Fabrics; Cleansing —— [*removing iron stains*]. H. B. Bishop, New York. U.S. Pat. 1,016,928, Feb. 13, 1912.

FABRICS contaminated with iron stains are cleansed by treatment with a soluble compound of fluorine having an acid reaction. A solution of hydrofluoric acid is separately specified.—J. F. B.

Cloth; Process for raising the nap of ——. J. A. Jamieson, Montreal, Canada. U.S. Pat. 1,017,151, Feb. 13, 1912.

IN the treatment of cloth for raising the nap, the affected portion of the cloth is subjected to the action of a solution of a carbonate and an acid. For instance, the cloth is first impregnated with a solution of sodium bicarbonate and acetic acid is then applied.—J. F. B.

Cellulose derivatives [*esters*]; *Manufacture of* ——. Act.-Ges. für Anilin-Fabrikation, Treptow, Germany. Eng. Pat. 22,237, Oct. 9, 1911. Under Int. Conv., Oct. 29, 1910.

CELLULOSE esters of organic acids are obtained by treating cellulose which has undergone a preliminary modification, *e.g.* hydrocellulose and oxycellulose, with the anhydride of an organic acid or with formic acid, in presence of chlorine or bromine, and preferably also in presence of the acid corresponding with the anhydride used. Example :—Modified cellulose is introduced into a mixture consisting of 3 parts of acetic anhydride, containing about 2 per cent. of bromine, and 4 parts of glacial acetic acid. The mixture is stirred at about 50° C. until the material is dissolved. The ester thus obtained may be subjected to hydrolysis according to the usual methods. If formic acid be employed instead of acetic anhydride, formyl derivatives of cellulose are obtained.—J. F. B.

Cellulosic materials; Acetylation of ——. Soc. Chim. des Usines du Rhone, Paris. Eng. Pat. 25,893, Nov. 20, 1911. Under Int. Conv., Dec. 14, 1910.

CELLULOSIC material is acetylated by exposing it to the vapours of boiling acetic anhydride; the intensity of the action may be moderated by reducing the pressure or diluting the vapours. The cellulose may be dry or moistened with water or a diluted mineral or organic acid. Example :—Cotton impregnated with sulphuric acid (as for the preparation of Girard's hydrocellulose) is placed in a cylindrical vessel connected with a condenser and vacuum pump. The pressure is reduced to 30 mm. and the cotton is heated to 55° C. The vessel is then connected with a steam-heated boiler containing acetic anhydride, which boils at 50°—55° C. under this pressure. The cellulose, when acetylated, retains its original form and the excess of acetic anhydride is recovered by condensation.—J. F. B.

Cellulose [*for nitration*]; *Manufacture of* ——. F. L. Stewart, Murrysville, Pa., Assignor to Maize Sugar and Cellulose Co., Pittsburgh, Pa. U.S. Pat. 1,017,023, Feb. 13, 1912.

A FINE bleached pulp produced from the fibres and cellular matters obtained by the treatment of immature maize stems, is treated with chloride of lime and hydrochloric acid, for the purpose of removing impurities which would hinder the material, after subsequent nitration, from dissolving in the ordinary solvents.—J. F. B.

Soda pulp mills; Treatment of waste liquors from ——. E. L. Rinman, Harnäs. U.S. Pat. 1,017,320, Feb. 13, 1912.

BLACK liquors from soda pulp mills are first freed from organic substances capable of being precipitated by carbonic acid and the soda is then precipitated as bicarbonate by saturating the liquor with carbon dioxide at a suitable concentration and temperature.—J. F. B.

Artificial tissues; Machines for the manufacture of ——. C. Baj, Lyons, France. Eng. Pat. 5077, Feb. 28, 1911. Under Int. Conv., March 1, 1910.

SEE U.S. Pat. 995,652 of 1911; this J., 1911, 888. T. F. B.

Formyl celluloses; Process for the production of ——. Verein. Glanzstoff-Fabr. A.-G., Elberfeld, Germany. Eng. Pat. 6241, March 13, 1911. Under Int. Conv., Nov. 23, 1910. Addition to Eng. Pat. 15,700 of 1910, dated Dec. 20, 1909.

SEE Addition of March 13, 1911, to Fr. Pat. 420,856 of 1910; this J., 1911, 1050.—T. F. B.

Solvents for cellulose esters; Process of regaining the volatile ——. A. Wohl, Danzig, Germany. Eng. Pat. 23,995, Oct. 30, 1911. Under Int. Conv., Nov. 12, 1910.

SEE Ger. Pat. 241,973 of 1910; this J., 1912, 225.—T. F. B.

Threads, filaments, bands, or films of cellulose; Manufacture of ——. S. Courtauld and Co., Ltd. Fr. Pat. 434,501, Sept. 22, 1911. Under Int. Conv., Jan. 6, 1911.

SEE Eng. Pat. 406 of 1911; this J., 1911, 1308.—T. F. B.

Cellulose and fibrous substances from plants; Process for separating ——. O. Silberrad. Fr. Pat. 434,709, Sept. 29, 1911. Under Int. Conv., Dec. 5, 1910.

SEE Eng. Pat. 28,193 of 1910; this J., 1912, 67.—T. F. B.

Fibres for the manufacture of paper and pulp; Process for "hydrating" and beating ——. H. Jackson. Fr. Pat. 435,090, Oct. 10, 1911.

SEE Eng. Pats. 25,051 of 1910 and 6019 of 1911; this J., 1912, 225.—T. F. B.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Dyeing phenomena; Investigation of ——. R. Haller. Chem.-Zeit. 1912, **36**, 169—171, 182—184.

THIS investigation deals particularly with the influence of the structure of the cotton fibre on the dyeing process. The author examined microscopically and optically, dyeings obtained by—(*a*) topping Chrome Yellow (lead chromate) with indigo and *vice versa*, (*b*) topping Para-Red with indigo and *vice versa*, (*c*) topping Manganese Bistre with Indigo and *vice versa*, and (*d*) dyeing Alizarin Blue on a tannin-chrome mordant. He arrives at the following conclusions. (1) The dyeing of cotton is not due to the filling up of pores in the cell wall by the dyestuff, since cotton which has been loaded with one substance to an extent which would fill up any pores can still take up further quantities of other substances. (2) The lumen of the fibre does not play a direct part in the dyeing process by giving rise to capillary effects, since the seed hairs (cotton fibres) are dyed in an exactly similar manner when in position on the seed, and hence with both ends closed, and the lumen apparently inaccessible. (3) There is no essential distinction between the fixation of pigment and mordant dyestuffs. Any differences may be ascribed to differences in the physical condition of the precipitated pigments. (4) The phenomena of indigo dyeing are thus explained. During the first passage of the material through the vat, the fibre acts as the adsorbing medium and particles of indigo white are deposited in and on the cell membrane and are oxidised by the air passage to indigo. During the second and subsequent passages, however, the fibre acts less and less and the adsorbed indigo more and more as the adsorbing medium. Further, the already adsorbed indigo prevents newly adsorbed particles from entering the cell membrane and they are therefore deposited on the outer wall of the fibre. Hence a cross-section of a strongly dyed fibre shows the interior of the fibre to be stained light blue only. The dyeing of mordant dyestuffs is similarly explained. (5) To explain the dyeing process the author is inclined to accept the "micellar" theory of Nägeli (Das Mikroscop, S. 416, 423—424). According to this theory, without altering their relative positions, the ultimate cells ("micells") of the fibre can draw into the spaces between them molecules of substances for which they have an affinity. In support of this theory the author mentions that if a fibre dyed with Para-Red and topped with indigo is treated with an ammoniacal copper oxide solution in order to cause it to swell and become transparent, the mixture of the different coloured particles gives a green effect in dispersed light. (6) From the fact that many pigment-dyed fibres were evenly dyed throughout, the author concludes that the fixation of dyestuffs by developing them on the fibre is based on the same reactions as the dyeing of cotton with substantive dyestuffs. —P. F. C.

Cotton; Absorption of tannin from its aqueous solutions by ——. A. Sanin. Z. Chem. Ind. Kolloide, 1912, 10, 82—88.

In the author's experiments 4·2 grms. of air-dried "Brunk's cotton wool" (=4 grms. of dry cotton wool) were immersed in 500 c.c. of a tannin solution, the concentration of which ranged, in different experiments, from 5 to 0·1 per cent., and after 45 hours, the cotton was withdrawn, and the tannin content of the solution again determined. The tannin was determined by precipitation as the compound, $C_{14}H_9(SbO)O_9$, by means of a reagent containing sodium chloride, tartar emetic, sodium acetate, and acid sodium tartrate (compare this J., 1910, 345). The results obtained could not be represented by the formula given by von Georgievics (this J., 1898, 845), but agreed satisfactorily with the adsorption formula: $\frac{x}{m} = \beta \cdot c^{\frac{1}{p}}$ where $\frac{x}{m}$ is the quantity of tannin adsorbed by 1 grm. of cotton, c is the concentration of the tannin solution after adsorption, and β and $\frac{1}{p}$ are constants. In similar experiments with an alkaline solution of tannin (a solution containing 22·4 grms. of tannin and 2 grms. of sodium hydroxide in 2 litres, diluted to different degrees), no adsorption of the tannin by cotton took place. In a third series of experiments, the effect of hydrochloric acid (about 10 per cent. of the weight of the tannin) was studied, and it was found that from the weakest tannin solution (0·2 per cent. of tannin) more tannin was adsorbed by the cotton in the presence than in the absence of hydrochloric acid, but in the stronger solutions (0·4 to 1 per cent. of tannin) the reverse was the case. The actual concentration of the acid in the tannin solution (from 10 to 70 c.c. of 2·04 *N* acid in 500 c.c. of 1 per cent. tannin solution) had no appreciable influence on the amount of tannin adsorbed by the cotton.—A. S.

Washing powders containing perborate; Influence of —— on fibres. E. Luksch. Chem.-techn. Mitt. Versuchsanstalten an der Staatsgewerbeschule Wien, **17**. Chem. Zentr., 1912, **1**, 615.

The washing powders in question usually consist of a mixture of soap and sodium carbonate with about 10 per cent. of sodium perborate. Using a mixture of equal parts of soap and soda crystals, the author found that the average loss of strength of tissues of different kinds after six washings was: linen, 15—20 per cent.; cotton, 18·5—22·5 per cent.; and wool, 15—20 per cent.; whilst with a mixture of 45 per cent. of soap, 45 of soda crystals, and 10 of sodium perborate, the corresponding figures were: linen, 24·5—39 per cent.; cotton, 29—43 per cent.; and wool, from 24 per cent. up to complete destruction in the case of fine materials. Very thin materials such as muslin or lace are practically completely destroyed, and mercerised cotton is also very greatly deteriorated.—A. S.

Patents.

Bleaching fibrous materials; Process of ——. C. Hall, Eccles, Lancs. Eng. Pat. 3284, Feb. 9, 1911.

The material is treated firstly with a liquor, such as a soda ash solution of 4° Tw., for removing the starchy substances from the fibre; secondly with a chlorine solution of 0·25°—1·0° Tw. in order to destroy motes or cotton seeds, and thirdly, with the wash waters obtained by rinsing the material after the fourth treatment, which consists in bleaching the fibre with a fresh chlorine liquor of 0·25°—1·0° Tw. A final washing with water completes the process.—P. F. C.

Brown reserves on vegetable fibres dyed with Aniline Black; Process for producing ——. C. Pilz. Ger. Pat. 242,611, Feb. 25, 1911.

Fabrics of animal fibres are prepared for Aniline Black in the usual matter, and are then printed with a mixture containing an easily oxidised aromatic amine, aminophenol, etc., and finally steamed. The reserving action of the aminophenols, diamines, etc., is so powerful as to prevent the formation of Aniline Black, only the brown dyestuff being formed. These brown reserves may themselves be reserved by the usual process for dyeing Aniline Black, so that a variety of new effects may be obtained. —T. F. B.

Fabrics and other materials; Treatment of —— with liquid or semi-liquid substances. A. M. Hart, London. Eng. Pat. 3070, Feb. 7, 1911.

By pressing two "doctors" vertically against the cloth, the first downwards from above, and the second upwards from below, at different points in its journey under tension from one batch roller to another, the path of the fabric assumes an oblique *N*-shaped appearance. The preparation with which the material is to be impregnated is poured into the valley formed by the first "doctor," and the cloth as it travels downwards to it from the batch roller. The tension exerted at the edges of the "doctors" and the sharp turnings in the path of the cloth, cause the filling preparation to be forced into and absorbed by the fibres. Any excess remaining on either side of the cloth is scraped off by the "doctors."—P. F. C.

Textiles; Apparatus for the treatment of —— in the form of threads, cords, hanks, and fabrics. F. Jaumandreu, Barcelona, Spain. U.S. Pat. 1,017,547, Feb. 13, 1912.

See Eng. Pat. 8424 of 1911; this J., 1911, 1208.—T. F. B.

Printing colours for printing textiles; Process for the preparation of ——. S. Wechsler, Vienna. Eng. Pat. 2912, Feb. 4, 1911.

See Fr. Pat. 425,777 of 1911; this J., 1911, 952.—T. F. B.

Printing on textiles; Process for ——. C. Winternitz and P. Zacslé, Budapesth, Hungary. Eng. Pat. 17,902, Aug. 5, 1911. Under Int. Conv., July 17, 1911.

See Fr. Pat. 432,809 of 1911; this J., 1912, 125.—T. F. B.

Preparing a formaldehyde compound containing sulphur and alkali. Fr. Pat. 434,914. *See* VII.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Ammonia; Oxidation of ——. W. Reinders and A. Cats. Chem. Weekblad, 1912, 9, 47—58. Chem. Zentr., 1912, 1, 708.

Air was led through a wash-bottle containing ammonia solution, then dried by means of quicklime, and passed through a tube containing a catalyser kept at a constant temperature in an electric furnace. Platinum, platinised copper, thoria, and ferric oxide were used as catalysers. With platinum and with ferric oxide 80—90 per cent. of the ammonia could be oxidised to nitric acid and nitrogen trioxide. The velocity of the current of air had a great influence, there being for each set of conditions a definite velocity at which a maximum oxidation of the ammonia was attained. With platinum the most favourable temperature was 600° C., and with ferric oxide, 650°—700° C.—A. S.

Copper salts and their behaviour with alkalis. S. U. Pickering. Chem. Soc. Trans., 1912, **101**, 174—192.

Copper salts of organic acids containing no alcoholic hydroxyl react with alkalis to form insoluble basic salts, whilst those of the hydroxy-acids form soluble cupri-compounds, either of the *cis*- or *trans*-description; in some cases a certain amount of basic salt is also formed. *trans*-Cupri-salts of monobasic acids are, in nearly every case, very unstable. Further evidence that copper in cupri-salts is present as CuO, and not as copper displacing hydrogen, was obtained in several cases, especially in that of the salicylate and malate, the latter being of importance, because the compound in question must be of the *cis*-type, and former evidence applied chiefly to compounds of the *trans*-type. In the case of copper glycerate, a cupri-compound has been obtained, differing in composition from the normal salt only by the elements of water, but certainly not being a mere hydrate. The two compounds have very different solubilities, colours, and decomposition temperatures; and in solution the cupri-compound may easily be converted into the normal salt. Thirteen basic salts precipitated by alkali from salts of acids containing no alcoholic hydroxyl conform to formulæ representing 1, 3, or 7CuO united with a molecule of the normal salt. Besides these, about twenty new compounds have been obtained.

Zinc hydroxide in alkalis; Solubility of ——. O. Klein. Z. anorg. Chem., 1912, **74**, 157—169.

Zinc hydroxide is found to exist at the ordinary temperature in at least three modifications; the first is formed when a zinc solution is added to a solution of potassium hydroxide, the second is deposited, often as crystals, when a saturated solution of the first in potassium hydroxide is allowed to stand, and the third (the most insoluble) is obtained by drying the second. The first, which is the most soluble in the alkali solution and the least stable, has the formula, $H_2Zn_2O_3$, and the others have the formula, $Zn(OH)_2$. All behave as very weak dibasic acids: they dissolve in strong alkalis forming zincates, and not colloidal solutions as suggested by Hantzsch (Z. anorg. Chem., 30, 289). Equations derived from the law of mass action, and tested experimentally, are given for the equilibrium of the hydroxides in alkaline solution.—F. Sodn.

Mercuric salts; New reaction of ——. J. A. Siemssen. Chem.-Zeit., 1912, **36**, 214.

Ethylenediamine gives with mercuric chloride solution a white amorphous salt, which is obtained in the presence of weak nitric or hydrochloric acid, but not in the presence of sulphuric acid. Unlike the uranium salt previously described (this J., 1911, 954), it is readily soluble in acids and alkalis, in potassium iodide solution, and in an excess of ethylenediamine.—F. Sodn.

Bologna luminous stones. A. Skrabal. Z. angew. Chem., 1912, **25**, 418.

Strongly phosphorescent substances contain, besides an alkaline-earth metal sulphide and an alkali-metal salt, small proportions of a heavy metal sulphide, which appears to be the real light-bearer. The phosphorescent substance is regarded as a solid colloidal solution of the metallic sulphide in alkaline-earth sulphide; and the method of preparation of such substances is directed towards obtaining at a high temperature solid solutions as concentrated as possible, and preserving these in a state of supersaturation by cooling as rapidly as possible. The luminescence of the previously insolated substance obeys the laws of chemical kinetics for reactions of the first and second order. Very probably there is a light-absorbing reaction which proceeds to a condition of photochemical equilibrium, and the reverse of which is a light-evolving reaction. Beyer's discovery that the decomposition of ozone at 350° C. is accompanied by luminescence suggests this reversibility of light-absorbing and light-producing reactions. The phosphorescence of these substances can be hastened and its intensity increased by dissolving the insolated substance in sulphuric acid or sifting it on to a hot iron plate. The duration of the phosphorescence is the shorter, the longer the wave-length of the emitted light; hence for practical applications violet-phosphorescing substances are of most importance.—J. T. D.

Silicic acid gel; Reactions in ——. E. Hatschek. Z. Chem. Ind. Kolloide, 1912, **10**, 77—79.

The author prepared silicic acid gels containing respectively sodium chloride, sulphate, and phosphate, by decomposing a 15 per cent. solution of sodium silicate with the corresponding acids, and covered the gels with aqueous solutions, so as to produce within the gels precipitates of lead chloride, calcium sulphate, copper phosphate, calcium phosphate, and strontium phosphate. The characters of the precipitates are described and it is stated that the tendency to the formation of very large crystals and crystal aggregates is greater in silicic acid gel than in elastic organic gels (compare this J., 1911, 256), whilst there is less tendency to stratification. If the aqueous solution be hypotonic or even isotonic compared with the sodium salt contained in the gel, the precipitation takes place in the solution above the gel. In this way the author obtained fern-like dendrites of barium chromate. The importance of reactions due to the diffusion of salts into or out of mineral gels from the geological standpoint is pointed out, and it is suggested that the inclusions of pyrites together with flint in chalk on the English coast, are produced in this way.—A. S.

Bromine and chlorine in commercial iodine; Determination of small quantities of ——. H. J. Watson. Chem. Eng. and Works Chem., 1912, **1**, 421—424.

The method of Tatlock and Thomson (this J., 1905, 187) for the determination of bromine and chlorine in commercial iodine gives accurate results, but is tedious, and the following method is recommended. 5 grms. of the finely ground sample are mixed with 200—250 c.c. of water, and sulphur dioxide is bubbled slowly through the mixture until the iodine is dissolved. A solution of 10 grms. of copper sulphate, free from chloride, is then added, and if necessary more sulphur dioxide is passed in until the iodine is completely precipitated as cuprous iodide. After about 1 hour, the precipitate is filtered off and washed, the solution is boiled to expel sulphur dioxide, and the chloride and bromide are precipitated with silver nitrate and separated by means of ammoniacal silver nitrate.—A. S.

Patents.

Gases [burner gases]; Purification of ——. F. G. Cottrell, Berkeley, Cal., Assignor to International Precipitation Co., San Francisco, Cal. U.S. Pat. 1,016,476, Feb. 6, 1912.

The process consists in repeatedly forming a cloud of non-gaseous particles in the gases to be purified and removing such cloud together with absorbed impurities by means of electric charges. The process is specially applicable to the purification of the gases employed for producing sulphur trioxide by the contact process, a cloud of particles of sulphuric acid being used as the purifying agent in this case.—H. H.

Nitrogenous [cyanogen] compounds; Process of preparing ——. L. L. Summers, Chicago, Ill. U.S. Pat. 1,013,460, Jan. 2, 1912.

Nitrogenous compounds, especially cyanogen compounds, are prepared by introducing into highly heated carbonaceous material or hydrocarbons, mixed, if desired, with an alkali, a liquefied nitrogenous gas, *i.e.* liquefied nitrogen or ammonia, under considerable pressure. The degree of heat and pressure of the hydrocarbons, etc., is regulated by the amount, and by the frequency of introduction of the liquefied nitrogenous gas introduced. —W. C. H.

Formaldehyde compound containing sulphur and alkali; Process for preparing a ——. G. Lewit. Fr. Pat. 434,914, Oct 5, 1911. Under Int. Conv., Oct. 6, 1910.

A compound, of undetermined constitution, containing sulphur and about 10 per cent. of alkali, is formed when the product obtained by adding an alkali sulphide solution to an alkali bisulphite solution is mixed with formaldehyde. It is sparingly soluble in water and alcohol, and insoluble in benzene and carbon bisulphide; it absorbs considerable quantities of iodine, reduces permanganate, and is decomposed by concentrated acids. It also reduces sulphide dyestuffs and thioindigo dyestuffs, furnishing solutions by means of which these dyes may be fixed on the fibre.—T. F. B.

Gases from pyrites-kilns and the like; Apparatus for cooling the hot ——. G. Eschellmann. A. Harmuth, and Ges. der Tentelewschen Chem. Fabrik, St. Petersburg. Eng. Pat. 14,670, June 21, 1911.

See Fr. Pat. 431,067 of 1911; this J., 1911, 1380.—T. F. B.

Ammonia; Process for the synthetic preparation of —— from its constituents. A. Matignon, Bourg la Reine, France. Eng. Pat. 17,411, July 31, 1911. Under Int. Conv., Aug. 13, 1910.

See Fr. Pat. 430,595 of 1910; this J., 1911, 1381.—T.F.B.

Formates; Process of producing ——. A. Hempel, Leipzig-Oetzsch, Germany. U.S. Pat. 1,017,261, Feb. 13, 1912.

See Fr. Pat. 389,039 of 1908; this J., 1908, 958.—T. F. B.

Barium hydroxide; Process of making amorphous anhydrous ——. C. Rollin, Newcastle on Tyne. U.S. Pat. 1,017,593, Feb. 13, 1912.

See Eng. Pats. 26,696 of 1909 and 14,268 of 1910; this J., 1911, 129.—T. F. B.

Mesothorium from monazite sand; Process for separating —— and for concentrating the mesothorium in crude products obtained from minerals containing thorium. F. Soddy. Fr. Pat. 434,830, Sept. 23, 1911. Under Int. Conv., Nov. 3, 1910.

See Eng. Pat. 25,504 of 1910; this J., 1911, 1115.—T.F.B.

Hydrogen; Process for producing ——. W. Näher, Karlsruhe, and K. Müller, Bretten, Germany. Eng. Pat. 20,486, Sept. 15, 1911. Under Int. Conv., Sept. 29, 1910.

See Ger. Pat. 237,283 of 1910; this J., 1911, 1116.—T.F.B.

Utilising lime mud in the manufacture of fertilisers. U.S. Pat. 1,016,989. *See* XVI.

VIII.—GLASS ; CERAMICS.

Quartz; Fusion of pure ——. Billon-Daguerre. Comptes rend., 1912, **154**, 506—507.

The powdered quartz in a carbon crucible is first heated by the electric arc till softened (about 1800° C.), then further heated by the oxy-hydrogen flame and drawn out into rods, from which are afterwards fashioned tubes, crucibles, basins, and other articles. Blocks for optical purposes are also manufactured by casting and compression. —J. T. D.

Patents.

Glass-pot furnace. H. L. Dixon, Knoxville, Pa., Assignor to H. L. Dixon Co., Pittsburg, Pa. U.S. Pat. 1,017,391, Feb. 13, 1912.

The bench of this recuperative furnace is provided with means of supporting a complete circle of glass pots. Within the circle of the pots are arranged fuel and air supply ports and off-take ports which discharge centrally through the support for the pots. Supply and off-take flues, communicating respectively with the supply and off-take ports, are arranged to maintain a circulation of the products of combustion continuously in one direction. —W. C. H.

Refractory oxides; Production of fused masses of ——. Industriewerke Ges. m. b. H. Jocksdorf b. Forst i. L. Ger. Pat. 242,455, April 7, 1911.

In order to remove bubbles of gas the corresponding metal or metalloid is added to the oxide, *e.g.* silicon to silica and aluminium to alumina. The mass of molten oxide may be obtained by forcing oxygen into the fused metal or metalloid, or a combustible compound thereof (*e.g.* silicon-ethyl, aluminium-ethyl), the heat thereby evolved being sufficient also to fuse a quantity of the corresponding oxide which may be added.—A. S.

Ceramic industry; Preparation of non-plastic materials for use in the ——. W. Eckhardt and E. Hotop. Ger. Pat. 242,897, Nov. 2, 1910.

Quartz or sand or powdered firebrick, is mixed with a flux, burnt, and the product ground. It is claimed to possess the combined advantages of refractory materials such as quartz, and more easily fusible materials such as felspar, basalt, etc.—A. S.

Mirrors; Process for obtaining permanent gilt glass ——. C. Boirre. Fr. Pat. 434,785, Dec. 6, 1910.

See Eng. Pat. 28,605 of 1910; this J., 1911, 1386.—T.F.B.

IX.—BUILDING MATERIALS.

Portland cement; Determination of iron in ——. Calame. Tonind.-Zeit., 1912, **36**, 357—358.

To determine whether the large fluctuations in the iron content of different samples of Portland cement, analysed in various laboratories, were genuine variations or were partly due to differences in analytical methods, the author drew a thoroughly uniform 100-grm. sample of cement and determined the iron by three different methods, taking 1 grm. of material for each analysis. The methods used were: (1), The cement was dissolved in hydrochloric acid, silica was rendered insoluble in the customary manner, ferric and aluminium hydroxides were precipitated twice with ammonia after oxidation with nitric acid, and the precipitate was dissolved in dilute sulphuric acid and titrated with permanganate after reduction with zinc; (2), The material was treated as in the previous case but without precipitation of the iron and alumina, the ferric solution was reduced with potassium iodide, and the separated iodine titrated with sodium thiosulphate; (3), The cement was dissolved in hydrochloric acid, the solution oxidised with potassium chlorate, and titrated with stannous chloride, as described by Fresenius (Quant. Analysis I. 225). The results varied as much in the individual figures under each method as did the average of one series from the average of either of the others.—O. R.

Concrete: Destruction of —— by constituents of the soil. E. Schick. Tonind.-Zeit., 1912, **36**, 358—359.

The author found that the injurious action of soil waters on Portland cement concrete could almost invariably be traced to the action of soluble sulphates on the calcium aluminate of the cement. The destructive effect was most marked in the case of magnesium sulphate acting in the presence of a small quantity of sodium sulphate, the reactions being then probably expressed by the following equations: (1), $2CaO,Al_2O_3+Na_2SO_4+H_2O = CaSO_4,CaO,Al_2O_3+2NaOH$, and (2), $MgSO_4+2NaOH = Mg(OH)_2+Na_2SO_4$, from which the sodium sulphate would appear to act catalytically.—O. R.

Wood; Preservation of ——. E. Pinoy. Comptes rend., 1912, 154. 610—611.

Wood may be preserved from the attacks of fungi, such as "dry rot," by soaking in a solution containing 2 per cent. of potassium bichromate and 1 per cent. of sodium fluoride, and then drying and exposing to light, and after this it may be coated with a solution containing 5 per cent. of gelatin, 2 per cent. of bichromate, and 0·5 per cent. of sodium fluoride, which forms a varnish when dried and exposed to light, and imparts a mahogany brown colour to the wood. When already attacked by fungi, the wood must, before treatment, be disinfected with a mixture of denatured absolute alcohol and xylol, containing 1 per cent. of corrosive sublimate; it is then steeped in baths of bichromated gelatin, of increasing strength, dried, and exposed to light. The treatment also preserves wood from the attacks of the death-watch beetle and other insects. —F. Sodn.

Asbestos-cement boards. K. A. Weniger. Papierfabrikant, 1912, 10, 247—251.

Sheets composed of asbestos and cement, useful as a substitute for slate, etc., are manufactured on paper-making machinery similar to that employed for book-binders' boards. A cylinder machine, having two cylinders, 860 mm. in diameter and 1300 mm. wide, can produce 500—600 sq. m. of board, 3·5—4 mm. thick, in 10 hours. The crude asbestos is disintegrated in an edge runner and charged into the beaters together with cement and colouring matters. The cement is ground and sifted through a screen with holes 5 mm. wide and 10 mm. apart before it enters the beating engine. The charge of a beater is 150 kilos. of dry asbestos, and the treatment requires 12—15 H.P. The beaten pulp passes into an agitating chest, thence through strainers with slits 0·8—1·0 mm. wide to the cylinder board-machine. The cylinders are covered with No. 50 mesh wire, supported by a No. 5 mesh wire; they run at a speed of 20—25 m. per min. The web of stuff is couched in the usual manner, passing with the felt over a suction-box, and is collected on the press-roll with about 55 per cent. of moisture. The couch-rolls have a diameter up to 2000 mm. and are mounted on oil-buffers to absorb the shock when the board is removed. The boards are at once cut to a suitable size, then placed singly between iron plates previously greased "with petroleum and oil" and submitted to heavy pressure in hydraulic presses; in a few hours they have set as hard as stone. The solid matters in the back waters from the board machine are collected in filters and the moist stuff is returned to the beaters. In certain cases the hardened boards must be steeped for a long time in running water to remove crystallisable salts.—J. F. B.

Patents.

Brick for metallurgical furnaces. W. N. McKnight and R. H. Youngman, Assignors to Harbison-Walker Refractories Co., Pittsburgh, Pa. U.S. Pat. 1,016,350, Feb. 6, 1912.

Claim is made for a brick faced with material of greater refractoriness than the body, the facing being at least ¼ in. thick and united to the body by a fused joint.—W. E. F. P.

Bricks; Manufacture of porous, specifically light ——. R. Wiedmann. Ger. Pat. 242,817, May 5, 1910.

Pulverulent dry-slaked lime, especially tufa lime, is added to the clay from which the bricks are made.—A. S.

Cement; Method of making ——. W. B. Hill, Kansas City, Mo. U.S. Pat. 1,017,211, Feb. 13, 1912.

A predetermined quantity of clay or shale is mixed with sufficient water to disintegrate it and cause it to become suspended in the water, and a quantity of quicklime is added which by the process of hydration will be sufficient to absorb all the water in the mixture, and reduce the mass to a dry, powdery condition. The lime and other materials are thoroughly mixed during the process of hydration in order to yield a mass of uniform composition, which is clinkered to yield Portland cement and finally pulverised. —W. C. H.

Blast-furnace slag and the like; Process for granulating —— *by means of foundry sand.* C. Bodenstab. Ger. Pat. 242,943, Nov. 2, 1910.

The foundry sand falls on to a rotating drum which projects it into a stream of incandescent molten slag, whereby the latter is granulated, whilst the sand is simultaneously dried, both products being thus brought into a suitable condition for the manufacture of cement. The "explosion" of the foundry sand, with liberation of steam, assists in the granulation of the slag.—A. S.

Wood; Process of preserving ——. C. Ellis, Montclair, N.J., Assignor to Copper Oil Products Co., New York. U.S. Pat. 1,017,636, Feb. 13, 1912.

An asphaltic petroleum oil containing an arsenic compound dissolved in it is injected into railroad ties or other fibrous material in amount sufficient to coat the fibres. The quantity of the arsenic compound employed is such that its preservative action may persist for a period substantially equal to the mechanical life of the tie or other material.—W. C. H.

Wood preservation; Method of ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 240,988, Oct. 23, 1910.

The wood is impregnated with water-soluble salts of compounds containing in a complex group such toxic constituents as mercury, arsenic, or antimony, and is then treated either with acids, such as carbonic acid, for the purpose of liberating complex free acids, phenols, etc., or with solutions of metallic salts, for the purpose of precipitating insoluble metallic salts of such compounds. Suitable impregnating substances are hydroxymercuriacetic anhydride, hydroxymercuribenzoic anhydride, hydroxyphenylenemercury oxide, hydroxy-*o*-nitrophenylenemercury oxide, mercurised *o*-acetylaminophenol, mercurised toluidines, hydroxyphenylarsenoxide, dihydroxyarsenobenzene, *p*-aminophenylarsinic acid, etc.—A. S.

Wood; Preservation of ——. M. van Cranem. Ger. Pat. 241,707, June 2, 1908.

The wood is impregnated with a liquid prepared by dissolving salts of zinc and copper in ammonia, and is then dried. A suitable solution contains 1—2 per cent. of copper sulphate, 0·5—1 per cent. of zinc chloride, and 3—6 per cent. of ammonia.—A. S.

Slag cement; Manufacture of ——. J. G. A. Rhodin, London. U.S. Pat. 1,017,912, Feb. 20, 1912.

See Eng. Pat. 2628 of 1910; this J., 1910, 820.—T. F. B.

Cement; White hydraulic —— *and process of making the same.* J. G. A. Rhodin, Assignor to G. Rosenbusch, London. U.S. Pat. 1,017,913, Feb. 20, 1912.

See Eng. Pat. 18,338 of 1910; this J., 1911, 688.—T. F. B.

Chemically resistant materials for coating and impregnating metals, fabrics, wood, etc. Fr. Pat. 433,415. *See* XIII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Mineral production of the United Kingdom in 1911. Board of Trade J., March 7, 1912. [T.R.]

The following tables, showing the output of coal and certain other minerals in the United Kingdom at mines worked under the Coal and Metalliferous Mines Regulation Acts (the returns from quarries under the Quarries Act are not yet available) during the year 1911, with comparative figures for the preceding year, are extracted from an advance proof (subject to correction) of the Mines and Quarries General Report and Statistics for 1911 :—

I.—*Output of Minerals under the Coal Mines Regulation Acts.*

——	1910.	1911.
	Tons.	Tons.
Barium (compounds)	5,970	8,940
Coal	264,417,588	271,878,924
Clay and shale, other than fire-clay and oil shale	441,786	404,223
Fire-clay	2,484,069	2,482,846
Igneous rocks	374	444
Iron pyrites	8,551	8,466
Ironstone	7,979,750	7,886,898
Limestone	16,428	17,149
Oil shale	3,130,280	3,116,803
Sandstone including "Ganister")	125,153	138,339

* The quantity of ganister obtained was 124,883 tons in 1910, and 109,954 tons in 1911.

II.—*Output of certain Minerals under the Metalliferous Mines Regulation Acts.*

——	1910.	1911.
	Tons.	Tons.
Barium (compounds)	36,979	33,610
Clay and shale	113,022	128,470
Copper ore and copper precipitate	4,160	3,244
Fluorspar	43,488	31,587
Gold ore	6,154	2,752
Gypsum	217,917	232,510
Igneous rocks	65,154	59,461
Iron ore	1,851,351	1,823,795
Lead ore	28,493	23,864
Limestone*	381,067	404,705
Manganese ore	5,467	4,987
Rock salt	205,423	210,087
Sandstone†	134,044	96,292
Slate	99,514	110,608
Tin ore, dressed‡	6,624	6,545
Zinc ore	11,238	17,652

* Including 6,941 tons of calc spar in 1910 and 2,515 tons in 1911.
† Including 13,615 tons of ganister in 1910 and 566 tons in 1911.
‡ In addition, 2,720 tons of undressed tin ore were obtained in 1910, and 1,721 tons in 1911.

The above figures do not in all cases represent the total production of the minerals for the year. Large quantities of several important minerals, such as iron ore, limestone, sandstone, slate, clay, etc., are obtained from quarries under the Quarries Act and from other open workings, the returns from which are not yet available. The totals for coal and for the ores of copper, lead, and zinc may, however, be regarded as substantially complete.

Iron ; Permeability of —— with respect to hydrogen. G. Charpy and S. Bonnerot. Comptes rend., 1912, **154**, 592—594.

IRON is found to behave as a semi-permeable membrane towards a mixture of gases containing hydrogen, the rate at which the gas passes through the metal, depending on the thickness of the latter and the temperature, as well as on the relative pressures. In a series of comparative experiments with tubes of soft steel, in which the external pressure was atmospheric and the internal pressure was maintained at about 0·2 mm., the speed of hydrogen in c.c. per hour was : 1·1 at 350° C., 3·2 at 450° C., 8·5 at 550° C., 30·0 at 750° C., and 42·0 at 850° C. Osmosis is practically nil below about 325° C., being only observed in the cold with nascent hydrogen and then being irreversible. It has been studied with nascent hydrogen by making the membrane (a steel tube connected with a pump) the cathode in a voltameter containing sodium hydroxide as electrolyte ; the speed was found to vary with the thickness of the metal and the nature of the iron, and it was diminished by internal pressure, though in a very variable way, osmosis continuing even with an internal pressure of 14 atmos. Soft steel was found to be impermeable to nitrogen up to the highest temperature employed (800° C.), and no osmosis was observed with copper. The results of the investigation are considered to indicate the formation of a solution of hydrogen in iron.—F. SODN.

Slime ; Settling of mill ——. D. L. H. Forbes. Eng. and Min. J., 1912, **93**, 411—415.

SMALL tests on ordinary mill slime often give misleading results when applied to calculations of settling capacity in large tanks. Four types of slime were experimented with, and the results of the tests are given in a series of diagrams, which show the degree of settlement attainable in practice with different slimes. The addition of a coagulant such as lime accelerates settling, but it was found that the final settlement at the end of 48 hours was practically the same, whether a coagulant was used or not. The depth of the settling vessel has a very marked effect, and as shallow tanks as possible should be employed. The following are the conditions which govern the rate of settling of slime in still water : (1) Size and shape of slime particles ; (2) percentage of colloids present ; (3) dilution of the pulp ; (4) height of the column of pulp, irrespective of size or shape of cross-section ; (5) average specific gravity of slime particles ; (6) presence and amount of electrolytes in the water. The standard conditions proposed for testing slime are : 75 per cent. through 200-mesh screen, and less than 10 per cent. on 100-mesh screen. Dilution expressed in grms. of solid per litre of pulp. All tests to be made with pulp column 30 cm. high. Sp. gr. of particles between 2·5 and 2·8. Water without addition of salts to be used. Under these conditions slimes may be classified according to a settling curve obtained by plotting the dilutions as abscissæ and the percentage of volume of clear water divided by volume of pulp at the commencement, for a settling period of ten minutes, as ordinates. Three to four experiments determine the curve. The point at which this curve cuts the 5 per cent. efficiency ordinate line may be taken as determining its position in a scale of settling, as it shows to what extent a pulp can be thickened by settling in practical work.—R. W. N.

Bronze ; Influence of metallic and non-metallic additions to ——. H. von Miller. Metallurgie, 1912, **9**, 63—71

FOR monumental work, bronze composed of copper and tin is generally specified, containing up to 20 per cent. of tin. The shrinkage of these pure copper-tin bronzes is considerable and very undesirable, as it militates against precise jointing of large bronze works of art cast in several pieces. Experimenting on a bronze composed of 92 per cent. of copper and 8 per cent. of tin, the author arrives at the following conclusions : shrinkage can only be appreciably lessened by the addition of about 10 per cent. of zinc in presence of tin. Cobalt, aluminium, silicon, iron, and nickel increase the shrinkage. Tensile strength is increased by cobalt, nickel, and manganese, and considerably lowered by antimony and zinc. Working (cutting, boring, chiselling and engraving) is rendered easier by antimony and lead (up to 2 per cent.) and more difficult by nickel and manganese. The formation of a patina is less on bronzes containing zinc and aluminium, and greater on those containing cobalt, nickel, antimony, iron, silicon, or phosphorus than on a normal copper-tin bronze. The addition of tungsten, nickel, iron, manganese, or cobalt raises the melting point. The cooling and shrinkage curves were taken simultaneously, and the bars obtained after the second melting were cut in two, one part being used for tensile tests, and the other for patina and machining tests. Patina formation was tested for with a weak solution of ammonium sulphydrate containing sulphur. A short bibliography is given.—R. W. N.

Aluminium bronzes ; Tempering of ——. A. Portevin and G. Arnou. Comptes rend., 1912, **154**, 511—514.

ALUMINIUM bronzes containing 80—90 per cent. of copper consist of a eutectoid of structure more or less fine according to the rapidity of cooling, and of an excess of the α-constituent (rich in copper) of this eutectoid. When heated above the transformation temperature and quenched, a "martensitic" crystalline constituent appears instead, and by increasing the duration and raising the temperature of the heating, the original structure can be made to disappear entirely, the "martensitic" structure taking its place. Samples of two bronzes of composition: copper, 89·84, 88·80; aluminium, 9·95, 10·02; and manganese, 0·00 and 1·11 per cent. respectively, were quenched in water at different temperatures after different durations of heating, and were then tempered by immersion for 10 minutes in baths of fused salts at various temperatures from 400° to 700° C. It was found that as the temperature of tempering rises, the hardness, as measured both by Brinell's and by Shore's method, at first increases, then diminishes till it falls below that of the original quenched alloy. These results are analogous to those shown by carbon-steels which exhibit austenite on quenching, and by quenched bronzes—all alloys showing a eutectoid structure. Tempering appears to make the "martensitic" needles show more sharply in the first place, and then to thicken, causing a structure resembling Widmanstatt's figures.—J. T. D.

Zinc refining industry in Japan. Board of Trade J., March 7, 1912. [T.R.]

Although zinc ore is mined in many localities within the Japanese Empire, it has hitherto been found impossible to attempt to refine it on a commercial scale in the country owing to the difficulties of the process. Chief among these is the high temperature required and the inability of Japanese furnace makers to construct furnaces capable of withstanding this temperature for the prolonged period necessary, owing to lack of sufficiently refractory material. Consequently the greater part of the zinc ore produced in Japan has been exported, chiefly to Belgium. The exports amounted to 14,793 tons in 1908, 18,206 tons in 1909, 22,151 tons in 1910, and 22,735 tons in 1911. The demand for refined zinc has been entirely supplied by imports, which amounted to 8,828 tons in 1908, 8,493 tons in 1909, 10,341 tons in 1910, and 11,408 tons, valued at £315,000, in 1911.

Within the last year or two, however, improved processes have been invented for the refining of zinc ore, among them one discovered in Japan by which the temperature is materially reduced and the period for which the ore is exposed to intense heat shortened by several hours. Several projects for refining zinc in Japan have accordingly been conceived. None of them has so far reached the point of producing refined zinc in commercial quantities, but the enterprises are backed by firms of the highest repute and by ample capital.

Galena; Theory of blast-roasting of ——. C. O. Bannister. Inst. Min. and Met., Feb. 8, 1912. [Advance proof.]

The investigation was made to determine the nature of the reactions occurring during the treatment of galena by the Huntington-Heberlein, the Carmichael-Bradford, the Savelsburg, and other "blast-roasting" processes concerning which various and conflicting theories have been suggested. Two series of experiments were conducted: the first with the object of recording the thermal and chemical changes occurring during the roasting of galena in admixture with, lime, silica, litharge and lime, limestone, calcium sulphate, magnesia, ferric oxide and slaked lime, respectively; and the second to determine the rates at which sulphur dioxide was evolved from similar galena mixtures when gradually heated in a current of air, and the temperatures at which large volumes of this gas were produced. The experiments of the first series were made in open dishes heated in a muffle, those of the second being conducted in an electrically-heated tube furnace. From the data obtained, the author concludes that the older theories requiring the formation and subsequent reaction of peroxides, plumbites and plumbates are untenable, as also are those based upon the supposed interaction of calcium sulphate and lead sulphide. In the author's opinion the oxidation of lead sulphide occurs in three stages, the first being a partial oxidation to sulphate and oxide, the second a reaction between sulphide and sulphate, and the third a reaction between sulphide and oxide; in the presence of lime, limestone or magnesia, calcium or magnesium sulphate is formed in preference to lead sulphate, the roasted material then containing a much larger proportion of lead oxide. Silica and calcium sulphate act merely as diluents until the charge attains a temperature of 1000° C., when the sulphates of calcium and lead are both decomposed by silica. Ferric oxide in certain physical states appears to act as a catalysing agent, lowering the temperature of oxidation of lead sulphide and increasing the proportion of lead sulphate formed during the roast.—W. E. F. P.

Nickel; Solubility of carbon in ——. O. Ruff and W. Martin. Metallurgie, 1912, 9, 143—148.

In continuation of experiments on the solubility of carbon in iron (see this J., 1910, 886; 1911, 1066; 1912, 233), its solubility in nickel between the temperatures of 1550° and 2500° C. has been determined, the results being tabulated and graphically illustrated. A maximum occurs at a temperature of 2100° C. and a total carbon content of 6·42 per cent., corresponding to the formula, Ni_3C. Microscopic examination of the quenched specimens revealed a supposed new constituent, brown in colour and very resistant to etching reagents and seen along with nickel and graphite. It is suggested that this constituent is the nickel carbide. The whole behaviour of the nickel-carbon alloys agrees with that of similar iron-carbon alloys and by analogy it is assumed that nickel forms similar compounds with carbon under like conditions.—A. H. C.

Process of manufacturing sublimed white lead. Buskett. *See* XIII.

PATENTS.

Iron; Method of producing practically pure ——. A. P. Scott, Brackenridge, Pa. U.S. Pat. 1,017,473, Feb. 13, 1912.

Crude iron is refined by the usual means (oxidation in the presence of suitable fluxes and reagents) until the carbon content of the metal is reduced to about 0·2 per cent. and the iron begins to oxidise; the purification is completed by the introduction of titanium and sticks of wood into the metallic bath.—W. E. F. P.

Iron; Method of denitrogenising practically pure ——. R. D. Campbell, Pittsburgh, Pa. U.S. Pat. 1,017,620, Feb. 13, 1912.

Titanium, preheated to a temperature not exceeding 500° C., is introduced into the molten iron, the latter being at a temperature of not less than 1575° C.—W. E. F. P.

Steel metals; Production of ——. A. J. Rossi, Niagara Falls, N.Y., Assignor to the Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,017,807, Feb. 20, 1912.

A steel containing less than 2·0 per cent. of titanium, 0·2 of manganese, and 0·02 of silicon may be produced by smelting the iron ore, removing manganese, silicon, and carbon, adding carbon to the molten metal, pouring the metal and then adding an alloy of iron and titanium, the titanium being so proportioned as to leave less than 2·0 per cent. of titanium in the product.—A. H. C.

Car wheels; Carbon steel ——. W. S. Potter, New York. U.S. Pat. 1,018,365, Feb. 20, 1912.

The carbon steel ingot is allowed to cool to a temperature not above 1150° C., soaked at between 1050° and 1150° C., forged and cut into wheel blanks. The tread portion of the blank is now worked at a temperature between 1050° and 1200° C. to prevent lamination, and after the hub and web portions have been formed, the tread is reduced to a fine grained condition by working at a temperature below 950° C., cooled during the final working to below 850° C., quickly cooled to below 550° C., equalised at about 500° C. to remove strains, and finally cooled evenly and gradually.—A. H. C.

Manganese steel ; Sheets and plates of ——. W. S. Potter, New York. U.S. Pats. 1,017,903, 1,017,905, 1,017,908, and 1,018,002. Feb. 20, 1912.

(1) The billet or blank is heated to a temperature of 1125° C. until it is in a uniform and ductile condition throughout ; it is then rolled until nearly of the desired dimensions, the temperature in the blank equalised, and the metal rolled to the finishing gauge at a finishing temperature of either between 800° and 1075° C. or below 1000° C. but above 800° C. and then rapidly cooled. It may be further cold rolled in order to stiffen it. (2) A billet or blank of manganese steel is heated until it is in a uniform and ductile condition throughout, rolled with intermediate reheating, the temperature at finishing the working being below 1075° C. and above 800° C., and then quenched. The quenching may be preceded by reheating to about the finishing temperature for such time only that the sheet or plate is suitably annealed or toughened. (3) A billet or blank of manganese steel is heated until it is in a uniform and ductile condition throughout, partially rolled until in a thoroughly worked condition and at temperatures which in the finishing stage of the partial rolling are between 800° and 1075° C. It is then worked with a light pressure and slight reductions with gradual water quenching until it has reached a black heat, in order that reversion out of the uniform austenitic condition may not take place. (4) The billet of manganese steel is heated until it is in a uniform and ductile condition throughout, rolled at temperatures which in the finishing stage are below 800° C., reheated to a temperature between 975° and 1075° C. in order to redissolve any separated carbides and then quenched.—A. H. C.

Manganese steel ; Rolled shapes of ——. W. S. Potter, New York. U.S. Pat. 1,017,904, Feb. 20, 1912.

Rails of manganese steel may be produced by heating an ingot above 1125° C. until of a uniform coherent condition, rolling to a bloom, reheating and equalising for a short time at temperatures between 1000° and 1225° C., rolling to a rail with a finishing temperature of below 1075° C. in the parts of the rail subjected to wear, equalising for a short time at temperatures between 975° and 1025° C. to effect the resolution of any carbides that may have separated, terminating the equalising before any loss of the wrought condition has occurred. and then quenching.
—A. H. C.

Manganese steel ; Wrought shapes of ——. W. S. Potter, New York. U.S. Pats. 1,017,906 and 1,018,367. Feb. 20, 1912.

(1) A blank of manganese steel is heated until it has a uniform, continuous and firmly coherent austenitic structure, preliminarily forged while in that condition, the worked shape allowed to cool slowly, reheated to above 1125° C., worked to its final form at a finishing temperature between 800° and 1075° C. in order to restore the fine grained condition, and then rapidly cooled. The rapid cooling may be preceded by rapidly reheating to an equalising temperature of about 1000° C. (2) The ingot of manganese steel is cooled and equalised at a temperature between 950° and 1025° C. thereby regulating the rate and extent of the cooling. It is then forged to the required shape and condition, heated to a temperature between 800° and 1075° C. and finally rapidly cooled.—A. H. C.

Manganese steel ; Heat treatment and rolling of —— *and heat treatment of large manganese steel shapes.* W. S. Potter, New York. U.S. Pats. 1,017,907, 1,018,000 and 1,018,368, Feb. 20, 1912.

(1) A blank of manganese steel is heated until it is in a uniform austenitic condition, forged, cooled rapidly to below 950° C., reheated to between 975° and 1075° C. for a short time in order to redissolve the carbides, and finally cooled rapidly to below 420° C. (2) The ingot of manganese steel is heated to a temperature above the melting point of the eutectic until the constituents are uniformly distributed, rolled to a bloom which is cooled to the recalescent point and worked by rolling to its finished shape at a temperature in the finishing stage between 800° and 1075° C., and then rapidly cooled. (3) A thick shape of manganese steel may be produced by bringing a blank of such steel into a uniformly austenitic condition at a suitably high working temperature, forging the metal into the intended form and completing the working at temperatures between 800° and 1000° C. in order to avoid separations and crystallizations within the mass, then subjecting it to the moderate cooling action of a suitable agent, and finally increasing the efficiency of the cooling by immersion of the block of manganese steel in a bath of molten metal having a temperature less than 420° C.—A. H. C.

Manganese steel ; Machining of and machined shapes of ——. W. S. Potter, New York, Assignor to Alloy Steel Forging Co., Wilmington, Del. U.S. Pats. 1,018,001 and 1,018,366, Feb. 20, 1912.

(1) The blank of manganese steel is heated to a temperature of between 300° and 1075° C. in order to produce uniformity of structure, and either machined while at this temperature and then quenched, or rapidly cooled to render the structure permanent and machined while between 300° and 420° C., or machined at a temperature between 420° C. and 1075° C. and then heated to a temperature of approximately 1000° C. and water quenched. (2) The metal is preliminarily forged at temperatures between 950° and 1250° C. and the forging continued at between 800° and 1075° C. thereby obtaining a fine grained wrought condition. This condition is preserved by machining at between 500° and 1075° C., after which the metal is toughened by heating to a temperature between 800° and 1075° C. and rapidly cooling to below 420° C., and the loss of the toughened condition avoided by completing the machining at temperatures between 300° and 420° C.—A. H. C.

Manganese steel ; Pins, links and the like from —— *and manufacture of chains.* W. S. Potter, New York, Assignor to Alloy Steel Forging Co., Wilmington, Del. U.S. Pats. 1,018,361 and 1,018,363, Feb. 20, 1912.

(1) The blank of manganese steel is heated to a temperature higher than 1125° C., rolled to form a bar having a surface temperature of between 800° and 1075° C. in the parts intended for wear with a higher interior temperature suitable for punching. The temperature of the wearing parts is maintained while the bar is being cut into lengths and formed into pins or links, and then the forging strains are removed by equalising the temperature in the pieces, and they are finally rapidly cooled. (2) A manganese steel billet is heated to about 1175° C., rolled into a bar with a finishing temperature below 1075° C., cut into pieces while still hot from the rolling, bent, interlocked, and electrically welded to form links, the welds thoroughly worked at temperatures between 800° and 1075° C., the temperature of the links equalized at about 1000° C. and the chain rapidly cooled to below 420° C.—A. H. C.

Manganese steel forgings ; Production of ——. W. S. Potter, New York, Assignor to Alloy Steel Forging Co., Wilmington, Del. U.S. Pat. 1,018,362, Feb. 20, 1912.

The ingot of manganese steel is heated to a temperature of 1125° C. when it is in a plastic condition and has its constituents in homogeneous solution, the forming operations are conducted at a temperature of about 900° C., and the metal is finally rapidly cooled in order to obtain a steel having a finely granular structure and high elastic limit. The ingot may also be heated until the carbides have been absorbed, cooled to avoid their separation, reheated rapidly to a temperature between 640° and 720° C., heated further to a temperature sufficient to impart the desired ductility, forged at a temperature below 1075°C., and cooled rapidly to a temperature below 420° C.
—A. H.C.

Car wheels ; Wrought manganese steel ——. W.S. Potter, New York. U.S. Pat. 1,018,364, Feb. 20, 1912.

A manganese steel ingot of sufficient size to produce several wheel blanks is allowed to cool to a temperature of between 1000° and 1100° C., reheated to between 1125° and 1200° C., forged to a uniform cross section and then out into blanks. These are immediately reheated to not above 1200° C., forged into wheel shape, the final working of the hub and web portion taking place at temperatures below 1075° C. and of the tread portion at temperatures below 1025° C. They are then equalized at between 975° and 1025° C. and rapidly cooled to below 420° C. —A. H. C.

Wire; Manganese steel ——. W. S. Potter, New York. U.S. Pat. 1,018,369, Feb. 20, 1912.

A finely grained austenitic steel rod is drawn with gradually diminished reductions until its temperature is below 420° C., with intermediate rapid cooling to below 420° C. and reheating for a short time to a temperature within the range of from 720° to 1050° C. before the final working. The ductility is then finally restored by heating the drawn product to a temperature of between 720° and 1025° C., immediately rapidly cooling, thereby toughening it, and further wire drawing to impart to the product the additional smoothness or stiffness.—A. H. C.

Furnaces; Cementation and annealing ——. C. Graddon, and J. Blumenau, Brussels. Eng. Pat. 3628, Feb. 13, 1911.

A furnace is described encased in metal plates which are lined with firebricks, which are separated from the plates by a layer of non-conducting material and so arranged as to provide for the circulation of air between the plates and the non-conducting material. Nozzles or blow-pipes are provided on the exterior on either side of the hearth of the furnace for the introduction of either liquid or gaseous fuel. These inject into channels, enclosed in the firebricks of the hearth, and having a progressively increasing cross-sectional area and open into the furnace on the opposite side of the corresponding nozzles. —A. H. C.

Furnaces for hardening or melting metal; Lead and salt bath ——. Fletcher Russell and Co., Ltd., and T. W. Fletcher, Warrington. Eng. Pat. 10,884, May 5, 1911.

In a gas-fired furnace, an open crucible or "copper" is centrally disposed within a cylindrical heating chamber in which it is supported upon a pillar. The crucible is surrounded by a partition extending from the floor of the heating chamber to a point near the roof, the chamber being thus divided into two communicating, annular compartments. The furnace is heated by means of burners extending into the lower part of the outer compartment from which the gases pass around the crucible in their descent to the flue communicating with the bottom of the inner compartment.—W. E. F. P.

Crucible furnaces. A. F. Cothias, Ivry Port, France. Eng. Pat. 13,678, June 8, 1911. Under Int. Conv., June 23, 1910.

In a gas-fired furnace, for melting alloys, the crucibles—which are open to the atmosphere but provided with loose covers—are so arranged within a heating chamber (upon movable foundations comprising discs, supports and sole plates) that the whole exterior of each is in contact with the heating gases, the interior being accessible without stopping the blast. Each crucible is heated from below by a separate burner, the ignition chamber of which is formed by an orifice in the movable sole plate. The apparatus is arranged upon the regenerative principle, the heating chamber communicating with side and exhaust flues. For the purpose of collecting and drawing off the metal in the event of a crucible breaking, each of the sole plates is provided with an inclined, circular groove communicating with passages leading to the exterior of the furnace.—W. E. F. P.

Fluid metal; Apparatus for coating objects with ——. G. Ostermann, Cologne, Germany. Eng. Pat. 9034, April 11, 1911.

Liquid metal in a container is sprayed by means of an ejector nozzle passing through the liquid metal and an atomising tube at the end of which is a protective shield, the whole being heated by a gas ring.—A. H. C.

Copper and its alloys; Method of producing cast articles of ——. British Thomson-Houston Co., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 12,920, May 29, 1911. (See also Fr. Pat. 422,441 of 1910; this J., 1911, 553).

The charge of copper, at a temperature 300°–400° C. above the melting point of the metal, is poured from the furnace into a preheated crucible containing boron or a boron compound, such as the suboxide or carbide, the metal being well stirred during and after the pouring. The charge is then covered with a layer of charcoal, allowed to cool to a temperature of about 1100° C., and poured into the mould.—W. E. F. P.

Copper alloys; Manufacturing and refining ——. W. S. Rockey and H. Eldridge, New York, Assignors to Metallurgical Research Co. U.S. Pat. 1,017,629, Feb. 13, 1912.

The molten copper, protected from oxidation by means of carbon, is added to the alloying metal which is maintained in a molten condition under a flux containing boron trioxide. The copper is caused to flow in beneath the surface of this flux, the temperature of the charge being maintained until the gases and impurities have been expelled from the resulting alloy.—W. E. F. P.

Metal parings and the like metal scrap; Briquettes of ——. Allgem. Briketierungs-Ges. m.b.H., Berlin. Eng. Pat. 16,802, July 21, 1911. Under Int. Conv., Aug. 11, 1910.

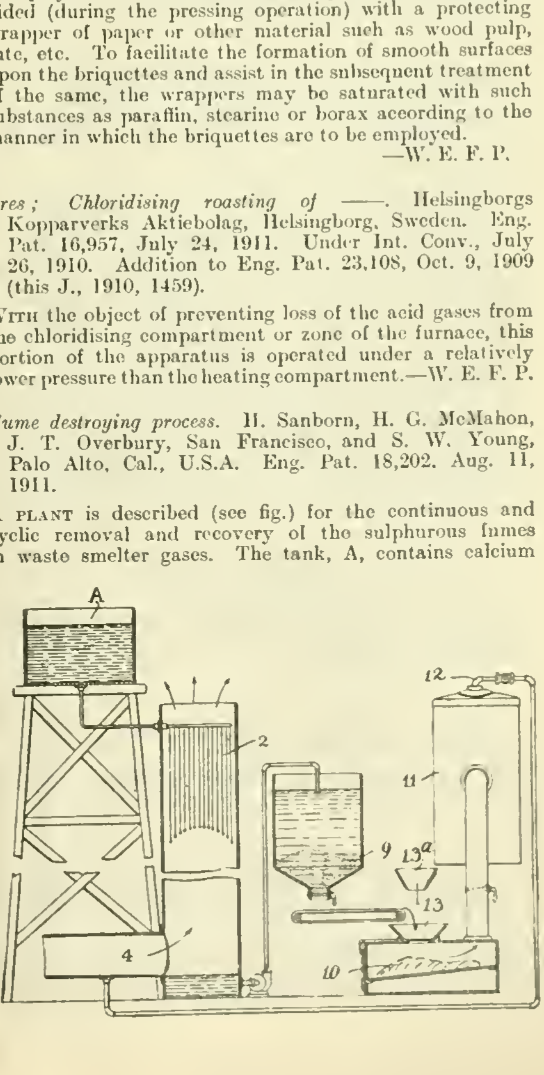
For the purpose of rendering the briquettes less susceptible to injury and to external influences generally, each is provided (during the pressing operation) with a protecting wrapper of paper or other material such as wood pulp, jute, etc. To facilitate the formation of smooth surfaces upon the briquettes and assist in the subsequent treatment of the same, the wrappers may be saturated with such substances as paraffin, stearine or borax according to the manner in which the briquettes are to be employed. —W. E. F. P.

Ores; Chloridising roasting of ——. Helsingborgs Kopparverks Aktiebolag, Helsingborg, Sweden. Eng. Pat. 16,957, July 24, 1911. Under Int. Conv., July 26, 1910. Addition to Eng. Pat. 23,108, Oct. 9, 1909 (this J., 1910, 1459).

With the object of preventing loss of the acid gases from the chloridising compartment or zone of the furnace, this portion of the apparatus is operated under a relatively lower pressure than the heating compartment.—W. E. F. P.

Fume destroying process. H. Sanborn, H. G. McMahon, J. T. Overbury, San Francisco, and S. W. Young, Palo Alto, Cal., U.S.A. Eng. Pat. 18,202. Aug. 11, 1911.

A plant is described (see fig.) for the continuous and cyclic removal and recovery of the sulphurous fumes in waste smelter gases. The tank, A, contains calcium



sulphide which is sprayed down the tower, 2, at the bottom of which the fumes from smelter furnaces are introduced by the flue, 4. The saturated product consisting of calcium sulphite and sulphate collects at the bottom of the tower and is pumped into a settling tank, 9, from which the solids are conveyed to the hopper, 13, in the roof of a furnace, 10. The sulphur distilled from this material is condensed in the chamber, 11, and any uncondensed gases are returned by the pipe, 12, to the flue, 4, for retreatment. Coal is now added by the hopper, 13a, to the residue in the furnace, and the calcium sulphide regenerated for use again.—A. H. C.

Zinc ; Metallurgy of ——. F. L. Clerc, Boulder, Colo. U.S. Pat. 1,012,816, Dec. 26, 1911.

A NUMBER of retorts (see U.S. Pat. 1,002,037, this J., 1911, 1167) are grouped about an outer well from which heat is conducted to the trapped portions of the molten metal, the metal of the outer well being subdivided to correspond to the several groups of retorts, but located in a continuous heating chamber so that a group of retorts may be tapped or drawn together with the portion of the metal co-operating with them.—A. H. C.

Zinc ; Electroplating with ——. A. A. Lemêtre, Paris. U.S. Pat. 1,017,981, Feb. 20, 1912.

THE electroplating bath comprises zinc sulphate, water, and materials capable of producing ammonium chloride, sodium sulphate, and sulphuric acid in the bath. An adherent deposit of zinc is obtained by passing the current through the cold electrolyte, using a zinc plate as the anode. (See also U.S. Pat. 1,012,665 ; this J., 1912, 137.) —B. N.

Electroplating process. F. J. McElhone, Jersey City, N.J. U.S. Pat. 1,018,332, Feb. 20, 1912.

GRAPHITE is treated with an organic acid of the carbocyclic group, washed, dried, and applied to a mould which is afterwards electroplated.—B. N.

Electrolytic cell [extraction of gold]. W. H. Davis, Assignor to G. W. Teal, Boulder, Col. U.S. Pat. 1,015,546, Jan. 23, 1912.

THE electrolytic cell, which is intended for use in the electrolytic deposition of gold or silver from cyanide solutions, contains one or more rotary, permeable, circular cathodes, mounted on a suitable shaft, and a "filler" occupies the space between the interior surface of the cell and the peripheral edge of each electrode. The cathodes thus conform to the cross-sectional area of the cell, so that as the electrodes are placed and rotate in a plane transverse to the flow of the electrolyte, the latter must in each case pass through the electrode. The anodes are arranged alternately with the cathodes, and may be solid or permeable.—B. N.

Iron-nickel-copper alloy. G. H. Clamer, Philadelphia. U.S. Pat. 1,016,549, Feb. 6, 1912.

CLAIM is made for a homogeneous alloy—free from hard metallic nodules—containing 25—50 per cent. of nickel, 5—20 of copper and 30—70 of iron, either with or without carbon.—W. E. F. P.

Alkali metal ; Process of producing ——, *from oxygen compounds of alkali.* H. Mehner, Berlin. U.S. Pat. 1,016,758, Feb. 6, 1912.

THE alkali-compounds are reduced by means of molten cast iron, and the evolved vapour is condensed. —W. E. F. P.

Tungsten ; Process of increasing the ductility of metallic ——. W. von Bolton, Charlottenburg, Germany, Assignor to General Electric Co., New York. U.S. Pat. 1,017,280, Feb. 13, 1912.

THE metal is subjected, at a high temperature, to the action of a mixture of sulphur protochloride (or other halogen compound of sulphur) and hydrogen (or other reducing agent which will unite with the halogen and thus prevent combination between the latter and the tungsten) and is then electrically heated in an inert atmosphere to eliminate any sulphur introduced by the treatment.—W. E. F. P.

Roasting kiln ; Recuperative ——. J. Zellweger, St. Louis, Mo. U.S. Pat. 1,017,839, Feb. 20, 1912.

A ROASTING kiln is described in which means are provided for the introduction of ore into the kiln chamber and conveying it through it. The fire gases are introduced into the rear portion of the chamber so as to roast the ore in this part by the radiation of heat from the fire gases, while air heated outside the chamber by these fire gases are introduced into the front portion of the chamber to oxidise the ore in this part. The gaseous products of roasting the ore in the front portion are also prevented from mixing with the fire gases in the rear portion of the chamber.—A. H. C.

Aluminium sheets ; Process for making very thin ——. E. R. Lauber and R. V. Neher. Fr. Pat. 434,400, Aug. 30, 1911. Under Int. Conv., Oct. 27, 1910, May 15 and July 7, 1911.

SEE Eng. Pat. 20,455 of 1911 ; this J., 1912, 192. Several of the sheets of aluminium foil, less than 0·02 mm. thick, may be pressed together, a liquid (such as oil) or a condensable vapour being introduced between the leaves.—T. F. B.

Iron and steel ; Manufacture of ——. Elektrostahl Ges. m.b.H., Remscheid-Hasten, Germany. Eng. Pat. 25,581, Nov. 3, 1910. Under Int. Conv., March 26, 1910.

SEE Fr. Pat. 422,493 of 1910 ; this J., 1911, 552.—T. F. B.

Steel plate ; Cement ——. H. A. Richardson, London. U.S. Pat. 1,017,914, Feb. 20, 1912.

SEE Eng. Pat. 9406 of 1910 ; this J., 1910, 1209.—T. F. B.

Metals and alloys, especially steels ; Process and apparatus for treating —— *to remove the gas therefrom.* L. Baraduc-Muller. Fr. Pat. 434,865, Dec. 8, 1910.

SEE Eng. Pat. 30,198 of 1910 ; this J., 1912, 135.—T. F. B.

Metals and alloys ; Process of case-hardening ——. M. Gräf and O. Peschel, Tezel, Germany. U.S. Pat. 1,017,748, Feb. 20, 1912.

SEE Fr. Pat. 421,000 of 1910 ; this J., 1911, 431.—T. F. B.

Furnace ; Electric —— *for use in metallurgy.* E. Stassano. Fr. Pat. 434,803, July 28, 1911. Under Int. Conv., April 1, 1911.

SEE Eng. Pat. 8901 of 1911 ; this J., 1911, 1067.—T. F. B.

Furnaces for calcining or roasting and desulphurising ores. T. Edwards. Fr. Pat. 435,094, Oct. 10, 1911.

SEE Eng. Pat. 21,198 of 1910 ; this J., 1911, 367.—T. F. B.

Ores or other substances proceeding from calcining or roasting furnaces ; Hearth for cooling ——. T. Edwards. Fr. Pat. 435,096, Oct 10, 1911.

SEE Eng. Pat. 21,197 of 1910 ; this J., 1911, 430.—T. F. B.

Zinc and other volatile metals ; Process for recovering by distillation ——. T. Huntington. Fr. Pat. 435,143, Oct. 11, 1911.

SEE Eng. Pats. 20,896 of 1910 and 8035 of 1911 ; this J., 1911, 1319.—T. F. B.

Brick for metallurgical furnaces. U.S. Pat. 1,016,350. *See* IX.

Granulating blast-furnace slag by means of foundry sand. Ger. Pat. 242,943. *See* IX.

XI.—ELECTRO-CHEMISTRY.

Patents.

Storage battery plates. W. E. Lake, London. From United States Light and Heating Co., New York. Eng. Pat. 8821, April 8, 1911.

The grids for battery plates are made by raising projecting fins upon blanks, by subjecting the plates to pressure applied very gradually and substantially normal to the surface. The metal is not disrupted, and the crystalline structure is rendered comparatively fine and uniform, so that it is adapted to resist evenly the action of the electrolyte. This ridging is performed by gradual and incisive motion of rows of blades, with little or no relative lateral motion, the tops of the ridges being made compact through a final compression by crowding the metal between the adjacent sides of ridge-forming blades, so that it meets the abrupt edge of a spacer. The rows of uniform ribs produced in this way are separated by reinforcing bars, the ribs joining these bars and projecting outwardly from the plates beyond these bars. The plates may also be constructed with openings between the ribs, extending entirely through the plate.—B. N.

Batteries; Secondary ——. V. de Karavodine. Eng. Pat. 28,867, Aug. 31, 1911.

The grid for a pasted electrode of a secondary battery is formed of a reticulated structure prepared as described in Eng. Pat. 2493 of 1911 (this J., 1912, 238), the structure being provided with conducting strips or wires interposed between the contiguous layers of threads.—B. N.

[*Electrical*] *Conductors; Process of making moulded* ——. C. Van Brunt, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,017,483, Feb. 13, 1912.

Carbonaceous material is mixed with pitch or heavy hydrocarbons and with sulphur, the mixture is pressed into the desired form, and heated to 400°—500° C. in order to carbonise the binding material.—A. T. L.

Galvanic cells or batteries; Regeneration of the hitherto waste products of ——. Chem. Fabr. Griesheim-Elektron Frankfort on Maine, Germany. Eng. Pat. 12,040, May 18, 1911. Under Int. Conv., June 3, 1910.

See Fr. Pat. 430,741 of 1911; this J., 1911, 1459.—T. F. B.

Carbon electrode for electrical purposes. B. Redlich, Assignor to Planiawerke Akt.-Ges. f. Kohlenfabrikation, Ratibor, Germany. U.S. Pat. 1,018,003, Feb. 20, 1912.

See Fr. Pat. 433,204 of 1911; this J., 1912, 138.—T. F. B.

Accumulator electrode and its manufacture. H. C. Hubbell. Fr. Pat. 434,939, Oct. 6, 1911.

See Eng. Pat. 21,783 of 1911; this J., 1912, 238.—T. F. B.

Separation by aid of electro-osmosis; Processes of ——. G. B. Schwerin. Frankfort on Maine, Germany. Eng. Pat. 27,931, Dec. 12, 1911. Under Int. Conv., Jan. 25, 1911. Addition to Eng. Pat. 3364 of 1911, dated Feb. 12, 1910.

See Ger. Pat. 241,177 of 1911; this J., 1912, 112.—T. F. B.

Resistant material; Process for preparing —— and the product resulting therefrom. H. T. Jones, East Orange, N.J. U.S. Pat. 1,014,882, Jan. 16, 1912.

See Eng. Pat. 1459 of 1911; this J., 1912, 79.—T. F. B.

Ozonising apparatus. M. Fuss, Berlin. U.S. Pat. 1,017,258. Feb. 13. 1912.

See Eng. Pat. 2618 of 1911; this J., 1911, 754.—T. F. B.

Furnaces; Rotary electric —— especially for the manufacture of aluminium nitride. O. Serpek. Second Addition, dated Dec. 8, 1910, to Fr. Pat. 430,553, Aug. 11, 1910.

See Eng. Pat. 29,715 of 1910; this J., 1911, 1222.—T. F. B.

XII.—FATS; OILS; WAXES.

Vegetable oils; Hydrolysis of —— by emulsion of Ricinus communis. D. Sommerville. Bio-Chem. J., 1912, **6**, 203—204.

On repeating Hoyer's experiments (this J., 1902, 1541; 1903, 428; 1904, 550) the author was unable to find any increase in tho amount of free fatty acids liberated when acetic acid and manganese sulphate were added to the emulsion. Prolonged heating of castor beans at 100° C. does not interfere with the activity of an emulsion prepared from them, although the emulsion itself rapidly loses activity when heated to 60° C.—J. A.

Sodium palmitate; Viscosity of aqueous solutions of ——, *and the influence of electrolytes on the same.* F. D. Farrow. Chem. Soc. Trans., 1912, **101**, 347—357.

The author determined the viscosity of aqueous solutions of sodium palmitate at 70° C. and the influence thereon of electrolytes. The apparatus used was a modification of that described by Scarpa (see this J., 1911, 51). The results are given in tables and curves. In all cases the addition of an electrolyte (sodium hydroxide, sodium chloride, potassium chloride) caused first a decrease of tho viscosity and later at higher concentrations an increase; the curves aro in each case of similar form. The effect of the electrolytes is regarded as attributable to the colloidal character of the sodium palmitate solution. The first effect of added electrolyte may be to cause dehydration of the colloidal particles constituting tho disperse phase, thus leading to a diminution of the bulk of the latter and hence to increased fluidity. With higher concentrations of electrolyte, the precipitating effect of the latter comes into play, leading in the first place to the formation in the solution of aggregates of colloidal particles, the size of which increases with the concentration of the electrolyte. This causes an increase of viscosity, as has been shown by Woudstra in the case of inorganic colloids (Z. Chem. Ind. Kolloide, 1911, **8**, 73). The influence of electrolytes on the viscosity of soap solutions is of some technical importance and the present results show that if a soap solution containing an electrolyte be diluted, tho viscosity of the diluted solution may be less than, equal to, or greater than that of the original solution according to whether the dilution is effected with water or with a solution of an electrolyte (*e.g.* salt solution) of suitable concentration.—A. S.

Glycerin; Temporary admission of crude —— into France. Board of Trade J., March 7, 1912. [T.R.]

The "Journal Officiel" for the 23rd February contains a Presidential Decree, dated the 16th February, laying down regulations under which the privilege of "temporary admission" may be accorded to crude glycerin and to soapmakers' lyes when destined to be re-exported in the state of refined glycerins. Declaration for the temporary importation of such crude glycerin may only be received at the Customs houses of Paris, Dunkirk, Havre, Blanc-Misseron, Rouen, Marseilles, and Bordeaux; and the re-exportation of pure glycerin (which must take place within a period of not more than six months from the date of importation) can only be effected through the Customs houses of Paris, Havre, Marseilles, and Bordeaux.

Emulsions; Simple apparatus for the preparation of ——. E. Hatschek. Z. Chem. Ind. Kolloide, 1912, 10. 79—80.

A tall graduated glass cylinder is closed by a rubber stopper having two holes; through one of the holes passes a long tube of 3—4 mm. diam., extending nearly to the bottom of the cylinder, whilst through the other passes a tube, provided outside the cylinder with two or three bulbs, and leading to a water-pump. A pipette is mounted above the cylinder so that its finely drawn out end just touches the inner surface of the top of the long tube. The opening of the pipette is of such size that 50 c.c. of "White Rose" petroleum oil takes 25—30 minutes to run out. A measured quantity of soap or saponin solution is placed in the cylinder, and after wetting the surface of the long tube by running through it some of the oil to be emulsified, the stopper is placed in position, and the bulb tube connected with the water-pump, which is regulated so that the air drawn in through the long tube just ceases to form separate bubbles. When this is attained the pipette is filled with the oil to be emulsified, which flows in a thin stream down the inner wall of the long tube and is carried from the lower end of the latter in a very finely-divided condition by the air. When the pipette is empty, the upper end of the long tube is closed, so that the pump can withdraw air from the emulsion. An emulsion of 50 c.c. of petroleum lamp oil in 100 c.c. of a 1 per cent. soap solution prepared with this apparatus separated gradually during the course of 3 days, after which the volume of the "cream" layer remained constant; this "cream" contained 93 per cent. by vol. of disperse phase and 7 per cent. of continuous phase.—A. S.

Determining the relative decolourising power of some mineral gels used for decolourising purposes. Pyhälä. *See* IIA.

Purification of lubricating oil after use. Donat and Höber. *See* IIA.

Cotton wax. Piest. *See* V.

Pharmacognostic study of Adenium Hongkel and Xanthoxylum ochroxylum. Leprince. *See* XX.

Patents.

Grease and oils; Apparatus for extracting ——. C. Edgerton, Philadelphia, Pa. U.S. Pat. 1,017,518, Feb. 13. 1912.

The apparatus comprises a rotating horizontal casing, with an opening in its side, and a marginal frame for the opening projecting outside the plane of the casing. The opening is provided with a cover consisting of an outer plate, with an attached filtering and straining inner diaphragm, parallel to the outer plate but of smaller size than the marginal frame. Several fixed spacing devices, between the outer plate and the filtering diaphragm, are distributed along the surface of the same. A pipe for taking off the liquid is arranged longitudinally on the outside of the casing, with branch connections extending through the edge of the marginal frame, and communicating with the space between the outer plate and the diaphragm. Fastening devices are provided for the cover of the opening, several such openings with covers and diaphragms being arranged in alignment, each being of oblong shape with the greatest length parallel to the axis of the cylinder, and each is connected by branch connections with the "off-take" pipe. The latter extends outside the end of the casing, and communicates with a hollow trunnion supporting the cylinder. A spray-pipe extends concentrically through the trunnion, and is bent upwards so as to be parallel to and within the upper wall of the casing.—B. N.

Emulsions; Process for the manufacture of solid ——. Kaliwerke Aschersleben, Aschersleben, Germany. Eng. Pat. 3515, Feb. 11, 1911. Under Int. Conv., Feb. 23, 1910.

See Fr. Pat. 425,838 of 1911; this J., 1911, 966.—T. F. B.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Sublimed white lead; Process of manufacturing ——. E. W. Buskett. Min. and Eng. World, Feb. 17, 1912, 393—396. (See also this J., 1911, 967.)

The author states that the manufacture of sublimed white lead pigment is one of the most profitable in the smelting industry and that it can be successfully carried on independently of any other smelting plant. A description of the process and plant (with diagrams) is given (see this J., 1909, 405, 464; 1910, 1397, 1463). An efficient plant with buildings of brick and steel can be erected in the Mississippi valley for $100,000. The daily working expenses are given as follows:—

	$
Salaries and wages	134·55
70 bbls. at 35 cts.	24·50
12 tons of coke at $2·50	30·00
Fluxes	12·50
40 tons of ore at $60	2400·00
Power	24·00
	$2625·55

The daily production is stated to be:—

	$
35,500 lb. of pig lead at 4½ cts.	1597·50
35,000 lb. of sublimed white lead at 5½ cts.	1925·00
	3522·50

showing a profit of $896·95, less deductions for selling expenses, repairs, amortisation, etc. Any high-grade lead concentrate can be used. The ores preferred are those containing upwards of 70 per cent. of lead with only very small quantities of zinc. Analyses of the product show the percentage of lead sulphate to vary from 73·5 to 88·3 and that of lead oxide from 8·5 to 20·5; the higher the percentage of the latter the better and whiter is the product. The proportion of zinc oxide present may be as high as 5 per cent., but the zinc sulphate should never exceed 1 per cent. The limit for sulphur dioxide is given as 0·07 per cent. There is a steadily increasing demand for sublimed white lead; "off colour" pigment is utilised in the rubber industry.—A. Sbld.

Bologna luminous stones. Skrabal. *See* VII.

Patents.

Kiln for the manufacture of ultramarine blue, lacquers and varnishes. D. Bourdet. Fr. Pat. 433,586, Aug. 22, 1911.

The kiln is designed so as to give a regular heat, and so that the process can be inspected and samples taken during its course. The roof has the form of a flattened dome, and the kiln is heated by means of the hot gases from a fire burning on a grate in the middle of the floor of the kiln, and below the level of the floor. The hot gases, after heating the space above the floor, pass downwards through channels at the sides of the kiln into flues running below the kiln-floor, and thence to the chimney. The pots containing the material to be heated are fed in through a door in the front of the kiln, which is afterwards bricked up and luted. Samples are taken through a door at the back of the kiln, and inspection openings, normally closed with plugs are provided at both front and back.—E. W. L.

Coating and impregnating metals, fabrics, wood, leather, etc.; Chemically resistant materials for ——. C. F. Boehringer und Söhne. Fr. Pat. 433,415, Aug. 19, 1911. Under Int. Conv., Aug. 22, 1910.

Substances possessed of a high degree of chemical inertness towards acids, halogens, etc., are obtained when animal and vegetable oils, fats, and waxes, resins or the products of their distillation, mineral oils, their various fractionation products. and mineral waxes, are chlorinated under such conditions as will ensure the introduction of at least 30, and in certain cases of as much as 70 per cent. of halogen into the oil, etc. These conditions include the use of high temperatures and pressures. In the case of the chlorinated products derived from the mineral oils, etc., a high degree of resistance towards the action of alkalis as well as of acids is shown. The chlorinated products may be applied either as such or in solution in such solvents as carbon tetrachloride, ether, etc. Other impregnating or coating agents as well as pigments may be applied with the chlorinated products.—E. W. L.

Paint and varnish vehicle. C. Ellis, Larchmont, N.Y. U.S. Pat. 1,017,141, Feb. 13, 1912.

The paint-thinning composition comprises the clear product produced by filtering a mixture of a light mineral hydrocarbon, such as kerosene flashing between 90° and 110° F., spirits of turpentine, and a modicum of pine oil or terpineol.—B. N.

Binding agents for pigment colours, powdered cork, and similar substances; Process for making —— and also lacquer-like products from wood oil. R. Lender. Fr. Pat. 434,768, Oct. 2, 1911. Under Int. Conv., Jan. 3, 1911.

See Eng. Pat. 21,667 of 1911; this J., 1912, 81.—T. F. B.

Condensation products of phenols and formaldehyde; Manufacture of ——. Knoll und Co., Ludwigshafen on Rhine, Germany. Eng. Pat. 6429, March 14, 1911. Under Int. Conv., March 14, 1910.

See Addition of March 14, 1911, to Fr. Pat. 395,657 of 1908; this J., 1911, 1125.—T. F. B.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Hevea trees at the Ivory Coast. M. Bret. Caoutchouc et Guttapercha, 1911, 8, 5507—5512, 5596—5600, 5673—5677, 5815—5819.

Data are given as to the yield and size of neglected *Hevea* trees of somewhat uncertain age growing at Dabou and Tiassalé on the Ivory Coast. At the present price of rubber, planting would probably be remunerative. Better results were obtained at Dabou on the coast, than at Tiassalé in the interior, where the growth is slow and the yield poor. It is concluded that planting would offer the greatest possibilities in this region on the coast districts.—H. E. P.

Caoutchouc; Determination of —— as bromide by Hübener's method. F. W. Hinrichsen and E. Kindscher. Chem.-Zeit., 1912, 36, 217—218, 230—232.

The method of Hübener (this J., 1910, 364: 1911, 98 and 224) for the determination of caoutchouc in vulcanised rubber was applied to samples of known composition; the method was modified however by estimating the bromine by heating with fusion mixture since it is now recognised that losses occur on heating with nitric acid. Experiments were made on raw Ceylon rubber, the same rubber cured with sulphur, with sulphur and ceresin, and with sulphur, litharge and zinc oxide. A sample of cable insulation was also examined. The caoutchouc was also determined by the difference method, and in the samples made from the Ceylon rubber the results agreed well with those calculated from the mixing ratios. As a result of numerous experiments it was concluded that the bromination of soft rubber is difficult to perform since the end point cannot be recognised; the precipitated bromide always contains bromine or compounds thereof, and over-bromination always occurs (these errors may be partially compensated in Hübener's original process by the bromine lost in the nitric acid treatment); the determination of "free sulphur" in the filtrate is inaccurate, yielding too high results (cf. Caspari, this J., 1911, 909); the content of vulcanisation sulphur in the bromide is always too low; in short all the theoretical speculations of Hübener which lie at the base of the method are unfounded. The authors find that too high results are practically always obtained, whether weighing the bromide or estimating the bromine therein, even when their method of purifying the precipitate by solution in chloroform and precipitation with petroleum spirit is employed. Finally they agree with Esch whose results show the method to be unsuitable (this J., 1911, 1126).—H. E. P.

Patents.

Rubber solutions and the like; Mixing apparatus for manufacture of ——. H. N. d'A. Drew, Prahran, Victoria, Australia. Eng. Pat. 2526, Jan. 31, 1911.

A mixing apparatus for the manufacture of rubber solutions and the like comprises a reservoir having a screen or screens arranged therein, the sizes of the orifices of which can be adjusted, and means for forcing softened rubber and a solvent through the screen. The mixture may be forced through a screen enclosing the lower end of the wall of the cylinder of a reciprocatory valved plunger or piston. The sizes of the orifices can be adjusted by a perforated rotatable screen or sieve surrounding the lower end of the cylinder. In this form a discharge pipe may lead from the upper end of the cylinder with a branch pipe passing back to the reservoir and a three-way cock at the junction.—H. E. P.

Rubber; Mechanical dry extraction of —— from plants. A. J. Boult, London. From Comp. Gén. d'Extraction de Caoutchouc, Paris. Eng. Pat. 10,942, May 5, 1911.

The plants are shredded between crushing parts so that the extracted substance is separated into particles which agglomerate under the action of the crushers whilst the woody portions are reduced to dust which can be separated from the extracted substance by simple screening. A portable apparatus is also claimed comprising rotary crushing discs and a system of vibratory screens.—H. E. P.

Rubber; Deresination of raw ——. M. Kochnitzky and A. Friedl, Brussels. Eng. Pat. 17,726, Aug. 3, 1911.

Raw rubber is freed from resin by treatment with compounds obtained by mixing equivalent proportions of aromatic bases such as pyridine, etc., with phenol or cresol. The resulting rubber may be successively treated with dilute caustic soda, water, and steam.—H. E. P.

Gum or caoutchouc; Raw —— and process of manufacture. Rauhgummi-Verwertungs-Ges. m. b. H. Fr. Pat. 434,215, Sept. 14, 1911. Under Int. Conv., Aug. 2, 1911.

Ground flint or a similar substance is mixed with raw rubber in quantities up to 30 per cent., and the mixture is vulcanised, the object being to increase the friction between the rubber and surfaces with which it comes into rubbing contact.—E. W. L.

Rubber goods; Process for preserving the elasticity of ——. C. Beyer. Ger. Pat. 243.248, April 20, 1911.

The rubber is treated with terpineol or with substances containing it, preferably with an aqueous emulsion containing 3—5 per cent. of terpineol.—A. S.

Rubber waste; Process for reclaiming ——. F. W. Golby, London. From The Moore Architectural and Engineering Co., Akron, Ohio, U.S.A. Eng. Pat. 21,567, Sept. 30, 1911.

See U.S. Pat. 978,584 of 1910; this J., 1911, 99.—T. F. B.

Rubber from rubber waste; Process for recovering ——. The Moore Architectural and Engineering Co. Fr. Pat. 434,727, Sept. 30, 1911.

See U.S. Pat. 978,584 of 1910; this J., 1911, 99.—T. F. B.

Rubber and other gums; Apparatus for extracting —— from plants, bark, fibres, and similar substances, and also for cleaning raw rubber and the like. The Vine and General Rubber Trust, Ltd. Fr. Pat. 434,277, Sept. 16. 1911.

See Eng. Pat. 18,375 of 1910; this J., 1911, 1462.—T. F. B.

Artificial rubber or similar elastic substance; Process and apparatus for making ——. R. Desouches, A. Riasse, and A. Duron. Fr. Pat. 434,523, Nov. 28, 1910.

See Eng. Pat. 10,420 of 1911; this J., 1912, 241.—T. F. B.

Caoutchouc; Process for producing substances resembling ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 434,989, Oct. 7, 1911. Under Int. Conv., Dec. 12, 1910.

See Eng. Pat. 1125 of 1911; this J., 1912, 241.—T. F. B.

Caoutchouc, its homologues and analogues; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 435,076, Oct. 9, 1911. Under Int. Conv., Dec. 12, 1910.

See Eng. Pat. 1124 of 1911; this J., 1912, 141.—T. F. B.

XV.—LEATHER; BONE; HORN; GLUE.

Acidity of tan-liquors; Determination of the ——. G. Grasser. Collegium, 1912, 57—58.

The Simand-Kohnstein method (this J., 1888, 528) of determining the acidity of tan liquors, being a gravimetric process, is unsuitable for works control purposes on account of the time required, and the accuracy of Procter's lime-water method is vitiated by the fact that the turbidity produced by a slight excess of lime-water is prevented by the presence of pine-bark liquor containing no acid. The author proposes the use of rosolic acid as indicator. Since tannin has an action on the indicator, the liquors are detannised by adding a solution containing 4 grms. of gelatin, 25 grms. of sodium chloride or 50 grms. of ammonium chloride and 100 c.c. of water which is previously made neutral to rosolic acid by adding alkali. 10 c.c. of strong liquor (30°—50° Bkr.) or 30 c.c. of weak liquor are stirred well with 25 c.c. of the gelatin solution and 100 c.c. of distilled water, and heated in a boiling water bath until the precipitate coagulates and rises to the surface. The precipitate is filtered off through a funnel of which the neck is lightly packed with wet wool. Filtration is more effective if the whole of the liquid is placed in the funnel at once, otherwise the precipitate collects in the wool, rendering the process very slow. The filtrate is collected in a large porcelain dish, and after addition of 1—2 drops of rosolic acid solution, $N/2$ caustic soda solution is run in till a marked darkening of the colour suddenly appears. Figures are given comparing the results obtained by the method with those obtained by the Simand-Kohnstein method, and also using litmus paper as external indicator.—D. J. L.

Leather by dehydration; The formation of ——. L. Meunier and A. Seyewetz. Collegium, 1912, 54—56.

The authors have shown that it is possible to tan gelatin or skin by purely chemical means, by quinone (this J., 1908, 909) and by halogens (this J., 1911, 1077, 1324) and have observed the effect of actions, purely physical, in the tanning process. Knapp has shown (Dingl. Polyt. J., **149**, 305) that if skin is dehydrated by alcoholic liquors of gradually increasing concentration, a white and supple leather is produced in which the fibres are perfectly isolated but which is transformed to raw skin again by the action of water. The re-conversion into raw skin with water is not, however, instantaneous, and if the immersion is of short duration and the skin is dried out again, a certain amount of suppleness is still observed. The sulphates of weak bases, especially of ammonium and zinc mentioned by Procter (Koll. Chem. 1911, 2, 243) as having strong dehydrating effects on skin previously swollen by acid, were tried but gave no practical result. Of all the more soluble mineral salts tested it was found that a saturated solution of potassium carbonate gave the best results. A piece of raw skin suspended in a saturated solution of this salt, containing an excess of the undissolved solid, loses the water contained in it with great rapidity under the action of osmotic pressure. Thin skins are dehydrated in 1—2 hours and thick hide in 10—12 hours. On removing the skin it is apparent that the inverse penetration of the carbonate into the interior is so little that the solution appears not to wet the skin but runs off like oil, the contact surface tension being very high. The greater part of the liquid can be removed by a cloth or filter paper and the skin becomes dry in a very short time. On a practical scale this is done by wringing or pressing or by striking out by machine. The leather thus obtained is as white and supple as Knapp's alcohol leather. The skin undergoes no alteration in strength and a piece of thin ox-hide thus treated showed a dynamometric resistance of 3·5 kilos. per sq. mm. The tannage by dehydration may be carried out more quickly by treatment with dry potassium carbonate. The skin may be restored to the raw state very quickly by treatment with warm water slightly acidified in order to neutralise the traces of alkali left in the skin. The skin is not affected by the alkaline nature of the salt as the percentage of salt hydrolysed in the concentrated solution, is considerably less than in weaker solutions. The process might be of use industrially in two ways. It offers a means of preserving raw skin for transport or storing in a completely unchangeable form and with the minimum weight and by augmenting the pliability of the leather by treatment with a fat liquor, the product is rendered resistant to water and capable of application for many purposes.—D. J. L.

Patents.

Chrome leather; Process for the manufacture of ——. A. Wolff, Cologne on Rhine, Germany. Eng. Pat. 27,900, Dec. 12, 1911.

Chromium formate is used either alone (without the addition of alkali to make the solution basic), or in conjunction with chromium oxide. The chromium formate solution is made either by dissolving the pure formate in water, or by the action of sodium formate on chromium sulphate. No addition of alkali is necessary, and there is no liberation of mineral acid during the tanning process. —J. R. B.

Hides; Process of tanning ungrained ——. Soc. anonyme des Matières Tannantes et Colorantes. Second Addition, dated Nov. 17, 1910, to Fr. Pat. 396,025, Jan. 13, 1908 (see this J., 1909, 804, 996).

In order to avoid stains and marbling effects and to give the leather the appearance and smell of leathers tanned with oak bark, the following method is adopted. The hides after tannage are piled for at least 24 hours, and then immersed in slightly acidified water for about 20 minutes, dusted over with oak bark, and slowly subjected to pressure. They are then finished in the usual way.—E. W. L.

Tanning materials very rich in tannin; Utilisation of natural ——. G. B. M. Spigno. Fr. Pat. 433,432, Aug. 21, 1911. Under Int. Conv., Aug. 24, 1910.

It is customary to avoid too fine crushing of tanning materials containing 25 to 40 per cent. or more of tannin. The invention consists in crushing such materials to very fine powders, and in moderating their tanning effect by adding them to old, partially exhausted, tanning liquors, in order to strengthen the latter.—E. W. L.

Plastic masses, masses for moulding, adhesives, etc. M. Küller. Ger. Pat. 242,466, Aug. 30, 1908.

Ground glue or gelatin is intimately mixed with a pulverulent or granular loading or filling material, such as chalk, and the mixture is stirred with hot water. It is stated when such a mixture is stirred with hot water the glue or gelatin dissolves directly, the usual swelling in cold water being unnecessary.—A. S.

XVI.—SOILS; FERTILISERS.

Organic compounds and fertilizer action. O. Schreiner and J. J. Skinner. U.S. Dept. Agric., Bureau of Soils, Bull. No. 77, Nov. 23, 1911, pp. 31. (Compare this J., 1911, 40. 1078.)

The experiments were made with wheat seedlings in soil and water cultures, the solutions containing the three fertiliser ingredients, namely, phosphoric anhydride, ammonia, and potash (K_2O) as calcium acid phosphate, sodium nitrate and potassium sulphate respectively in all

possible ratios of one, two and three constituents, the individual ingredients being varied in stages of 10 per cent. In addition to the control series of experiments, similar series were made with the addition of small quantities of the toxic organic substances coumarin, vanillin, and quinone. Their effect on the development of wheat seedlings was shown by decreased green weight, by the morphological effects and by decreased absorption of plant nutrients. In presence of coumarin, the plants have stunted tops and broad distorted leaves; in presence of vanillin there is decreased top growth and strongly inhibited root growth, and in presence of quinone the plants are tall and slender with thin narrow leaves. The removal of potash and nitrate from the nutrient solutions by the plants is reduced more than that of phosphate by coumarin, whilst by quinone the removal of phosphate and nitrate is reduced more than that of potash. The various fertilizer salts acted quite differently in overcoming these harmful effects. Phosphatic manures were the most effective in overcoming effects due to coumarin, the nitrogenous manures were most antagonistic to the effects due to vanillin, whilst the effects due to quinone were best resisted by potash manures. Apparently reducing substances are antagonised by those fertilisers which promote oxidation; quinone, an oxidising substance, is antagonised by the manures which retard oxidation. The results obtained are expressed graphically by means of triangular diagrams.
—E. F. A.

Superphosphates; Preparation of —— with sulphur dioxide and chlorine. Q. Sestini. L'Ind. Chim., 1912, 12, 49—53.

Experiments on a small scale with 1—2 kilos. of crude mineral phosphate in a cast iron vessel provided with a stirrer and with inlet pipes for sulphur dioxide and chlorine showed that it is possible by the combined action of these two gases to convert tricalcium phosphate into superphosphate according to the equation: $Ca_3(PO_4)_2 + 2\,SO_2 + 4\,H_2O + 2\,Cl_2 = Ca\,(H_2\,PO_4)_2 + 2\,CaSO_4 + 4\,HCl$. In the early stages of the operation the sulphur dioxide should be present in slight excess, whilst towards the end a slight excess of chlorine should be passed in; the quantity of water should be kept as small as possible. In one experiment the product obtained, contained 19·52 per cent. of water, 2·86 per cent of chlorine (as calcium chloride), 17·15 per cent. of total phosphoric anhydride, 15·08 per cent. of phosphoric anhydride soluble in water, and 16·70 per cent. soluble in ammonium citrate solution. The liquid obtained by absorbing the gases discharged from the apparatus contained 12·32 per cent. of hydrochloric acid, 4·87 per cent. of sulphuric acid, and 0·69 per cent. of chlorine. By the use of several reaction chambers on the countercurrent principle, it would probably be possible to obtain a solution of hydrochloric acid, containing a much smaller proportion of sulphuric acid. It would be necessary to provide means for the removal of silicon fluoride from the hydrochloric acid.—A. S.

Citrophosphatic solutions. A. Quartaroli. Atti R. Accad. dei Lincei, Roma, 1912, 21, I., 130—135.

The author criticises the recent work of Pratolongo (this J., 1912, 195), and points out that owing to the method of preparation, the supposed solution of diammonium citrate used by that author was really one of a mixture of di- and tri-ammonium citrate. Cryoscopic data are given for solutions of citric acid, ammonium citrates, potassium citrates, ammonium phosphates, and of calcium and barium phosphates in ammonium citrate, and it is contended that these are in accord with the author's view of the formation of complex ions (see this J., 1911, 127), whilst they exclude the conception that the reaction between ammonium citrate and alkaline-earth phosphates is one of double decomposition with hydrolytic dissociation of the reaction products.—A. S.

Sulphur; Fertilising action of ——. A. Demolon. Comptes rend., 1912, 154, 524—526.

The residues from gas purification, widely used for agricultural purposes in the north of France, contain about 40 per cent. of sulphur and 1 to 3 per cent. of ammoniacal nitrogen. Their manurial value is stated to depend on their sulphur content: to test this the effect of the addition of flowers of sulphur to garden soil has been studied. Increased crops both of roots and leaves were obtained in every case and the treated plants were a much deeper green. The sulphur appears to exercise a favourable influence on the development of chlorophyll. It is shown that the sulphur undergoes a certain amount of oxidation to sulphate in the soil.—E. F. A.

Patents.

Fertilisers from natural phosphates; Production of ——. S. B. Newberry and H. N. Barrett, Bay Bridge, Ohio, U.S.A. Eng. Pat. 13,891, June 10, 1911.

See Fr. Pat. 430,997 of 1911; this J., 1911, 1400. The material is heated in an oxidising atmosphere.—T. F. B.

Fertilisers; Process of utilising lime-mud in the manufacture of ——. H. A. Galt, Assignor to Columbia Chemical Co., Barberton, Ohio. U.S. Pat. 1,016,989, Feb. 13, 1912.

The caustic soda remaining in lime mud after treatment of sodium carbonate with lime and separation of the bulk of the caustic soda from the calcium carbonate, is utilised for making fertilisers by mixing the lime mud with phosphate rock and soda ash, and calcining the mass.
—W. C. H.

Nitrolim [crude calcium cyanamide]; Process for improving the manurial value of ——. A. Stutzer. Ger. Pat. 242,522, Sept. 21, 1910

The nitrolim is intimately mixed with colloidal substances or substances readily converted into the colloidal condition, *e.g.*, with ferric oxide. It is stated that if such substances are added to the nitrolim before it is applied to the soil, the transformation of cyanamide into urea is accelerated, apparently by contact action, and the manurial effect is increased.—A. S.

Phosphorites; Process for converting —— into useful phosphate. H. V. Dunham. Fr. Pat. 434,944, Oct. 6, 1911. Under Int. Conv., Aug. 24, 1911.

See Eng. Pat. 19,045 of 1911; this J., 1912, 37.—T. F. B.

XVII.—SUGARS; STARCHES; GUMS.

Cane mills; The relative efficiency of six-roller compared with nine and twelve-roller ——. G. S. Chiquelin. Intern. Sugar J., 1911, 13, 654—657.

A comparison between (a) six and (b) nine-roller cane mills in Louisiana gave the following figures: Tons of cane ground per hour, (a) 39·61, (b) 43·2; length of roller in ft., (a) 7, (b) 6; tons of cane ground per hour per sq. ft. of roller surface, (a) 6·50, (b) 7·72; juice extraction, (a) 77·45, (b) 79·15; maceration, per cent., (a) 12·80, (b) 18·26; sucrose in the bagasse, (a) 26·64 lb., (b) 21·80 lb.; sucrose in the bagasse, per cent., (a) 5·02, (b) 4·27; and fibre in the cane, (a) 10·32, (b) 10·82. It is thus seen that the nine-roller mill grinds 17·35 per cent. more cane per sq. ft. of roller surface than the six-roller, and still retains a slight advantage in mill extraction. In the case of nine and twelve-roller mills of equal length of roller, it was found in Hawaii that a twelve-roller mill is capable of treating 50 tons of cane per hour as efficiently as a nine-roller set grinds 35 tons, with a dilution of 12 per cent. compared with one of 34 per cent. Similar figures, also obtained in Hawaii, show that a six-roller mill with 7-ft. rollers, attached to a crusher, grinding at the rate of 43 tons per hour, gives an extraction of 77·6; while if made into a nine-roller it will yield an extraction of 82·6, the maceration being 13·1. From these results the relative efficiency of (a) six (b) nine and (c) twelve-roller mills with 7 ft. rollers may be summarised as follows: On an equal rate of grinding of 1100 tons per 24 hours, the maceration is, (a) 15·20, (b) 20·25, (c) 20·25; and extraction, (a)

76·78, (b) 82·83, (c) 84·86. It is pointed out that the great advantage of nine and twelve-roller mills is the possibility of saturating behind the rollers, due to the disintegrated condition in which the bagasse emerges after repeated crushings.—J. P. O.

Yield of sugar; Calculation of the —— in cane sugar factories. W. F. Gaymans. Archief Suikerind. Nederl.-Indië, 1911, **19**, 1287—1299.

SINCE the percentage of sucrose on the cane that is recoverable = $(QP/100-QP)n$, where QP is the quotient of purity of the juice, and n is the non-sugar; and since the non-sugar in the molasses = the non-sugar in the raw juice, minus the non-sugar in the scums, and in the sugar, the following formulæ expressing the amount of sucrose theoretically obtainable per 100 parts of cane are deduced: (1), $(s-f)-(QP/100-QP)(n_1-n_2-n_3)$; and (2), $(s-f)-(QP/100-QP)(N-n_3)$; in which s is the sucrose introduced, and f is the sucrose in the scums, per 100 parts of cane; QP is the quotient of purity of the molasses; n_1 is the non-sugar in the raw juice, n_2 is the non-sugar in the scums, n_3 is the non-sugar in the sugar, and N is the non-sugar in the thin-juice, per 100 parts of cane. The author then gives a number of figures for (a) the yield by the formulæ just given, (b) the yield by Hazewinkel's formulæ for defecation and carbonatation factories, (c) the yield actually obtained, (d) the actual yield as a percentage of the yield by (a), and (e) the actual yield as a percentage of the yield found by (b). In the case of the carbonatation factories the figures for (d) and (e) are 94·66 and 98·58 per cent.; for the defecation factories making white sugar the corresponding values are 96·28 and 98·69 per cent., and for defecation factories not making white sugar they are 97·80 and 99·30 per cent. As Hazewinkel's formulæ do not give the theoretical yields, but only values indicating the results that should be obtained with good work, it is concluded that the new formulæ should be used for controlling the losses other than those occurring in the scums and molasses.—J. P. O.

White sugar; Comparative cost of manufacturing —— by the carbonatation and the defecation-sulphitation processes. J. S. De Haan. Archief Suikerind. Nederl.-Indië, 1911, **19**, 1341—1367. Intern. Sugar J., 1912, **14**, 108—110.

FOR the clarification of cane juice in the manufacture of white plantation sugar in Java, the carbonatation process as practised in European beet factories was formerly in vogue, but this is now being replaced by the method involving only liming and sulphitation. The author has made a financial comparison of the two processes, dealing only, however, with those stages that are dissimilar in the two modes of treatment. In order to obtain an indication as to which method yields the greater amount of sugar, a comparison of the various losses was made, and the results are summarised as follows:—In clarifying the raw juice: (*a*) carbonatation, 0·58; (*b*) defecation, 1·414; during evaporation: (*a*) 0·810; (*b*) 0·675; in clarifying the syrup: (*a*) 0·014; (*b*) 0·064; and in the molasses: (*a*), 5·14; (*b*), 6·78; the total losses thus being: (*a*) 6·544; (*b*) 8·933 per cent. on the sugar in the juice. Thus 2·39 per cent. more sugar can be obtained by the carbonatation process than by defecation. This figure practically confirms that calculated from Winter's rendement formula, viz., for carbonatation, 103·26, and for defecation, 100·91, a difference of 2·35 per cent., and this latter value the author prefers to use since it is more actually based on practice. Expressed on 1000 picols (60 tons) of cane, the relative cost of working the juice in the several stages of clarification are: In the carbonatation process: for limestone, coke, sulphur, and filter-cloths, fl. 22·615 (£1 17s. 8d.); labour in working kilns, fl. 0·535 (11d.); extra labour in carbonatating, fl. 3·38 (5s. 8d.); handling the filter scums, fl. 1·610 (2s. 8d.); total, fl. 28·14 (£2 6s. 11d.). In the defecation process: lime, sulphur, cloths, fl. 4·76 (7s. 11d.); labour, fl. 1·24 (2s. 1d.); dealing with scums, fl. 0·21 (4d.); total, fl. 6·21 (10s. 4d.). Thus the difference of cost in working the two processes is fl. 21·93 (£1 16s. 7d.) per 1000 picols (60 tons) of cane. Better yields are, however, obtained by carbonatation, although it is more expensive to work, the average comparative rendements found in a Javan factory being: in defecation, 106·06 (6·36 tons), and in carbonatation, 108·52 (6·51 tons), a difference of 2·46 picols (0·15 ton) per 100 picols (60 tons) of cane in favour of carbonatation. This surplus amount of sugar is calculated to have a value at the port of fl. 19·57 (£1 12s. 7d.). Summarising these figures, the extra cost of working carbonatation is fl. 21·93 (£1 16s. 7d.); the net value of the extra sugar obtained is fl. 19·57 (£1 12s. 7d.); a difference of fl. 2·36 (4s.). Assuming that for every 1000 picols (60 tons) of cane 108·52 picols (6·51 tons) of total sugar are obtained, the excess cost of the carbonatation process is fl. 0·02 (0·4d.) per picol (1·2 cwt.) of total sugar.
—J. P. O.

Sucrose; The hydrolysis of —— by various acids in presence of invertase. G. Bertrand and M. Rosenblatt. Bull. Soc. Chim., 1912, **11**, 176—186.

STARTING from baker's yeast, a solution of invertase of so high activity and purity was obtained that the small quantity of it employed introduced a negligible amount of organic and mineral impurities into the reaction mixtures; whilst in order that the proportion of sucrose hydrolysed might remain sensibly proportional to the enzymic activity a large excess of sucrose was employed. On keeping, the yeast extract became gradually less active, but this had no influence on the results obtained as it was shown that the concentration of the acid for optimal action was independent of the hydrolytic activity of the invertase. On tabulating the results for optimal activity in grm.-mols. per litre and subsequently calculating these on the basis of the activity of hydrochloric acid = 100, it was found that with three exceptions the order into which the various acids fell was the same as that stated by Ostwald for their relative catalytic activity. Neglecting these exceptions, which are more probably peculiar to the particular enzyme than to experimental error, it may be said, in general, that each acid in a series retains the same position with regard to enzymic phenomena as it does when acting alone upon a hydrolysable substance. In examining the relative extent of this activity it is found that the proportionality is different in the presence or absence of the enzyme. Thus in presence of invertase the activity varies in the acids examined from 464·3 (benzenesulphonic acid) to 0·57 (isobutyric acid), whilst the figures calculated from Ostwald's data are 104·4 to 0·33 for the same acids. It may be said that the enzyme extends the scale of activity of monobasic acids and it is remarkable that this influence is not so great with dibasic acids, whilst the reverse is the case with tribasic acids. Since the solutions used were so highly diluted that ionic dissociation must be complete, the high activity of such acids as benzenesulphonic (464·3), trichloracetic (430), etc. compared with hydrochloric (100) can only be explained by supposing that, in the presence of invertase and doubtless of other soluble enzymes, the activity of acids does not depend only upon the hydrogen ions produced by dissociation, which should be the same from whatever source they are derived, but in large measure also upon the nature of the radicals to which the hydrogen is attached in the acid molecule.—J. A.

Glucose and glucosides; New anhydrides of ——. E. Fischer and K. Zach. Ber., 1912, **45**, 456—465.

TRIACETYLMETHYLGLUCOSIDE-BROMHYDRIN, which is prepared from acetodibromoglucose (formed by the prolonged action of hydrobromic acid on pentacetylglucose) is a very useful material for the preparation of new derivatives of methylglucoside and dextrose. By warming it in aqueous alcoholic solution with barium hydroxide it is converted into a compound, $C_7H_{12}O_5$, containing a molecule of water less than methylglucoside. This new anhydride distils undecomposed under a very small pressure, and forms a crystalline hydrate. It is not converted into sugar by emulsin, but warm dilute acids hydrolyse it readily, producing a crystalline compound, $C_6H_{10}O_5$, which is regarded as an intramolecular anhydride of dextrose. This anhydro-glucose resembles the hexoses in many respects but differs from them in restoring the colour to solutions of fuchsine decolourised by sulphurous acid; the colouration, however, appears less rapidly than in the case of simple aldehydes. Determinations of the specific rotatory power of the anhydride gave values of 53·89 and 53·68 for $[a]_D$ at 20° C. With phenylhydrazine it gives a hydrazone in the cold and on warming, an osazone containing one molecule of water less than phenylglucosazone. The anhydride appears therefore to contain the reactive grouping of the aldohexoses. It is certainly different from the anhydrides of glucose hitherto described and probably represents a new type of sugar derivative. The preparation of other new compounds, including anhydro-mentholglucoside, is also described.—J. H. L.

Relative efficiency of long and short tubes for multiple effect evaporators. Newbold. *See* I.

XVIII.—FERMENTATION INDUSTRIES.

Malting; Some aspects of floor ——. T. R. Dixon. J. Inst. Brewing, 1912, **18**, 105—121.

The author strongly recommends the kiln-drying of home-grown barleys, and finds that in effecting this it is preferable to employ a final temperature of 120°—130° F., and to reduce the moisture-content of the grain to about 9 per cent. The dried barley should be stored for at least 4 weeks prior to use, and it is found that barley stored in bins yields a more mellow malt than that stored in lofts. For inferior malts, a short period of steeping (*e.g.* 46 hours) is recommended, since with such malts, long steeping causes not only loss of extract, but also an appreciable increase in the percentage of ready-formed sugars. With regard to flooring, the author finds it best not to allow the final temperature of the couch (maintained during the last 24 hours) to exceed 60° F.; the acrospire-growth is more rapid, modification is better, the 1000-corn weight and the yield of extract are higher, and the weight of culms is less than when the final temperature is allowed to rise to 65° F.—L. E.

Hops; [Behaviour of the] bitter resins of —— in worts and beers on boiling, and their determination by titration. V. Neumann. Woch. f. Brau., 1912, **29**, 97—99.

The difficulties which have hitherto attended the determination of the bitter substances in worts and beers have been largely due to the formation, when the sample is shaken with the extracting liquid, of an emulsion which persists for a very long time. This difficulty does not arise if the following method is employed: Of the total quantity of wort or beer to be extracted a suitable portion, *e.g.*, 50 or 100 c.c., is shaken for 10—15 mins. with 5 times its volume of ether. The mixture rapidly separates into two layers on standing, no persistent emulsion being formed. The aqueous layer is drawn off and replaced by an equal volume of the fresh sample, the cycle of operations being repeated until the whole of the sample has been extracted with the ether. The extract is then concentrated to 15—20 c.c. in a water-bath at 40° C. and mixed with 40—50 c.c. of benzene, the mixture being transferred to a separating funnel and washed with water until the washings are no longer acid. The funnel should not be shaken violently during this washing, for the mixture is liable to emulsify. Finally the ether-benzene extract is titrated with $N/10$ alcoholic caustic potash solution in presence of phenolphthalein, the result being corrected by means of a blank titration of a mixture of 40 c.c. of benzene, 20 c.c. of ether and 30 c.c. of alcohol. One c.c. of the alkali corresponds with 0·04 grm. of bitter substances. The results obtained by this method were checked by experiments on wort treated artificially with a known quantity of hop-extract. It was found subsequently that when wort so treated was boiled for two hours under a reflux condenser and extracted without previous filtration, only about 75 per cent. of the bitter substances added could be found again. From further experiments it appeared that when the a-bitter acid (humulone) is boiled with wort it is in part converted into other bitter substances more soluble in water, whilst about 35—40 per cent. of it is destroyed or cannot afterwards be detected by extraction and titration with alkali.—J. H. L.

Brewing water containing alkaline earth carbonates; Influence of —— on the acidity of the malt, wort and beer. E. Prior. Allgem. Z. Bierbrau. u. Malzfabr., 1912, **40**, 40—43, 53—55. (See also this J., 1912, 87.)

The salts present in water are always in a dissociated state, and their influence on the acidity of the wort and beer depends not only on their absolute quantity but also on the equilibrium finally produced. The matter is complicated by the subsequent activity of acid-forming organisms during fermentation. The composition of the water used for steeping the barley is of little practical account; the real influence of the water begins with the setting up of the mash, and reaches its maximum in the boiling process. The final reactions only take place when the activity of the organised and soluble ferments of the malt has ceased, and the interchanges between the bases of the water and the various phosphates and organic acids of the malt are completed. Dibasic calcium phosphate is split up on boiling, forming the acid monobasic phosphate, and the insoluble tribasic phosphate; thus the acidity is increased and incidentally a portion of the yeast nutrients is removed. It has been found that if calcium sulphate be present in the water it neutralises to a certain extent the prejudicial influence of a high proportion of calcium carbonate. This is explained by the following equation: $KH_2PO_4 + CaSO_4 = CaKPO_4 + H_2SO_4$, whereby the acidity of the mash is increased. In the case of the beer, in addition to the acids produced by bacterial activity, the acidity is increased by reactions between the carbon dioxide and the phosphates. The whole question is most complicated and can hardly be solved by chemical methods; some method based on electrical conductivity might lead to useful results. The removal of the earthy carbonates is not always desirable, and each case must be investigated on its merits by comparative brewings with ordinary and treated waters. The acidity of normal malt, expressed as lactic acid, ranges from 0·45 to 0·75 per cent. on the dry weight, and with such malts in most cases a reduction of the earthy carbonates to 5—8 degrees of hardness (as grains of chalk per gallon) is all that is desirable. Poor results with malts of low acidity are not always attributable to that fact, but low acidity often connotes other deficiencies in modification of the barley substance. In former times it was customary to precipitate the carbonates by boiling the mashing liquor for some hours and cooling it before use; the precipitated carbonates were not removed, since it has been established that, in the insoluble form, these carbonates take no part in the reactions with the acid constituents of the mash.—J. F. B.

Manganese; Extraordinary sensitiveness of Aspergillus niger towards ——. G. Bertrand. Comptes rend., 1912, **154**, 616—618.

Further experiments on the culture of *Aspergillus niger* (this J., 1911, 228, 502, and Comptes rend., 1912, 154, 381), using quartz vessels and specially purified materials, have shown the yield to be appreciably increased by adding as little as 1 mgrm. of manganese (reckoned as metal) to 10,000 litres of nutritive solution.—F. Sodn.

Arsenic on grapes and in wines. Mathieu. Ann. Falsif., 1912, **5**, 78—80.

Grapes and wines obtained from vines which had not been treated with arsenical insecticides were found to contain traces of arsenic. Rather larger quantities, less than 0·06 mgrm. per litre, however, were found in red wines (two years old) produced from vines which had received arsenical treatment before flowering. The fresh grapes from vines so treated contained not more than 0·05 mgrm. of arsenic per kilo., even when the weather had been very dry (year 1911) and therefore favourable to the retention of the insecticide on the vine. A part of the arsenic in the grapes remains in the marc in the manufacture of red wines, and such wines should therefore contain, under the most unfavourable conditions, not more than 0·05 mgrm. per litre. —J. H. L.

Methyl alcohol; Detection of —— in spirituous liquors. E. Aweng. Apoth.-Zeit., 1912, 27, 159.

THE spirit is oxidised by potassium permanganate and the excess of permanganate destroyed by oxalic acid as directed by Denigès (this J., 1910, 451 and 585), and 6 c.c. are tested by Schiff's reagent, following Denigès. As a confirmation, to 10 c.c. of the decolourised solution are added successively 2 c.c. of 4 per cent. aqueous solution of phenylhydrazine hydrochloride, 6 drops of 10 per cent. solution of ferric chloride, and 5 c.c. of hydrochloric acid; acetaldehyde gives in this way a pale yellow colouration, but formaldehyde a brilliant raspberry red. If both of these tests (which should be controlled by blank experiments with pure ethyl alcohol) give negative results, there is no need to go further; but if they indicate formaldehyde, further confirmation should be sought as follows:—100 c.c. of the spirit are distilled at 65°—70° C.; the first 5 c.c. of distillate are oxidised with 250 c.c. of the permanganate, and the excess of the latter destroyed by oxalic acid. The liquid is then distilled, and the distillate tested from time to time by adding to 5 c.c. 10 drops of the phenylhydrazine solution, 4 drops of 2½ per cent. solution of sodium nitroprusside, and 1 c.c. of sodium hydroxide solution As soon as the colour struck changes from deep red (acetaldehyde) to blue (formaldehyde), the distillate is collected till Schiff's reagent shows that no more aldehyde is coming over. Excess of ammonia is added, and the solution evaporated to dryness on the water-bath; the residue is taken up with a little water, and a drop of the solution mixed on a microscope slide with two drops of solution of mercuric chloride or potassio-mercuric iodide, and examined with the microscope for the characteristic crystals which the mercury salt makes with hexamethylenetetramine.—J. T. D.

Ozone as a disinfectant [*Fermentation*]. H. Will and P. Beyersdorfer. Z. ges. Brauw., 1912, 35, 73—77, 89—93.

IT has previously been shown that air containing 0·6—0·7 grm. of ozone per cubic metre destroys organisms which are injurious to brewing operations (Z. ges. Brauw., 1910, 33, 4). It is also important, however, that the source of infection should be exposed to the greatest possible quantity of ozone per unit time. To obtain a small increase of concentration of ozone in ozonised air, the rate of the air-current through the ozoniser must be reduced very considerably, and, as the authors show, with increasing ozone-concentration, the amount of ozone formed per unit time decreases. Experiments on the disinfecting power of ozone are described, in which a current of air ozonised to the extent of 0·625 grm. per cubic metre, and yielding about 0·07 grm. of ozone per minute, was used. A copper pipe, the wall of which was wetted with aqueous suspensions of *Sacch. pastorianus*, *Sacch. turbidans*, *mycoderma*, *Willia anomala*, and *sarcina*, was not sterilised even by prolonged action (90 minutes) of a current of ozonised air; this result is ascribed to the drying of the tube and adherent organisms by the current, and it is shown that in a dry state, *S. turbidans* is remarkably resistant to the action of ozonised air. Filtering material, suspended in water, was not sterilised by treatment with a current of ozonised air for 90 minutes; this is ascribed to decomposition of the ozone, as a result of contact-action, by the finely divided filtering material. Finally, transport-casks, coated internally with pitch, were not rendered sterile by a current of ozonised air continued for two hours. The results obtained by the authors are in marked contrast to those obtained by Vetter and Moufang (this J., 1911, 232, 1131).—L. E.

Casks [*Fermentation*]; *Cleansing of* ——. E. Moufang. Z. ges. Brauw., 1912, 35, 77—80, 93—97.

THE author has investigated the efficacy of ozonised air and of ozone solutions for disinfecting casks. The casks were first cleansed by spraying with water. The experiments show that the passage of a current of dry ozonised air through the empty cask has practically no sterilising effect; this appears to be chiefly due to the drying of the surface of the cask (see preceding abstract). The passage of a current of ozonised air through the cask filled with water is also useless, though a partial sterilisation is effected if the cask is shaken during the treatment. Much more satisfactory results are obtained, however, if the cask (previously sprayed out twice with water) is shaken with a solution of ozone in water acidified to the extent of about 0·05 per cent. In order that the treatment may be applicable under practical conditions, the time required for effecting it should not exceed 30 seconds. For a 10-litre cask (which, after rinsing, will retain say 15 c.c. of adhering water), treatment for 30 seconds with 3 litres of a solution containing not less than 8·5 mgrms. of ozone per litre, may generally suffice to insure practical sterility, and as a general prescription for casks of any size, 24 litres of solution, containing at least 0·2 grm. of ozone, may be used for the same time. The author has observed that a slight acidification not only increases the stability (this J., 1911, 1210) but also increases the disinfecting power of aqueous solutions of ozone. Further, aqueous solutions of ozone, unlike gaseous ozone, do not attack rubber.—L. E.

PATENTS.

Malt houses; Apparatus for treating air for use in ——. W. E. Lake, London. From W. H. Prinz, Chicago, U.S.A. Eng. Pat. 15,681, July 5, 1911.

THE apparatus includes an attemperator room leading to a malting compartment room. Air, entering the attemperator room, is deprived of part of its moisture and impurities by contact with a system of pipes through which the water (at a temperature of 60°—65° F.) from the steep tanks is passed. The air then passes through a series of transverse, perforated metal sheets, being washed by spraying devices adjacent to the sheets constituting the first part of the series, and freed from suspended water by the sheets constituting the last part of the series. Finally, the air is freed from part of its moisture by contact with a second system of pipes through which cold water (at 48°—50° F.) is pumped to the steep tanks.—L. E.

Beers; Process for removing the coagulable albumin and allied substances contained in fermented —— and for the manufacture of beer containing little or no alcohol. J. O. O'Brien, Manchester. From Betriebs- und Studienges. für Alkoholarmes Bier, Ges. m. b. H., Berlin. Eng. Pat. 8946, April 11, 1911.

To remove coagulable albumin, etc., the beer is treated (*e.g.*, after the main fermentation and before filtering or pasteurising) with yeast or yeast extract that has been deprived of zymotic power but not of proteolytic power, by preservation, free from infection, for 5—12 days at a suitable temperature between 10° and 60° C. To the same end, the beer may be treated with "strong yeast" prepared from a special culture and rendered zymotically inactive. The process is also applicable to the manufacture of beer containing little or no alcohol, in which case it is best to use yeast extract of high proteolytic activity, prepared as above described. Claim is also made for a modified process in which the finished beer is treated with freshly fermenting wort containing less than 1 per cent. of alcohol, the product being subsequently filtered, if necessary, and pasteurised.—L. E.

Beer; Removing alcohol from and purifying ——. H. F. Deckebach, Cincinnati, Ohio. U.S. Pat. 1,017,086, Feb. 13, 1912.

THE beer is withdrawn from the fermenting tub and a current of heated compressed air passed through it.

Then the beer is sent through a cooler and afterwards a strainer, and returned to the fermenting tub. This circulation is continued until the beer is lowered to the desired temperature.—J. H. J.

Fermented malt beverages, Process for making ——. Wahl-Henius Institute of Fermentology. Fr. Pat. 435,219, Oct. 14, 1911.

See U.S. Pat. 1,006,154 of 1911; this J., 1911, 1329.—T. F. B.

XIXa.—FOODS.

Saccharin in foods and drugs; Prohibition of the use of —— in the United States. Oil, Paint, and Drug Rep., March 4, 1912. [T.R.] (See this J., 1912, 1227—1228.)

The Secretaries of the U.S. Department of Agriculture and of the Department of Commerce and Labour have assented to the decision of the Pure Food Board, that the use of saccharin in foods and drugs is deleterious to health and must be stopped. Notice is given that on and after April 1st, 1912, proceedings will be taken against offenders.

Saccharin in foods; Rapid method for the determination of ——. G. Possetto and G. Issoglio. Giorn. Farm. Chim., 1912, **61**, 5—11. Chem. Zentr., 1912, **1**, 754.

The authors extract the saccharin by means of dialysis. (1) *Milk and milk preparations.* 50 c.c. of milk are made alkaline by means of sodium carbonate and dialysed. After 12—24 hours the yellow solution is acidified with phosphoric acid and extracted twice with ether. The ethereal solution is washed, filtered, and evaporated. If saccharin be present a crystalline residue is left which may be identified by fusing with alkali, dissolving in water, acidifying with hydrochloric acid, and adding *p*-aminodimethylaniline and some ferric chloride, when if saccharin were present, a blue solution is obtained in consequence of the formation of methylene blue. In the case of milk preparations, 30 grms. are mixed with 20 c.c. of a very dilute solution of sodium carbonate and dialysed. (2) *Jams and fruit jellies.* 50 grms. are made alkaline with sodium carbonate and dialysed, and the solution treated as described under (1). The crystalline residue is tested for salicylic acid. If this be present it may be separated either by treating the original solution after dialysis with excess of bromine water and filtering, the filtrate being acidified with phosphoric acid and extracted with ether; or by treating the solution with permanganate and sulphuric acid and after standing for 12 hours in the cold, filtering, the filtrate being decolourised with sulphur dioxide, and extracted with ether. (3) *Candied fruits, sweets, etc.* 30 grms. are well mixed with water and dialysed. (4) *Cocoa and its preparations.* 30 grms. are mixed with alkaline water and dialysed, and the yellow solution is decolourised with animal charcoal.—A. S.

Rice; The proteins of ——. S. Kajiura. Bio-Chem. J., 1912, **6**, 171—181.

The proteins of peeled and polished "white rice" as used for food in Japan consist only to the smallest extent of albumins and globulins, in this respect differing from other cereals with the exception of maize. The amount of alcohol-soluble proteins (prolamins) is extremely small, the sample examined yielding only 0·013 per cent., this feature distinguishing rice sharply from all other cereals used as food. The chief protein of rice, oryzenin, belongs to the glutelin class and about 70 per cent. of the total proteins present in the grain consist of this body. In its nitrogen partition oryzenin differs from wheat glutenin (the only other glutelin so far studied), the nitrogen present as ammonia after hydrolysis being much lower and the basic nitrogen higher than is the case with the latter protein. —J. A.

Tomatoes; Changes taking place during the spoilage of ——, *with methods for detecting spoilage in tomato products.* R. F. Bacon and P. B. Dunbar. U.S. Dept. Agric., Bureau of Chem., Circular No. 78, Oct. 16, 1911. Pp. 15.

When tomatoes spoil as the result of bacterial decomposition the carbohydrates are changed into acetic and lactic acids, alcohol and carbon dioxide, and the citric acid present is rapidly decomposed. Sound tomatoes contain 3·5 per cent. of invert sugar and 0·5 per cent. of citric acid, with no volatile acids; the spoiled fruit contains much volatile acid and little or no sugar and citric acid. It is thus easy to detect spoilage in tomato pulp or canned tomatoes and also with somewhat less certainty in tomato ketchups and sauces. As tomatoes spoil, the ammonia obtained by distillation with magnesium oxide increases in amount. Significant determinations are quoted made on commercial products prepared from unsound fruits. Citric acid is determined in ketchups as follows: 25 grms. are made up to 200 c.c. with 95 per cent. alcohol, allowed to stand with frequent stirring for four hours, filtered and washed with 50 c.c. of 80 per cent. alcohol. Enough water is added to the filtrate to dilute the alcohol to 50 or 60 per cent., 10 c.c. of 20 per cent. barium acetate solution are added, and the solution after stirring is allowed to stand over night. The precipitate is collected in a Gooch crucible, washed with 50 per cent. alcohol, dried at 100° C., and weighed: this weight × 0·51 equals anhydrous citric acid.—E. F. A.

Patents.

Tea; Improving the flavour and digestive and nutritive value of ——. S. C. Gearing, Birmingham. Eng. Pat. 7014, Mar. 21, 1911.

The sprouts or acrospire of malted grain, which are a waste product in malting, are roasted to a dark colour and then passed through a fanning process which removes the woody portions. The sprouts thus treated are mixed with tea in the proportion of about 1 : 30. It is claimed that this admixture improves the flavour of the tea, increases its stimulating action on the digestive organs, and raises its nutritive value.—J. H. J.

Chocolate paste and other substances; Machine for refining ——. F. E. F. Neumann. Fr. Pat. 434,434, Sept. 14, 1911. Under Int. Conv., Sept. 16, 1910.

See Eng. Pat. 20,363 of 1911; this J., 1912, 43.—T. F. B.

XIXb.—WATER PURIFICATION; SANITATION.

Disinfecting power of complex organic mercury compounds. I. Aromatic mercuri-carboxylic acids. W. Schoeller and W. Schrauth. Z. Hyg. u. Infekt.-Krankh., 1911, **70**, 24—34. Chem. Zentr., 1912, **1**, 596. (See also this J., 1910, 1328.)

The authors compared the disinfecting power of a number of compounds of the type, $C_6H_3(X)(COONa)(HgOH)(1:2:3)$, sodium hydroxymercuribenzoate ($X=H$) being taken as a standard. The test objects used were *Staphyloc. pyogenes aureus* and in certain cases also anthrax spores, the organisms being dried on glass beads (roughened with hydrofluoric acid) of as far as possible uniform size. It was found that the introduction of chlorine, iodine, methyl, or methoxyl into the benzene nucleus increased considerably the disinfecting power of sodium hydroxymercuribenzoate, but the introduction of the acidic salt-forming hydroxy or sulphonic groups diminished it. The introduction of an amino-group also caused a decrease of disinfecting power; on replacing the hydrogen atoms of the amino-group by alkyl, the disinfecting power increased again according to the number of alkyl groups introduced, but on replacing the hydrogen atoms of the amino-groups by acyl groups the disinfecting power was diminished still further. Elimination of the carboxyl group from the benzene nucleus caused the disinfecting power to increase again; the sodium salt of hydroxymercuriphenylglycin being more active than sodium hydroxymercuriphenylglycin-o-carboxylate. Introduction of a second hydroxymercuri-group into the benzene nucleus also increased the disinfecting power.—A. S.

Radium content of the Bath waters. Sir W. Ramsay. Times, Mar. 12, 1912.

The recorded analyses of the Bath waters showed in the main merely ordinary constituents, most of which were present in many drinking waters, and the only unusual constituents, so far as was indicated by the analysis made at the Lancet laboratory, were small quantities of strontium and lithium, with a trace of bromine. But the fact that many mineral waters all over Europe had for ages past been used for curative purposes, combined with present knowledge that such waters while not unusual in "chemical" composition all agreed in yielding helium, made it interesting to examine the Bath waters for radium and for niton, the emanation of radium. In 24 hours the King's Well gave off 4,927 litres of gas containing in 10,000 parts, 360 of carbon dioxide and 9,640 of nitrogen, etc., including 73·63 parts of argon, 23·34 of neon, and 2·97 of helium. In the water of the King's Well there was 0·1387 mgrm. of radium per million litres. If the niton was represented by the weights of radium capable of forming the niton present in a million litres of water or gas, the figures for the water of the King's Well, the Cross Bath, and the Hetling Bath were respectively 1·73, 1·19, and 1·70, and for the gas from the King's Well 33·65. The water from the Hospital Natural Baths and from the Crescent Pump Room at Buxton were found by Dr. Makower each to contain 0·83 mgrm. per million litres, so that the waters from the King's Well and the Hetling Bath were more than twice as rich in niton. The Gentlemen's Natural Baths at Buxton contained 1·1 mgrms. per million litres, or about the amount in the Cross Bath. The gas from the King's Well at Bath contained about four times as much as was contained in the natural gas from Buxton, viz., 7·7 and 8·5 mgrms. per million litres. It was unfortunately impossible to compare these amounts with statements of the radioactivity of foreign waters, for the latter were stated in uncertain units.

Ozone as a disinfectant. Will and Beyersdorfer. *See* XVIII.

Patents.

Refuse; Burning town ——. E. E. Glaskin, Putney, Middlesex. Eng. Pat. 3002, Feb. 6, 1911. (See also Eng. Pat. 6175 of 1895.)

The improvements consist in providing sloping movable firebars under the combustion space in those destructors in which the refuse is fed in from a shoot and combustion maintained by an air blast from tuyères. These bars form the bottom of the combustion chamber and direct the molten slag into a settling chamber at the side of the furnace under a boiler. Further, an annular space is provided round the inner wall of the furnace for heating the air supply, which is directed through the space in a helical manner. This space and the tuyères are water jacketed.—J. H. J.

Water; Process and apparatus for extracting micro-organisms and solid substances from ——. G. W. Durbrow. Fr. Pat. 434,973, Oct. 7, 1911.

See U.S. Pat. 1,006,070 of 1911; this J., 1911, 1331. The "sticky substance" may consist of a mixture of gum copal and paraffin.—T. F. B.

Sterilising and purifying water or sewage by means of ozone; Apparatus for ——. M. P. Otto, Paris. Eng. Pat. 3250, Feb. 8, 1911. Under Int. Conv., Feb. 9, 1910.

See Fr. Pat. 423,223 of 1910; this J., 1911, 645.—T. F. B.

Pasteuriser. C. H. Loew, Lakewood, and A. Ruetschi, Assignors to The Loew Manufacturing Co., Cleveland, Ohio. U.S. Pat. 1,017,777, Feb. 20, 1912.

See Fr. Pat. 413,848 of 1910; this J., 1910, 1128.—T. F. B.

Manufacture of fuel briquettes, ovoids, and the like from waste products. Eng. Pat. 21,192. *See* IIa.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Alkaloid; Photo-synthesis of a new —— from acetophenone and ammonia. E. Paternò and C. Maselli. Gaz. chim. ital., 1912, 42, I, 65—75.

Solutions of acetophenone in alcoholic ammonia in sealed tubes were exposed to the light for periods of several months, after which the alcohol was expelled, and residue distilled with steam to remove unaltered acetophenone. The distillation residue was separated from the water, dissolved in boiling alcohol, and the solution allowed to crystallise. Large colourless transparent crystals were obtained disseminated in a soft yellow resin, which was dissolved away by means of cold ether. The crystals, after recrystallisation from benzene, melted at 227° C. Analysis and molecular weight determinations gave the formula, $C_{18}H_{18}N_2$. The new alkaloid is only slightly soluble in water even on boiling, and in cold ether or petroleum spirit. It dissolves more easily in alcohol, giving a strongly alkaline solution. It is soluble in acetic, sulphuric, and nitric acids, but forms a sparingly soluble salt with hydrochloric acid. An intense emerald green colouration is produced when a crystal of potassium bichromate is added to a solution of the alkaloid in concentrated sulphuric acid. Several salts and a mononitroso-derivative of the alkaloid have been prepared. The hydrochloride, $C_{18}H_{18}N_{2s}$,HCl, forms white crystals which remain unaltered when heated to 270° C., or to 350° C. in a current of dry hydrochloric acid gas. The chloroplatinate, $(C_{10}H_{18}N_2,HCl)_2PtCl_4$, begins to decompose when heated to 260° C.—A. S.

Cinchonine and quinine; Conversion of —— into their toxic isomerides, cinchotoxine and quinotoxine. H. C. Biddle. Ber., 1912, **45**, 526—528.

The author claims priority for experiments on the effect of different acids on the rate of conversion of quinine into quinotoxine (Ber., 1910, **43**, 3308). It has been found that salts of quinine or cinchonine become converted into cinchotoxine or quinotoxine when heated to 95°—98° C. in aqueous solution with or without excess of acid. The rate of this transformation is increased by using an acid with a low dissociation-constant. The conversion is almost quantitative when acids such as acetic and propionic are used. With the latter acids, about 2 per cent. of conversion takes place at 36° C. in 48 hours. The change is also brought about by sunlight, but owing to the production of resin at the same time, the solutions become brown. These facts may account for cases of so-called "quinine poisoning."
—F. Shdn.

Morphine and colchicine; Colorimetric determination of ——. R. Fabinyi. Oesterr. Chem.-Zeit., 1912, **15**, 61—62.

When morphine is dissolved in dilute sulphuric acid, treated with sodium nitrite, and the solution then rendered alkaline, a red colouration is produced; this colour is very stable and is not given by many of the organic substances which are liable to be present and interfere with the usual colour reactions of morphine. The determination is carried out by diluting a quantity of the morphine solution under examination, and also definite volumes of a standard morphine solution (prepared by dissolving 0·3 grm. of morphine in 1 litre of 10 per cent. sulphuric acid), to 10 c.c. with 10 per cent. sulphuric acid, adding a small fragment of sodium nitrite to each mixture, then 10 c.c. of potassium hydroxide solution, and, finally, diluting each mixture with water to 100 c.c. The colourations are then compared.

In the case of colchicine, an aqueous solution of the substance is treated with a quantity of concentrated sulphuric acid and a few drops of ferric chloride solution, and the mixture is boiled for 3 minutes. A dark, olive green colouration is produced and the colour is not discharged when the mixture is diluted with water. When the green coloured solotion is shaken with chloroform, the latter is coloured bright red. The quantity of colchicine present is ascertained by comparing the colouration with those given by known amounts of colchicine under similar conditions.—W. P. S.

Damascenine, the alkaloid of Nigella damascenea; Constitution and synthesis of ——. A. J. Ewins. Chem. Soc. Proc., 1912, **28**, 38.

Damascenine has been proved by synthesis to be the methyl ester of 2-methylamino-3-methoxybenzoic acid. It thus possesses the composition, $C_{10}H_{13}O_3N$, differing from the formula originally suggested by Schneider (Pharm. Centralh., 1890, **31**, 173) only by having two hydrogen atoms less. The formula, $C_9H_{11}O_3N$, assigned to this alkaloid by Pommerehne (Arch. Pharm., 1900, **238**, 531), and the betaine-like constitution suggested by Keller (this J., 1908, 295) are therefore without foundation, the "damascenine hydrochloride" of these workers being a mixture of the hydrochlorides of damascenine and damasceninic acid.

Asebotin; Identification of the glucoside in the leaves of Kalmio latifola with ——. E. Bourquelot and A. Fichtenholz. Comptes rend., 1902, **154**, 526—528.

The glucoside from the fresh leaves of *Kalmia latifolia* crystallises in slender needles, m. pt. 115° C. (hydrated) and 154° C. (corr.) when anhydrous. It has $[\alpha]_D = -59°$ and gives a characteristic red colouration with ferric chloride (compare Bourquelot and Fichtenholz, Comptes rend., 1911, **153**, 1500). The identity with asebotin, the glucoside of the leaves of *Andromeda japonica*, discovered by Eykman, has been established by the preparation of this latter glucoside. *Kalmia* leaves give 26 grms. of glucoside per kilo., whilst *Andromeda* leaves yield only 4 grms. per kilo.—E. F. A.

Scammony root and scammony; Chemical examination of ——. F. B. Power and H. Rogerson. Chem. Soc. Proc., 1912, **28**, 39—40.

The material employed for this investigation consisted of Levant scammony root (from *Convolvulus Scammonia*, Linné), and the product known as scammony, or "virgin scammony," the latter having been obtained directly from Smyrna. The scammony root yielded 9·65 per cent. of resin, 97 per cent. of which was soluble in ether, whereas the gum-resin, scammony, contained 83·1 per cent. of resin, which was completely soluble in ether. The specific rotatory power of the two crude resins was $[\alpha]_D = -20·20°$ for that obtained from the root, and $[\alpha]_D = -21·15°$ for that from scammony. For a complete examination of the root, 50·35 kilos. of the ground material were extracted with hot alcohol. The resulting extract, when distilled in a current of steam, yielded a very small amount of an essential oil. From the portion of the extract which was soluble in water the following substances were isolated: scopoletin, $C_{10}H_8O_4$; 3:4-dihydroxycinnamic acid, $C_9H_8O_4$; and a small amount of sucrose. The aqueous liquid contained, furthermore, a quantity of dextrose. The portion of the alcoholic extract which was insoluble in water consisted of a resin which possessed the above-mentioned characters. The resins obtained from scammony root and from scammony respectively, sometimes designated as "scammonin," are very similar in many respects, but not perfectly identical. On the other hand, the resin of scammony root was found to differ very considerably from that obtained from the root of *Ipomoea orizabensis* (this J., 1911, 153), which has received the appellation of "jalapin." Both of these resins consist of exceedingly complex mixtures, and their components are not entirely glucosidic.

Adenium Hongkel D. C. and Xanthoxylum ochroxylum D. C.; Pharmacognostic study of ——. M. Leprince. Bull. Sci. Pharmacol., 1911, **18**, 337—345. Chem. Zentr., 1912, **1**, 586—587.

Adenium Hongkel is a West African shrub belonging to the *Apocynaceae*, named "Kidi Sarané" by the natives who use the sap for the treatment of ulcers and carious teeth. The plant contains no alkaloids, but an amorphous yellow substance, *adeniine* ($C_{19}H_{28}O_8$), m.pt. 84°—85° C., $[\alpha]_D = +134°$ (in alcoholic solution). Adeniine is insoluble in water and gives an intense violet red colouration with concentrated sulphuric acid. It is not a glucoside, but is a powerful cardiac poison resembling in this respect the digitalin group.

Xanthoxylum ochroxylum or *Busaga blanca* is a native of Central and South America and belongs to the *Rutaceae*. The root bark and seeds are used in Venezuela as a local anæsthetic against toothache and neuralgia. The author isolated from the plant two alkaloids (α- and *β-xantherine*) apparently of the berberine group, two crystallised neutral substances, α and *β-xanthoxylin* and a mixture of an essential and a fatty oil. α-Xantherine, $C_{24}H_{23}O_6N$, crystallises from benzene in colourless microscopic needles (m. pt. 186°—187° C.) which turn yellow on exposure to the air; it is insoluble in water, very sparingly soluble in alcohol and ether, and slightly soluble in benzene. Its salts resemble those of berberine in insolubility, crystalline form, colour, and taste. β-Xantherine is distinguished from the α- compound by its melting point, and the ready solubility of its hydrochloride in water. The amount of α- and β-xantherine together in the bark is 0·3 per 1000. The fat obtained by extraction with petroleum spirit (yield 6 per cent.) is yellow and has the sp. gr. 0·945 at 15° C. It has a powerful odour and a characteristic, pungent taste. It remains for the most part unsaponified on treatment with alcoholic potash. When allowed to stand for some weeks, it is transformed into a wax-like mass of unpleasant odour, which is only partly soluble in petroleum spirit. The fat is an analgesic, whilst α-xantherine has a paralysing effect on the intracardiac nerve system.—A. S.

Physiological action; Relation between chemical constitution and ——, *more particularly as exemplified by the arylarsonic acids, the alkamine esters, and the tropeïnes.* H. A. D. Jowett and F. L. Pyman. Proc. Seventh Int. Congr. Appl. Chem., London, 1909.

After a brief discussion of the general question, the authors deal more particularly with the three classes of compounds mentioned in the title.

Arylarsonic acids. Taking sodium *p*-aminophenylarsonate, $C_6H_4(NH_2)AsO(OH)(ONa),5H_2O$, as a standard, the toxicity towards mammals is increased by the introduction of halogens into the benzene ring, and diminished by acylation of the amino-group or its replacement by hydroxyl (compare Ehrlich, this J., 1909, 218).

Alkamine esters. Local anæsthetic properties are possessed by alkamine esters of widely different characters: (1) The acyl group may be a benzoyl or a substituted aromatic acid residue. (2) The amino-group may be secondary or tertiary and may contain alkyl groups or be associated with simple or bridged ring complexes. (3) The alcohol group may be primary, secondary, or tertiary, and may separate the acyl- and amino-groups by a chain of either two or three carbon atoms.

Tropeïnes. It has been stated in the literature that a tropeïne to possess mydriatic properties must contain: (1) a benzene nucleus; and (2) an alcoholic hydroxyl group in the side chain containing the carboxyl group. The first postulate is true in so far that tropeïnes of aliphatic acids show no mydriatic power in dilute solutions, but tho closed chain need not be a benzene nucleus, for replacement of the latter by a pyridine residue does not cause the disappearance of mydriatic activity. The second postulate is incorrect, for: (1) the hydroxyl group of atropine may be replaced by acetoxyl, chlorine or bromine; (2) the hydroxyl group of homatropine may be replaced by hydrogen, chlorine, or an amino group, or may be linked up to form a lactone, without destroying mydriatic activity; (3) *o*- and *m*-hydroxybenzoyl- and benzoyl-tropeïnes possess mydriatic properties. It is true, however, that those tropeïnes which are more active than or are equal to homatropine in mydriatic properties contain an alcoholic hydroxyl group. The tropeïnes of substituted hydratropic, phenylacetic, and phenylpropionic acids are all active with the exception of the lactone of o-carboxyphenylglyceryltropeïne and those containing an unsaturated linkage in the side chain containing the carboxyl group. The differences in constitution between active and inactive tropeïnes of substituted benzoic acids are only slight: *p*-hydroxybenzoyltropeïne is inactive and *p*-methylmandelyltropeïne is less active than its ortho- and meta-isomerides. In tropeïnes containing a di-substituted benzene ring, the para-compounds have the least mydriatic action. A classification of about 30 tropeïnes in the order of their mydriatic activity is given. The three most powerful ones, viz., atropine, $C_6H_5.CH(CH_2OH).CO.OT$, atrolactyltropeïne, $C_6H_5.C(CH_3)(OH).CO.OT$, and β-phenyl-α-hydroxypropionyltropeïne, $C_6H_5.CH_2.CH(OH).CO.OT$ (T = the tropine residue) are isomeric.—A. S.

Cassia oil. E. J. Parry. Perfum. and Essent. Oil Rec., 1912, 3, 46.

IN the technical valuation of cassia oil, the cinnamic aldehyde is absorbed, and the volume of unabsorbed oil measured. It is pointed out that most of the cassia oil arriving in London at the present time is adulterated with resin, and the unabsorbed portion of the oil consequently has a much higher specific gravity than cinnamic aldehyde, so that an apparent content of 80 per cent. (by vol.) of cinnamic aldehyde represents a considerably lower actual percentage by weight.—A. S.

Japanese pepper and its oil. E. M. Holmes. Perfum. and Essent. Oil Rec., 1912, 3, 37—38.

JAPANESE pepper is the name usually given to the fruit of *Xanthoxylum piperitum* (Jap. *Sansho*), but the product now on the market under this name is almost certainly derived from *X. alatum* (Jap. *Fuyu Sansho*), being distinguished by prominent oil glands whereas in the former the oil glands are depressed. A sample of oil distilled from the *X. alatum* fruits was pale yellow in colour, and had an odour resembling a mixture of lime fruit and nutmeg. It had the sp. gr. 0·889 and optical rotation, — 23°. When allowed to stand for a few days in the cold, a stearoptene ($C_5H_6O_2$) of m. pt. 80° C. separated in the form of long white needles; this is identical with Stenhouse's *xanthoxylin.* The liquid portion of the oil consisted chiefly of terpenes boiling between 170° and 200° C. The oil, which contains less than 1 per cent. of citral, appears to be identical with that examined by Stenhouse, but is different from the Japanese pepper oil described by Schimmel and Co. (Semi-Annual Report, Oct., 1890), which is stated to have been derived from *Xanthoxylum piperitum.*—A. S.

Gum labdanum; Essential oil of ——. H. Masson. Comptes rend., 1912, 154, 517—519.

WHEN distilled with steam, gum labdanum yields 0·7—0·9 per cent. of a golden yellow essential oil of sp. gr. 0·950 at 15° C., and boiling at 15 mm. pressure from 50° to 185° C. Treatment in the cold with dilute solution of sodium hydroxide extracted phenolic compounds and free acids, and phthalic anhydride removed from the dried residue substances of alcoholic function. The remainder was fractionally distilled, and from the fractions coming over between 70° and 78° and between 85° and 90° C. the ketonic compounds they contained were separated and examined. The first fraction contained a ketone which was proved to be trimethyl-1·5·5-hexanone-6, not hitherto described, boiling at 178°—179° at normal and at 66°—67° C. under 10 mm. pressure, having sp. gr. 0·922 at 0° C., refractive index (n_D at 15° C.) 1·4494. The second fraction contained acetophenone, which has not before been recognised as a constituent of an essential oil.—J. T. D.

Master-wort; Essential oil of ——. F. Lange. Arbb. aus dem Pharm. Inst. d. Univ. Berlin, 1911, 8, 98—120. Chem. Zentr., 1912, 1, 654.

ONE hundred kilos. of *Rhizoma imperatoriae* on distillation with steam, yielded 1 per cent. of an essential oil, which after a second distillation with steam was obtained as a greenish yellow liquid of peculiar aromatic odour and pungent taste. It has the sp. gr. 0·8659 at 15° C.; $[\alpha]_D^{14} = +69{\cdot}75°$; acid value, 0·8; saponification value, 17·9, 16·6; ester value of acetylated oil, 28·34. It consists of about 95 per cent. of terpenes, together with free acids, alcohols, esters, and sesquiterpenes. The terpenes consist of pinene, dipentene, *d*-limonene, and *d*-phellandrene, the last-named preponderating. A sesquiterpene was isolated in the form of its crystalline dihydrochloride, m. pt. 157°—157·5° C. Of the acids, palmitic acid was detected in the free state, and acetic, formic, isobutyric, isovaleric, and ββ-dimethylacrylic acids as esters. Wagner's statement that the oil probably contains the aldehyde of angelic acid could not be confirmed. An alcohol of the probable formula, $C_{10}H_{19}OH$, was found to be present; its phenylurethane melted at 145°—146° C.—A. S.

Terpene; Synthesis of an aliphatic ——. C. J. Enklaar. Chem. Weekblad, 1912, 9, 68—72. Chem. Zentr., 1912, 1, 726.

BY passing linalool vapour over "active" copper at 130°—140° C., an aliphatic hydrocarbon, $C_{10}H_{16}$, is obtained, which is probably identical with myrcene. It boils at 62° C. at 14 mm., has the sp. gr. 0·802 at 15° C., and $n_D^{15} = 1{\cdot}47$. The same hydrocarbon is produced when linalool is heated with phenyl isocyanate:

$$2C_6H_5NCO + C_{10}H_{18}O = CO(NH.C_6H_5)_2 + C_{10}H_{16} + CO_2.$$

When hydrogenised in presence of nickel at 130° C., this hydrocarbon yields 2·6-dimethyloctane.—A. S.

Tanacetyl alcohols; Isomeric ——. V. Paolini. Gaz. chim. ital., 1912, 42, I., 41—49.

TANACETONE (b.pt. 201° C.) from tanay oil was reduced with sodium and ethyl alcohol, yielding a tanacetyl alcohol of b.pt. 206°—209° C., sp. gr. 0·925 at 20° C.; $n_D = 1{\cdot}4635$; and $[\alpha]_D = +69°\ 49'$. This was dissolved in petroleum spirit and treated with metallic sodium and the solution treated with phthalic anhydride. The crude phthalic ester finally obtained melted at 70°—80° C. It was dissolved in benzene and the solution fractionally precipitated with light petroleum spirit. In this way a pure product was obtained of m. pt. 120° C., which on hydrolysis yielded an alcohol (β-thujyl alcohol) of b.pt. 206° C., sp. gr. 0·9229, $n_D^{16} = 1{\cdot}4625$, $[\alpha]_D = +114°\ 67'$, the purity of which is shown by the fact that it yields directly the pure phthalic ester of m. pt. 120° C., and on oxidation with chromic acid gives β-thujone. If the mother liquors from the fractionating operations (see above) be evaporated and the residue hydrolysed, a liquid boiling at 206°—209° C. is obtained, which has a rotatory power lower than that of the original tanacetyl alcohol. This liquid must contain an isomeric alcohol which is either lævo-rotatory or has a much lower dextro-rotatory power than β-thujyl alcohol.—A. S.

Hydrocarbons; The addition of organic acids to unsaturated ——. A. F. Sievers. Bull. Univ. of Wisconsin, No. 434, Science Series, 1911, 4, No. 3, 39—80. (See also this J., 1912, 45.)

LIMONENE was mixed with glacial acetic acid and the rate of ester-formation was determined under various conditions.

When mixed with double the volume of acid, 2·84 per cent. of hydrocarbon was esterified after 5 months, but with an equal volume of acid a rather less amount was attacked. In the presence of hydrogen chloride 3·78 per cent. of esterification took place. Sodium acetate as a catalyser brought about the esterification of 5·71 per cent. of the hydrocarbon. Using mixtures of pinene and glacial acetic acid alone, the maximum percentage of hydrocarbon changed to ester at 175°—185° C. was just over 25 per cent. after 24 hours' heating. The maximum percentage obtained after boiling a similar mixture for 20 hours was 24·8 per cent. In a mixture of equal volumes of limonene and acetic acid which had stood for 2½ years, one-third of the limonene was converted into ester, but where twice the amount of acid had been used, only 13·95 per cent. was converted.—F. Shdn.

Methyl alcohol ; Detection of —— in tincture of iodine and other alcoholic preparations. E. Voisenet. J. Pharm. Chim., 1912, 5, 240—245.

Two c.c. of iodine tincture are completely decolourised by adding, drop by drop, a solution of sodium thiosulphate (1 : 2), the liquid is rendered alkaline with 10 drops of a solution of potassium hydroxide (1 : 10), and diluted to 20 c.c. with water. The mixture is then slowly distilled from a 50 c.c. distillation flask, so that the first 5 c.c. of distillate come over in 10 minutes. Two c.c. of this alcoholic distillate are diluted to 20 c.c. with water; 0·2 grm. of potassium bichromate and 1 c.c. of sulphuric acid (1 : 5) are added. When the bichromate is dissolved the solution is placed in the small distillation flask, and very slowly distilled, as before. The first 6 c.c. of distillate are rejected, and a second fraction of 4 c.c. collected. To detect the presence of methylal, derived from any methyl alcohol present, this fraction is tested with nitrous hydrochloric acid and albumin solution (see this J., 1906, 957).—J. O. B.

Hydrogenation and dehydrogenation. Wieland. *See* III.

Heavy oil obtained in the manufacture of soda wood pulp. Bergström. *See* V.

Patents.

Medicinal preparations. M. Salter, Torquay, Devon. Eng. Pat. 7826, March 29, 1911.

The marine algae, chondrus, gelidum and gigartina, are boiled in the freshly gathered unbleached state, macerated, and quickly incorporated into ordinary food products. The medicinal qualities of the algae are thus preserved. —J. H. J.

Homopiperonylamine ; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 12,550, May 24, 1911.

Three methods are given. (1) Homopiperonal is treated with ammonia, hydroxylamine or hydrazine, and the oxime thus formed reduced in alcohol and acetic acid with sodium amalgam ; unchanged oxime is removed by ether and the acid solution saturated with caustic potash ; it is then extracted with ether, which is evaporated off and the residue of homopiperonylamine distilled *in vacuo*. It is an oily liquid boiling at 145° C. under 15 mm. pressure ; its hydrochloride melts at 210°, and the picrate at 169° C. (2) Piperonal and nitromethane are condensed, and the product reduced with zinc dust and then with sodium amalgam, as above. (3) The carboxyl group of the methylene ether of hydrocaffeic acid is replaced by the amino group by the usual methods.—J. H. J.

Nicotine ; Extraction of ——. G. N. Keller, Dublin and G. J. Taaffe, Ardee, Ireland. Eng. Pats. 23,528, Oct. 24, 1911, and 25,375, Nov. 14, 1911.

Fresh green tobacco is cut up or pulped and then boiled or steamed in a small quantity of water or the juice from a previous operation, and the liquid is expressed from the product. The remaining pulp is steeped in warm water and again pressed, and the combined liquids are concentrated to about one fifth their original volume. Alternatively, the pulp is distilled with a solution of alkali, and the free nicotine condensed ; the residue may be treated as described above to extract the remainder of the nicotine. —T. F. B.

Carbamates of tertiary alcohols ; Manufacture of ——. H. Thron, Assignor to Verein. Chininfabr. Zimmer und Co., Frankfort on Maine, Germany. U.S. Pat. 1,016,977, Feb. 13, 1912.

Carbamic acid esters of tertiary alcohols (*e.g.*, tertiary amyl alcohol) are obtained by the action of urea chloride on the alcohol in presence of a substance capable of combining with hydrochloric acid.—T. F. B.

Cantharidic acid ; Process of producing derivatives of —— containing iodine and mercury. A. Klein, Berlin. U.S. Pat. 1,017,560, Feb. 13, 1912.

See Ger. Pat. 193,219 of 1906 ; this J., 1908, 713. The reaction is carried out in presence of alkali.—T. F. B.

1-*p*-*Dimethylaminophenyl*-3.4.4-*trimethyl*-5-*pyrazolone and process of making same.* F. Stolz, Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,017,699, Feb. 20, 1912.

1-*p*-Dimethylaminophenyl-3.4.4-trimethyl-5-pyrazolone is obtained by methylating 1-*p*-aminophenyl-3.4.4-trimethyl-5-pyrazolone, in the form of a white crystalline powder, of m. pt. 58°—59° C., scarcely soluble in water, and readily soluble in ether, alcohol, benzene, and acids. The aqueous solution of its hydrochloride is coloured bluish-violet on addition of ferric chloride.—T. F. B.

Perfume from flowers or powders ; Apparatus for extracting the ——. S. Pierre. Fr. Pat. 434,541, Sept. 25, 1911.

The material to be extracted is fed continuously into the lowest of a series of vats placed stepwise ; each vat contains an endless chain carrying a number of buckets which lift the material from each vat to that next above it, whilst the liquid overflows from the highest to the lowest vat. On leaving the highest vat, the material is transferred to an endless band, placed horizontally, on which it is passed between pressure rollers ; the expressed solvent, together with the water, falls into a separator, where the water is removed, and the solvent is returned again to the highest vat. Portions of the solvent charged with perfume are successively passed through two stills, the condensates from which are introduced into the extraction apparatus, thus making the apparatus continuous in its action. —T. F. B.

Diolefines [*isoprene, etc.*] ; *Process for producing ——.* Badische Anilin und Soda Fabrik. Fr. Pat. 434,586, Sept. 26, 1911. Under Int. Conv., March 14, 1911.

It is stated that excellent yields of pure diolefines are obtained by treating dihalogen derivatives of paraffin hydrocarbons or monohalogen derivatives of monoalkylenes with agents capable of effecting the elimination of hydrohalogen acids, or by treating halogen derivatives of alcohols with substances favouring elimination of hydrohalogen acids and water : chlorides of barium, nickel, or lead, quicklime, and alumina are suitable substances. The use of alcoholic potash is excluded. For example, when the vapours of trimethylethylene bromide, $(CH_3)_2CBr.CHBr.CH_3$, generated by boiling at a pressure of 15 to 20 mm., are passed over barium chloride heated to 340°—360° C., isoprene is obtained from the condensed vapours after removal of the hydrobromic acid by means of alkali. Dimethylallylene, b. pt. 38°—41° C., is obtained similarly from 3-bromo-2-methylbutene(2) and quicklime, whilst isoprene may also be obtained from the chlorhydrin of glycoltrimethylethylene, $(CH_3)_3CCl.CH(OH)CH_3$, and alumina.—T. F. B.

Isoprene; Process for preparing ——. C. Harries. Ger. Pats. 243,075 and 243,076. Aug. 3 and Nov. 5, 1910.

(1.) The dihalogenides or halogenhydrins of isopentane of the general formula, $C_5H_{10}Hal_2$ or $C_5H_{10}Hal(OH)$, with the exception of chlorodimethylethylcarbinol, are converted into isoprene by heating with basic oxides or hydroxides to temperatures above 200° C., preferably about 600° C. Soda lime, dry slaked lime, and magnesium oxide may be used as basic compounds. The following may be used as primary substances:—
$(CH_3)_2CCl.CHCl.CH_3$, $(CH_3)_2CBr.CHBr.CH_3$,
$(CH_3)_2C(OH).CHCl.CH_3$, $(CH_3)_2C(OH).CHBr.CH_3$, and the product obtained by brominating isoamyl bromide in presence of iron powder. The yield from the bromides is said to be 50—60 per cent. and from the chlorides 30—40 per cent. of the theoretical yield. (2.) The dihalogenides or halogenhydrins of isopentane are passed in the form of vapour over carbonates or salts of organic acids at high temperatures, or the same compounds are passed, together with carbon dioxide or an organic acid, over a heated basic oxide or hydroxide. The yields are somewhat better in this process than in that described above, since here no formation of amylene occurs.—T. F. B.

Chlorinating agent [monochlorourea] and process for obtaining it. Fabr. de Prod. de Chimie Organique de Laire. Fr. Pat. 434,907, Dec. 9, 1910.

Monochlorourea is found to be an effective chlorinating agent. It may be prepared as follows:—A stream of chlorine is passed into a cooled mixture of 60 grms. of urea and 13 grms. of water until an increase in weight of 32 grms. is attained; on further cooling the solution a mass of crystals of chlorourea is obtained, which are separated and washed with a solution of chlorourea. It is soluble in about 5 parts of water, the solution being stable; it melts at about 80° C., with decomposition. In aqueous solution monochlorourea is neutral to phenolphthalein: it displaces iodine from iodides quantitatively in acid solution, this reaction being available for its titration. It reacts, without application of heat, progressively with organic compounds. Acetone is quantitatively converted into monochloroacetone, phenol is converted into a mixture of *m*- and *o*-chlorophenols, whilst paraldehyde furnishes monochloroacetaldehyde; if the product of this last reaction is not isolated quickly, it combines with the urea, producing a compound which is converted by alcohol and acid into monochloroacetal and the salt of urea. When unsaturated compounds are treated with chlorourea, addition compounds are formed; from anethol is obtained a mixture of monochlorhydrin and an urein-chlorhydrin, of m. pt. 130·5° C., from which the chlorhydrin may be removed by ether; when treated with sodium carbonate solution, the urein-chlorhydrin loses hydrogen chloride, giving a new cyclic urein of m. pt. 155°—156° C.—T. F. B.

Methylene-acetone and its homologues; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 242,612, June 3, 1910.

Methylene-acetone and its homologues of the formula, $CH_3.CO.CR : CH_2$ (where R represents hydrogen or alkyl), are obtained by heating alone or with water to high temperatures, β-acetylacrylic acid or β-alkylacetylacrylic acids of the formula, $CH_3.CO.CR : CH.COOH$.—T. F. B.

Alkyl esters of metaphosphoric acid; Process for preparing ——. K. Langheld. Ger. Pat. 242,613, June 22, 1910.

A rapid and efficient method of preparing alkyl esters of *m*-phosphoric acid consists in heating phosphoric anhydride with dialkyl ethers. The esters may be utilised in pharmacy or for other purposes.—T. F. B.

Unsaturated hydrocarbons of the terpene series; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 10,915, May 5, 1911.

See Fr. Pat. 434,285 of 1911; this J., 1912, 257.—T. F. B.

Pharmaceutical product [mercury substituted esters of carboxylic acids]. W. Schoeller, Charlottenburg, and W. Schrauth, Berlin-Halensee, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,012,923, Dec. 26, 1911.

See Ger. Pat. 228,877 of 1909; this J., 1911, 48.—T. F. B.

Organic mercury compounds and process for making them. Act.-Ges. f. Anilinfabr. Fr. Pat. 435,025, Dec. 13, 1910.

See Eng. Pat. 28,583 of 1910; this J., 1911, 1409.—T. F. B.

Arsenobenzene derivatives and process of making same. P. Ehrlich and A. Bertheim, Frankfort, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,017,657, Feb. 20, 1912.

See Eng. Pat. 11,709 of 1911; this J., 1912, 256.—T. F. B.

Perfumes; Solution of —— and method of making the same. A. Hesse, Wilmersdorf, Germany. U.S. Pat. 1,017,669, Feb. 20, 1912.

See Ger. Pat. 227,667 of 1909; this J., 1910, 1398.—T. F. B.

Sulphur derivatives derived from glycerin; Process of producing ——. L. Lilienfeld, Vienna. U.S. Pat. 1,018,329, Feb. 20, 1912.

See Eng. Pat. 26,928 of 1910; this J., 1912, 122.—T. F. B.

Pinacone; Process for the production of ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 434,553, Sept. 25, 1911. Under Int. Conv., Oct. 20, 1910.

See Eng. Pat. 22,795 of 1911; this J., 1912, 151.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Patents.

Colour screen plates and films for colour photography; Manufacture of ——. H. W. H. Palmer, Tunbridge Wells. Eng. Pat. 6279, March 13, 1911.

A coloured liquid is sprayed by means of a compressed air spraying device, so as to form particles, the size of which depends on the pressure of the air and the size of the needle or aperture. A number of such devices may be employed to spray differently coloured liquids so as to form particles of the proper size and in the required proportions to produce a screen plate. The particles may be caught in a long chamber having an inclined floor made of enamelled or polished steel, down which they pass to suitable receptacles. The liquids may consist of (1) solutions of gelatin or a soluble gum in water to which a colour solution is added; (2) solutions of celluloid or a colloid or resinous gum in a volatile solvent with the addition of an alcoholic solution of a suitable dye; (3) melted coloured glass of low melting-point, forced directly from the retort: in this case the particles may be cemented together on glass plates by firing in an ordinary ceramic kiln. It is advisable to add formalin or tannin to the solutions of colloids. The solutions of colloids may be sprayed directly on the surface of the film, either separately or collectively, or the finished particles may be spread on the surface of a celluloid or cellulose film whilst it is still in a plastic condition, after which the films may be passed between finishing rollers. The coloured particles, made of material having no affinity for the substance of the film, may be suspended in an emulsion and floated upon the surface of the plate or film, or they may be mixed with a solution of celluloid and so form a component portion of the finished film.—T. F. B.

Photographic negative; Process and apparatus for determining the opacity of a ——. R. Leumann. Fr. Pat. 434,625, Sept. 14, 1911.

Light is caused to pass through a negative of known opacity and across an aperture of determined size, so that it falls on to a sensitive electric cell, the resistance of which is then measured. The same quantity of light is now allowed to pass through the negative of which the opacity is to be measured, and through an aperture of variable size, and is then allowed to fall on the same cell, the size of the aperture being regulated to make the resistance of the cell the same as that produced by the negative of known opacity; the relative opacities of the negatives may be found from the relative sizes of the apertures. A suitable apparatus for the purpose is described.—T. F. B.

Photographic printing; Process of ——. P. J. and J. E. Taton. Fr. Pat. 434,791, Dec. 6, 1910.

The following means may be used, separately or collectively, to produce photographic prints on pigmented paper sensitised by chromium salts: Use of violet or ultraviolet rays from a mercury vapour lamp in a quartz tube; replacing the glass of the photographic plate or of the printing frame by a substance more permeable to such rays (*e.g.*, quartz or celluloid); converting the silver of the negative image into a product more permeable to the rays, for example, by treating it with a copper, mercury, or chromium salt, or with iodine or a sulphiding agent. —T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Nitrocellulose; Determination of sulphur in ——. C. Kullgren. Z. ges. Schiess- und Sprengstoffw., 1912, 7, 89—91.

The author considers that the method of Hake and Lewis (this J., 1905, 374, 914) gives erratic and low results. Using the same sample of nitrocellulose the following results were obtained, the figures referring to mgrms. of barium sulphate per grm. of nitrocellulose. Hake and Lewis's method, 9—15 mgrms.; oxidation by boiling for 4—5 days with *aqua regia*, 20·8—24·4 mrgms. On burning the denitrated nitrocellulose in oxygen, higher figures were obtained, viz., 26·3—29·0 mgrms. The author considers the last method to give the true content of sulphur in nitrocellulose.—G. W. McD.

Smokeless powders; Photolytic decomposition of ——, *and of picric acid and ammonium picrate, by ultraviolet rays.* D. Berthelot and H. Gaudechon. Comptes rend., 1912, **154**, 514—517. (See also this J., 1912, 204.)

The experiments have been repeated in oxidising (oxygen), reducing (hydrogen), and inert (carbon dioxide, nitrogen) atmospheres. With oxygen, two-thirds of the free oxygen disappeared, and added its oxidising effect to that of the oxygen of the nitrocellulose. With hydrogen, about one-quarter disappeared, forming water and formaldehyde. With carbon dioxide, much depends on the temperature: at 25°—30° C. (70—80 mm. from the lamp) there is absorption, due no doubt to the solvents and stabilisers, which are basic in their character; at 40° C. (50 mm. distance) no change in volume occurs; at 75° C. (20 mm. distance) there is disengagement of carbon dioxide from the powder, and the final volume shows an increase. Nitrogen has no effect on the evolution of nitrogen or nitrous gases from the powder.

Heating "B" powders to 110° C. for periods of from 4 to 110 hours produced no effect on their behaviour under the lamp, save that due to the fact that a certain quantity of the solvent in the powder was volatilised by the heating; but no nitric oxide was produced, showing that much longer periods of heating would be needed to "age" a powder artificially.

Picric acid, like other aromatic compounds, was found to be very stable under exposure; no decomposition took place at 50 mm. distance, and after 3 hours at 20 mm. only a slight browning occurred, and evolution of about 0·7 c.c. of gas. Ammonium picrate was still more stable, and showed no decomposition even at 20 mm. from the lamp.—J. T. D.

Patents.

Explosives; Manufacture of ——. A. T. Cocking and Kynoch, Ltd., Birmingham. Eng. Pat. 2836, Feb. 3, 1911.

Cane or invert sugar (20 parts), is dissolved in glycerin (80 parts), and the solution nitrated with an anhydrous mixture of sulphuric acid (54 parts) and nitric acid (46 parts). The product is purified in a similar manner to nitroglycerin with the exception that, in order to produce a stable explosive, a more thorough washing is required—two washings with water, six with 2 per cent. sodium carbonate solution, and two final washings with 0·2 per cent. sodium carbonate solution, all at 40° C. Blasting gelatin, gelatin dynamite, and gelignite containing this nitro-product, instead of nitroglycerin, are also claimed.—G. W. McD.

Explosive. M. Ugalde, Guatemala. Eng. Pat. 8968, April 11, 1911.

Sugar (40 parts), is dissolved in water, and to this solution is added potassium chlorate (60), potassium permanganate (0·8), turpentine (2), and vegetable tar (2 parts). The ingredients are mixed hot, until they form a plastic mass, which is rubbed through a sieve. The grains form the finished explosive.—G. W. McD.

Detonating compounds for use in rim-fire cartridges and percussion caps. W. Meyer, Berlin-Wilmersdorf, Germany. Eng. Pat. 21,337, Sept. 27, 1911.

The composition consists of mercury fulminate (25 parts), barium nitrate (25), lead peroxide (35), and antimony sulphide (15 parts). The replacement of potassium chlorate by barium nitrate and lead peroxide is said to prevent rusting of the barrel.—G. W. McD.

Explosive powder; Apparatus for treating ——. F. I. du Pont, Assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,017,286, Feb. 13, 1912.

A conical vessel is provided inside with alternate sets of fixed and rotating blades. The angles, with respect to the axis, of successive sets of fixed blades increase, whilst the angles of the successive sets of rotating blades decrease from inlet to outlet.—G. W. McD.

Smokeless powder; Process for the manufacture of tubular ——. C. Claessen, Berlin. Eng. Pat. 3116, Feb. 7, 1911.

See Fr. Pat. 426,437 of 1911; this J., 1911, 984.—T. F. B.

Guncotton; Process for making —— *more soluble in its various solvents.* T. Chandelon, Liege, Belgium. Eng. Pat. 11,941, May 17, 1911. Under Int. Conv., May 17, 1910.

See Fr. Pat. 429,750 of 1911; this J., 1911, 1281.—T.F.B.

Bursting shells for guns, torpedo-heads, maritime mines, and the like; Loading charge for ——. E. Sokolowski, Hamburg, Germany, Assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,015,214, Jan. 16, 1912.

See Fr. Pat. 432,981 of 1911; this J., 1912, 153.—T.F.B.

Cartridges and gunpowder; Process for packing ——. E. Goltstein. Fr. Pat. 434,995, Oct. 7, 1911. Under Int. Conv., April 19, 1910.

See Eng. Pat. 21,506 of 1911; this J., 1912, 204.—T.F.B.

Manufacture of cellulose [*for nitration*]. U.S. Pat. 1,017,023. *See* V.

XXIII.—ANALYTICAL PROCESSES.

Magnesia; Rods of ——, *as a substitute for platinum wire in analytical work.* E. Wedekind. Ber., 1912, **45**, 382—384.

Rods, about 15 cm. long and 1 mm. diameter, of the magnesia-composition used for incandescent mantle supports, form an excellent substitute for platinum wire for flame-reactions, borax- or microcosmic-beads, volatilisations, etc. After each experiment a short length of the rod is broken off, and the rod can be used till its length is reduced to about 1½ cm.—J. T. D.

Fractional distillation in the laboratory, and a new rectifying apparatus. A. Golodetz. Chem. Ind., 1912, **35**, 102—108, 141—145. (See also this J., 1912, 150, 215.)

After a discussion of the principles underlying fractional distillation and a brief review of previous work on the subject, the author describes a new form of still-head which he has devised and which he terms a "birectifier." It consists essentially of two concentric tubes of 20—25 mm. and 35—40 mm. diameter respectively, both the inner tube and the annular space being packed with a suitable glass or metal filling; pieces of aluminium wire or rod are recommended. The vapours pass from the distilling flask upwards through the annular space and thence into a spiral condenser, cooled by the air or by means of water. The condensed liquid drops slowly from the lower end of the spiral into the inner tube, which ends below in a capillary tube bent in the form of a hook, the loop of which becomes filled with liquid at the beginning of the distillation and acts as a seal; the inner dephlegmator may be of approximately the same height as or shorter than the outer one. The vapours from the inner dephlegmator pass to the condenser and receiver, whilst the condensed liquid flows gradually through the capillary tube at the bottom back into the distilling flask. The height of the still-head is 1 metre for distillation temperatures up to 100° C., 50 cm. for 100°—150° C., and 30 cm. for 150°—200° C., but taller columns can be used if they are lagged with asbestos. For small quantities of material, where a column packed with filling material cannot be used, a still-head can be constructed on similar principles, but using in place of the inner cylindrical tube, a bulbed tube such as is used in other forms of still-head. Results obtained with the "birectifier" with a mixture of toluene and benzene and with Russian oil of turpentine are given showing the efficacy of the apparatus: the figures show that the "birectifier" with aluminium filling is much superior to older forms of still-head.—A. S.

Reduction of nitrobenzene by means of ferrous hydroxide. H. C. Allen. *See* III.

New reaction of mercuric salts. Siemssen. *See* VII.

Determination of small quantities of bromine and chlorine in commercial iodine. Watson. *See* VII.

Determination of iron in Portland cement. Calame. *See* IX.

Determination of caoutchouc as bromide by Hübener's method. Hinrichsen and Kindscher. *See* XIV.

Determination of the acidity of tan liquors. Grasser. *See* XV.

Changes taking place during the spoilage of tomatoes, with methods for detecting spoilage in tomato products. Bacon and Dunbar. *See* XIXa.

Rapid determination of saccharin in foods. Possetto and Issoglio. *See* XIXa.

Behaviour of the bitter resins of hops in worts and beers on boiling, and their determination. Neumann. *See* XVIII.

Detection of methyl alcohol in spiritous liquors. Aweng. *See* XVIII.

Colorimetric determination of morphine and colchicine. Fabinyi. *See* XX.

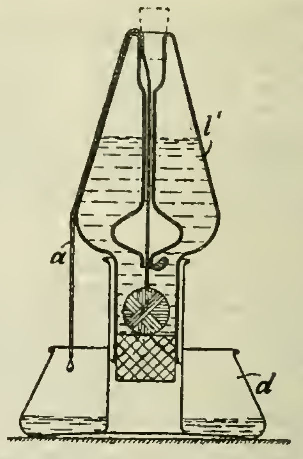
Detection of methyl alcohol in tincture of iodine and other alcoholic preparations. Voisenet. *See* XX.

Determination of sulphur in nitrocellulose. Kullgren. *See* XXII.

Patents.

Gas- and air-testing apparatus. M. Arndt. Ger. Pats. 242,540, April 7, 1911 (Addition to Ger. Pat. 241,075, Sept. 23, 1910) and 242,630, April 7, 1911.

(1) In a further modification of the apparatus described previously (see this J., 1911, 714), the vessel, *l'*, which acts as a Mariotte's bottle, is pear-shaped as shown, or has its walls inclined in any other suitable manner, in order better to retain the test-thread, *a*, in position. The vessel is preferably constricted below the pear-shaped enlargement, in order that only a part of the test-thread rests on the inclined wall of the vessel, whilst the remainder hangs freely. Instead of the vessel having inclined walls, the test-thread may be supported by a suitable straight, curved, or zig-zag path, surface, or trough or the like, which may be connected with either the vessel, *l'*, or the receptacle, *d*, or with both, or may be carried by one of them. (2) The guide-tube for the test-thread within the vessel, *l'*, is provided with an enlargement for the purpose



of accommodating any liquid forced into the tube by expansion of the air-cushion in the upper part of the vessel, *U*.—A. S.

Density of gases ; Apparatus for determining the ——. A. Dosch. Ger. Pat. 242,704, July 6, 1911.

The apparatus consists of a closed casing in which a kind of paddle-wheel rotates, somewhat similar to an ordinary centrifugal fan. The inlet and outlet pipes are at different distances from the axis of the wheel, and are connected with one or more differential manometers, the difference of pressure observed being a measure of the specific gravity of the gas flowing through the casing. The inlet and outlet pipes may be provided with transverse discs or the like having apertures the size of which can be varied, whereby the difference of pressure between the incoming and outgoing gas can be altered whilst keeping the speed of rotation of the fan constant. In order to avoid the use of a device for registering the speed of rotation of the fan, a second similar fan, on the same axis, may be rotated in a casing containing a standard gas.—A. S.

Instrument and method for testing the viscosity of tar. Eng. Pat. 22,042. *See* III.

Trade Report.

Protection in the United States. Times, March 13, 1912.

The U.S. Supreme Court has decided that an importer can appeal against an assessment of duty by a collector of Customs on the ground that the assessment is too low. This means, according to experts, that American manufacturers, if they believe that they are not receiving the amount of protection intended by the law, may import a test shipment and appeal to the Customs Court for higher duties.

Books Received.

Manufacture of Nitro-lignin and Sporting Powder. Outlined by Earle Durnford. Whittaker and Co., 2, White Hart Street, Paternoster Square, E.C., and 64—66, Fifth Avenue, New York. 1912. Price 5s. net.

8vo volume, containing 84 pages of subject matter, and a frontispiece showing the microscopic characters of "Sulphite wood pulp, disintegrated." The subject matter is treated under the following heads :—I. Early wood nitro-powder. II. Sulphite wood pulp manufacture. III. Nitrolignin as a base. IV. Essential requirements of pulp. V. Disintegrating. VI. Drying and cooling. VII. Nitration. VIII. Tank system. IX. "Oleum." Water in mixed acids, etc. X. Pot system. XI. "After" nitration. XII. Aluminium pots. XIII. Nitrating-centrifugal system, etc. XIV. Extraction of acids. XV. Pulping, boilers, edge-runners. XVI. Plant and equipment. XVII. Notes on nitro-cellulose.

Historical Papers on Modern Explosives. By George W. MacDonald, M.Sc, Head of Research, Messrs. Curtis's and Harvey, Ltd. With an introduction by Sir Andrew Noble, Bart., K.C.B., F.R.S. Whittaker and Co., 2, White Hart Street, Paternoster Square, London, E.C., and 64—66, Fifth Avenue, New York. 1912. Price 7s. 6d. net.

8vo volume, containing 188 pages of subject matter, and an alphabetical index of names and subjects. The subject matter is subdivided as follows :—I. Howard's discovery of mercury fulminate (1800). II. Braconnot's discovery of nitrostarch (1833). III. Schönbein's discovery of guncotton (1846). IV. Gun-cotton in France, Scotland and England. V. The patents of Schönbein, Tonkin, and Abel. VI. Letters from Berzelius, and Hall and Schönbein, on gun-cotton. VII. The British Association Committee on guncotton (1863). VIII. Manufacture of guncotton in Austria (1863) and at Waltham Abbey (1863). IX. Abel on guncotton ; its stability ; action of light and heat upon it, etc. X. Abel on pulping guncotton, and the effect of alkalis (1867). XI. Abel on the protective action of water on guncotton ; on the storage of guncotton, etc. XII. Sobrero's discovery of nitroglycerin (1847). XIII. Nitroglycerin in Holland and England (1855). XIV. Nobel's patents for its manufacture and detonation, etc. ; also blasting gelatine, gelignite, and ballistite. XIV. Analysis and composition of nitroglycerin. Its decomposition by caustic potash ; also certain chemical decompositions of nitroglycerin.

Chemical Works, their Design, Erection and Equipment. By S. S. Dyson and S. S. Clarkson. Scott, Greenwood and Son, 8, Broadway, Ludgate, London, E.C. 1912. Price 21s. net.

8vo volume, containing 201 pages of subject matter with 80 illustrations and 9 plates, and an alphabetical index. The text is classified under the following heads : I. Choice of site. II. Materials used in construction. III. First principles in laying out of works. IV. The power house. V. Sulphuric acid plant. VI. Hydrochloric acid plant. VII. Nitric acid plant. VIII. Notes on high explosives plant. IX. Sulphate of ammonia plant. X. Artificial manure plant. XI. General plant. Appendix : I. The chemical engineer. II. The saw-mill and box-making department. III. The Alkali, etc., Works Regulation Act. IV. "Welfare work" or "Prosperity sharing."

Memoirs of the Department of Agriculture in India. Records of Drainage in India. By Dr. J. Walter Leather, Imperial Agricultural Chemist. Agricultural Research Institute, Pusa. Published for the Imperial Department of Agriculture in India. Thacker, Spink and Co., Calcutta. W. Thacker and Co., 2, Creed Lane, London. 1912. Price R. 1.

Pamphlet of 8vo size, containing 140 pages of subject matter, with 4 illustrations. The subject matter is classified as follows :—I. Introductory. Methods of analysis used. Soils of Pusa and Cawnpore. Character of seasons. Cause of muddy drainage water. II. Drainage and evaporation. III. Combined nitrogen in drainage water. IV. The nature of water movements during wet weather.

Analytische Schnellmethoden. Von Dr. Victor Samter. Druck und Verlag von Wilhelm Knapp. Halle a. S. 1911. Price M. 10. Bound M. 11.

8vo volume, containing 237 pages of subject matter, with 14 illustrations. The text is classified and subdivided as follows :—I. Introduction. II. General, (i) Methods of analysis, (ii) Gravimetric determinations. (iii) Art of dry testing, (iv) Electrolysis, (v) Volumetric, (vi) Gas analysis. (vii) Colourimetric analysis, (viii) "Densimetry," (ix) Refractometry, (x) Spectroscopic and photometric, (xi) Calorimetry, (xii) Calculations based on measurement of electrical resistance. (xiii) Determinations based on measurements of the volume of precipitates. II. Special analytical methods. The metals and halogens with carbonic acid, phosphorus, oxygen, sulphur, silicon, nitrogen, hydrogen.

Huiles et Graisses Végétales Comestibles. Olive, Coton, Œillette, Arachide, Coco. Par G. Halphen. Libraire Polytechnique Ch. Béranger. Successeur de Baudry et Cie. 15, Rue des Saints-Pères, Paris. 21, Rue de la Régence, Liège. 1912. Price 8 fr.

Small 8vo volume, containing 477 pages of subject matter with large table and 14 illustrations. The alphabetical index at the end, is followed by a systematised table of contents. The text is classified under the following heads :—I. Definitions of products. II. General considerations as to legislation. III. Processes employed. IV. Spontaneous alterations of oils. V. Preparation of sample. VI. Investigation and determination of foreign substances in fatty matters. VII. Determination of characters, physical and chemical. VIII. Monographs, (i) Olive oil, (ii) Arachis oil, (iii) Cotton seed oil, (vi) Margarine from cotton seed oil, (v) Walnut oil, (iv) Poppy seed oil, (vii) Sesamé oil, (viii) Cocoanut oil. APPENDIX with legal enactments, regulations, etc.

THE STUDY OF TIMBER AND FOREST PRODUCTS IN AMERICA. A Report presented to the Forestry Committee of the University of Cambridge. By E. R. BURDON, M.A. University Press, Cambridge. 1912. Price 6d.

PAMPHLET, containing 24 pages of subject matter, and classified as follows :—I. FOREST SERVICE OF PRODUCTS. II. FOREST PRODUCTS LABORATORY, (i) Selection of Madison, Wisconsin, and co-operation of Wisconsin University, (ii) Saw-mill and drying sheds, (iii) Laboratory. Organisation. Description of each department. Wood-working shop. Timber-testing. Timber physics and microscopy and wood collection. Wood preservation and pathology. Wood distillation. Pulp and paper. Engineering Chemistry. III. OFFICE OF WOOD UTILISATION. IV. FORESTRY SCHOOLS.

CHEMICALS, OILS, AND PAINTS. Glossary on Schedule A. An analysis, by paragraphs, of Schedule A of the Tariff Act of August 5, 1909, and a Statistical survey of the Industries affected thereby, with a comparison of tariff laws since 1883. Prepared under the Direction of the Tariff Board. Transmitted to the Ways and Means Committee of the House of Representatives, Feb. 7, 1812. B. HERSTEIN, Technical Expert, Tariff Board. Washington, U.S.A. 1912.

8vo volume, containing 274 pages of subject matter, and containing six diagrams, and 100 tables. The whole of the text is arranged under three sections. SECTION I. deals with acids, alkalis and chemicals of all kinds. SECTION II. refers to (i) Chemical industry in the United States, in Germany, England, France, Canada. Also comparison of foreign trade in chemicals in 1910 in France, Germany, United Kingdom, and United States. SECTION III. (i) Tariff laws covering Schedule A. (ii) Synopsis of tariff laws relating to chemicals, etc. (iii) Synopsis of free lists relating to chemicals, etc.

SPICES. By HENRY N. RIDLEY, M.A., F.R.S., etc. Director of Botanic Gardens, Straits Settlements. Macmillan and Co., Limited, St. Martin's Street, London. 1912. Price 8s. 6d. net.

8vo volume, containing 446 pages of subject matter, with frontispiece, 15 illustrations, and an alphabetical index of subjects. The subject matter is arranged in chapters under the following heads :—I. Introduction. II. Vanilla. III. Nutmegs and mace. IV. Cloves. V. Pimento or allspice. VI. Cinnamon. VII. Cassia bark. Massoi bark. VIII. Black peppers. IX. Long pepper, Grains of Paradise. X. Cardamoms. XI. Capsicums or Chilies. XII. Coriander, Dill, Cumin. XIII. Ginger. XIV. Turmeric, Zedoary, Galangal, and Calamus root.

THE DATA OF GEOCHEMISTRY. By FRANK W. CLARKE. U.S. Geological Survey, Washington, Bulletin 491.

THE scope of this work, which consists of 782 8vo pages, including index, is indicated from the titles of the chapters :—I. The chemical elements. II. The atmosphere. III. Lakes and rivers. IV. The ocean. V. The waters of closed basins. VI. Mineral wells and springs. VII. Saline residues. VIII. Volcanic gases and sublimates. IX. The molten magma. X. Rock-forming minerals. XI. Igneous rocks. XII. The decomposition of rocks. XIII. Sedimentary and detrital rocks. XIV. Metamorphic rocks. XV. Metallic ores. XVI. The natural hydrocarbons. XVII. Coal.

SYNTHESE DER ZELLBAUSTEINE IN PFLANZE UND TIERE. Lösung des Problems des künstlichen Darstellung der Nahrungstoffe. Von Professor Dr. EMIL ABDERHALDEN, Direktor des physiolog. Institutes der Universität zu Halle a/S. Julius Springer's Verlag. Berlin. 1912. Price M. 3.60. Bound M. 4.40.

8vo volume, containing 112 pages of subject matter, arranged, as to treatment under the following heads :—I. The first dwellers upon this earth. II. Functions and operations of cellular tissue of plants. III. Synthesis of cellular constituents by the vegetable cells. IV. Functions and operations of animal cells. V. Conversion and building up of foodstuffs into flesh, blood and cellular products. VI. Building up carbohydrates. VII. Building up fats. VIII. Building up of the phosphatides. IX. Building up of the nucleoproteins. X. Building up the albuminous matters. XI. Up-build of inorganic-organic compounds. XII. Glimpses into the mystery of disturbances of cellular change. XIII. Solution of the problem of the artificial preparation of foodstuffs. XIV. Value of the results of research on the subject of digestion of foodstuffs by invalids.

AN INTRODUCTION TO THE STUDY OF FUEL. A Text Book for those entering the Engineering, Chemical and Technical Industries. By F. J. BRISLEE, D.Sc. Constable and Co., Limited. 10, Orange Street, Leicester Square, London, W.C. 1912. Price 8s. 6d. net.

8vo volume, containing frontispiece, 258 pages of subject matter with 61 illustrations, and five brief Appendices, No. I. with works recommended for reading and reference. II. Table of "Comparison of the Different forms of Energy." III. True and mean specific heats. IV. Furnace control. V. Table for converting weights and measures. There is an alphabetical index of subjects. The subject matter is treated under the following heads :—I. General chemical principles. II. Weight and volume of air required for combustion. III. Analysis of fuel and flue gases. IV. Calorimetry and determination of the heating value of a fuel. V. Measurement of high temperatures. Pyrometry. VI. Calculation of combustion temperatures. VII. Natural solid fuels. VIII. Artificial solid fuels. IX. Gaseous fuel. X. Manufacture of producer gas and water gas. XI. Theory of the producer gas and water gas reactions. XII. Explosion and the explosion engine. XIII. Air supply and measurement of draught. XIV. Furnace efficiency and fuel economy. XV. Heat balances, furnace and boiler tests. XVI. Liquid fuels.

PER CENT. TABLES FOR OIL IN COTTONSEED PRODUCTS. By Prof. C. H. HERTY, University of North Carolina. The University Press. Chapel Hill, N.C., U.S.A.

A SIMPLE and rapid method, devised by the author, is described for the determination of the oil content of various cottonseed products, by noting the specific gravity of the extract obtained by means of carbon tetrachloride (this J., 1909, 316). A set of tables is given, showing the amount of oil contained in carbon tetrachloride extracts of various specific gravities from 1·5489 to 1·604, at different temperatures.

RELATION OF LIGHT TAPPING TO THE COMMERCIAL YIELD OF NAVAL STORES. By Prof. C. H. HERTY. U.S. Dept. of Agriculture, Washington Forest Service. Bulletin No. 90.

Journal of the Society of Chemical Industry.

No 7, Vol. XXXI. APRIL 15, 1912. No. 7, Vol. XXXI

London Section.

Meeting held at Burlington House, on Monday, February 5th, 1912.

MR. E. GRANT HOOPER IN THE CHAIR.

THE PHOTOGRAPHIC INDUSTRY.

BY DR. C. E. KENNETH MEES.

History and Development.

The position of the photographic industry among the chemical industries is a somewhat peculiar one. While essentially a branch of chemistry, the nature of the product and the methods of production are distinct from those employed in other chemical industries, so that the photographic industry has evolved a complete technique of its own, with its own machines, its own type of factory, and its own methods of testing the products, methods which bear little relation to the usual analytical processes of the chemist. Moreover the photographic industry has from its origin been a secret industry, the working methods of which have never been published, and the technique of which is largely unknown to the majority of scientific men other than those of the industry itself. While, in spite of it, some factories have undoubtedly developed to a very high state of organisation, this secrecy must also have reacted upon the industry as a whole, tending to inefficiency and a vast amount of unnecessary waste and difficulty, which the lack of free exchange of knowledge must bring in its train.

The industry at present is developed chiefly in England, America, France, and Germany, though there are a number of scattered factories in other parts of the world. Climatic conditions, however, have tended to restrict manufacture to the temperate regions, although at the same time, the fact that photographic products are, on the whole, unstable, causes constant attempts to be made to erect factories wherever a ready market can be found, and the centralization in selected localities, which is so typical of such industries as the steel industry, is less marked in photographic work. On *a priori* grounds it might be expected that the photographic industry would have been developed near districts producing its chief raw materials, glass and paper. But a survey of the position brings out very stongly the fact that the history of the photographic industry is a history which hinges round men, and round very few men. Where the early manufacturers started, there the business has remained, and the new firms which have sprung up have mostly been offshoots from some one or other of the older factories; so that the two main original centres of the industry as a whole, have been London in England, and Rochester in the United States, while in France, Lyons has developed as a great photographic centre.

The typical history of the photographic material business has been somewhat as follows. In the first place, we have an amateur, or, more generally, a professional photographer making the materials which he required for his own business. Next, finding that the manufacture of the materials was more congenial or more remunerative than the pursuit of his own avocation, he supplied other photographers of his acquaintance, and then for a number of years may have carried on a small business employing three or four people, generally girls, and either making the emulsions himself, or, what was commoner, getting his wife to make them for him. It is an interesting fact that in most of the original photographic factories, the emulsions were made by the wife or daughter of the owner, generally for the obvious reason that they could better be trusted than any outsider. With the replacement of hand coating by the coating machine, came production on a factory scale. The owner of the business usually weighed out all the chemicals required, keeping the formulae strictly to himself, and comparatively small factories organised on these lines have for many years been the backbone of the photographic industry, indeed, it is largely to such factories that we owe the high standard of product which has been reached to-day. But, as in all other businesses, the day of the small factory is practically over, and the future of the photographic industry is to the modern factory, employing hundreds of workpeople, manufacturing on a vast scale and at low costs, and using specially designed machinery at every step of the process.

It is difficult for those who regard photography as an occasional hobby to realise to what an extent it has developed as an industry; but even as a chemical industry it is not to be despised, as is evident from the fact that one factory in England alone orders its potassium bromide in thirty-ton lots, and that one company is the largest user of silver except a Government mint; that the production of the biggest English photographic paper factories is counted in miles per day, and of plates in acres. In this, as in all other industries, the question of the available supply of raw material is a serious one. Just as one of the great dye works refused to use toluol as the raw material for a new product because the world's production of toluol was insufficient to supply the market, so one great photographic firm, after many costly experiments, abandoned a new paper, because the whole world's supply of fucose would not have kept them running for three months. And so to-day I may rightly claim that the photographic industry is not only a chemical industry, but is a great chemical industry numbering its workers by the thousand, and its products by the ton.

Chemical nature of the processes involved.

The photographic industry is an industry based on colloidal chemistry, its nearest relatives among the chemical industries being apparently the production of rubber and of high explosives, although when looked at from the standpoint of factory organisation, no two industries could be more diverse than the photographic one and the explosives industry, the factory organisation of photography being concentrated to a degree, while the dangerous nature of the explosives industry necessitates the segregation of almost every individual worker in a separate building, so that whereas an explosives factory may occupy a square mile or more of land, a photographic plate factory is simply a cubical block of building. The fact that the work is conducted in darkness, renders arrangements for external lighting superfluous, the chief problem in the erection of a photographic factory being the supply of a sufficient quantity of pure, dust-free air to all parts, by means usually of forced draught, with appropriate heating, cooling, and purifying appliances.

As by far the greater portion of the photographic industry deals with the light-sensitive properties of salts of silver, and as I have no practical acquaintance with those sections of the industry which deal with other salts than those of silver, I propose to restrict my remarks to the processes involving the use of silver compounds. Essentially the production of sensitive photographic materials relates to the behaviour of silver salts when they are converted from the colloidal condition to the crystalline, the conversion being retarded and regulated by the suspension of the salts in gelatin, and complicated by the changes simultaneously undergone by the gelatin itself. Dealing first with the production of high speed photographic plates—the branch of industry with which I have the most practical acquaintance—the process is briefly as follows. A concentrated solution of potassium bromide, usually dimolecular, is made, and to this is added a small quantity of gelatin, the amount being sufficient to prevent the complete deposition of the silver bromide when a concentrated warm solution of silver nitrate is added. Now, if instead of using dimolecular solutions, much weaker solutions, say, quintimolecular, are used and gelatin is added to the silver solution as well as to the bromide solution, then on mixing the two solutions the resultant mass will be quite transparent, showing only slight opalescence, and in such an emulsion the whole of the silver bromide will be in a state of colloidal suspension. With greater concentration of the solutions the bromide will be precipitated in a state of greater agglomeration, but it may be assumed that even with the concentrated solutions generally used for making emulsions, a certain amount of the silver bromide precipitated is at first in the colloidal condition. Now if the newly mixed emulsion is kept at a moderate temperature for a short time it will, as the emulsion maker says, "go over," this "going over" being manifested by an increase in the optical opacity and a change from a red colour to a white when a flame is observed through a thin film of the emulsion on glass. This "going over," which appears to be the fundamental change in a photographic emulsion, would seem to indicate that the silver bromide was no longer in the colloidal state, but had become entirely crystalline, and a further digestion of the emulsion, during which the optical opacity decreases, and the colour of the flame tends to become bluer, appears to be associated with an aggregation of the silver bromide into larger crystalline agglomerates, with a progressive elimination of the originally formed small crystals, the change from a physico-chemical point of view being apparently a concentration of energy into large crystals, which, the concentration being an endothermic one, are really in an explosive state, the simplest explanation of the formation of an image by the action of the very small quantity of light energy required to make a fast photographic plate developable, being apparently that this additional energy is sufficient to initiate a decomposition in the silver bromide crystals by a mode analogous to that in which a detonator causes the decomposition of an explosive mass.

It is, consequently, each individual grain which must be regarded as the analogue of an explosive cartridge, and the film may be likened to a sandbank in which many cartridges are imbedded at various depths, each cartridge being isolated from all others, so that its detonation is not communicated. In such a bank the effect of a shock incident from above (represented by the number of cartridges exploded), would be proportional to its intensity, each separate cartridge, however, being completely shattered if the shock is sufficient to explode it at all.

The unit of the image, which I have been referring to as a large crystalline agglomerate, is the silver grain of the photographic plate; when it is referred to as large, it is only so in comparison to the units of colloidal suspension, for instance, because in comparison with visible crystals it is extremely small, the diameter of average grains being of the order of one thousandth of a millimetre, and the grain itself would appear to be a complex structure, consisting of a number of crystals, and quite possibly containing gelatin. It is probable that photographically each grain is a self-contained unit, attackable by the developer only if it has itself been exposed to light, and that the sensitiveness of an emulsion is a statistical average of the sensitivenses of the individual grains of which it is composed.

It is impossible here to enter into a discussion of the theory of the latent image or of development, and I have introduced it at all only because of its bearing on the reactions involved in the making of an emulsion, the fundamental process of the photographic industry.

Photographic papers may be divided into two classes. The older papers, or print-out papers, on which the print is made by exposure to daylight, the colour of the deposit being afterwards modified, usually by the deposition of gold upon it; and the later class, now rapidly supplanting the former, in which an emulsion, similar to a plate emulsion, is coated upon paper instead of glass, and the image obtained by exposure for a short time to a weak light source is developed. Print-out papers consist of a silver chloride emulsion precipitated in gelatin or collodion, generally in the colloidal condition, and usually containing both free silver nitrate and an organic acid. On exposure to light, the chloride is converted into the so-called photochloride, having a purple or reddish colour, the photochloride apparently consisting of an adsorption compound of silver chloride and silver, the composition varying according to the conditions of production. After the paper has been printed, the colour of deposit is modified by immersion in a bath containing a gold or platinum salt associated with a weak reducer, so that metallic gold or platinum is precipitated, and the unused silver chloride is then removed by solution in thiosulphate, which only attacks the photo-chloride to a very small extent. The chief difference between emulsions for development papers and those for plates, apart from the fact that paper emulsions are of much lower sensitiveness and consequently finer grain, lies in the fact that as the image is to be observed by reflected light, it is necessary that as far as possible it should be kept on the surface of the paper, and to this end the emulsion used has a larger proportion of silver to gelatin, the coating being thin. The colour of the image obtained is naturally dependent upon the size of the grain, and if warm tones are required, developers can be used by which the silver is deposited in a very finely divided state almost approaching to colloidal division. By the admixture of such fine grain silver with larger grains, various tones can be obtained upon development papers.

Factory Organisation.

The typical organisation of a photographic factory is similar to that of most chemical factories, the raw materials going through a progressive series of processes, and the factory costs being most easily estimated upon a process costs system taking a definite area of the product as the unit charge, and the work done in each section progressively, so that the total gives the cost of the product at the stock room.

Taking as typical of the industry the production of photographic plates, the processes are as follows:—Cleaning the glass; Making the emulsion; Coating the emulsion upon the glass; Drying the plates; Cutting the plates to the required sizes; Examining the plates and packing them in paper; Packing the plates in boxes and labelling, the plates being then dispatched to the stock room.

The factory is divided into:—Glass stock and cleaning rooms; Emulsion making and stock room; Coating room; Drying room; Cutting room; Packing room; Boxing room; Plate stock.

A paper factory will be similarly organised, except that paper does not require cleaning; if any preliminary process is necessary the paper is surfaced with barium sulphate, but as far as I know, baryta coating is only done in one factory in this country. The paper is also automatically dried by the machine on which it is coated. The paper after passing through the trough containing the emulsion, travels over a cold roller to set the gelatin, and then it is hung up in loops in a long drying chamber, through which it slowly travels, emerging dry at the end of about 2½ hours from the time at which it was coated, and being rolled direct and taken to the cutting rooms. Surface coated papers without gelatin, such as platinum papers, are dried almost instantaneously on a short machine by hot air, and do not require the elaborate hanging and slow drying arrangements necessary for gelatin coated papers.

Photographic glass is the specially selected best quality of thin sheet glass, made in a works which prepares sheet glass for all purposes. Even in the best works, only about one-quarter of the sheets prepared are fit for photographic use, the remainder being used for windows, etc. The best photographic glass comes at present from Belgium, although good glass is also made in England, and the cost is about 2½d. per square foot. The glass is supplied cut to sizes which can be at once cut to the sizes used by photographers; the smallest size coated being generally the English whole plate, or 8½″ × 6½″, which cuts into four quarter plates. The glass arrives at the works packed in straw in boxes holding usually about two gross sheets, and it is left in these boxes in the glass store until it is required for use, when it is unpacked and transferred to the glass-cleaning room.

In the early days of the industry the glass was cleaned by hand, being rubbed over with a mixture of methylated spirit and whiting, which was then washed off and the glass polished. Nowadays, however, the glass is cleaned by automatic machinery into which it is fed. The glass plate is received between two rubber covered rollers which push it forward between rapidly rotating brushes, the glass first passing between two metal tubes which spray a strong solution of soda and water on both sides. As it passes through the rollers the brushes, of which there are two or more pairs, remove all dirt from the surfaces; it is then passed through more sprays and brushes with clean water running over it, and emerges at the end of the machine perfectly clean and ready for the next process. This consists of the coating of the glass with a substratum, usually a weak solution of gelatin containing chrome alum, by means of which the emulsion is made to adhere to the glass and "frilling" is prevented. After coating with the substratum, which may be done either by the machine or by hand, the glass is dried either by passing through a long, heated box on the cleaning machine, or by transferring it to a heated oven. Each sheet is then examined for defects, and if passed, packed in a box and transferred to the coating room.

The emulsion is made, as has already been explained, by adding a concentrated solution of silver nitrate to a bromide solution containing gelatin. Negative emulsions also usually contain a small amount of iodide, a percentage of potassium iodide being introduced into the gelatin solution, while diapositive and "gas light" paper emulsions consist chiefly of silver chloride, only a small proportion of the silver salt being in the form of bromide. After the emulsion has been mixed it must be treated in order to increase its sensitiveness or "ripen" it. This can be done either by maintaining the emulsion at a high temperature for a considerable time, or by digesting at a lower temperature in the presence of ammonia. Both methods have advantages, the choice between them depending on the use for which the plates are intended and on the experience of the emulsion maker.

After ripening, the emulsion is cooled by means of ice and set to a firm, hard jelly, and then cut into thin shreds for washing, the washing being necessary to remove the potassium nitrate produced in the reaction. The emulsion is cut up by forcing it by pressure through a metal plate containing a number of small holes, so that it emerges in thin shreds. The press in a factory is usually a hydraulic one. After the shreds have been washed, the emulsion is melted and is then ready for coating.

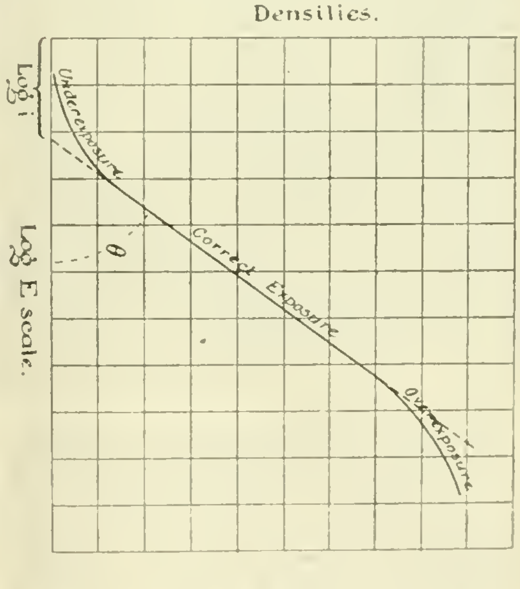
For about ten years after the manufacture of gelatin dry plates was commenced the glass was coated by hand, each sheet of glass being covered with an even layer of emulsion, usually poured from a teapot, and then laid on a level plate to set; but in all modern factories the coating is done by means of a special machine. There are several forms of coating machines, but one of the simplest is that invented by Dr. Smith of Zurich, which has been generally adopted in Germany and in several works in England. In this machine the plates are carried chiefly by means of felt bands. The glass is first laid on a dry band, which carries it under the weir. Above the weir is a barrel containing the emulsion which flows down a tube on to the weir, where it spreads out into a thin sheet which then flows down on to the plates, which are carried through under the weir by means of felt-covered rollers. The plates are then carried forward separated from each other by a roller moving at a slightly faster rate, and carried on to a long band of felt, the under side of which travels in a tank full of iced water. In travelling down this long cold band the emulsion sets on the glass, and at the other end the coated plates are transferred to a dry band, which removes the superfluous moisture from the backs, and are then placed in racks and taken to the drying rooms, where they are slowly and evenly dried, the process lasting about twelve hours. When dried, the plates are stacked in boxes and taken to the cutting and packing rooms.

The cutting can be done by hand with a diamond, using pieces of wood of accurate widths as gauges, but it is more usually done on a more or less complicated machine. One of the best known cutting machines is the Munro Cutter. In the table of this machine are four jaws which open automatically and close on the plate when it is laid on the table, centering it and at the same time holding it fast while two diamonds running at right angles to each other slide over the back. The plate is then lifted off the table and breaks accurately into quarters. It is most interesting to watch one of these machines at work cutting up plates at an enormous rate and yet with certainty and accuracy.

The cut plates are now examined for defects by red light and then packed in fours in paper and the three fours packed again in paper and placed in the box in which they are to be sold.

Testing Methods.

Since the products of the photographic industry are essentially materials which are sensitive to light, it is clear that chemical analysis will not be a satisfactory method of testing the products, and in practice they have always been tested in relation to the actual purpose for which they are to be used. In the early days of the industry it was customary to have attached to each factory a studio, in which an operator tested the plates by taking a portrait, usually of himself, and, either allowing for variations in the daylight and atmospheric conditions, or exposing together with a standard plate, judged as to whether each successive batch of plates was sufficiently good to be issued. While this method of testing has been almost entirely abandoned for sensitive plates and films, papers are still tested in a similar manner, and I am informed by the manager of a most important photographic paper factory who is a man of the highest scientific attainments, that he does not consider that any photometric test has yet been devised by which so small a difference in the quality of the paper can be detected, as by a skilled printer used to the paper, and printing by a negative to which he is accustomed. If this be so, it would seem to suggest that much work is still necessary for the perfection of the photometric methods which can be applied to paper, and indeed, so far as I know, very little work has been done on the subject.



The earlier and cruder methods of testing plates have, however, been almost completely abandoned. The first change came when Warnerke introduced his sensitometer as early as 1881, and for many years all factories used some form or other of sensitometer of the Warnerke type for their routine testing. The Warnerke instrument consists of a graded series of densities, with a number printed on the middle of each, and the sensitiveness of the emulsion is estimated as being the last number which can be read after development and fixation. This method has the very great advantage of speed in working, and if used with really constant light, it should be still of great use to the practical emulsion maker for such a purpose as roughly testing his emulsion to see whether it is good enough to coat, or for checking batches against one another to commence packing before a complete laboratory trial can be made.

In 1890, Hurter and Driffield introduced their famous system of sensitometry, in which a plate is exposed for a number of varying times to a standard light source, and after development the mass of silver corresponding to each exposure is determined photometrically, and the relation between the amounts so obtained, which they called the density, and the logarithm of the exposure is plotted on a curve (see diagram). They showed this curve to be analyzable into three sections: the first, where the rate of increase o density steadily increases, termed the under-exposed portion of the curve; the second, where the increase of density is proportional to the logarithmic exposure, the period of correct exposure; and the third, where the density increases less rapidly than the logarithmic exposure, the period of over-exposure. They showed that for a considerable variation of development, the point at which the straight line portion of this curve meets the exposure axis is independent of the time of development, or of the composition of the developer, provided that the developer does not contain free potassium bromide; and this point they took as representing a fixed point, the position of which was proportional to the sensitiveness of the plate. The slope of the curve is dependent upon the time of development, becoming steeper as development is increased, and it can be shown that the relation between the slope of this line and the duration of development follows an exponential function which can be defined by two constants, one giving the maximum contrast to which the plate can attain, and the other being a velocity constant dependent on the composition of the developer, the temperature, and the nature of the plate. In modern photographic factories some form of this Hurter and Driffield testing system is generally adopted as the control for the emulsions, the instruments originally used having been superseded by others capable of more rapid work and of superior accuracy, while the candle originally used by Hurter and Driffield has been replaced by a more modern standard light source, such as the pentane lamp, an acetylene standard burner, or an electric glow lamp with potentiometer control. Different factories at present differ very widely in the speeds which they assign to their products by this means of testing plates, and apart from the tendency to exaggeration, which commercial interests may sometimes introduce, there is no doubt that the photographic industry is, at the present time, sorely in need of a definite standard light source. Two light sources which are photometrically equal to the eye may be of different photographic value, and there is, at the present time, nothing which is in any sense a standard photographic candle. It is impossible here to deal with the conditions which such a standard must fulfil, or with possible methods of approaching it; but there is no doubt that one of the great needs of the industry as a whole is the adoption of a uniform standard in its testing methods.

At the conclusion of the paper the lecturer explained the construction and use of the testing instruments employed in the industry, a set of which was kindly lent by Messrs. A. Hilger, Limited. A full description of these will be found in the Photographic Journal, July, 1904, while for further information on the theory of the photographic process the book on that subject, published by Messrs. Longmans, may be consulted.

Discussion.

The Chairman said that Dr. Mees had given them a very good idea of the magnitude of the photographic industry. When they heard of potassium bromide being bought in 30 ton lots and of the use of silver in an amount only equalled by a mint, they got a very clear idea of what was being done on a manufacturing scale. Personally he would have liked to hear a little more in the way of a review of the progress which had taken place in connection with the photographic art. Dr. Mees had referred to what yet remained to be done in connection with the provision of an improved standard light, but there were other features of which those not directly concerned in the industry would have been pleased to have heard a little more. For instance, there was very little said about photographic paper beyond the reference to baryta coated paper as to which they would have been glad to have heard something further.

Mr. J. Spiller said that he had used dry plates as soon as they were offered in commerce in the year 1880. In 1854 Sir William Crookes and himself had succeeded in preserving the sensitiveness of collodion plates, but they never could reach anything like the high standard of convenience which the vastly improved gelatino-bromide dry plates subsequently offered. A great difficulty in the early years of the use of gelatino-bromide plates was that, when working in warm weather, many beautiful pictures were lost as soon as developed, owing to "frilling" of the plate. Many schemes were introduced for the purpose of meeting this inconvenience, one of which was to touch the edges of the plate with a brush immersed in india-rubber solution, so as to secure at any rate the margin from undergoing this process; but that was not a cure, for still, in the middle of the plate, the "frilling" would sometimes occur. This defect was met at present by the use of a substratum of gelatin containing a small proportion of chrome alum, which, when dry, clung, as it were, to the subsequent film of gelatino-bromide and held it down. He asked how was it that when the substratum was applied to the glass in that manner and dried, when the truly sensitive coating was applied on the surface thereof, some of that chrome alum did not work upwards and spoil the result? Also what were the proportions between the bromide, iodide, and chloride employed? At first, he believed, the bromide was used alone as the sensitive material in haloid emulsions. Then it was found that much better effects were obtained by introducing a certain quantity of iodide or even chloride. Probably the selection of the salts would be varied in order to obtain different effects. Thus, colour plates might be more efficient with bromide alone, or with a minimum of the other salts. In an inspection of a photographic factory some years ago he was inclined to pity those who had to work there either in what seemed to be utter darkness or in a very feeble red light. Were there any statistics as to the influence that had upon the human eyesight? Did it not somewhat prejudice the ordinary vision? One final question he would ask: how was it in cutting the plate to smaller sizes the manufacturer did it so carefully as not to loosen the film from the glass?

Mr. C. H. Bothamley said that he, like Mr. Spiller, could go back to the comparatively early days of dry plate photography, and having used a considerable quantity of dry plates from that time to this, he was struck very much by the marked progress in the mechanical perfection of the plate. It was extremely rare nowadays to meet with the various mechanical defects which were a constant source of trouble certainly 20 years ago and even later, and one of the points of progress was the very one to which Mr. Spiller had just referred, the absence of frilling, which formerly resulted, not infrequently, in the rapid and complete separation of the film from the glass. That absence of frilling was no doubt produced by the method which Dr. Mees had described. A very interesting point, which users of plates must have noticed very frequently, was that the cutting of the glass did to a certain extent lessen the adhesion of the film, because it was very common to find a film very slightly frilled along two edges, but the frilling, unlike what it used to do in the old days, never spread, and of course there was complete freedom now, in all the better class of plates, from a tendency to fog and from insoluble patches that would not dissolve even if the plates were left all the night in the fixing bath. He thought one might say that, notwithstanding the essentially unstable character of the film to which Dr. Mees had referred, the modern photographic plate was really one of the most perfect products any chemical manufacturer now produced.

Mr. F. F. **Renwick** said he thought the time was coming when those who were engaged in the photographic industry would undoubtedly have to pay a great deal more attention than they had done in the past to the scientific study of the under-exposure portion of the characteristic curve of the plate. He could confirm the opinion that, at present, scientific methods of testing, such as could be applied to plates, were useless for paper. The under-exposure portion of the curve in the case of papers was of the utmost importance. Practically speaking, he supposed that from one-half to two-thirds of most pictures was contained within the under-exposure period of the emulsion on the paper. Further, in the negatives themselves, the under-exposure portion of the plate curve frequently played a very large part. That branch of the curve would, he thought, soon be studied with as much care as the so-called correct-exposure period had already received.

Mr. **Krohn** said it was quite true that the question of standards of light for photographic purposes was still somewhat in a state of chaos, and in consequence the speeds of plates were fictitious to a very large extent. In spite of what Dr. Mees had said, he thought the method of testing plates by making negatives on them was a practically useful one and, in fact, necessary for the purpose of settling whether the plates were good in quality or not. The eye was often able to detect delicacies and variations in quality in the actual negative which it was almost impossible to detect with a sensitometer or with a curve unless one had a great deal of experience. So he thought the two tests should always go hand in hand, and until a great deal more was known about the curves, negatives should be constantly checked against the curves and the curves against the negatives. In coming to a decision as regards standard light, standard apparatus and standard conditions, something should be done to try and use apparatus which was not so expensive as some of that shown, since a great deal of useful work, and work which was accurate enough for the purpose, could be done with very much more simple apparatus. When they considered that in exposures in a camera a difference in exposure 25 per cent. or even 30 per cent. either way, was practically indistinguishable to the eye in the finished picture, it did seem straining the point when they asked for accuracies of 5 per cent. or even 10 per cent. which were possible in the Hurter and Driffield apparatus. The apparatus seemed to him to be too expensive for general use. When it came to a question of studying plates from the scientific point of view and getting improvements in the manufacture, it was a different thing.

Mr. W. **Gamble** expressed a little disappointment that Dr. Mees had confined himself entirely to photography with silver salts. There was a much larger field in photography with other salts, and with other compounds, and he would have liked to have heard a good deal about salts of iron, of platinum, and of chromium, especially of chromium, because they entered into all photographic mechanical processes largely. Again, bitumen was a most interesting sphere of photographic work, and there were also many organic compounds which had considerable photographic sensitiveness and possessed features of great interest. Dr. Mees had dwelt upon the great improvement in photography, but only in regard to the photographic dry plate and photographic papers; but it was probably inconceivable to many what an immense field there was in those photographic processes which were now employed for the purpose of mechanical work. From a chemical point of view it was far more interesting work and offered much greater fields for research. They probably did not know to what extent the old processes of collodion and collodion emulsion were still used.

Mr. A. J. **Newton** referred to the progress in the development of colour-sensitive plates, to which Dr. Mees had largely contributed.

Mr. W. F. **Reid** said Dr. Mees had made one theoretical observation only in his paper, and it was that very observation which had interested him most. It was as to the form in which the silver compound exists. He had used the word "crystals" and he supposed he meant it in the general sense more than in the accurate scientific sense. Dr. Mees said that those crystals were acted upon by light, and that the light acted in the same way as a detonator might act on an explosive; but he (the speaker) did not think the simile was quite correct and he did not think the action was the same, because if they detonated an explosive, no matter how much explosive they had, once they exploded a detonator in contact with it they detonated the whole mass. With the plate, however, a very small quantity of light would not act in that way. It was a quantitative action with regard to a plate, whereas with a detonator and an explosive it would not be quantitative. That particular observation had interested him specially, because it was a similar observation that had first interested him in photography. It was over 40 years ago and he was working in the laboratory of Helmholtz in Berlin, who had just invented the Opthalmoscope, which was then composed of a number of thin sheets of glass and on looking through those one could see into the eye. It was considered a most wonderful invention at that time. Helmholtz was working on the eye and he (the speaker) had learned the fact which had ever since puzzled him and which he thought had a very great bearing on photography. It was that the human eye will take an impression of light in say a millionth of a second, but the same human eye will not form a complete picture in less than about 1/50th of a second. If that was the case, the final impression caused by the light on the eye must be developed at a slower rate and there must be some substance in the eye that could develop it after the light itself had ceased. Many years afterwards he had had an opportunity of trying a number of experiments on that very line. Some similar experiments had been carried out by others, especially by Dr. Russell; but not quite in the same direction. If a substance that was acted on by the light, even if one could see no action at all, were put in contact with a sensitive plate, an image would be formed on the plate. For instance, luminous paint would produce a weak impression; but if to the luminous paint a substance was added which was more acted on even than luminous paint, although not visibly, a very strong action would be produced on the plate and the exposure of what he might call the dummy plate was much shorter. He had tried in many ways to accelerate the speed of the dummy plate. The problem was a very fascinating one, because plates prepared in that way and afterwards kept in the dark could, after a certain time, be used again. That might not appeal to those present from a commercial point of view, but he thought to the photographer who was in distant lands it would be very useful to know that he could use his plates again and again. He well remembered taking photographs in a forest in Brazil with 12 in. by 10 in. collodion plates and the difficulty he had to keep the stoppers in the collodion bottles. A dark tent was then necessary and there were many other troubles. He also remembered making experiments with emulsions in the early days. He heard many people complain of the quality of the gelatin they got, and most faults were attributed to its quality. He thought himself that a blind adhesion to gelatin was doing the photographic trade some injury. Gelatin was the best thing known at present from the practical point of view, but if Dr. Mees could tell them something about research work being carried out with other materials it would be of very great interest to him.

Mr. F. H. **Carr** asked for information as to the chemistry of the process of the ripening of the emulsion, also as to the possibility of adding other chemical substances to the gelatin to bring about the same change.

Dr. J. **Lewkowitsch** referred, in connection with the explosive action of silver, to a mild explosion he had experienced recently after placing a stock solution of silver nitrate with the usual proportions of ammonia and caustic soda (for testing for acrolein) containing about 4 per cent. of silver nitrate in a glass stoppered bottle in a dark place to keep; after a week when the cupboard was opened, the bottle was found to have been practically pulverised, atomised silver clinging to the pieces of glass. He mentioned this to warn against the repetition of this experiment. Had silver amide or nitride been possibly formed?

Dr. H. P. Stevens, referring to the substratum which contained the chrome alum, asked what was the maximum temperature at which it would hold. Would it hold at a temperature where the water was perhaps 80° or 85° F. ? Also was that substratum applicable to films ? He had had some unfortunate experiences about four years ago in the tropics, in trying to develop films where no ice and no cold water could be obtained. Of course the gelatin softened, but this would not have mattered if it had not slid off the surface of the celluloid film.

Mr. Maitland said that for the prevention of frilling, the substratum of the plate would, by itself, be useless for plates used in the tropics, since, if the emulsion was of the ordinary unhardened kind, the substratum alone would not prevent frilling or blistering. The emulsion itself needed to be of a certain viscosity for use in the tropics. An ordinary plate which would develop at a normal temperature of 68° F. in temperate climates would be useless in the tropics unless it was specially prepared. It was customary to harden it, and, in that case, it was developed at any temperature up to 100° F., which was about the practical limit. The fact that the cutting of the plates did not prevent the frilling round the edges might, of course, be due to a particular make of plate in which the stratum had not been properly prepared, as for example, the right proportion of chrome alum. Otherwise the cutting of the plates would have no effect.

As far as his experience went the physiological effect which the red light had on the workpeople, amounted to practically *nil*. Green light was considered to have a beneficial effect on the nervous system, but he had not found that a red light had any injurious effect on people who were constantly working in it day after day. It might, however, have a slight effect on persons of markedly hysterical temperament, but otherwise he did not think the average person was affected.

Mr. Krohn referred to the unsatisfactory effect of the Hurter and Driffield method. He endorsed what Mr. Krohn said. One very often found that the eye could detect finer differences in plate testing, by a merely visual examination, than when a plate was subjected to the highly scientific procedure of the Hurter and Driffield system. Different people, even when using the same apparatus, the same spectrophometer, etc., obtained widely varying results. The personal equation largely affected the question, and consequently it was hardly to be wondered at that various makers got such widely divergent results.

These other light-sensitive salts would amply repay a more thorough investigation into them, and, personally, he would like to hear that something more than a cursory examination was being made into their properties and effects.

Dr. Mees, in replying to questions, said he was very doubtful whether any progress had been made for some time. The progress in the photographic industry had been for the past ten years mainly concerned with the development of factory methods.

Mr. Spiller had asked how it was that chrome alum did not work up through the emulsion from the substratum. It must be borne in mind that the amount of chrome alum in the substratum was very small indeed, and that as the emulsion also contained chrome alum, the shifting of it from one coating to the other was of no consequence. A negative emulsion contained approximately 5 per cent. of iodide, the remainder being bromide, no chloride being present, the latter being always converted, if added, by the bromide present. Red light was apparently harmless to the eyes, and owing to first-rate ventilation and cleanliness being essential to a plate factory, good health was a noticeable feature among the employees.

The matter of frilling was of considerable interest. In the early history plates were cleaned before coating with polishing powders, giving a splendid surface but no hold for the film such as the modern use of soda solutions in place of polishing powders gave. Mr. Renwick and Mr. Krohn had both suggested that greater attention should be given to the measurement of the under-exposed portion of the curve, but that would mean more accurate apparatus.

He did not want to carry to its limit the analogy, the relation between the detonator of an explosive and a plate, but he considered that when a grain in a photographic plate was detonated it was detonated absolutely, once for all. He did not mean it necessarily flew into small pieces, but it was a distinct molecular change brought about by the action of light. The action of light with regard to that individual grain was exactly the action of a detonator on an explosive, it sets it off; but there were an enormous number of grains in a plate. A small amount of light falling on the plate let off a few grains, but a larger amount of light let off more of the grains. Mr. Reid's remark about the human eye and the time required for an impression, was a most interesting experiment. Whereas people generally ascribed increased sensitiveness in a dark place to the expansion of the iris, it was certain it was not due to that except to a very small extent.

Mr. Reid's reference to gelatin as a source of failure and acting as general whipping boy, was perfectly applicable at the present time. Emulsion makers generally ascribed bad emulsions to bad gelatin. But gelatin was not the only material suggested for making emulsions. There had been a considerable amount of work done with other substances. Glucose had been tried and glycerin had been used. Apparently any colloid might be used for making emulsions, but none approaching gelatin in sensitiveness had been obtained.

With regard to the ripening of emulsions, they were beginning to get dawnings of the elementary chemistry and physics of the subject, but they were only dawnings. He had no doubt sooner or later the theory of the ripening of emulsions would be developed. He thought Professor W. Bancroft had developed one from *a priori* investigations with which emulsion makers would not agree. The frilling to which Mr. Maitland had referred was really a melting of the gelatin. The substratum ought to keep a film on whether it was in the tropics or anywhere else. If the emulsion used in England melted, then it was necessary to have a harder one for use in the tropics, but the substratum should hold it on. Chrome alum and gelatin would not substratum celluloid film, and film makers were very careful not to tell people what would substratum film. Since cinematograph films had come into use, substratums for films had very much improved, because the films in a cinematograph worked off the slide and rolled up separately if they were not good.

Manchester Section.

Meeting held at the Grand Hotel on Friday, March 1st, 1912.

DR. GILBERT J. FOWLER IN THE CHAIR.

SOME BASIC COPPER COMPOUNDS.

BY W. F. A. ERMEN.

Having occasion recently to investigate the formation of cuprammonium compounds of cellulose, I found it necessary to determine the nature of the products formed by the action of different alkalis on copper sulphate. It was not until I had completed my work that I came across the paper by Pickering read before the Chemical Society in 1907, where he describes the results of the action of soluble hydroxides on copper sulphate in dilute solutions. I have investigated this reaction under various conditions, and also the action of carbonates, bicarbonates, and ammonia. The results with caustic soda confirm those obtained by Pickering, whilst some of my further results appear to be of sufficient interest to warrant their publication.

Copper sulphate and sodium hydroxide.—When caustic soda is added to copper sulphate solution, a greenish precipitate is first formed, which on further addition of alkali turns blue, owing to the formation of cupric hydroxide, and this gradually turns brown and then black, the black compound being cupric oxide. This latter change is much accelerated by warming. When solutions approximately normal are used, no very definite or concordant results can be obtained, but if the reactions are allowed to proceed in the presence of much water, it is found that the reactions become definite, and can be associated with the formation of identifiable compounds.

Whether caustic soda is added to copper sulphate or copper sulphate is added to caustic soda, until all the copper is just precipitated in the one case, or copper just begins to appear in the solution in the other case, the reacting quantities are always the same, *viz.*, 2 molecules of copper sulphate and 3 of caustic soda. If the copper sulphate solution is kept boiling during the addition of the caustic soda the final result is the same; but if copper sulphate is run into boiling caustic soda the black hydrated oxide first comes down, and this slowly and incompletely turns into a blue basic sulphate after long boiling.

The greenish compound formed when all the copper sulphate is just decomposed by the addition of caustic soda was identified in several ways. For the precipitation, 1/10 normal solutions of the reagents were used; from the volumes of these, the quantity of each reagent could be measured. These indicate the probability of the equation, $4CuSO_4 + 6NaOH = CuSO_4.3Cu(OH)_2 + 3Na_2SO_4$. The nature of the compound was further identified by the distribution of the SO_4 in the filtrate and precipitate. When caustic soda was added to a known volume of copper sulphate and the mixture filtered, 75 per cent. of the total amount of SO_4 was found in the filtrate. Then the precipitate was dissolved in acid, and yielded 25 per cent. of the original SO_4 taken. The same amount of SO_4 was extracted from the precipitate by washing it with 4 per cent. caustic soda solution. During this treatment the precipitate turned from green to blue, owing to the formation of copper hydroxide, but, contrary to our expectation, the blue compound did not turn black, even after several weeks keeping, at the ordinary temperature. The formation of the green $CuSO_4 3Cu(OH)_2$ was observed by Pickering to take place with other alkalis as well as caustic soda. When lime water was used, he found that the copper compound was always associated with definite amounts of calcium sulphate. He also found that when sufficient alkali was added to the copper sulphate to make the liquor just alkaline, the alkalinity slowly disappeared, and that further small additions of alkali could be made gradually, until there was formed a compound $CuSO_4.9Cu(OH)_2$. When excess of alkali is added to copper sulphate solution we finally get the blue hydroxide, and this slowly (more rapidly on warming) turns brown, and if boiled, almost black. The black compound is very little attacked by copper sulphate, but if the change is allowed to proceed in the cold, we get a dark brown product, quite free from SO_4, which on treatment with copper sulphate slowly turns green again. I have not had time to study this compound very thoroughly: the precipitates take many days to wash free from the excess of the reagents used. The analyses I have made point to the formation of a compound containing 3·5 atoms of copper to 1 of SO_4, which suggests a mixture of equal parts of $CuSO_4.3Cu(OH)_2$ and $CuSO_4.2Cu(OH)_2$.

Copper sulphate and sodium carbonate.—When dilute solutions of these substances are mixed in the cold, basic carbonates are formed, as is well known. When all the copper has been precipitated, or just ceases to be precipitated, one molecule of each substance has reacted, but the carbonate initially formed at once breaks down, and gives $CuCO_3.Cu(OH)_2.H_2O$. This substance is blue, but on standing loses water, becoming granular and green, and is then malachite, $CuCO_3{\cdot}Cu(OH)_2$. Treatment of the precipitate with caustic soda appears to remove all the carbonate, blue copper hydroxide being left. At boiling temperatures the reaction proceeds quite differently. Copper sulphate solution added to boiling carbonate gives a black precipitate of copper oxide, in such a dense form that boiling copper sulphate has no action at all on it.

When sodium carbonate is run into boiling copper sulphate, no carbonate is produced. The volumes of the solutions required to just precipitate all the copper show that there have entered into the reaction 4 molecules of copper sulphate and 3 of sodium carbonate:—

$$4CuSO_4 + 3Na_2CO_3 = CuSO_4.3Cu(OH)_2 + 3Na_2SO_4 + 3CO_2.$$

This result was confirmed as usual by the analysis of the filtrate and precipitate.

Copper sulphate and sodium bicarbonate.—The action of bicarbonate, at the point when there is no copper in solution, is the same as in the case of the carbonate. Basic carbonates are formed, containing no sulphate. When copper sulphate is added to hot bicarbonate, the same black precipitate is formed as with the carbonate. When bicarbonate is run into hot copper sulphate, there is formed apparently mainly the tri-hydrate again, $CuSO_4.3Cu(OH)_2$. The reaction, however, is not quite straight forward, as instead of the 3 molecules of bicarbonate demanded by this equation, only 2·8 are required.

Copper sulphate and ammonia.—When copper sulphate solution is added to ammonia, a blue precipitate is at first formed, which, however, at once dissolves. At a certain stage, any further addition of copper sulphate produces a permanent precipitate. The volumes of the solutions required to reach this point indicate that one molecule of copper sulphate has reacted with four molecules of ammonia. The blue solution is supposed to contain the compound, $CuSO_4.4NH_3.H_2O$

If the addition of copper sulphate is continued, the green precipitate increases in amount, until the point is reached when the liquor is colourless, and copper just begins to appear in the solution as copper sulphate. At this period the quantities used indicate the equation,

$$3CuSO_4 + 4NH_4HO = CuSO_4.2Cu(OH)_2 + 2(NH_4)_2SO_4.$$

That there is here a different basic sulphate to that produced by sodium hydroxide or carbonate is also shown by the fact that the filtrate contains 66·6 per cent. of the SO_4 originally taken, and the precipitate 33·3 per cent. The reaction is the same whether copper sulphate is run into ammonia or *vice versa*, and whether the copper sulphate in the latter case is hot or cold.

If gaseous ammonia is used instead of ammonia solution, the reaction may be taken somewhat further. First the basic sulphate is formed as before, and then the precipitate dissolves again with the formation of the blue solution, presumably of $CuSO_4.4NH_3.H_2O$. If still further ammonia is passed into this, a violet precipitate is produced, the production of which was patented by Follet and Ditzler (Eng. Pat. 22,753 of 1907; see this J., 1908, 19). I have analysed these crystals, and find them to be the actual substance, $CuSO_4.4NH_3.H_2O$, which Roscoe and Schorlemmer describe as separating when the blue solution is covered with alcohol and allowed to stand. They are almost insoluble in strong ammonia, and also in alcohol and ether. The crystals are not very stable in air unless they are at once washed free from ammonia with alcohol and ether and dried at a low temperature.

The same compound can be formed by merely triturating together crystalline copper sulphate and strong ammonia, or by adding anhydrous copper sulphate to strong ammonia solution. The final product of passing ammonia gas over crystalline copper sulphate also appears to be the same product. If anhydrous copper sulphate is used there is first formed $CuSO_4.5NH_3$, which, however, by exposure to moist air or ammonia liquor of the right strength again gives rise to the same compound.

In these notes, I have dealt only with the compounds produced from copper sulphate, as this is the cheapest and most commonly used of the soluble copper salts. At a later date I hope to describe the similar compounds formed from the chloride and other copper salts.

DISCUSSION.

The AUTHOR, in reply to questions, stated that he had not tried washing the basic sulphates with ammonium carbonate. He had tried the action of sodium carbonate and bicarbonate. From the tri-hydrate, as it might be called. sodium bicarbonate always removed a definite amount of sulphate, about 4·6 per cent. of the total amount taken, whilst sodium carbonate had practically no action. Caustic soda removed all the sulphate left in the precipitate. In the washing of the precipitates with sodium bicarbonate, the results obtained were confused by the solvent action of the bicarbonate in which both the basic sulphate and the hydroxide of copper were slightly soluble. The ordinary insecticide in the wine district (Bordeaux mixture) was prepared by mixing lime or lime water with copper sulphate. Pickering showed that when a correct quantity of lime was added to precipitate the copper sulphate there was formed what might be called the tri-hydrate, and the precipitate was always associated with definite proportions of calcium sulphate. Pickering also showed that if the basic sulphates were formed in presence of excess of sodium sulphate, compounds associated with sodium sulphate were obtained. He ascribed the poisonous action of all such compounds purely to a slow "going-back" of the mixture, probably owing to the action of carbon dioxide of the air liberating copper sulphate in very minute proportions. Pickering further stated that the insoluble copper compounds were inactive as insecticides or fungicides; their slow action was due to the gradual liberation of copper sulphate. A solution of copper sulphate alone could not be employed as it killed the leaves, and presumably it could not be used weak enough. Emulsions of paraffin oil with basic compounds of copper had been proved to be most useful. One gramme of copper sulphate dissolved in a large quantity of soft water with 134 c.c. of lime water gave the tri-hydrate, which if charged with paraffin oil produced a perfect emulsion that never seemed to separate. The oil itself was also a good insecticide; its effect would be subsequently added to by the slowly decomposing tri-hydrate. The tri-hydrate made with lime seemed to give a better emulsifying effect than when made with caustic soda owing to its being heavier, on account of the associated calcium sulphate.

Newcastle Section.

Meeting held at Armstrong College, on Wednesday, March 13th, 1912.

MR. E. F. HOOPER IN THE CHAIR.

AN EXAMINATION OF SOME BITUMINOUS MINERALS.

BY F. C. GARRETT, D.SC.

While in Trinidad in 1902, Professor Henry Louis made a collection of bituminous minerals, the examination of which was entrusted to me by the Colonial Office; some of the results obtained I am now permitted to lay before the Society, and I have added figures obtained by the examination of some specimens from other sources.

Methods of analysis.—*Water* has usually been determined either by drying the specimens at 40°—50° C. or by desiccation *in vacuo* over sulphuric acid, and the two methods give very similar figures. Thus, when a sample of finely divided "Soft Lake Pitch" was heated for three hours it lost 19·15 per cent.; heating for another hour gave a further loss of 1·0 per cent., and a third period of 1½ hours of only 0·34 per cent.—total loss 20·49 per cent. Another portion was placed in a desiccator which was exhausted several times daily; in the first 18 hours the loss amounted to 19·16 per cent.; in the next 41 hours to 0·4 per cent., in the following week to 0·59 per cent., and in the next 24 hours to 0·14 per cent.—total 20·28 per cent. In each case there is some loss of organic matter, and with pitches containing much water this is not negligible; in a number of experiments the mineral was carefully heated in a tube through which a stream of purified air was blown, and the escaping gases were led (after drying) over red-hot cupric oxide and into potash bulbs. In two experiments with the "soft lake pitch" it was found that after five hours heating a gain in the weight of the potash bulbs corresponding to 0·51 and to 0·63 per cent. of carbon had been obtained. With the drier pitches (which could be dried in a shorter time) the loss was decidedly smaller, and as desiccation *in vacuo* is exceedingly slow it was finally decided to air-dry the samples and record the loss on heating to 45°—50° for two hours as "moisture"; an exception being made in the case of specimens containing large percentages of water; these would have required several hours heating, and were therefore dried over sulphuric acid. Clearly the method is not absolutely accurate, but is sufficiently so for my purpose.

Sulphur.—The estimation of sulphur in these substances presented great difficulty, and Hodgson (J. Amer. Chem. Soc., 1898, **20**, 882) showed that none of the methods commonly in use gave trustworthy figures except that of Carius. To overcome this difficulty, a modification of Eschka's method was devised, and has been described by Garrett and Lomax (this Journal, 1905, **24**, 1212). In all cases duplicate determinations were made and the results are summarised in Table I.

TABLE I.

Sulphur content of the specimens.

	Percentage of sulphur (mean).	Percentage of sulphur calculated on organic matter only.
Petroleum	1·39	1·39
Liquid pitch	2·66	2·66
Soft pitch from Hatley's Hole, Lot C.	2·88	3·13
Soft lake pitch	3·62	5·54
Lake pitch	3·81	5·98
Lake pitch artificially dried by steam	4·12	6·52
Land pitch	3·55	6·17
Cheese pitch	3·84	6·38
Iron pitch	3·86	6·27
Impure pitch from sea shore	3·20	7·67
Manjak (Grahamite) A	3·57	3·74
Manjak (Grahamite) B	2·96	3·13
Manjak (Grahamite) C	3·05	3·20
Glance pitch	5·12	5·17
Barbados manjak	0·86	0·89
Cuban hard pitch (Grahamite)	8·47	8·59
Elaterite (elastic)	1·14	1·16

The figures in the second column being obtained from those in the first by calculation, it is obvious that the experimental errors will have been magnified—in some cases almost doubled.

Proximate analysis by heat.—As the proximate analysis of coal by heat gives results which are of considerable value for purpose of comparison, those obtained with other bituminous minerals should be of equal interest. The result obtained, however, varies very much with slight alterations of the conditions, and therefore, except in particular cases, all determinations were made with the same crucible, and under the same conditions. About two grams of the pitch were placed in a platinum crucible, which was heated (with the lid on) by the tip of the Bunsen flame for half a minute after the disappearance of flames around the lid, the time required in nearly all cases being within a few seconds of two and a half minutes, and the bottom of the crucible being faintly red during the last half minute. The crucible was then lowered into the centre of the flame of a "Blast Bunsen" and heated to bright redness for two minutes, was cooled without removing the lid, weighed, and the loss of weight (less "moisture") recorded as "volatile hydrocarbons." The coke was then heated to redness until all combustible matter was burned away, the loss of weight recorded as "fixed carbon," and the residue as "ash."

Variations were made when examining glance pitch, manjak, Cuban pitch and elaterite, all of which melt, and very easily froth over; it was necessary in these cases to use a rather larger crucible, a smaller quantity of the mineral (1 to 1·5 gram), and to spread the first heating over about five minutes instead of two and a half.

As the burning off of the fixed carbon would decompose any calcium or magnesium carbonates which might be present, in several cases the ash was treated with ammonium carbonate and again weighed, but in no case did this produce any change in the weight of the ash.

The results are decidedly interesting, and we have here a ready method of distinguishing between certain of the minerals; for example, it is perfectly easy to distinguish Lake pitch from Land pitch by this method. If the percentage of volatile matter is divided by that of "fixed carbon," a figure is obtained which may be called the "volatility factor," and may prove of great use in classification. Thus the volatility factor of a Lake pitch is above 5, of a land pitch between 4 and 5; again, the factor for Barbados manjak is 2, while that of Trinidad manjak is only about 1·6. Clifford Richardson (J. Amer. Chem. Soc., 1910, **32**, 1032), contends that the Trinidad manjak and the "hard pitch" of Cuba are Grahamite, and my results confirm his conclusions.

The results are summarised in Tables II., III., and IV.

Table II.

Proximate analyses by heat of petroleum and the "pitches."

	Petroleum.	Liquid pitch.	Soft pitch from Hatley's Hole, Lot C.	Soft lake pitch.	Lake pitch.	Lake pitch dried by steam.	Land pitch.	Cheese pitch.	Iron pitch.	Weathered pitch from shore.
Moisture	—	—	1·2	5·0	1·2	—	8·6	3·5	0·6	6·0
Volatile matter .	97·94	93·0	81·9	54·5	53·3	52·9	47·7	49.35	50·6	33·7
Fixed carbon ..	2·01	7·0	10·15	9·6	10·25	10·3	9·85	10·8	11·2	8·0
Ash	0·05	0·02	6·75	30·9	35·25	36·8	33·85	36·35	37·6	52·3
	100·00	100·02	100·00	100·0	100·0	100·0	100·0	100·0	100·0	100·0
Volatility factor.	48·9	13·28	8·08	5·68	5·2	5·14	4·85	4·56	4·49	4·2

Table III.

Proximate analyses by heat calculated on the anhydrous pitches.

	Liquid pitch.	Soft pitch from Hatley's Hole, Lot C.	Soft lake pitch.	Lake pitch.	Lake pitch artificially dried by steam.	Land pitch.	Cheese pitch.	Iron pitch.	Impure pitch.
Volatile matter	93·0	82·9	57·4	53·9	52·9	52·2	51·1	50·8	35·8
Fixed carbon	7·0	10·25	10·1	10·40	10·3	10·8	11·2	11·3	8·5
Ash	0·02	6·85	32·5	35·7	36·8	37·0	37·7	37·9	55·7
	100·02	100·00	100·0	100·0	100·0	100·0	100·0	100·0	100·0

Table IV.

Proximate analyses by heat of the Grahamites, manjak, etc.

	Cuban hard pitch (Grahamite).	Trinidad manjak (Grahamite). A.	B.	C.	Barbados manjak.	Glance pitch.	Elaterite (elastic).
Moisture	nil.	nil.	0·46	0·8	0·5	nil.	nil.
Volatile matter	53·55	59·8	57·28	59·05	64·6	74·8	96·7
Fixed carbon	45·0	37·8	37·36	36·25	31·9	24·2	1·1
Ash	1·45	2·4	4·89	3·9	3·0	1·0	2·2
	100·0	100·0	100·00	100·0	100·0	100·0	100·0
Volatility factor	1·19	1·58	1·55	1·62	2·0	3·09	87·9

Proximate analysis by solvents.—The natural pitches are most commonly examined by successive treatment with various solvents, and it is usual to call that portion which is soluble in petroleum spirit or acetone "petrolene," and that which is insoluble in these liquids but soluble in chloroform "asphaltene"; petrolene and asphaltene together making up the "bitumen," the remaining organic matter, which will not dissolve in any of these solvents, is reported as "organic matter not bitumen." Several methods of extraction having been tried, especially those of Linton and of Sadtler, it was decided to adopt Sadtler's method; there seems little to choose between the two, the results with careful work being very similar, but Linton's method is very tedious, and Sadtler's is undoubtedly the more convenient.

In our early experiments about two grams of the anhydrous mineral were mixed with the same amount of clean sand, and wrapped in a dry filter paper; this was then placed in a second dry filter paper, and fastened round the mouth with a platinum wire, both the papers and the wire being also weighed. In our latter experiments, instead of proceeding in this manner, a piece of filter paper 9 in. by 6 in. was dried in the steam oven and weighed, it was then folded lengthwise, about two grams of the pitch accurately weighed was placed on the central portion of the paper, spread in a very thin layer, the sides of the paper turned over, and the whole rolled from each end towards the centre; the cylinder so obtained (about 3 in. high and 1¾ in. thick) being tied round with a weighed platinum wire. In this way a larger surface of pitch was exposed to the solvent and extraction proceeded more rapidly. The roll or bag was then placed in a Sohxlet's extractor, and treated with acetone until the extraction was complete; from time to time the specimen was removed from the extractor, allowed to drain, dried in the steam oven for two hours, and weighed; when two consecutive weighings were identical, or when twelve hours treatment removed less than ten milligrams the extraction was considered to be complete, and the loss was recorded as "petrolene." The sample was then treated in the same manner with chloroform and the loss entered as "asphaltene." Finally the roll was burned, the amount of mineral matter which remained was weighed, the percentages of petrolene, asphaltene, and mineral matter added together, subtracted from 100, and the difference entered as "organic matter not bitumen," *i.e.*, as being the amount of organic matter which had not been removed by the solvents but had been burnt during the last operation. Microscopic examination showed that in the case of the "pitches" this insoluble organic matter was largely composed of plant remains.

Attempts were made to check these determinations by evaporating the solvents and weighing the residue, but it was found impossible to free the oily petrolene from acetone, without driving off some of the more volatile portions of the petrolene itself. The acetone solutions were of a fine orange-red colour and showed a strong green fluorescence; on evaporation they gave a thick red-brown syrup, while on prolonged boiling (in absence of air) decomposition appeared to take place, and drops of a black tar, easily soluble in chloroform, separated. The chloroform solution was black even when very dilute, underwent no apparent decomposition when boiled, and on slow evaporation gave a black shining brittle residue, very like glance pitch.

Analyses by extraction with solvents are not very accurate, as differences in the rate of extraction affect the amounts extracted. Endemann (this J., 1896, 15, 871) has shown that asphaltene is to some extent soluble in solutions of petrolene, and it seems likely that if the acetone be allowed to stand on the pitch long enough to become even a moderately concentrated solution of petrolene it will dissolve some of the asphaltene. This is probably the reason why we were not able to get as good agreement between our analyses by this method as by others.

Peckham and others state that the petrolene and asphaltene when burnt leave an appreciable ash, and contend that the bitumen contains some acid able to form with inorganic bases salts soluble in chloroform, etc. Clifford Richardson, however, has shown that if the solution is spun in a centrifugal machine for some time the amount of mineral matter is greatly reduced, and that its composition is that of clay; he therefore concludes that it is only mud which has passed through the paper, and our results confirm his conclusion.

With common filter paper considerable amounts of ash were obtained from the extract, but when working with two thicknesses of good paper (Munktell's No. 1 F) the loss was negligible, and the outer paper contained a small quantity of a fine grey inorganic matter.

The results are summarised in Table V.

Notes on the specimens.

1. Petroleum from Guayaguare; a rather thick almost black liquid of a disagreeable smell. Sp. gr. 0·9226. Flash point, 27° C.

2. Liquid pitch from an "asphaltic spring" 50 yards from the shore just before getting to "Point Rouge." A viscous fluid of a dark brown colour, with an extremely offensive smell suggestive of volatile sulphur compounds. Sp. gr. 0·926. On standing in a tall glass cylinder for some weeks about 5 per cent. of water separated, and the oil above was used for examination.

3. "Soft pitch from Hatley's Hole, Lot C." A black, lustrous cake, in cold weather somewhat similar in appearance to Glance pitch.

4. Soft lake pitch. This was packed in a wide-mouthed glass bottle, the stopper being held down by a pad of soft pitch wedged between it and the lid of the box, but the stopper had been forced out, and part of the contents of the bottle had frothed over. That remaining in the bottle was quite black, and could be powdered and sampled during frosty weather.

5. Lake pitch.

6. "Dried pitch" (lake pitch dried by steam). Forty-five tons of lake pitch are placed in an iron tower heated by steam under 100 lb. pressure; the pitch melts, and such impurities as may float up or sink are removed. About 30 tons of dried pitch are obtained.

7. Land pitch.

8. Cheese pitch (land pitch). A honeycombed mass of a light brown colour; on breaking it up it was found that many of the cavities contained water.

9. Iron pitch.

10. "Impure pitch." A piece picked up on the seashore; it was very much weathered and portions of seashells were embedded in it.

11. Manjak (Grahamite). A.: Obtained by Professor Louis from the Vista Bella Mine. Professor John Cadman (at that time Inspector of Mines in Trinidad) kindly sent me two other specimens from the same mine, and wrote of them as follows:—"Manjak taken from the 180-foot level at the Vista Bella Mine, San Fernando, Trinidad. The section of the vein at this point is:—

Fine clay.	Columnar structure.	Bright manjak.	Dull columnar structure	Fine clay.
65°	ft. 8	ft. in. 7 6	ft. 16	—

The samples were taken near the edge of the different varieties." Both samples contained many small specks of grey, inorganic matter, and looked as if they had been splashed with mud. Sample B., from the columnar portion of the vein, presented no special features, but C.

Table V.

Proximate analyses by solvents.

	Liquid pitch.	Soft pitch from Hatley's Hole. Lot C.	Soft lake pitch.	Lake pitch.	Lake pitch artificially dried by steam.	Land pitch.	Cheese pitch.	Iron pitch.	Manjak (Grahamite).	Glance pitch.	Barbados manjak.	Impure pitch from sea shore.
Moisture	—	—	—	—	—	—	—	0 67	—	—	—	—
Petrolene	90·95	65·36	44·43	39·22	38·37	35·23	34·99	35·82	17·06	34·64	38·72	30·47
Asphaltene	5·10	27·11	14·75	16·69	16·81	10·42	11·72	17·03	80·70	64·84	56·27	7·88
Organic matter not bitumen	—	1·03	8·55	8·95	8·34	19·64	16·91	9·13	—	—	4·04	9·61
Ash	—	6·50	32·27	35·12	36·48	34·71	36·30	37·33	2·24	0·83	0·97	52·04
	—	100·00	100·00	99·98	100·00	100·00	99·92	99·98	100·00	100·31	100·00	100·00

(E. L. Lomax.

from the central portion was very interesting. It was in large lumps of fine lustre, was brittle, the fracture being quite irregular and the surfaces uneven; it is clear that the "penicillate and cuboidal structure" usually held to be characteristic of the grahamites is not so.

12. Glance pitch. A lustrous black solid of conchoidal fracture, very similar to

13. Manjak (Barbados), a specimen given to me by Professor P. Phillips Bedson.

14. "Cuban hard pitch" (Grahamite), from Parker Mine, Cacarajicara, given to me by Mr. J. Kirsopp, Junr.; remarkable for the very high percentage of sulphur.

15. Elaterite, from Windy Gap near Castleton in Derbyshire; given to me by Mr. C. W. Osmond. It melted readily, and it was obvious that the inorganic matter consisted only of grains of sand, etc., entangled in the bitumen. Johnson (Phil. Mag., **13**, 22) analysed elaterite and found C = 85·47, H = 13·28, total 98·75 per cent., and ascribed the low result to loss, but the addition of S = 1·16 brings the total to 99·91 per cent. Unfortunately the amount at my disposal was too small for full investigation.

My thanks are due to the Secretary of State for the Colonies for permission to publish these figures, and to Professor Louis and the various other gentlemen who have been good enough to provide me with material. Also to Mr. E. L. Lomax for his assistance in the study of the action of solvents on some of the minerals.

Yorkshire Section.

Meeting held at Queen's Hotel, Leeds, on Monday, 22nd January, 1912.

MR. C. RAWSON IN THE CHAIR.

THE ACTION OF SULPHUR DIOXIDE UPON OILS AND THEIR FATTY ACIDS.

BY S. A. HIRD AND L. L. LLOYD, PH.D.

The bleaching of oils and fats by means of sulphur dioxide does not appear to be employed technically, and little appears to have been published upon the action of this bleaching agent upon these compounds. Some attempts were made to find a suitable method for using sulphur dioxide or sulphurous acid for this purpose. The experiments that were carried out appeared to give promising results, many oils being considerably reduced in colour by the action of sulphur dioxide during a short time. In some cases the action of the reagent was allowed to continue for two months, the majority of the oils becoming dark brown or black and very viscous. The dark colour was not removed on again treating with sulphur dioxide, but in some cases appeared to increase. The colour of the final reaction products appeared to be dependent upon the nature of the fatty acids present in the oils. A number of oils, and independently the fatty acids obtained from the oils, were subjected to the action of sulphur dioxide under different conditions. In most cases the physical and chemical properties were found to alter. Generally, the iodine value was reduced, the saturation number increased, and the melting point and solubility were altered by the treatment. These values were determined after thoroughly washing the treated oils or fatty acids with boiling water, until the washings no longer gave a precipitate with barium chloride and nitric acid; the washed fats were then dried at 100°—103° C. The values have not been recorded because they vary according to the length of time and the conditions of treatment with sulphur dioxide. The increase in the saturation number and the decrease in iodine value was found to be highest when the oils, or better the fatty acids, were treated in petroleum ether solution. After thoroughly washing with water, the products of the reaction were free from sulphur. The acetyl value of the treated fatty acids was also determined, but in all cases the value was only slightly higher than the apparent acetyl value of the untreated acids, thus proving that hydroxylation was not the cause of the decrease in the iodine value.

The production of a dark colour and the polymerisation of most of the oils or fatty acids appeared to be governed by the iodine value, because the higher the iodine value, the more rapid was the darkening and thickening of the oils or fatty acids. This view, however, was not supported by the results of the action of sulphur dioxide upon castor oil when treated in the cold, or to a greater extent upon practically pure oleic acid. The fatty acids from castor oil and olive oil, and pure oleic acid, have roughly the same iodine value; after these compounds have been treated with sulphur dioxide and air, sulphuric acid is present in the case of olive oil, a minute trace of sulphuric acid only in the case of castor oil when a solvent is used, but with pure oleic acid sulphuric acid could not be detected. The sulphuric acid was detected by extracting with boiled water, then distilling off the greater portion of the water and testing with barium chloride after addition of hydrochloric acid. Further, by evaporating the extract in a vacuum until a few cubic centimetres remained, the liquid was found to carbonise a small piece of cotton on heating to 100°—110° C. The formation of sulphuric acid, but to a far less extent, was also proved when the oils or fatty acids were treated with sulphur dioxide in absence of oxygen. The oxygen for the conversion of the sulphur dioxide into sulphur trioxide was apparently obtained from the oxidised oils or fatty acids present. The darker colour obtained with the oils or fatty acids by means of oxygen and sulphur dioxide is no doubt due to the oxidisable oils acting as catalytic agents in the transference of oxygen from the air to the sulphur dioxide, the production of sulphuric acid being consequently cumulative. This catalytic action is upheld from the fact that the colour reactions take place according to the drying qualities of the oils, the quicker drying oils giving the colour reactions most readily. Again, with quicker drying oils, the higher is the amount of sulphuric acid which is produced. The fatty acids, in most cases, do not give so deep a colour as the oils; this may be due to the action of the sulphuric acid that is produced upon the glyceryl radical. On treatment with sulphur dioxide, especially in presence of air, the oils develop an unpleasant odour, whereas the fatty acids are scarcely altered in odour.

When the oils or fatty acids are heated with sulphur dioxide and air or oxygen in sealed tubes, the amount of sulphuric acid produced is high, on account of the oils being more readily oxidised at the higher temperature. In the case of castor oil fatty acids, the product obtained was the sulphated fatty acids.

The action of sulphur dioxide upon the oils was carried out in bottles of about 200 c.c. capacity: 50 grms. of the dried oils was poured into the bottles and sulphur dioxide passed for a few seconds, the bottles being then well-stoppered and well waxed to prevent access of air.

The fatty acids from the oils were obtained by saponifying with alcoholic potash, diluting with twice the volume of distilled water, and then extracting the unsaponifiable matter twice with benzene, the separating funnel being placed in a water oven at about 60°—70° C. The alcoholic solution of the soap was evaporated and acidified with hydrochloric acid, the fatty acids being afterwards dissolved in ether and well washed with water. The ether was distilled off and the fatty acids dried in a vacuum desiccator. The dried fatty acids, in portions of 20 grms., were subjected to the action of sulphur dioxide in bottles in the cold under similar conditions to those used in the treatment of the oils.

Oils and fatty acids.	Colour.	Action of sulphur dioxide.			Solubility of products after six months' action of sulphur dioxide.			Action of sulphur dioxide upon oils or fatty acids in solution in benzene, carbon tetra-chloride, and petroleum ether.
		In presence of air or oxygen.		In absence of air or oxygen.				
		Short period.	Long period.		Benzene.	Ether.	Petroleum ether.	
Linseed oil ……	pale brown	bleached in four hours to pale amber	black solid mass	similar to cols. 3 and 4.	partially soluble	soluble	practically insoluble	Solutions become warm, reddish brown colour which slowly disappears giving pale yellow. The solutions then turn gradually black, with separation of insoluble substance.
Fatty acids ..	chestnut brown	do.	not quite as black as the product from the oil	do.	more soluble than oil product	do.	do.	Similar to above, except that no red changing colour is obtained.
Soya bean oil ….	golden yellow	brown thin liquid	solid black mass	brown to black, varying with different samples	soluble	do.	sparingly soluble	Solutions become warm, quickly bleached, afterwards turning brown. With petroleum ether as sol a dark skin collected on the surface.
Fatty acids ..	yellowish white	liquefied, slowly darkened	solid dark brown mass	do.	do.	do.	moderately soluble	Similar to oil, products more soluble.
Maize oil …….	dark reddish brown	olive brown, changing slowly to golden yellow	viscous black mass	similar to cols. 3 and 4	do.	do.	partially soluble	Solutions become warm, bleached, then turn dark. In the experiments where pet. ether and carbon tetra-chloride were solvents some of the sulphur dioxide was displaced by oxygen. The solutions turned black, insol. matter separating.
Fatty acids ..	light brown	bleached to golden yellow and then liquefied	do.	dark brown product	do.	do.	do.	Similar to oil, products more soluble.
Cotton-seed oil ..	golden yellow	turns viscous rapidly changing to brown	dark brown	chestnut brown	do.	do.	sparingly soluble	Solutions become warm, bleached to pale yellow, colour gradually changes to chestnut brown. The colour increases quickly on replacing some of the sulphur dioxide by oxygen.
Fatty acids ..	pale yellow	partially liquefied	do.	do.	do.	do.	soluble	
Sesame oil …….	pale yellow	brownish, partially liquefied	chestnut brown	light brown	do.	do.	do.	The solutions turn green and then almost colourless, gradually developing a light brown colour. The fatty acids do not give the green colour.
Fatty acids ..	practically colourless	yellowish brown	do.	do.	do.	do.	do.	
Arachis oil (edible nut oil)	very pale yellow	changes slowly in colour	chestnut brown	light brown	do.	do.	do.	The oil or fatty acids gave only a slight yellowish brown tone.
Fatty acids ..	colourless	partially liquefied	solid chestnut brown mass	do.	do.	do.	do.	
Olive oil …….	yellowish green	olive brown, slowly discolourised	yellowish brown, slight thickening	very little change	do.	do.	do.	
Fatty acids ..	practically colourless	no change	yellowish brown, no liquefaction	do.	do.	do.	do.	
Castor oil …….	do.	do.	no change	no change	—	—	—	After standing for one year with sulphur dioxide and oxygen a slight brown colour is obtained. In the experiment where carbon tetra-chloride was employed, a small amount of brown substance separated from the solution.
Palm oil ……..	reddish brown	bleached	not much change	no change	—	—	—	
Fatty acids ..	pale yellow	no change	no change	no change	—	—	—	
Cocoanut oil …..	white	do.	do.	do.	—	—	—	
Fatty acids ..	do.	do.	do.	do.	—	—	—	
Whale oil …….	pale yellow to brown	bleached, and then thickened	black viscous mass	black viscous mass	partially soluble	fairly soluble	sparingly soluble	Solution becomes warm, the colour of the solutions turn yellow, red, and finally black. With carbon tetra-chloride or petroleum ether as solvents an almost black substance separates.
Fatty acids ..	pale yellow to brown	bleached and liquefied	do.	do.	do.	do.	do.	
Tallow ……….	pale cream	pale yellow	pale yellow	no apparent change	—	—	—	
Fatty acids ..	colourless	do.	do.	do.	—	—	—	
Bone fat ……..	pale yellow	pale yellow	pale yellowish brown	do.	—	—	—	
Fatty acids ..	do.	do.	do.	do.	—	—	—	

Note.—From all of the oils except castor, coconut, and tallow, sulphuric acid was produced by the action of sulphur dioxide and air.

Notes on preceding Table.

Linseed Oil.—The product, after neutralising the sulphur dioxide with caustic soda, had an unpleasant odour. Different samples of linseed oil when treated with sulphur dioxide in absence of air did not give the same black final products, but all the samples tested gave at least a dark brown colour.

Soya Bean Oil.—A sample of hot expressed oil, rich brown in colour, was bleached, and then gave a darker colour by action of sulphur dioxide than the cold expressed oil.

Maize Oil.—The froth, which is generally obtained on shaking maize oil, is no longer observable after the oil has been in contact with sulphur dioxide for four days.

Cotton Seed Oil.—The rapidity with which the colour develops to a chestnut brown by action of SO_2 and air varies with different samples of oil.

Sesamé Oil.—The fatty acids, after allowing to stand in a thin film in an atmosphere of oxygen, give a far deeper colour on treating with sulphur dioxide.

Arachis Oil (Edible Nut Oil.)—Arachide oil, an impure arachis oil, used largely for oiling tops and for the manufacture of soaps, gives results that cannot be distinguished from the purer oil.

Olive Oil.—The change to olive brown by the action of sulphur dioxide is probably due to the presence of chlorophyll.

Castor Oil.—Sulphuric acid is only formed in the cold with castor oil and sulphur dioxide when a solvent is used. This appears to show the presence of oxidisable oils in castor oil.

Palm Oil.—Sulphuric acid appears to be soluble and to have practically no action upon the oil or fatty acids in the cold.

Coconut Oil.—No sulphuric acid is produced.

Whale Oil.—Four different samples were examined, the colours ranging from pale yellow to brown. By the treatment with sulphur dioxide in absence of air different amounts of sulphuric acid were produced.

A. Albitzky* has shown that on heating elaidic acid under pressure with sodium bisulphite or sulphurous acid, transformation takes place with formation of oleic acid. The transformation is, however, not a complete one, the reaction being reversible.

The fatty acids from linseed, cotton seed, and castor oil, and also commercial pure oleic acid, with an iodine value of 86·5, and oleic acid, that had been prepared from tallow having an iodine value of 89·2—89·5, in portions of 20 grms., were heated to 150° C. in sealed tubes, filled with sulphur dioxide during twenty four hours. In all the experiments, except with pure oleic acid, darkening or carbonisation was observed, and sulphuric acid was formed. Sulphuric acid was produced in largest amount with linseed oil fatty acids, a fairly large amount from cotton seed oil, and only a small amount from commercial pure oleic acid. The pure oleic acid was slightly darkened, but no mineral acid could be detected.

Castor oil fatty acids gave a brownish liquid product; sulphuric acid was not detected, but, after hydrolysing with hydrochloric acid, sulphuric acid was found. This is, no doubt, due to the ease with which castor oil fatty acids are "sulphated." The castor oil fatty acids when heated with sulphur dioxide, in absence of oxygen, do not give a "sulphated" product. Although oxidisable fatty acids are present, they appear to be prevented from absorbing oxygen from the air at the ordinary temperature unless a solvent is present.

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* See this J., 1900, 357 and 1903, 306.

Obituary.

JOHN PATTINSON.

John Pattinson was born in 1828 at Alston in Cumberland, and educated at the Grammar School there. His early training was at the Felling Chemical Works, Newcastle, where the Pattinson process of desilverising lead was carried on. He was there for some years, afterwards entering the laboratory of Messrs. Bell Bros., Middlesbrough. In 1858 he returned to Newcastle, and became an analytical and consulting chemist. He was appointed Food Analyst for Newcastle, and, under the Food and Drugs Act of 1875, became Public Analyst for the County of Northumberland and several other local authorities.

Mr. Pattinson was Vice-President of the Chemical Society; an original Fellow of the Institute, on whose Council he served, and of which he was a Censor; Vice-President of the Society of Public Analysts; original member of the Iron and Steel Institute. He was one of the founders, in 1868, of the Newcastle Chemical Society, which, chiefly at Mr. Pattinson's instigation, was merged in 1882 in the Society of Chemical Industry, of which he was an original member; he served the Society as Chairman of the Newcastle section, he was a member of the Council, and for many years, until his death, a member of the Publication Committee.

Mr. Pattinson was a sound musician; President of the local Choral Society; Vice-President of the Literary and Philosophical Society; a Magistrate, and keenly interested in social and philanthropic matters.

Mr. Pattinson was active to the last. He was at the laboratory the day before an illness resulting from a chill; this lasted but a few days, and he died on the 28th March, 1912.

Journal and Patent Literature.

Patent Specifications may be obtained by post by remitting as follows:—

English.—8*d.* each, to the Comptroller of the Patent Office, W. Temple Franks, Esq., Southampton Buildings, Chancery Lane, London, W.C.

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German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

Diesel oil-engine, and its industrial importance, particularly for Great Britain. R. Diesel. Inst. Mech. Eng., Mar. 15, 1912. [Advance proof.] Pages 1—52.

The first reliable Diesel engine, of 18 h.p., was set to work in 1897 at Augsburg. During the 14 years which have since elapsed, the engine has been improved and the sizes increased, so that now an indicated efficiency of 48 per cent. and brake efficiency 35 per cent. are attained, and a large marine engine is now being tested at Nürnberg giving over 2500 h.p. per cylinder (two-cycle double-acting). Oil-fuel is stated to yield 2¼ times more power in a Diesel engine, than when used for raising steam for steam engines. The oils which can be used in the Diesel engine are, (*a*) mineral oils freed from benzine (gas oils); (*b*) lignite tar oils; (*c*) fatty oils from vegetable or animal sources, such as earth-nut (arachis) oil, castor oil, fish oils, etc. With the aid of special apparatus, pit coal-tar oil, water-gas and oil-gas tars, and tar from vertical retorts can also be used. In the present state of development of the Diesel engine, tars from horizontal or inclined retorts cannot be used. There is no fear at present that the supply of mineral oil will not meet the growing demand. The number of engines now working could be increased a hundredfold with the present production of oil, whilst 40 per cent. of the present production would be sufficient for the world's naval and mercantile fleets. New oil-districts are being developed and the production increases 3½ times more quickly than the production of coal. Since tar and tar-oils can be used most economically in the Diesel engine, it is suggested that the best use of Britain's coal supplies would be by the production of coke, for metallurgical purposes, and tar and gas for use in Diesel engines and in gas engines. The distribution of liquid fuel can be effected by pipe-lines. Such a scheme is now being executed on the River Congo, where a line about 250 miles in length is being built from Matadi to Leopoldville, for the distribution of petroleum. A further possibility is the cultivation of plants from which vegetable oils can be obtained, thus providing a native source of fuel. The results of recent tests with arachis oil (earth-nut or peanut oil) show a consumption of 240 grms. (0·53 lb.) per b.h.p.-hour, calorific power of oil 8600 cals. per kilo.; hydrogen, 11·8 per cent. Engines have also been run satisfactorily on castor-oil and animal oils, such as train oil. The arachis oil is also suitable for lubricating, so that with this source of fuel the engine becomes quite independent of imported oil in tropical countries. A historical account of the development of the Diesel engine is given; at present the four-stroke-cycle engine is used for stationary engines up to 600 h.p., but the two-stroke cycle engine will probably soon come into more general use. The paper also includes the following specification of tar-oil suitable for Diesel engines:—(1) Tar-oils should not contain more than a trace of constituents insoluble in xylol. (2) The water content, tested by the xylol method, should not exceed 1 per cent. (3) The residue on coking should not exceed 3 per cent. (4) 60 per cent. by volume of the oil should distil up to 300° C. (5) The minimum calorific power must not be less than 8800 cals. per kilo. For oils of less calorific power, the purchaser has the right of deducting 2 per cent. of the net price of the delivered oil, for each 100 cals. below this minimum. (6) The flash-point, as determined in an open crucible by Holde's method for lubricating oils, must not be below 65° C. (7) The oil must be quite fluid at 15° C. The purchaser has not the right to reject oils on the ground that emulsions appear after five minutes' stirring when the oil is cooled to 8° C. Purchasers should be urged to fit their oil-storing tanks and oil-pipes with warming arrangements to redissolve emulsions caused by the temperature falling below 15° C. (8) If emulsions have been caused by the cooling of the oils in the tank during transport, the purchaser must redissolve them by means of this apparatus. Insoluble residues may be deducted from the weight of oil supplied. In the discussion which followed the paper, Dugald Clerk gave the efficiency of the Diesel engine aa 40 per cent. indicated and 30 per cent. brake; about the same as that of a modern gas engine.—A. T. L.

Patents.

Raising liquids by means of steam, or compressed air, or other fluid; Apparatus for ——. C. A. Bowen, Llanelly, S. Wales. Eng. Pat. 6950, March 20, 1911.

The valve controlling the admission of the compressed air or other fluid to the pressure vessel or "egg" and the escape of air from the same during the filling, is situated above the level of the upper reservoir. A float in the latter reservoir is attached to a cord or chain which passes over a wheel and operates the valve.—W. H. C.

Fibrous material [*asbestos*]; *Separation of* —— *from substances of different specific gravity.* British Thomson Houston Co., Ltd., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 8614, April 6, 1911.

When crude asbestos fibre is shaken with water to which a small proportion of a light liquid such as gasolene has been added, the asbestos fibre floats to the surface whilst the mineral impurities, unground lumps, magnetite and other grit, sink to the bottom, and are separated. A few drops of the oil per litre of water are sufficient for the purpose. Generally, for the separation of fibrous material from impurities a process is claimed consisting either in introducing the unshredded material into a liquid of lower specific gravity than the material, the said liquid containing another liquid of still lower specific gravity, or in wetting the fibrous material with the light liquid before introducing it into the heavier liquid.—J. F. B.

Furnaces; [*Boiler* ——.] G. Wilton, Hendon. Eng. Pat. 15,459, July 3, 1911.

The furnace comprises an arc-shaped bed-plate which lies on the furnace flue, extending from near the front to the bridge and terminating in vertical end portions. Built up on this bed-plate in sections are a number of perforated plates which form the grate and which with extending webs divide the space between the grate and the bed-plate into three longitudinal chambers into which the blast passes by suitable connecting pipes from the front of the boiler. Pipes extend from the interior of the two outer chambers and are connected with a pipe surrounding the furnace door so that a definite portion of the combustion air may be taken from these chambers, where it has become preheated, and employed, as a secondary air supply on the top of the fuel. A thick layer of fuel, almost filling the furnace flue, is employed, and during the period when smoke is being evolved, the supply of secondary air is increased while that of primary air is diminished, the proportioning of the air being effected from outside by a piston valve operating in the pipes from the chambers. (See also this J., 1905, 1293.)—B. G. McL.

Filter presses. Chem. Fabr. Güstrow, Güstrow, Germany. Eng. Pat. 22,560, Oct. 12, 1911. Under Int. Conv., Oct. 19, 1910.

The filter-press which is intended for filtering turbid, slimy or colloidal fluids is built up of a number of circular horizontal units, the filter plates for which are semicircular and are arranged in pairs so that a clear vertical diametric passage extends through the press. From a central rotatable shaft a pair of lateral arms extend between the plates into each of the chambers containing the liquid to be filtered; these arms, while not exerting any brushing or scraping action on the surfaces of the filter cloths, agitate the liquor sufficiently to keep the solid particles suspended in it and so to prevent clogging of the cloths. The vertical space between the plates permits of the agitating gear being lifted out.—B. G. McL.

Filter. C. E. Singer, Parral, Mexico. U.S. Pat. 1,017,476, Feb. 13, 1912.

A number of filter frames secured to a corresponding number of telescoped tubular fittings grouped around a common shaft are rotated above a tank so that the filters are partially immersed. By means of rotary valves on the shaft and connections through the supporting trunnions the interior of the filter frames are put into communication alternately with a source of compressed air and with a vacuum chamber. The material to be filtered is contained in the tank and the deposit formed on the frames is detached by scrapers and falls into a trough.—W. H. C.

Liquids; Centrifugal filter for the clarification of ——. F. Malvezin. Fr. Pat. 434,331, Nov. 22, 1910.

A centrifugal drum, open at the top, is mounted on a vertical shaft. The liquid to be clarified is introduced into a space between this shaft and a perforated cylinder, covered with fabric or the like, which surrounds it. The liquid leaves the drum through a pipe at the top, the end of this pipe being outside the perforated cylinder, whilst solid substances separated from the liquid as the result of the centrifugal action pass through openings into a casing surrounding the upper half of the drum. Means may be provided for cooling the drum.—W. P. S.

Filter surfaces used for wet filtration ; Process for cleaning ——. Zuckerraffinerie Hildesheim, Ges. m. b. H. Ger. Pat. 240,978, May 20, 1909.

The filter-surface is, if necessary, moistened with water or with the filtrate, and a suction device of small cross-section is moved over it, so that air is drawn through the filter in a direction contrary to that taken by the liquid during the filtering operation.—A. S.

Filter ; Vacuum ——. W. Deckert. Ger. Pat. 242,569, July 3, 1910.

The patent relates to an arrangement by means of which the filtrate can be discharged without interrupting the working of the filter. The receptacle into which the filtrate flows, and the suction pipe, are both connected with a second receptacle by means of a multiple-way cock. By suitable adjustment of the latter the second receptacle may be made to communicate: (1) only with the suction device; (2) with the suction device and with the first receptacle in order to receive the filtrate from the latter; or (3) with the air, when the filtrate is being discharged.—A. S.

Vacuum system for use in connection with heating, refrigerating, evaporating and other apparatus. N. E. Frost, Chicago, Ill. U.S. Pat. 1,012,837, Dec. 26, 1911.

In order to maintain a more or less perfect vacuum in a set of radiators for heating, or in refrigerator chambers to assist insulation, and in other apparatus, they are all connected with a vacuum producer. The latter is of the ejector type and is operated by water from an overhead reservoir. Water flowing from the reservoir may be utilised for other purposes either before, or after, it passes through the ejector. By means of a system of ball valves, floats and siphons, the tank may be maintained full of water or refilled when the water sinks to a predetermined level and emptied through the vacuum producer at predetermined intervals.—W. H. C.

Condensing apparatus. E. W. Strohn, Buffalo, N.Y. U.S. Pat. 1,017,338, Feb. 12, 1912.

In an evaporating system consisting of an evaporator proper, a condenser and a vacuum pump, arranged in the order given, an expansion chamber and a final condenser are added to the system. The air and vapour from the pump are allowed to come to comparative rest in the expansion chamber before passing through the final condenser to the outer air.—W. H. C.

Fires ; Process of extinguishing ——. M. Breslauer, Charlottenburg, Germany, Assignor to Minimax Consolidated, London. U.S. Pat. 1,017,949, Feb. 20, 1912.

The claim is for the process of extinguishing fires by treating the burning substance with an aqueous solution of the chloride, or other halogen salt, of aluminium. —W. H. C.

Expressing liquids from solids ; Apparatus for ——. J. J. Berrigan, Assignor to K. S. Berrigan, Orange, N.J. U.S. Pat. 1,018,958, Feb. 27, 1912.

The materials to be treated are enclosed in press chambers having flexible sides and supported on a travelling band. The belt passes round a drum and the chambers are given a concave form and pressed against the drum by an external curved ram.—W. H. C.

Absorption apparatus. G. Aminoff, Baltimore, Md. U.S. Pat. 1,019,003, Feb. 27, 1912.

The gas is introduced by a pipe into the lower end of an inclined shoot, from the upper side of which a number of cross partitions or baffles project at right angles. These projections do not extend right across the shoot but form a series of box-like compartments. The absorbing liquid is fed into the upper end of the shoot through a trap and flows down, sealing the ends of the partitions, and is discharged through an upright pipe at the lower end of the shoot. The gas is thus forced to bubble through a seal of liquid as it passes upwards from box to box to the gas discharge at the upper end of the shoot.—W. H. C.

Evaporating liquids to dryness; Apparatus for ——. R. Joya. First Addition, dated Sept. 15, 1911, to Fr. Pat. 429,564, May 10, 1911 (this J., 1911, 1240).

The evaporating drum has a smooth or polished, instead of a corrugated surface.—W. H. C.

Column apparatus for distillation, refrigeration, heating or similar objects. H. A. Gasser. Fr. Pat. 431,323, Sept. 18, 1911. Under Int. Conv., March 3, 1911.

Instead of forming the column of vertical cylindrical sections fastened together, the sections are independent horizontal cylinders suitably connected together by pipes. The whole column apparatus is mounted on a movable frame, and the sections can be isolated and disconnected for repairs, without disconnecting the whole column —W. H. C.

Desiccating granular materials in paste or powder ; Apparatus for ——. Lambert Frères et Cie. Fr. Pat. 434,407. Sept. 2, 1911.

The horizontal partitions or shelves of a vertical cylindrical drying tower are provided with inclined passages similar to venetian shutters instead of simple perforations. The object is to ensure a better circulation of the drying medium.—W. H. C.

Drying pasty materials ; Process and apparatus for ——. O. Müller. Fr. Pat. 434,758, Oct. 2, 1911.

The pasty materials are placed on travelling bands by which they are carried through a tunnel or chamber through which a current of warm air is passed in the opposite direction. Spaces are provided at either end of the tunnel, so that the current of air, which is forced into the system by a fan, has time to lose its high speed, and passes over the materials to be dried at a low velocity. Water sprays are provided at the air inlet end to increase the humidity of the air if desired.—W. H. C.

Gas ; Process and apparatus for ensuring the uniform and regular passage of —— *through solid materials.* Bayerische Akt.-Ges. für Chem. und Landwirtschaftl.-chem. Fabrikate. Fr. Pat. 434,640, Sept. 25, 1911.

The gas outlet from the furnace or other chamber in which the solid materials are subjected to the action of a gas is closed by a flap-valve, which is opened at intervals, either by an arm on a rotating shaft which acts on a lever attached to the valve, or by a lever actuated by the pressure of the gas in the furnace. The pressure thus produced at intervals within the furnace, ensures the gas penetrating the solid material under treatment.—W. H. C.

Rendering liquid the vapours of liquefied gases of low boiling point or of mixtures of gases forming the motive agent of motors ; Process and apparatus for ——. F. Hildebrand. Fr. Pat. 434,817, Sept. 15, 1911. Under Int. Conv., Sept. 16, 1910.

The exhaust valve of the cylinder of the motor, or the escape pipe of the turbine, is so arranged as to act at the same time as an expansion valve or pipe. The cold produced by the expansion of the gas is utilised to liquefy the vapour.—W. H. C.

Recovery of the vapour of volatile liquids ; Process for the ——. Soc. l'Air Liquide (Soc. Anon. pour l'Étude et l'Exploit. des procédés G. Claude). Fr. Pat. 435,073, Dec. 14, 1910.

In a closed system, in which the same air is used over and over again, the air, charged with the vapour of the solvent, is submitted to successive compressions and coolings whereby the vapours are condensed. After passing through the last cooler, the air is allowed to expand and the cold produced is utilised to effect a supplementary condensation. The process depends upon the fact that the maximum vapour tension of a liquid is dependent solely on the temperature, and is independent of the pressure to which the air is subjected.—W. H. C.

Evaporating apparatus; Multiple effect ——. S. M. Lillie, Philadelphia. Eng. Pat. 4261, Feb. 20, 1911.

SEE U.S. Pat. 984,226 of 1911; this J., 1911, 346.—T. F. B.

Gaseous mixtures; Centrifugal apparatus for separating the elements of ——. E. Mazza, Turin, Italy. Eng. Pat. 13,737, June 8, 1911. Under Int. Conv., June 8, 1910.

SEE Fr. Pat. 430,621 of 1911; this J., 1911, 1366.—T. F. B.

Drying and conveying moist material: Apparatus for ——. F. A. Bühler, Gross-Lichterfelde, Germany. Eng. Pat. 14,412, June 17, 1911.

SEE U.S. Pat. 992,939 of 1911; this J., 1911. 792.—T. F. B.

Cooling or warming drums; Method of building ——. *Apparatus for cooling or warming water, air, or gas.* H. Heenan, Manchester U.S. Pats. 1,018,242 and 1,018,243, Feb. 20, 1912.

SEE Eng. Pat. 29,015 of 1910; this J., 1912. 60.—T. F. B.

Filter-press for filtering colloidal and mucilaginous liquids difficult to filter. Chem. Fabr. Güstrow, Dr. Hillringhaus, and Dr. Heilmann. Fr. Pat. 434,522, Sept. 23, 1911.

SEE Eng. Pat. 22,560 of 1911; preceding.—T. F. B.

Raising and forcing liquids; Methods and apparatus for ——. H. A. Humphrey. Fr. Pat. 435,240, April 20, 1911. Under Int. Conv., July 1, 1910.

SEE Eng. Pat. 15,820 of 1910; this J., 1911, 940.—T. F. B.

IIA.—FUEL; GAS; MINERAL OILS AND WAXES.

Paraffin wax; Examination of ——. F. Epstein and H. Polonyi. Petroleum, 1912, 7, 594—596.

MOST of the methods suggested for the determination of the oil in paraffin wax are complicated and not entirely reliable. For example, the authors state that in testing Redwood's expression method, a sample of oil-free paraffin wax solidifying at 56° C. was mixed with 1 per cent. of a vaseline oil (sp. gr.=0·882 at 15° C.) and expressed, but yielded no oil. On the other hand, a transparent oil-free soft paraffin, solidifying at 46° C., yielded 0·27 per cent. of oil in this test. Much more trustworthy results may be obtained by the following method of applying Schulz's picric acid test for mineral oils (Chem.-Zeit., 1908, 345): About 20 grms. of the melted sample of wax are mixed with about 0·02 grm. of powdered picric acid, and the mixture poured into a small mould of tinfoil (area, 35 mm. × 35 mm., with sides about 20 mm. high), which is cooled externally with ice water. As soon as the tablet is completely cold its colour is noted, and compared with that given by a sample of oil-free paraffin under the same conditions. According to the proportion of oil in the wax the colour will range from bright yellow to red. In this way it is possible to detect as little as 0·05 per cent. of a partially refined oil of sp. gr. 0·882 in paraffin wax. An application of the test to different parts of commercial blocks of paraffin wax, showed that in the case of oil-containing samples the parts near the surface were richest, and those near the middle of the block were poorest in oil. In this respect the results were analogous to the differences in solidification points observed by Breth (this J., 1911, 1302) in different parts of a block, and also showed the necessity for taking an average sample. It is suggested that a standard colour might be selected as the limit in this test for commercial "oil-free" paraffin wax.—C. A. M.

Petroleum in New Zealand. Board of Trade J., March 28, 1912. [T.R.]

ALTHOUGH boring operations for oil have been carried out in various places, no oil has yet been produced except at New Plymouth. At Motorua (the artificial harbour made by a breakwater near the town) a third bore has just been brought into play, and oil to the extent of some 200,000 gallons has already been run into underground cisterns, pending the arrival of refining plant. From the first bore oil has now been running for two years. The wells are almost on the beach right in the harbour, and oil is being obtained from a depth of about 2500 feet, the strata through which the bores go presenting no technical difficulties. The oil contains a very high percentage of paraffin wax; so high is this percentage that as soon as the petroleum touches the cold earth it solidifies and makes an impervious lining, inside which much of the oil also solidifies. In spite of these natural advantages, it is doubted whether the local demand would be sufficient to make the refining profitable.

Gas companies and the manufacture of chemical products.

THE Alkali Manufacturers' Association recently presented petitions against several Gas Bills before Committees of both Houses of Parliament, the petitions being directed against the practice by large gas undertakings of purchasing from smaller gas companies and others ammoniacal liquor and other raw materials, and working them up into ammonium sulphate and other products, in competition with chemical manufacturers.

Lord Ritchie's Select Committee of the House of Lords has given its decision on the South Suburban Bill, and has decided to insert the following clause:—"The South Suburban Company, notwithstanding anything in any Act relating to their undertaking or any part thereof, shall not purchase or use in any process of manufacture any materials other than those required for the making and supply of gas by them or for the working up of their own residual products or for the construction, maintenance, and repair of their gas works, plant, buildings, and gas fittings."

The above clause has also been adopted for the Armfield Plain Gas Bill and for the Fleetwood Gas Bill.

Charcoal; Spontaneous combustion of ——. Report of Nat. Physical Lab., 1910, 85; 1911, 86.

THE experiments were conducted in an electrically heated oven, in which 1 cub. ft. of the charcoal was exposed to a uniform temperature (constant within 1° C.), measured by means of thermo-couples. The charcoal was surrounded by an air space about 3 ins. wide, and the oven could be closed air-tight or a current of air of any desired velocity passed through it. Experiments with flake charcoal showed that with air currents ranging from 5 to 62 cb. ft. per minute for 1 cb. ft. of charcoal, spontaneous combustion occurred at temperatures of from 96° to 110° C., whilst at lower temperatures no signs of spontaneous heating could be observed. Experiments undertaken at the request of Lloyd's Register showed that in a current of air containing 5 per cent. of sulphur dioxide, spontaneous combustion of the charcoal took place after some hours. These experiments show that there is risk of danger in using sulphur dioxide for disinfecting rooms, etc., where charcoal is present in the walls. Decayed wood appears to be much less inflammable than charcoal.
—A. S.

Diesel oil engine. Diesel. *See* I.

[Coal dust explosions.] Outside tamping with non-combustible dust. Watteyne and Lemaire. *See* XXII.

New thermoelectric combustion calorimeter. Féry. *See* XXIII.

Patents.

Coal dust explosions in coal mines; Prevention of ——. W. Warr, Stalybridge, Cheshire. Eng. Pat. 4227, Feb. 20, 1911.

The mine is sprinkled with a mucilage made from seaweed, preferably "Irish moss" (*Chondrus crispus*), which binds the particles together. For example, 2 oz. of dry "Irish moss," and ¼ oz. of sodium carbonate are used per gallon of water, the solution being boiled and filtered. In very dry mines, 2 oz. of calcium chloride are added per gallon of solution.—A. T. L.

Coal dust in collieries; Precipitating ——. R. Cremer, Leeds. Eng. Pat. 21,083, Sept. 25, 1911. Under Int. Conv., Oct. 18, 1910.

The walls of the mine roadways are covered with material of organic origin having a highly absorbent and fluid-retaining capacity, such as moss, turf, sponge and the like; this covering is sprinkled with water or a suitable saline solution. It is claimed that moisture applied in this way keeps the dust moist and hence in a non-explosive condition and also prevents accidents due to falls of earth which are liable to occur when water is applied directly to the walls. A second claim embodies means for fixing the material to the walls.—B. G. McL.

Peat; Drying wet carbonised ——. N. Testrup and O. Söderlund, London. Eng. Pat. 4684, Feb. 24, 1911.

Water is removed from wet carbonised peat prepared according to Eng. Pats. 10,834 and 20,420 of 1903 and 6041 of 1910 (this J., 1903, 1122, 1238; 1911, 883) by first passing it through a filter press under a pressure of about 100 lb. per sq. in. and treating the residue in a band press under a pressure of about 600 lb. per sq. in. The amount of water contained in the peat is reduced in this way from about 90 to 50 per cent., and the solid material thus obtained is suitable for direct use in a producer for conversion into gaseous fuel.—H. H.

Fuel for increasing the power of internal-combustion engines. K. Hadorff. First Addition, dated Sept. 25, 1911, to Fr. Pat. 416,325, April 27, 1910 (this J., 1910, 1365).

The fuel ("fortoline") contains nitrobenzene in addition to benzene picrate as described in the prior patent. 10 parts of benzene are mixed with 0·5 part of nitrobenzene to which a small quantity of picric acid has been added, and the mixture is boiled for a long time. The product is added to 10 times its amount of petroleum, naphtha, petrol, benzene, or other hydrocarbon.—A. T. L.

Coke ovens or retorts; Method of and apparatus for discharging ——, *and cooling the coke discharged.* J. Armstrong, London. Eng. Pat. 4427, Feb. 22, 1911.

A vertical cylinder, carried on a wheeled trolley, is brought beneath the lower end of a vertical retort, and a loose bottom in the cylinder is raised by a ram so as to support the coke while a temporary support for the same is withdrawn from the bottom of the retort. The ram is then lowered, the temporary support refixed, and the cylinder full of coke removed and quenched. The temporary support consists of pointed bars or forks which slide through apertures in the lower part of the retort wall.—A. T. L.

Coke from horizontal and inclined retort ovens; Graded delivery of ——. H. Koppers, Essen-on-the-Ruhr, Germany. Eng. Pat. 27,624, Dec. 8, 1911. Under Int. Conv., June 29, 1911.

The lower denser layer of coke is separated from the upper less dense layer as the coke issues from the oven; this is effected by guiding planes mounted on a trolley which is placed in front of the oven, the upper layer being deflected sideways and falling between the trolley rails, while the lower layer passes right through and falls beyond the outer rail. The graded portions are quenched separately. —B. G. McL.

Coal; Distillation of —— *in large charges.* H. Breuille. Fr. Pat. 435,189, Oct. 13, 1911.

The patent relates to a retort setting in which inclined retorts are arranged at 35 to 40 degrees to the horizontal, so that the charge fills the retorts instead of lying in a bed 10—12 cm. in thickness, as is the case with horizontal or less steeply inclined retorts. The retorts are charged from the upper end by means of a charging shoot which is more steeply inclined than the retorts, the inclination being suitably chosen according to the vertical distance from the mouth of the retort to the hopper. To facilitate the discharge of the column of coke, the retorts are tapered, and the column is dislodged by means of a weight which is released and allowed to run freely down an inclined plane so as to strike against a pusher which enters the mouth of the retort. The weight is raised again by means of a winch, and the whole discharging apparatus is mounted on a wheeled trolley so that it can be brought into position for each retort.—A. T. L.

Gas producers. A. C. A. Holzapfel, London. Eng. Pats. 6625, Mar. 16, and 8005, Mar. 30, 1911.

The invention relates to the construction of evaporators to enable sea water to be used for supplying water vapour to gas producers. The evaporator consists of a cylindrical vessel containing a number of vertical tubes through which the gases passing from the producer to the scrubber or the exhaust gases of an engine are led. Blow-off cocks are fitted to allow the concentrated sea-water to be discharged, and reducing valves are provided in the steam outlet to reduce the pressure to about 2 lb. per sq. in. The evaporators are mounted in pairs so that one can always be in use while the other is being cleaned.—H. H.

Gas producers. E. R. Royston, Liverpool. From A. J. Rickie, Calcutta. Eng. Pat. 10,911, May 5, 1911.

In a gas producer for bituminous fuel, the gases are drawn off through the incandescent fuel at the hottest portion of the generator into an annular retort or fixing chamber situated in the central part of the producer and surrounded on all sides by incandescent fuel. The fixing chamber is supported upon cantilever or projecting brickwork supports built out from the inner wall of the producer. —H. H.

Gas; Production of ——. J. L. and G. Scott, Christchurch, New Zealand. Eng. Pat. 11,344, May 10, 1911.

In a combined up-and-down draught gas producer the gases produced are drawn off through an annular passage having its complete inner circumference open to the producer, and pass through diametrically opposite ports in this passage to a semi-circumferential passage leading to the main eduction pipe situated midway between them. The currents of gas are balanced in this way and even working is secured. The air and steam enter the producer from a mixing and heating chamber surrounding the annular gas eduction passage.—H. H.

Gas-producer. A. von Kerpely. Fr. Pat. 434,322, Sept. 18, 1911. Under Int. Conv., Feb. 16, 1911.

The producer is designed for working with high-pressure blast in order to utilise fuels which form a dense and compact mass. The blast enters the fuel column through a large number of fine orifices formed in a central rotating conical grate. These orifices are directed downwards and outwards from the surface of the grate. The grate is mounted on a rotating base-plate from which the ashes are discharged into a hopper which is within an air-tight casing enclosing the lower part of the producer. The ashes are discharged from this hopper periodically into a second air-tight chamber beneath it, so that after the hopper-valve is re-closed the ashes can be withdrawn without interrupting the blast.—A. T. L.

Sulphur and cyanides contained in spent materials [*oxide*] *used for the purification of illuminating gas; Process of simultaneous extraction of* ——. H. Gouthière et Cie. and P. Ducancel. Fr. Pat. 434,673, Dec. 2, 1910.

The material is treated in the cold with normal ammonium sulphide, which dissolves the sulphur, thiocyanates, and part of the Prussian blue, besides transforming the oxide of iron into sulphide, with the fixation of ammonia, probably as a double sulphide of iron and ammonium, and the mixture is then filtered and a current of steam passed through the filtrate; this causes the precipitation of sulphur, and the volatilisation, with the steam, of normal ammonium sulphide which is recovered. The residue of iron sulphide, etc., containing part of the Prussian blue, is immediately suspended in water, or better in the filtrate from the sulphur, and boiled with lime, in absence of air; the ammonia from the sulphide decomposed is thus recovered, the rest of the Prussian blue dissolved, and a precipitate of hydrated iron oxide obtained. This residue, after oxidation in the air, constitutes a revivified purifying material, the solution, which contains calcium ferrocyanide and thiocyanate, being treated by known methods. Part of the sulphur produced is vaporised and converted by hydrogen into hydrogen sulphide, which is absorbed by the ammonia previously recovered to re-form the ammonium sulphide decomposed in the process. —F. Sodn.

Paraffin wax; Apparatus for treating ——. A. F. G. C. P. J. von Groeling, Vienna, and H. S. Smith-Rewse, Darlington, Durham. Eng. Pat. 29,306, Dec. 16, 1910.

The patent is for improvements in sweating cells of the kind described in Eng. Pat. 7630 of 1905 (this J., 1906, 12) comprising tall vessels provided with a vertical draining screen of wire gauze or the like, the object being to secure better control over the temperatures of different parts of the walls of the cells. When an annular cell having inner and outer walls of circular or polygonal cross-section is used, the screens being near the inner wall, the outer wall may be surrounded by a water-jacket. In modifications, the screens may be near the outer wall, which may be jacketed or not; the inner wall may be closed at the lower end to form a vessel in which water circulates in series with the jacket; or in this arrangement the jacket may be dispensed with and the screens placed near the outer wall; the cells may be in the form of a parallelopiped instead of being annular; a perforated false bottom in the cell may be covered with stones to retain the larger paraffin particles; the cells may be tapered; the walls may be cooled by water sprays; and, finally, the draining screens may be tapered. Cells constructed according to any of these modifications may be arranged in a sweating chamber heated by injecting steam. The steam nozzles regulate the admission of air to the chamber, and further control is obtained by means of fans at the upper part of the opposite end of the chamber. A series of tapered cells, which are widest at the top may be suspended in a sweating chamber heated by pipes, by hot air, or by hot water sprays, the cooling being effected by air or by water sprays.—A. T. L.

Utilising petroleum containing sulphur. (1) C. I. Robinson, West New Brighton, N.Y., and (2) J. E. Eggleston, Assignor to Standard Oil Co., Bayonne, N.J. U.S. Pats. 1,018,374 and 1,018,040, Feb. 20, 1912.

"Beaumont" or other sulphur-bearing petroleum is progressively heated to between 300° and 500° F., at which temperature the hydrogen sulphide is driven off. The vapours of petroleum and the hydrogen sulphide are passed through coolers, where the former are condensed and recovered, and the latter is then burned into sulphur dioxide, and utilised for the manufacture of sulphuric acid. —W. H. C.

Hydrocarbon liquids; Method of purifying ——. T. S. Hamilton, Kansas City, Mo., Assignor to The Purified Petroleum Products Co., S. Dakota. U.S. Pat. 1,018,971, Feb. 27, 1912.

The hydrocarbon to be purified is discharged, in a finely divided state, under pressure, into a liquid with which it will form an emulsion. The two liquids are then agitated to produce the emulsion, which is discharged from the vessel in a thin stream and submitted to a shock or jar to break the emulsion in order to allow the heavy impurities to be separated from the lighter pure oil.—W. H. C.

Distillation and purification of crude petroleum or of coal tar; Simplified apparatus for continuous ——. E. A. Barbet. Fr. Pat. 434,677, Dec. 3, 1910.

The apparatus comprises a single still and a single fractionating column. This column comprises in its height four sections separated from one another by three condensers, so that it forms virtually four fractionating columns connected in series, from which different fractions are drawn off. The vapours escaping from the uppermost section of the column are condensed in a separate condenser. Several fractions may be drawn off from each section of the column at different heights, the hot liquid in each case passing through a cooling coil on its way to the collecting vessel. The amount of liquid drawn off at each level is regulated by a cock. The uppermost condenser in the column is cooled by passing through its interior the liquid condensed in the fractionating section above it; the two lower condensers are cooled by means of the crude petroleum.—A. T. L.

Oils; Solidification of mineral or hydrocarbon ——. G. Garfounkel. Fr. Pat. 434,980, Dec. 12, 1910.

The oil is made into an emulsion with an aqueous solution of dextrin or similar substance, and the emulsion is dried by means of quicklime, whereby a solid fuel is obtained which burns without smoke or ash, and is not readily inflammable.—A. T. L.

Coke ovens; Charging of —— *and apparatus therefor.* W. Hiby, Sandal. U.S. Pats. 1,019,642 and 1,019,643, March 5, 1912.

See Eng. Pat. 18,922 of 1910; this J., 1911, 1004.—T.F.B

Paraffin; Process of manufacturing ——. J. Tanne, Rosniatow, Austria-Hungary, Assignor to G. Oberländer, Berlin. U.S. Pat. 1,019,102, March 5, 1912.

See Fr. Pat. 409,516 of 1909; this J., 1910, 747.—T. F. B.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Spontaneous combustion of charcoal. See IIa.

Patents.

Wood-charcoal; Furnaces for burning commercial residues of different industries, especially in oil works, for obtaining ——. L. Félizat, Salon, France. Eng. Pat. 4935, Feb. 27, 1911.

Waste residues of olives, nut shells, sawdust, and other woody substances are converted into charcoal in a furnace provided with helical screw feeders at the top and fitted with sloping baffles inside to prevent the too rapid descent of the material through the furnace. Combustion of volatile products occurs in the upper part of the furnace to which air is admitted, complete carbonisation is effected in the central portion, and quenching or cooling is effected in the lower portion.—H. H.

Wood-distilling apparatus. R. W. Hilton, Smethport, Pa. U.S. Pat. 1,018,419, Feb. 27, 1912.

The still, which is enclosed in an outer casing, has its lower part divided into parallel compartments by transverse passages. The compartments are provided with steam coils for heating the contents. This heating is assisted by passing gases from a furnace through the transverse passages to the stack.—W. H. C.

Incandescence [electric] lighting; Impts. in ——. Soc. L'Air Liquide. Fr. Pat. 434,525, Nov. 28, 1910.

In preparing vacuum tubes containing traces of neon, for use in lighting, it is essential to remove all traces of other gases. This is effected by passing a current through the tube which is charged with neon and exhausted by means of a pump several times, then introducing a definite charge of neon and immersing in liquid air a part of the tube containing wood-charcoal or cocoanut charcoal and passing the current until the gases other than neon have been absorbed, and finally sealing off the tube separately from the part containing the charcoal. The gases used are thoroughly dried before entering the tube. A stronger current is used in preparing the tube, than that used in the actual lighting circuit. During the preparation of the tube, the electrodes may be covered with asbestos paper, in order to raise their temperature above that attained when in use. The electrodes, which may be of carbon, iron, copper, aluminium, etc., should have a surface of 1·5 sq. dcm. per ampère, in order to avoid too rapid absorption of the neon in use, since it is found that the rate of absorption increases with the current-density. The pressure of neon in the tube may be as high as 1 mm. of mercury. The neon may be renewed from time to time, as it disappears, from a receptacle forming part of the tube, with which it communicates by a cock. This receptacle is charged with pure neon sufficient for one or several years, and contains a purifying agent. Lithium may be used for this purpose, the receptacle being heated before recharging the vacuum tube, or the receptacle may contain charcoal and be plunged in liquid air. Variation in the current between two periods of charging the tube may be corrected by varying the resistance or inductance of the circuit. To obtain a white light, the lamps may be used in conjunction with mercury vapour lamps, or the tubes may be made of quartz and worked at high temperature with a current of about 1 ampère for a tube of 45 mm. diameter.—A. T. L.

Furnaces for burning residues of various industries, especially those of oil works, in order to produce wood-charcoal. Huilerie et Savonnerie de Lurian. Fr. Pat. 435,985, Jan. 10, 1911.

See Eng. Pat. 4935 of 1911; preceding.—T. F. B.

Arc-light electrode. J. Härdén, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,019,464, March 5, 1912.

See Eng. Pat. 26,919 of 1904; this J., 1905, 270.—T.F.B.

Tungsten and similar metals; Process of producing hydrogenous compounds of —— *[for incandescence lamp filaments].* H. Zerning, Halensee, Germany, Assignor to The International "Z." Electric Lamp Assoc., Ltd., London. U.S. Pat. 1,019,581, March 5, 1912.

See Eng. Pat. 2554 of 1906; this J., 1906, 918.—T. F. B.

III.—TAR AND TAR PRODUCTS.

Value of the higher phenols in wood-preserving oils. Cabot. *See* IX.

Patents.

Compositions containing pitch. J. Radcliffe, East Barnet. Eng. Pats. 4859, Feb. 23, 1911, and 20,635, Sept. 18, 1911.

Compositions said to have properties similar to those of natural asphaltums or bitumens, are obtained by mixing with pitches finely divided wood, cellulose, peat, or similar organic matter in proportions up to about 20 per cent.; if softer compositions are required, about 7 per cent. of linseed or other oil may be added, and also, if desired, a small quantity of dryers. Instead of using wood or peat and oil, oil-seed hulls, oil-cake, or similar oil-containing cellulosic material may be used. The products may serve as insulating materials or as dielectric substances (from pitches free from carbon), or they may be mixed with mineral matter and used for making or treating roads. —T. F. B.

Organic bodies; Manufacture of compounds by the action of formaldehyde on —— *in concentrated sulphuric acid.* E. E. Naef, Clydach. Eng. Pat. 4648, Feb. 24, 1911.

Compounds of formaldehyde with aromatic compounds, which differ from previously known compounds in that they contain sulphur combined in the molecule, are obtained by bringing the substances together in concentrated or fuming sulphuric acid: as a rule the application of heat is unnecessary, but it may be desirable in some cases. The reaction is usually complete in fifteen minutes. In place of formaldehyde, paraformaldehyde, trioxymethylene, or similar substances may be used. One molecule of the aromatic compound combines with one mol. of formaldehyde and one mol. of sulphur. Forty examples of the process are given in the specification, illustrating the production of various compounds.—T. F. B.

Diazo and tetrazo compounds with formaldehyde; Manufacture of products by condensing ——. E. E. Naef, Clydach, and W. Thevenaz, Hull. Eng. Pat. 4651, Feb. 24, 1911.

The diazo compound of a mono- or diamine of the benzene or naphthalene series containing one free amino group, or the tetrazo compound of benzidine, tolidine, or dianisidine, is caused to react with formaldehyde, paraformaldehyde, or trioxymethylene in presence of moderately concentrated sulphuric acid (preferably 60 to 70 per cent.); the reaction temperature may have to be controlled. When the reaction, which is accompanied by loss of nitrogen, is complete, the mixture is poured into water or on ice, the new compound being usually precipitated. The products are usually white or grey substances, sparingly soluble in water. Nine examples of the process are given.—T. F. B.

Condensation product from ketodihydrobenzo-p-thiazine; Process for preparing a ——. Act.-Ges. f. Anilinfabr. Ger. Pat. 243,196, Aug. 12, 1910.

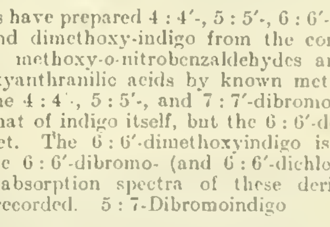
When ketodihydrobenzo-*p*-thiazine is heated to a high temperature, alone or in presence of an indifferent solvent or diluent, a red crystalline substance of undetermined constitution is obtained; it may be used in the preparation of dyestuffs.—T. F. B.

Distillation and purification of crude petroleum or of coal tar. Fr. Pat. 434,677. *See* IIa.

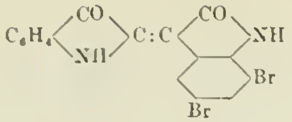
IV.—COLOURING MATTERS AND DYES.

Indigo; Bromo- and methoxy-derivatives of ——. P. Friedländer, S. Bruckner and G. Deutsch. Annalen, 1912, **388**, 23—49.

The authors have prepared 4 : 4′-, 5 : 5′-, 6 : 6′-, and 7 : 7′-dibromo- and dimethoxy-indigo from the corresponding bromo- and methoxy-o-nitrobenzaldehydes and bromo- and methoxyanthranilic acids by known methods. The shades of the 4 : 4′-, 5 : 5′-, and 7 : 7′-dibromoindigos are similar to that of indigo itself, but the 6 : 6′-derivative is reddish-violet. The 6 : 6′-dimethoxyindigo is the same shade as the 6 : 6′-dibromo- (and 6 : 6′-dichloro) derivative. The absorption spectra of these derivatives of indigo are recorded. 5 : 7-Dibromoindigo



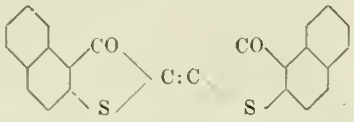
is formed by the condensation of o-p-dibromoisatin chloride with indoxyl. It forms blue needles. When indoxyl is condensed with dibromoisatin, dibromoindirubin



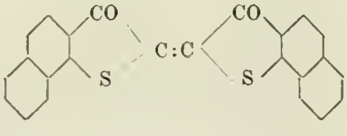
is obtained. This crystallises in red needles.—J. C. C.

Thioindigo dyestuffs of the naphthalene series. P. Friedländer and N. Woroshzow. Annalen, 1912, 388. 1—23.

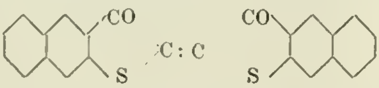
BIS-2 : 1-NAPHTHATHIOPHENINDIGO,



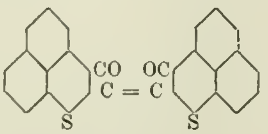
is prepared by the following series of reactions. The starting material is 1-naphthylamine-2-sulphonic acid in which the amino-group is replaced by the cyano-group, then the sulphonic group converted into the SO_2Cl group, the product reduced to 1-cyano-2-thionaphthol or 2-thionaphthol-1-carboxylic acid, which is treated with chloroacetic acid and ring formation is attained by treatment with alkalis. A second method consists in converting α-acetnaphthalide into thioacetnaphthalide, oxidising this to ethenylaminonaphthylmercaptan and eliminating acetic acid from this by treatment with alkali hydroxide. The resulting α-aminothionaphthol is then converted into naphtha-oxythiophen which is readily transformed into the required dyestuff. A third method starts from β-naphthylthioglycollic acid which when treated with sulphuric acid furnishes the corresponding oxythiophen derivative. The dyestuff is red-brown. In a similar manner 1 : 2-naphtha-oxythiophen and hence bis-1 : 2-naphthathiophenindigo



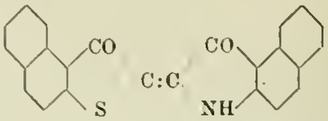
is obtained from 2-naphthylamine-1-sulphonic acid or β-acetnaphthalide. It forms dark red needles. Bis-2 : 3-naphthathiophenindigo



is prepared from 2 : 3-naphthylthioglycolcarboxylic acid by heating its sodium salt with acetic anhydride and sodium acetate, saponifying the resulting naphtho-acetoxythiophen and oxidising with potassium ferricyanide. The dyestuff forms almost black needles. Bis-1 : 8-naphthopenthiophenindigo



is obtained from naphthostyril which is converted into the aminonaphthoic acid by heating with sodium hydroxide, the diazo derivative of this is converted by means of potassium xanthate into 1 : 8-thiolnaphthoic acid anhydride, and this when treated with chloroacetic acid furnishes 1 : 8-naphthathioglycolcarboxylic acid. On heating the sodium salt of this acid with acetic anhydride and sodium acetate and saponifying the resulting acetyl derivative, naphtha-oxypenthiophen is obtained which is then oxidised by air to the dyestuff; this crystallises in coppery needles and forms a vat with difficulty. Naphthindol-2 : 1-naphthathiophenindigo



is produced by condensing β-naphthisatin chloride and 2 : 1-naphtha-oxythiophen. It dyes in violet-grey shades. —J. C. C.

PATENTS.

Condensation products of the anthraquinone series ; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 17,137, July 26, 1911.

PRODUCTS, which may be used as vat dyestuffs, are obtained by condensing ω-dichloro-2-methylanthraquinone or anthraquinone-2-aldehyde, or a halogen derivative of either of these, with an o-diaminoanthraquinone (viz., the 1·2- or the 2.3-compound); condensation is effected by heating together the components, preferably in a suitable solvent or suspending agent. The 1.2-diaminoanthraquinone may be prepared by reducing 1-amino-2-nitroanthraquinone, or by removing the sulpho group from 1·2-diaminoanthraquinone-3-sulphonic acid, or by heating 1-aminoanthraquinone-2-sulphonic acid with ammonia under pressure. When the new products are reduced by alkali hydrosulphite solutions, vats are obtained in which cotton is dyed yellow and violet shades, according to the components employed.—T. F. B.

Vat dyestuffs of the anthraquinone series ; Manufacture of ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 23,110, Oct. 19, 1911.

A NEW series of vat dyestuffs, dyeing yellow or orange shades, may be obtained by the action of oxidising agents on the products formed by α-dianthrimide or the α-trianthrimides with alkaline condensing agents, such as alkalis, sodium amide or sodium amylate, or metallic chlorides. The dyestuffs are probably perazines of the anthraquinone series: the simplest compound of the series is regarded as having the constitution of a dianthraquinonylindanthrene, and is obtained by the elimination of two molecules of hydrogen from α.α-dianthrimide. Chromic acid or hypochlorites may be used as oxidising agents, the latter giving the better results. The shades produced by the new dyestuffs are said to be very fast to light and to resist well the action of chlorine and washing. —T. F. B.

Acidyl derivatives of aminoanthraquinones or of mixed acidylurea derivatives of the anthraquinone series ; Process for preparing aromatic ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 243,490, May 19, 1909.

THE above compounds are obtained by the action of β-anthraquinonylurea chloride or β-anthraquinonyl isocyanate on aromatic carboxylic acids or their substitution products. For example, by heating pure β-anthraquinonylurea chloride with benzoic acid in nitrobenzene, benzoyl-β-aminoanthraquinone is obtained, together with a yellow vat dyestuff of undetermined constitution, insoluble in nitrobenzene.—T. F. B.

Monoazo dyestuffs ; Productions of black —— with basic properties. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 435,789, Oct. 28, 1911. Under Int. Conv., Nov. 28, 1910.

DIAZOTISED asymmetrical dialkyl-safranines (dimethylpheno-, diethylpheno-, dimethyltolu-, or diethyltolusafranines) are combined in acid solution with 1-aryl-3-methyl-5-pyrazolones. The dyestuffs produce black shades on unmordanted or tannin-mordanted cotton or artificial silk.—J. C. C.

Dyestuffs resistant towards acids ; Production of substantive ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 435,932, Nov. 3, 1911. Under Int. Conv., Nov. 22, 1910.

Amino-derivatives of benzylsulphonic acid (for example the *p*-amino-compound) are diazotised and combined with aminobenzoyl-2 : 5 : 7-aminonaphtholsulphonic acids (for example the *p*-amino-compound) and the product is diazotised and combined with β-naphthol. The dyestuff thus produced gives orange shades on unmordanted cotton. —J. C. C.

Indigo ; Halogen derivatives of ——. Ges. für Chem. Ind. in Basel. Eighth Addition, dated Dec. 5, 1910, to Fr. Pat. 375,514, Feb. 25, 1907. (See this J., 1911, 124.)

Bromo-derivatives of indigo are obtained by dissolving indigo or its halogen substituted products containing less than six atoms of halogen, in sulphuric acid, fuming sulphuric acid or chlorosulphonic acid and adding the requisite amount of bromine or hydrobromic acid (preferably in the form of sodium bromide). The halogenated products are isolated in the usual way.—J. C. C.

Orthohydroxy-azo dyestuffs ; Manufacture of ——. Kalle und Co., Akt-Ges. Fr. Pat. 434,405, Sept. 2, 1911. Under Int. Conv., Dec. 9, 1910, and March 21, 1911.

Chloro-1 : 2- or 2 : 1-diazo-oxynaphthalenesulphonic acids (prepared by chlorinating the 1 : 2- or 2 : 1-diazo-oxynaphthalenesulphonic acids in the presence of sulphuric acid containing sulphuric anhydride, in the absence or presence of a chlorine carrier and preferably under pressure) combine with, (for example, β-naphthol to form dyestuffs giving, after chroming, blue to blue-black shades fast to light and milling, and with 1-phenyl-3-methyl-5-pyrazolone to form dyestuffs producing, after chroming, reddish blue shades on wool.—J. C. C.

Halogenated indigos and process for obtaining them. E. Kunz. Fr. Pat. 435,798, Oct. 30, 1911.

See Ger. Pat. 239,672 of 1909 ; this J., 1911, 1373. The reaction is carried out in presence of a nitro-hydrocarbon, such as nitrobenzene or nitrotoluene.—T. F. B.

Colouring matters containing sulphur ; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 9122, April 12, 1911.

See Fr. Pat. 431,981 of 1911 ; this J., 1912, 22.—T. F. B.

Compounds and colouring matters of the anthracene series ; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 15,205, June 29, 1911.

See Addition of June 30, 1911, to Fr. Pat. 425,859 of 1911 ; this J., 1912, 119.—T. F. B.

Vat [anthracene] dyes ; Orange-red and yellow ——. A. Lüttringhaus and H. von Diesbach, Mannheim, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pats. 1,018,836 and 1,018,837, Feb. 27, 1912.

See Addition of June 30, 1911, to Fr. Pat. 425,859 of 1911 ; this J., 1912, 119.—T. F. B.

Indophenols ; Manufacture of —— and of sulphur dyestuffs derived therefrom. A. G. Bloxam, London. From Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 17,123, July 26, 1911.

See Fr. Pat. 432,440 of 1911 ; this J., 1912, 119.—T. F. B.

Vat dyestuff ; Brown —— and process of making same. R. Maag, Sindlingen, Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,018,433, Feb. 27, 1912.

See Eng. Pat. 14,904 of 1910 ; this J., 1911, 1110.—T. F. B.

Tetrazo dye ; Brown ——. O. Günther, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,019,321, March 5, 1912.

See Eng. Pat. 21,200 of 1910 ; this J., 1911, 1108.—T.F.B.

[Trisazo] dyestuffs for cotton ; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 436,174, Nov. 10, 1911. Under Int. Conv., Nov. 25, 1910.

See Eng. Pat. 27,861 of 1910 ; this J., 1912, 66.—T. F. B.

Dyestuffs derived from carbazoleindophenols ; Process for preparing bisulphite compounds of ——. L. Cassella und Co., G. m. b. H. Fr. Pat. 435,537, Dec. 27, 1910.

See Eng. Pat. 489 of 1911 ; this J., 1911, 1208.—T. F. B.

Diazotisable dyestuffs for cotton ; Process for preparing ——. L. Cassella und Co., G.m.b.H. Fr. Pat. 435,805, Jan. 6, 1911.

See Eng. Pat. 488 of 1911 ; this J., 1912, 181.—T. F. B

V.—FIBRES ; TEXTILES ; CELLULOSE ; PAPER.

Root-cotton, a fibrous cork tissue of a tropical plant. S. Kusano. J. Coll. Agric., Imp. Univ. Tokyo, 1911, 4, 67—81.

The "root-cotton" described in the paper is found in the form of a fibrous covering on the roots of *Fagara integrifoliola*, a plant growing abundantly in Botel-tobago, an island near Formosa, and in the Philippines. The fibre from its behaviour with reagents appears to be composed essentially of lignin and suberin and to be a kind of cork tissue homologous to the ordinary cork developed on the bark of trees. The fibres consist of exceedingly thin-walled, empty elongated cells, of light straw colour and silky lustre. They are very fine, soft, and weak, being easily pulverised to a waxy powder. They are less hygroscopic than ordinary cotton, and show remarkable resistance to wetting by water The root-cotton is used by the natives of Botel-tobago for caulking the seams of boats, and in the Philippines for stuffing pillows. It can be removed from the root of the plant without injuring the latter, and the author suggests cultivation of the plant and collection of the root-cotton for technical application. —A. S.

Patents.

Textile belting ; Manufacture of —— and apparatus therefor. W. G. Maxwell, Edinburgh, and E. J. C. Christie, Leith. Eng. Pat. 1300, Jan. 18, 1911.

The impregnated textile material is guided through a series of consecutively graded dies designed to fold in succession one edge of the fabric upon another without the intervention of rollers. A suitable composition is made up of glue, raw linseed oil, yellow soap and copper sulphate, mixed with water ; the completed belt may be treated with formaldehyde and subsequently run through a bath containing soap and water and a solution of copper sulphate.—J. F. B.

Wool washing machine. P. Dubrule, jun., Tourcoing, France. Eng. Pat. 21,357, Sept. 27, 1911. Under Int. Conv., Jan. 30, 1911.

The washing vessel has a false bottom provided with prismatic depressions lying parallel to the direction of movement of the wool. A propulsive rack is provided composed of a number of prismatic perforated troughs with teeth on their lower apices and shaped similarly to the false bottom.—J. F. B.

Imitation wool in the raw or spun condition ; Process for obtaining —— by a chemical treatment of stripped ramie fibre. P. Birkenstock. Fr. Pat. 434,416, Sept. 5, 1911.

100 KILOS. of stripped ramie, cut into lengths of 30—80 mm., are boiled for 2 hours in 1000 litres of a 2·5 per cent. solution of sodium carbonate. The liquor is then run off and the material is again boiled for 6 hours in 1000 litres of water to which have been added 20 litres of caustic soda of 36° B. After draining and washing thoroughly with cold water, the scoured fibre is hydro-extracted, dried, opened and next curled by working it for one hour in a cold bath containing 1000 litres of water and 1000 litres of caustic soda of 36° B. The excess of the solution is then expressed from the curled fibre and the process is completed by the operations of souring, washing, drying and carding.—P. F. C.

Textile fibres of jute, hemp, flax, etc. ; Treatment of raw and manufactured ——. R. Schreckenbach. Fr. Pat. 434,966, Oct. 7, 1911. Under Int. Conv., Nov. 29, 1910.

FOR the treatment of 50—60 kilos. of jute a fermentation bath is prepared containing 100 litres of water, 5 lb. of sugar, 3 lb. of the best brandy-yeast and ½—1 lb. of glycerin. The fibres are fermented in this bath at a temperature of 25°—28° C. After fermentation, if the fibres are not yet supple, the material is subjected a second time to the action of the same bath, which is renewed by the further addition of 5 lb. of sugar and ½ lb. of glycerin. It is claimed that this treatment makes the fibres more readily divisible for the manufacture of fine counts of yarns. Further effects are obtained by steeping the fermented fibre in a solution of sodium peroxide of 3 per cent. strength at the maximum, for 3 days. The latter treatment enables jute to be drawn to a fine yarn resembling silk in lustre and softness.—J. F. B.

Artificial threads ; Spinning machines for ——. O. Müller, Cologne, and Gebr. Franke, Chemnitz, Germany. Eng. Pat. 2222 of 1912, date of appl., Feb. 17, 1911.

THE spindles for the reception of the bobbins are attached by pivot pins to the bobbin carrier so that they can be turned outwards for changing the bobbins without disturbing the particular bobbin in operation, and can be held both in the operative and inoperative position by a spring bearing on the faces of the spindle. The revolving shaft of the bobbin carrier acts simultaneously as the driving shaft for the bobbins by means of spur wheels on the bobbin spindles gearing into driving wheels on the common shaft, the engagement of the spur wheels being capable of interruption.—J. F. B.

Artificial threads ; Spinning machines for ——. O. Müller, Cologne, and Gebr. Franke, Chemnitz, Germany. Eng. Pat. 4078, Feb. 17, 1911.

THE several threads issuing from the jets of the spinning apparatus are led, either directly or after passing through a twisting device, through a reciprocating eye in the form of a bundle of threads and are cross-wound on to spools, wherein a single lifting cam moves the reciprocating guide eyes more quickly at the ends of the spool than at the centre, so that the spool is given a bulged form and the threads are laid over one another at the ends in regular cross turns in such a manner that every point of the threads can be reached by the liquid in which they are treated.—J. F. B.

Artificial thread spinning apparatus. O. Müller, Cologne, and Gebr. Franke, Chemnitz, Germany. Eng. Pat. 4080, Feb. 17, 1911.

IN order to maintain a uniform pressure at the jet orifices, the jet pipe branching from the main supply pipe is constructed with an enlarged portion, from which extend, in the direction of the length of the pipe, a number of outwardly contracted or funnel-shaped nozzles, each terminating in a capillary orifice.—J. F. B.

Films, pellicles, threads and the like of artificial silk of the Chardonnet type ; Process for rendering impermeable ——. J. Bourgeois, E. Nieuviarts and C. de Clercq. Fr. Pat. 434,602, Nov. 30, 1910.

THE material is treated with petrol and allowed to dry ; or petrol is added to the cellulose preparation during the process of manufacture.—P. F. C.

Filaments, films and moulded articles ; Product for obtaining —— and its process of manufacture. G. Cahen. Fr. Pat. 434,868, Dec. 8, 1910.

A MIXTURE of 100 parts of collodion, 20 parts of aluminium chloride, 4—10 parts of sodium formate, 6 parts of nitric acid of 40° B. and 40—80 parts of water, is strongly agitated for some hours at the ordinary temperature in order to convert it into a homogeneous liquid of the consistence of glycerin. It is then filtered and passed through spinning nozzles into the atmosphere without the application of pressure. The resulting threads are finally denitrated by treating them with a solution of ammonium sulphydrate.—P. F. C.

Artificial silk ; Arrangement for spinning ——, without pressure and coagulating in the air. G. Cahen. Fr. Pat. 434,869, Dec. 8, 1910.

THE arrangement consists of a closed reservoir for the solution, which passes thence into a horizontal pipe, pierced at intervals with holes in which are situated vertical tubes capable of being rotated about their axes. The holes in the horizontal pipe are of such a size that the vertical tubes can rotate in them with a minimum of friction, and are suitably packed to prevent leakage. The vertical tubes are constructed in three portions of different diameters, the uppermost being the narrowest and the lowest the widest ; these are detachable and are joined together by unions. The middle portion is supported and carries a helical wheel in engagement with a worm, which provides for the rotation of the tube ; the bottom portion carries any convenient number of spinning jets. The liquid emerges from the jets under the action of gravity and coagulates as soon as it emerges into the air. The threads are drawn away and are twisted by the rotary motion of the spinning tubes.—J. F. B.

Silk and cellulose ; Manufacture of threads, films, ribbons, etc., from pure silk or mixtures of ——. D. Lance. Fr. Pat. 435,156, Dec. 17, 1910.

THE solvent properties of ammoniacal or methylamine solutions of the carbonates of zinc, nickel or copper, or mixtures of any of them, are utilised for preparing solutions of raw and waste silk, wild silk, old silk rags, etc., alone or in combination with cellulose, such solutions being spun or otherwise suitably coagulated to produce artificial threads, films, etc. The ammoniacal solution of zinc carbonate is most appropriate for degumming raw silk, since it dissolves the sericin alone in the cold. Raw silk may be dissolved in a mixture of the zinc and nickel solvents, or it may be degummed in a previous operation by the zinc solvent and then dissolved alone or in admixture with cellulose by means of the nickel solvent, preferably in admixture with the copper solvent. Treatment with these solvents is carried out in a rotating drum from which the liquid may be discharged by means of compressed air. The solution of sericin in ammoniacal zinc carbonate may be reduced by treatment with zinc or aluminium powder and added to the solution to be spun, or it may be used as a sizing agent to coat the products after coagulation. Coagulation is effected by acids, and means are provided for recovering the ammonia and the metallic carbonates.—J. F. B.

Acetylcellulose compositions. G. Koller, London. Eng. Pat. 4744, Feb. 25, 1911.

ACETYLATED cellulose derivatives, alone or in combination with other cellulose esters are treated with trichloroethylene or perchloroethylene in presence of mono- or poly-hydric phenols. On evaporation or removal of the solvent a plastic material is obtained which is claimed to be a new compound having special properties. Example: a solution is made containing 1 part of cellulose acetate, 2 parts of carbolic acid and 20 parts of tri- or perchloroethylene, and the cellulose compound is obtained either by precipitation or evaporation.—J. F. B.

Cellulose from substances containing cellulose fibres; Manufacture of ——. J. A., G. and A. Resenblum, G. de Gottinan, L. Brech and E. Tyborowski, Warsaw, Poland. Eng. Pat. 5552, Mar. 6, 1911.

Cellulose is manufactured from raw materials, such as wood, straw, grasses, hemp and the like, by treating the material under pressure with ammonium sulphite lyes containing free ammonia so that the pressure developed is higher than that corresponding to the temperature of the boiling lye. The used lye may be regenerated by driving off the free ammonia, treating the liquid with sulphurous acid, separating the precipitate so formed and adding ammonia again in excess to the clarified lye. The digester is in communication, by means of a pipe extending from its upper part, with an ammonia absorption tank, whilst a pipe from the bottom of the digester leads the used lye to a tank in which it is treated with sulphurous acid. After clarification the lye is transferred together with the ammoniacal liquid from the absorption tank to a second cellulose digester, and the used lyes from this may be treated with lime for the recovery of the whole of the ammonia. Example:—For the treatment of pine wood the composition of the lye corresponds to 3—3·5 per cent. of sulphur dioxide and 1·75—2 per cent. of ammonia; the wood is digested for 10 hours at a temperature of 165° C. under a pressure of 10—12 atmospheres; the yield of cellulose is stated to be 65 per cent., and the product is capable of being bleached.—J. F. B.

Celluloid; Non-inflammable substitutes for ——. L. L. T. Labbé. First Addition, dated Sept. 21, 1911, to Fr. Pat. 430,035, May 22, 1911 (this J., 1911, 1308).

By this modification of the original process the time of drying is curtailed and the tedious operation of rendering the products insoluble is done away with. The ingredients, *e.g.*, protein substances, are employed in the form of an extremely fine powder, which is moistened with a minimum quantity of the solvent and other materials, *e.g.*, shellac solution, so that the particles are only slightly swollen. The mixture is stirred until it becomes uniform and is pressed in heated moulds in hydraulic presses, so that the softened particles fuse together to a solid mass. On cooling, the articles are dried and re-formed in a press. The substance intended to convert the material into an insoluble form, *e.g.*, alum, formaldehyde, aluminium acetate, etc., is incorporated with the plastic mass and comes into operation during moulding.—J. F. B.

Cellulose esters and their transformation products; Manufacture of new ——. H. Dreyfus. Third Addition, dated Sept. 13, 1911, to Fr. Pat. 432,046, July 5, 1911 (this J., 1912, 24, 225).

The manufacture of the cellulose acetates sparingly soluble in chloroform but readily soluble after the addition of alcohol, and the manufacture of modified products soluble in various media should be carried out by performing the acetylation at a temperature in no case exceeding 40°—60° C., and preferably at the ordinary atmospheric temperature or even at lower temperatures.
—J. F. B.

Cellulose esters; Process for producing ——. Act.-Ges. f. Anilinfabr. Fr. Pat. 435,507, Oct. 20, 1911. Under Int. Conv., Oct. 29, 1910, and June 13, 1911.

See Eng. Pat. 22,237 of 1911; this J., 1912, 279. In place of chlorine or bromine iodine mono- or trichloride, iodine monobromide, or bromine chloride may be used.
—T. F. B.

Cardboard; Composite ——. L. H. Baekeland, Yonkers, N.Y., Assignor to General Bakelite Co., New York. U.S. Pat. 1,019,406, March 5, 1912.

Superposed layers of paper or the like are combined with intermediate layers of an insoluble non-fusible product of the condensation of phenols with formaldehyde.—C. A. M.

Paper and boards; Process for sizing ——. W. Bräuner and J. Kollmann. Fr. Pat. 435,013, Oct. 9, 1911. Under Int. Conv., Oct. 11, 1910.

In the engine-sizing of paper and boards, the rosin which is in combination in the form of sodium soap is precipitated by treating the sized pulp with an acid gas, particularly carbon dioxide, and neutralising the sodium carbonate thus formed by means of aluminium sulphate. Alternatively, gas containing sulphur dioxide may be employed. It is claimed that for the precipitation of the rosin a quantity of carbon dioxide equal to only 5 per cent. of the quantity of aluminium sulphate usually employed is required, whilst for neutralising the sodium carbonate, aluminium sulphate equal to 12 per cent. of the usual quantity suffices.—J. F. B.

Jute, hemp, flax, and other textile fibres; Process for treating raw and manufactured ——. R. Schreckenbach, Salzgitter, Germany. Eng. Pat. 21,801, Oct. 3, 1911. Under Int. Conv., Nov. 29, 1910.

See Fr. Pat. 434,966 of 1911; preceding.—T. F. B.

Textile fibres, such as jute, hemp, flax, and the like; Method of treating raw and worked ——. R. Schreckenbach, Salzgitter, Germany. U.S. Pat. 1,017,176, Feb. 13, 1912.

See Fr. Pat. 434,966 of 1911; preceding.—T. F. B.

Vegetable fibres; Process for converting —— into threads of silky appearance. J. M. J. Debourg, Lyons, France. U.S. Pat. 1,018,650, Feb. 27, 1912.

See Fr. Pat. 427,113 of 1910; this J., 1911, 1050.—T.F.B.

Cellulose esters; Process for recovering the volatile solvents of ——. A. Wohl. Fr. Pat. 435,742, Oct. 27, 1911. Under Int. Conv., Nov. 12, 1910.

See Ger. Pat. 241,973 of 1910; this J., 1912, 225.—T.F.B.

Sulphur compounds derived from glycerin; Process for making ——. L. Lilienfeld. Fr. Pat. 436,088, Nov. 8, 1911. Under Int. Conv., Nov. 12, 1910.

See Eng. Pat. 26,928 of 1910; this J., 1912, 122.—T. F. B.

Paper with thinned portions; Manufacture of ——. P. Weston. Fr. Pat. 435,942, Nov. 4, 1911. Under Int. Conv., July 26, 1911.

See Eng. Pat. 24,815 of 1911; this J., 1912, 226.—T.F.B.

Manufacture of resin soap. U.S. Pats. 1,017,692 and 1,017,693. *See* XII.

Fertiliser from waste sulphite liquors. Fr. Pat. 434,943. *See* XVI.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Indigo-vat; Theory of the ——. A. Binz and K. Schädel. Ber., 1912, **45**, 586—598.

This is a review of the present knowledge of the process of dyeing with indigo. (*a*) From experimental evidence published in this and previous papers (this J., 1898, 759, 1141; 1899, 1132; 1903, 901; etc.) the authors conclude that the formation of indigo-white during the "setting" of a vat is not due to a simple addition of hydrogen. The reaction takes place in two stages. One molecule of indigo first combines with one or two molecules of alkali or alkaline-earth to form an additive compound which is subsequently converted by de-oxidation into indigo-white (see this J., 1906, 1089; also compare Friedländer, this J., 1908, 440). (*b*) The fixation of indigo differs from the dyeing of substantive dyestuffs on cotton in two respects :—(i) The rate of fixation of indigo-white cannot, under normal conditions, be hastened by the addition of neutral salts to the dye-bath. (ii.) The authors have proved experimentally that whilst colloidal solutions of indigo-white readily dye cotton, colloidal solutions of indigo under the same conditions have no dyeing properties. From this and other evidence of a similar nature it is therefore concluded that the conversion of vat dyestuffs into their leuco-compounds not only makes them soluble but endows them with an affinity for the fibre. This is in accord with the theory of Binz and Schroeter as to the influence of "quinonoid desmotropy" on the dyeing properties of organic dyestuffs (this J., 1903, 23, 1126), for the formula of indigo-white can be expressed in either the ketonic or phenolic form. The authors consider it probable that indigo-white forms a condensation product with the fibre. (*c*) Since the behaviour of indigo on the fibre differs from its behaviour in the form of powder (*e.g.*, towards sodium ethylate), it cannot be that indigo-blue is deposited in the fibre after the oxidation of indigo-white as a purely mechanical precipitate, but must be combined in some way with the fibre-substance. If, however, the fibre is supersaturated with the dyestuff granular precipitation of indigo occurs and the dyed fabric will be liable to "rub."—P. F. C.

PATENTS.

Fibrous materials ; Bleaching plants for ——. C. Hall, Eccles, Lancs. Eng. Pat. 3285, Feb. 9, 1911.

THE plant for bleaching cotton or linen fabrics or yarns in continuous lengths comprises four vats fitted with squeezing and guide rolls. In the first vat the starchy matters are removed, in the second the motes, etc., are eliminated. For this purpose the first two vats are provided with hot liquor supply tanks, and means for circulating, injecting and heating the liquors. In the third vat the material is washed and partially bleached by treatment with dilute bleach liquor derived from the washings from the fourth vat. The fourth vat, in which bleaching proper is performed, is divided into two compartments by a horizontal partition. The lower compartment is provided with the usual arrangement of rolls by which the material is run through the bleach liquor and squeezed. The upper compartment is provided with a false bottom on which the cloth, saturated with liquor, is piled, whilst liquor is circulated from the lower tank and sprayed over the goods. At the conclusion of the operation the connection between the upper and lower compartments is closed, water is sprayed over the goods and the washings are discharged into the third vat.—J. F. B.

Lye from textile fabrics steeped in soda lye for the purpose of mercerising, by means of steam ; Process and apparatus for removing ——. M. Petzold, Zittau, Germany. Eng. Pat. 20,656, Sept. 18, 1911. Under Int. Conv., Sept. 27, 1910.

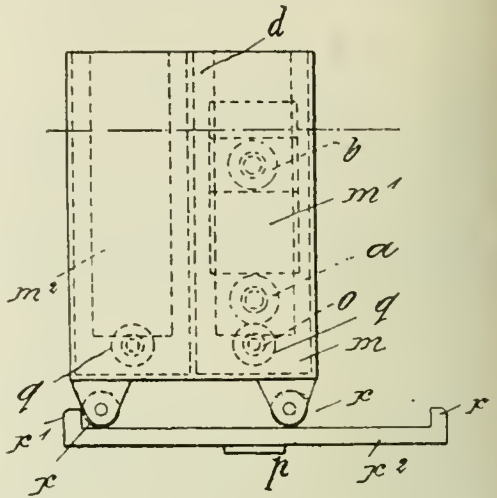
THE fabric impregnated with a caustic soda solution, is passed through a chamber in which it is subjected to the action of steam jets in order to remove most of the lye for subsequent recovery. The steamed material is next passed through hot water or weak lye and stretched to the desired width whilst it is still immersed. Souring and washing complete the process.—P. F. C.

Dyeing textile materials with circulating dye liquor under pressure ; Apparatus for ——. H. Giesler. Fr. Pat. 434,317, Sept. 18, 1911.

A CLOSED dye-vat is divided into three compartments by two horizontal perforated partitions and the material to be dyed is packed into the middle compartment. The upper and lower compartments are connected with a pump by pipes provided with valves. The pressure in the dye-vat is registered on a manometer connected with the uppermost compartment and by adjusting the valves on the pipes leading to the pumps, that pressure is maintained which has been found in practice to give the most satisfactory results on the material to be dyed.—P. F. C.

Mercerising cotton in hanks ; Process and apparatus for ——. P. Hahn. Fr. Pat. 434,516, Sept. 23, 1911.

A RECEIVER, *m*, mounted on wheels, *r*, and divided into two compartments, m^1, m^2, by a vertical partition, *d*, can be moved horizontally along a short rail, r^2, fitted with end pieces, r^1, and can be raised or lowered by means of a rack fixed at *p*, geared with a toothed wheel. One of the side walls of the receiver is cut away on each side of the vertical partition, *d*, so as to form two openings of similar shape, and a fixed metal plate is so situated above the receiver that when the latter is raised to its maximum height the plate fits tightly into one opening or the other according to the position which the receiver, *m*, occupies on the rail, r^2. This plate carries the bearings for two rollers, the lower one, *a*, being fixed whilst the upper one, *b*, can be moved vertically. By this means the tension on the hanks, which are placed over and under the rollers, *b*, *a*, respectively, can be varied at will. The wall of the receiver, *m*, carries bearings, *o*, for two rollers, *q*, which are so fitted that when the receiver is raised, one or the other of them forms a nip with the positively driven roller, *a*. In working the machine, the hanks are placed over the rollers, *a*, *b*, which are then suitably adjusted. The receiver, *m*, is next raised, the rollers are set in rotation and mercerising liquor is rapidly run into the compartment, m^1, whilst the stretched hanks are in motion. This movement, together with the squeezing of the yarn between the rollers, *a*, *q*, ensures even mercerisation. When the impregnation is complete, the liquor is run off and the excess is squeezed out at the nip, *a*, *q*. The receiver, *m*, is then lowered, moved along the rail, r^2, and raised again so that the rollers, *a*, *b*, are now fitted into the compartment, m^2. The rollers, *a*, *b*, *q*, are again started and the moving yarn, whilst still in the stretched condition, is thoroughly washed.—P. F. C.



Dyeing or impregnating hanks with a circulating bath ; Process for ——. Textil Maschinenfabrik B. Cohnen, G. m. b. H. Fr. Pat. 434,816, Sept. 15, 1911.

THE hanks are wound round a perforated tube provided with a flange at its lower end and a tightly-fitting cap at its upper end for compressing the roll of yarn. These tubes are then mounted on any suitable device in such a way that liquor can be forced through the yarn in either direction.—P. F. C.

Silk yarns, dyed and loaded, for the manufacture of velvet and plush ; Production of ——. Schmid Frères. Fr. Pat. 435,155, Dec. 16, 1910.

HITHERTO, yarns made of twisted silk or spun silk have not been loaded with mineral weighting materials when they are intended for forming the pile of velvets and plushes in colours other than blacks owing to the danger

of damaging the knives used for cutting the pile. According to this specification, yarns of raw twisted silk intended for this purpose are degummed by treatment with the froth of a soap solution, according to Fr. Pat. 345,173 of 1905 (this J., 1905, 24; 1906, 475; 1909, 1031), and are then loaded and dyed in the usual way; or the yarns may be loaded in the raw state, then degummed as described, and finally dyed. In the case of spun silk, the silk waste or floss is first degummed more or less incompletely, according to the process mentioned, it is next converted into spun silk yarn with two ends or "brins," the yarn is then fully degummed by soap froth, followed by washing, and finally loaded and dyed. The machine used for degumming is described in Fr. Pat. 387,796 of 1908 (this J., 1908, 854).
—J. F. B.

Printing, embossing or ornamenting fabrics, sheets, paper and the like; Process of ——. L. A. Brila and W. Andrews, London. Eng. Pat. 12,893, May 29, 1911.

The colours are applied to corresponding embossed gelatin transfer rollers and by them to a collecting roller having a plain surface, from which they are transferred to the printing roller. The printed material is finally embossed.
—P. F. C.

Soaping textile materials; Process of ——. Schmid Frères. Fr. Pat. 434,450, Nov. 26, 1910.

Instead of immersing them in a soap solution, the materials are subjected to the action of a soap lather or foam. (See also this J., 1905, 21; 1910, 588; 1911, 79 and 1445.)
—P. F. C.

Sizing, stopping, filling, etc.; Manufacture of a [starch] product for ——. H. Milligan and A. V. Board, Liverpool. Eng. Pat. 5269, Mar. 2, 1911.

A root of the manioc species, preferably in the dry, ground state, is treated with ammonium fluoride, hydrofluoric acid, ammonium bifluoride or other compound of hydrofluoric acid. Treatment of the manioc flour with 1 per cent. of its weight of dry powdered ammonium fluoride for 7—15 days is recommended. The manioc flour so treated may be mixed with a little sago flour and dextrin, with or without a suitable preservative.—J. F. B.

Soda lyes which have been used for mercerising; Process for purifying and clarifying —— *by treatment with lime.* M. Petzold. Fr. Pat. 435,685, Oct. 26, 1911. Under Int. Conv., Dec. 2, 1910.

See Eng. Pat. 17,626 of 1911; this J., 1912, 184.—T. F. B.

Hair-dye. R. Wolffenstein and J. Colman, Assignors to Act.-Ges. f. Anilinfabr., Berlin. U.S. Pat. 1,019,576, March 5, 1912.

See Eng. Pat. 11,044 of 1910; this J., 1911, 617.—T. F. B.

Printing and dyeing of textile fabrics; Process for the production in the —— *of the colours ordinarily produced by means of beta-naphthol.* Heilmann und Co., and M. Battegay, Mülhausen, Alsace. Eng. Pat. 22,915, Oct. 17, 1911. Under Int. Conv., Oct. 17, 1910.

See Ger. Pat. 238,841 of 1910; this J., 1911, 1310.—T. F. B.

Printing and dyeing of fabrics; Process for producing in the —— *the shades usually obtained with β-naphthol.* Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 435,350, Oct. 16, 1911. Under Int. Conv., Oct. 17, 1910.

See Ger. Pat. 238,841 of 1910; this J., 1911, 1310.—T. F. B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Selenium; Iodometric method of determining small quantities of ——, *in sulphur and pyrites.* P. Klason and H. Mellquist. Z. angew. Chem., 1912, 25, 514—518. (See also this J., 1910, 375.)

The selenium, obtained from the sample of sulphur or pyrites as described below, is filtered from the associated liquid on an asbestos plug in a hard glass filter tube 28 cm. long and of 1 cm. bore, the plug being supported by a platinum cone at the narrowing of the filter-tube. After washing the selenium thoroughly, and drying the tube, a second asbestos plug is inserted near the open end of the tube, a slow stream of oxygen is passed through from the narrow end, and the selenium heated, and gradually driven towards the second plug. The direction of the oxygen-stream is now reversed and the selenium driven slowly back again; this process is repeated if necessary till the pure white colour of the sublimate shows that the selenium has been completely converted into selenious anhydride. The selenious anhydride is then dissolved out by water into a flask provided with a ground stopper, diluted to 100—300 c.c., 2—10 drops (according to the volume) of strong hydrochloric acid added, the flask heated on the water-bath, the air displaced by carbon dioxide, 2—5 grms. of potassium iodide are added, the flask is closed and shaken till the iodide is dissolved, cooled in a stream of water, and left to stand in the dark for an hour. The iodine set free is titrated by $N/100$ sodium thiosulphate, using starch as indicator. The reaction is $SeO_2+4HI=Se+2H_2O+2I_2$. The results are very accurate. Any tellurium present is left behind in the filter-tube, as tellurous anhydride is not dissolved by water. Selenic acid does not react with iodide under the conditions of the method.

Sulphur is burnt, in boats holding 10—14 grms., in a stream of oxygen in a tube 1 m. long and of 2 cm. bore, at the further end of which is a plug of very fine asbestos, 5 cm. long. When the combustion (which carries itself on) is over, the boat is heated to drive out any selenium, removed, and another introduced; in this way 100—200 grms. of the sulphur can be used for the analysis. At the end, the selenium is dissolved off from the tube and plug by potassium cyanide solution. The solution is then acidified by hydrochloric acid, sulphur dioxide led through to reduce any selenious acid present, and the precipitated selenium collected in the filter-tube as already described. (Any arsenic present in the sulphur will be found in the filtrate, and can be determined if desired.)

Pyrites may be burnt in a similar manner, using a quartz tube, and applying heat; but the authors found that only from 50 to 75 per cent. (the more, the higher the temperature) of the total selenium is evolved with the gases. To obtain the whole the pyrites is dissolved in hydrochloric acid and chlorate, the insoluble residue filtered off, the iron reduced to the ferrous condition by means of zinc, more hydrochloric acid added, the solution boiled, and the selenium precipitated by stannous chloride, and filtered off upon asbestos. It is then dissolved in cyanide and reprecipitated as above, to separate arsenic, collected in the filter-tube, and treated as described.

In Silician sulphur the authors found 0·9 grm. of selenium per ton; in Japanese sulphur from 1 to 20, in Fahlun pyrites about 90 grms. per ton.—J. T. D.

Sulphur dioxide; Catalytic conversion of —— *into sulphuric acid.* H. Wieland. Ber., 1912, 45, 685—687.

When palladium black is exposed to moist sulphur dioxide, air being excluded, and the excess of sulphur dioxide is afterwards removed by carbon dioxide, sulphuric acid is found in the palladium, which can only have been produced by the removal of hydrogen from sulphurous acid:

$$H_2SO_3=H_2+SO_3;\quad SO_3+H_2O=H_2SO_4.$$

The equivalent hydrogen was not found, but instead of it, sulphur; and the author has found that palladium-hydrogen does reduce aqueous sulphurous acid

$$SO_2+2H_2=2H_2O+S.$$

The author suggests that the ordinary contact-process of sulphuric acid manufacture is not a direct oxidation, but a reaction similar to the above, in which the function of the oxygen is to oxidise the hydrogen produced, forming the water which is itself necessary for the reaction to occur: $SO_2+H_2O=H_2SO_3=SO_3+H_2$; $2H_2+O_2=2H_2O$.
—J. T. D.

Sulphuric acid; New and simple process for the purification of —— [from arsenic]. G. Bressanin. Chem.-Zeit., 1912, **36**, 306. (Compare this J., 1912, 93.)

The acid is diluted to 50° B., treated with a few c.c. of hydriodic acid, filtered through asbestos, and heated to expel iodine and attain the desired concentration.—A. S.

Potash and phosphoric acid; Waste and conservation of ——. F. K. Cameron. J. Ind. Eng. Chem., 1912, **4**, 169—172.

The author refers to the waste of phosphates by inefficient methods of mining the phosphate rock, but states that the deposits of high-grade phosphate rock in the United States are so large that even at three times the present rate of consumption they would last about 1200 years. The possibilities of various waste materials and natural products as sources of potash are also referred to (see this J., 1912, 227). In discussion, C. L. Parsons stated that in the cement industry from 5 to 10 per cent. of the raw material escapes from the kilns in the form of dust. In an attempt to recover this dust, the gases were first passed through dust-collecting flues and then treated by the Cottrell electrical process (this J., 1911, 1037), and it was found that the dust separated by the latter contained as much as "35 per cent. of soluble alkali of which one-half was potash."—A. S.

Chili saltpetre [sodium nitrate]; Discolouration of —— through the agency of a blue alga. F. Hundeshagen. Z. öffentl. Chem., 1912, **18**, 91—92.

A consignment of crude Chili saltpetre showed a diffused bluish colouration, with here and there particles of a substance of deep blue to black colour. No copper was present, and the colour had nothing to do with the reddish-green coloured layers frequently seen in crude Chili saltpetre, caused by contact with iron sand. These were also present, the sample containing 1·2 per cent. of insoluble matter and about 0·1 per cent. of iron oxide. The blue particles contained round cells (5 to 7 μ in diameter) which enclosed a blue coloured plasma and cell nuclei. The blue colouring matter was partially soluble in water, the solution showing a reddish fluorescence. It was immediately decolourised by acids and alkalis. The presence of a subordinate red colouring matter was clearly to be seen in the dried microscopical preparations. The conclusion drawn was that the blue tint originated from the cellular substance of one of the lower algae belonging to the group *cyanophyceæ*, and was probably introduced with the water used for the extraction of the salt.—C. A. M.

Barium hydrate; Increase in Italian import duty on ——. Board of Trade J., March 28, 1912. [T.R.]

The Italian "Gazzetta Ufficiale" for the 16th March, contains a Law, dated the 10th March, modifying No. 39 of the Customs Tariff to read as follows:—

	Lire	cts.	
(39) Hydrate of baryta:			
a. Crystallised (100 kilos.)	4	50	(3s. 7d.)
b. Fused or anhydrous (100 kilos.)	8	00	(6s. 5d.)

Anhydrous baryta shall be classified as such even if it has not been deprived of all the water of crystallisation.

Hitherto, the duty leviable on hydrate of baryta of all kinds has been 2 lire per 100 kilos.

Calcium oxide; Hydration of ——. S. Chumanoff. J. Russ. Phys.-Chem. Soc., 1912, **44**, 201—204.

Definite weights of pure lime were left for three days in contact with different proportions of boiled water in vessels which were free from carbon dioxide and were frequently shaken. The solid phases were subsequently separated by filtration and dried at 112°—115° C., until of constant weight, carbon dioxide being excluded during these operations. The proportion of water remaining in each of these phases after drying was then determined by ignition. In the following table p shows the number of parts of water originally taken per 1 part of lime and n the number of mols. of water per mol. of lime in the dried solid phase:

p	17·962	35·917	179·65	353·17	718·67
n	1·0725	1·0996	1·1592	1·1866	1·5563

—T. H. P.

Calcium nitrate. Part I. The two-component system, calcium nitrate, water. Part II. The three-component system, calcium nitrate, nitric acid, water at 25° C. H. Bassett, jun., and H. S. Taylor. Chem. Soc. Proc., 1912, **28**, 48.

The solubility of calcium nitrate in water has been studied between the temperatures of $-28·7°$ (the cryohydric temperature) and 151° C. (the boiling point of the saturated solution). There are only three hydrates of calcium nitrate, namely, $Ca(NO_3)_2,4H_2O$, $Ca(NO_3)_2,3H_2O$, and $Ca(NO_3)_2,2H_2O$, each of which is stable in contact with its saturated solution over a definite range of temperature. The tetra- and tri-hydrates have true melting points. The solubility of calcium nitrate increases rapidly with rise of temperature throughout the range of existence of the several hydrates, but at 51°, where the anhydrous $Ca(NO_3)_2$ becomes the stable solid phase, the solubility reaches a value which hardly changes with further rise of temperature. The addition of nitric acid lowers the solubility of calcium nitrate, and at the same time promotes dehydration. Solubility determinations have been made at 25° between the limits of nitric acid concentration of 0 and 98 per cent. In contact with pure water and dilute nitric acid solutions, $Ca(NO_3)_2,4H_2O$ is the stable solid phase, whilst the anhydrous $Ca(NO_3)_2$ is alone stable in presence of the most concentrated acid solutions. Between these two extremes, however, there are well marked intermediate regions, where the stable solid phases are $Ca(NO_3)_2,3H_2O$ and $Ca(NO_3)_2,2H_2O$ respectively.

Fluorspar, Valuation of ——. E. Bidtel. J. Ind. Eng. Chem., 1912, **4**, 201—202.

The following method is used by the author for the commercial analysis of fluorspar. 1 grm. of the finely powdered sample is heated with 10 c.c. of 10 per cent. acetic acid in a small covered Erlenmeyer flask on the water-bath for 1 hour, with occasional agitation, and then filtered; the ashless filter paper and residue are washed four times with warm water, and the filter paper then incinerated and the residue weighed. The loss of weight minus 0·0015 grm. (correction for the solubility of calcium fluoride) is returned as calcium carbonate, but may include also small quantities of the carbonates of lead, zinc, and iron, and calcium sulphate. The residue is mixed in a platinum crucible with an aqueous emulsion of 1 grm. of yellow mercuric oxide, evaporated to dryness, heated to dull redness (in order to oxidise any lead sulphide present), cooled and weighed. The contents of the crucible are now evaporated once with 2 c.c. and twice with 1 c.c. of hydrofluoric acid, then treated with a few drops of hydrofluoric acid and some macerated filter paper, and with a few drops of ammonia solution to precipitate the iron, evaporated to dryness, heated to dull redness, cooled and weighed: the loss of weight represents the silica. The residue is treated with 2 c.c. of hydrofluoric acid and a few c.c. of nitric acid, and the crucible covered and heated on a moderately warm water-bath for 30 minutes, after which the lid is removed and the contents evaporated to dryness. If the residue is not perfectly white it is evaporated again with hydrofluoric acid. It is then digested on the water-bath for 30 minutes with a few drops of hydrofluoric acid and 10 c.c. of ammonium acetate solution (400 c.c. of 80 per cent. acetic acid neutralised with ammonia, mixed with 20 grms. of citric acid, and made up to 1 litre with strong ammonia solution), filtered, and the insoluble matter washed by decantation first with hot water containing some of the ammonium acetate solution mentioned above and next with pure hot water, then dried and ignited in the same crucible and weighed. The residue should consist of pure calcium fluoride; this is checked by converting it into sulphate. The above method was found to give satisfactory results with artificial mixtures of similar composition to commercial fluorspar. —A. S.

Magnesia in magnesium carbonate and in admixture with asbestos; Determination of ——. V. Fortini. Chem.-Zeit., 1912, **36**, 270—271.

A known weight of the mixture is treated with hydrochloric acid in a suitable calorimeter, and from the rise of temperature, which, for a given instrument, is proportional to the weight of magnesium oxide present, the percentage of this substance is calculated. An alkaline earth oxide may be similarly determined, provided always that no other substance is present, which reacts with hydrochloric acid with the liberation of heat. Tortelli's thermoleometer (this J., 1904, 668) is recommended for carrying out the test, 12·5 c.c. of hydrochloric acid (sp. gr. 1·019), diluted with an equal volume of water, and 0·5 to 1 grm. of substance being employed.—F. Sodn.

Barium peroxide; Thermal dissociation of ——. J. H. Hildebrand. J. Amer. Chem. Soc., 1912, 34, 246—258.

In a study of the thermal dissociation of barium peroxide it was found that the presence of water is necessary for the reaction, and consideration of the results from the standpoint of the phase rule showed that the system is divariant at the beginning and end of the process and univariant over an intermediate stage, the extent of which varies somewhat with the proportion of water (or of barium hydroxide) in the barium peroxide. In the two stages of the process where the system is divariant, the solid phases consist of solid solutions of barium oxide in barium peroxide and of barium peroxide in barium oxide respectively, in each case together with some barium hydroxide, whilst in the intermediate stage the solid phase consists of a mixture of the two saturated solid solutions together with barium hydroxide; in one experiment at 750° C. this latter stage started when about one-third of the peroxide was decomposed and persisted until about 92 per cent. was decomposed, and it is only during this stage that there is a definite dissociation pressure for a given temperature. During this period the dissociation pressure is given satisfactorily by the equation:

$\log p = -6850/T + 1{\cdot}75 \log T + 3{\cdot}807$, where p is the pressure in mm., and T is the absolute temperature. The heat of the reaction at constant pressure and an average temperature of 775° C. is calculated to be 35,370 cals. The conditions necessary for obtaining high yields of barium peroxide from oxide and of oxide from peroxide are discussed.—A. S.

Copper salts; The formation of dithionic acid by the action of alkali sulphites on ——. H. Baubigny. Comptes rend., 1912, 154, 701—703. (See this J., 1912, 228.)

It has now been found that the reducing action of alkali sulphites on salts of copper can take place at 15° C. out of contact with the air. The reaction proceeds according to the following equation:—

$2CuSO_4 + 4Na_2SO_3 = 2Na_2SO_4 + (Cu_2SO_3, Na_2SO_3) + Na_2S_2O_6$.

The double sulphite of sodium and copper separates in the form of crystals which become at first brown, then green on exposure to the air. The salt crystallises with 12 mols. of water.—F. Sodn.

Vanadic acid; Reduction of —— in concentrated sulphuric acid solution by hydrogen peroxide and by persulphates. J. R. Cain and J. C. Hostetter. J. Amer. Chem. Soc., 1912, 34, 274—276.

Vanadium pentoxide dissolved in concentrated sulphuric acid is immediately and quantitatively reduced to the quadrivalent condition by hydrogen peroxide, and the reaction may be utilised for the standardisation of pure vanadium solutions. The solution is evaporated with concentrated sulphuric acid until fumes are evolved freely, then cooled, treated with a slight excess of 3 per cent. hydrogen peroxide, again heated to destroy the excess of peroxide, and finally titrated with permanganate. Molybdenum, titanium, and iron are not reduced under similar conditions. This action of hydrogen peroxide is probably the cause of the reduction occasionally observed by Trautmann in the analysis of ferrovanadium (this J., 1911, 807). Vanadium pentoxide is also reduced under similar conditions by persulphates and by Caro's acid. Quadrivalent vanadium does not give the colour reaction with strychnine in presence of sulphuric acid (this J., 1909, 1202).—A. S.

Metallic sulphates; Decomposition of some —— at an elevated temperature in a current of air. H. O. Hofman and W. Wanjukow. Met. and Chem. Eng., 1912, 10, 172. (See also this J., 1910, 1457.)

The sulphates were heated in a tube open at both ends and the temperature noted at which decomposition was first observed. The following results were obtained:—

Sulphate.	Decomp. temp.	Product.
	° C.	
$FeSO_4$	150	$Fe_2O_3(SO_3)_2$
$Fe_2(SO_4)_3$	530	Fe_2O_3
$Bi_2(SO_4)_3$	540	$5Bi_2O_3,4(SO_3)_3$
$CuSO_4$	653	$2CuO,SO_3$
$MnSO_4$	680	Mn_3O_4
$2CuO,SO_3$	704	CuO
$NiSO_4$	708	NiO
$CoSO_4$	718	CoO
$ZnSO_4$	739	ZnO
$CdSO_4$	830	$5CdO,SO_3$
$5Bi_2O_3,4(SO_3)_3$	850	Bi_2O_3
$5CdO,SO_3$	875	CdO
$CaSO_4$	1200	CaO
$BaSO_4$	1500	BaO

—A. S.

Penetrating radium rays; Chemical action of ——. Influence of penetrating rays on alkali iodides in aqueous solution. A. Kailan. Monats. Chem., 1912, 33, 71—98.

Potassium iodide, both in neutral and acid solution, is decomposed more rapidly than sodium iodide by penetrating radium rays, in absence of light. The rate of decomposition is increased by increasing the concentration of the salt (though in a less degree), and by the addition of small quantities of acid; it also increases with the strength of the radium preparation, though more slowly than the latter, as observed in the decomposition of hydrogen peroxide (Kailan, Monats. Chem., 1911, 32, 1019). With neutral, normal potassium iodide solution, a somewhat smaller decomposition was observed at 25° C. than at 12° C. and 7° C. The decomposition is considered to be due principally to the direct action of the radium rays on the non-dissociated iodide molecule.—F. Sodn.

Carbon monoxide; Combustion of ——. H. Wieland. Ber., 1912, 45, 679—685.

The author shows that in the complete absence of oxygen in the presence of palladium black and water, carbon monoxide is completely converted to dioxide, the hydrogen being retained by the palladium. The absorption of hydrogen by the palladium reduces its activity but oxygen will restore it by converting the hydrogen to water. He also shows that formic acid is an intermediate product in the reaction, *i.e.*, that the process may be represented as follows: $CO + H_2O \rightarrow CH_2O_2 \rightarrow CO_2 + H_2$. It is suggested that the normal combustion of carbon monoxide takes this course, and that in this way the necessity for traces of water vapour in the combustion is explained. The occurrence of hydrogen peroxide in the carbon monoxide flame is accounted for by the union of the hydrogen with oxygen when the flame is suddenly cooled by impinging on ice.—W. H. P.

Apparatus for the rapid quantitative removal of nitrogen from gaseous mixtures by sparking. [Determination of rare gases]. Henrich and Eichhorn. *See* XXIII.

Method for the separation of thorium. Smith and James. *See* XXIII.

Patents.

Sulphur-burner. G. E. Miller, Madison, Me. U.S. Pat. 1,018,255, Feb. 20, 1912.

A furnace for burning sulphur is combined with an agitator, which is arranged to operate beneath the surface of the burning sulphur; the agitator comprises a centrally disposed flat bar, to which are secured a series of angle-iron cross-bars, which project laterally to form agitator arms; the outer end of the agitator is connected with a suitably driven crank disc, which imparts a reciprocating motion to the agitator, and means are provided for feeding sulphur uniformly into the burner.—O. R.

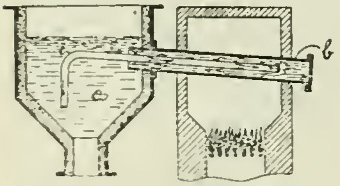
Sulphur trioxide; Process of making ——. K. Albert, Wiesbaden, Germany. U.S. Pat. 1,018,402, Feb. 27, 1912.

Sulphur dioxide is brought into contact with a catalyst, comprising "a combination of" ferric peroxide and an oxide of strontium or other alkaline earth metal, in the presence of an oxidising gas such as air, at a temperature (suitably 450°—550° C.) sufficient for the formation of sulphur trioxide.—F. Sodn.

Gay Lussac, Glover, and like towers; Packing means [tiles] for ——. S. W. Wheatley, F. S. Sheldon, and J. A. Tomlinson, Newcastle-under-Lyme, Staffs. Eng. Pat. 17,472, Aug. 1, 1911.

A flat tile is provided near each of its ends with a projection, one at one side of the tile and the other at the opposite side. The tiles are placed on their sides against each other in superposed rows, and each of the above-mentioned projections has two points of contact with the tiles respectively above and below it. The tiles may be made of any suitable size and the projections may be designed to give any desired space between the tiles.—O. R.

Sulphuric acid and other liquids; Apparatus for the evaporation, boiling and the like of ——. F. Brandenburg. Ger. Pat. 243,544, July 21, 1910.



The evaporating vessel, *a*, is provided with one or more side chambers, *b*, in which the actual heating takes place, these side chambers being connected with the interior of the evaporating chamber by means of siphons, *c*. When the side chambers, *b*, are heated, bubbles of vapour escape into the vessel, *a*, carrying with them some of the liquid, fresh liquid entering *b* through the siphon, *c*, so that after a short time, a vigorous circulation is set up, and the liquid in *a* finally begins to boil at the surface, any mud or suspended impurities settling to the bottom. The siphon rests loosely in the side chamber, and the side chamber, *b*, is fixed only at one end, so that strains due to unequal expansion are avoided, thus permitting of the use of such materials as fused quartz, glass, etc.—A.S.

Formic acid from alkali formates; Process for preparing ——. Chem. Fabr. Grünau, Landshoff und Meyer, E. Franke, and W. Kirchner. Ger. Pat. 243,225, May 31, 1910.

Alkali formates are converted into ammonium formate by treatment with ammonia and carbon dioxide, and the ammonium formate is either decomposed by sulphuric acid or is converted into calcium formate and this is decomposed by acid. In either case the ammonia is recovered from the solutions by means of lime.—T. F. B.

Zinc oxide and ammonium zincate; Production of ——. C. Ranson, Paris, and R. W. Greeff, London. Eng. Pat. 4702, Feb. 24, 1911.

Zinc ores, preferably roasted, are treated with an excess of sulphurous acid solution with the formation of soluble zinc bisulphite; the latter solution is heated with the separation of insoluble zinc sulphite and the evolution of sulphur dioxide; the zinc sulphite is washed, re-dissolved in an excess of sulphurous acid solution, and the liquor is treated with milk of lime, which precipitates zinc hydroxide; the latter is digested with ammonia to form ammonium zincate, from which zinc oxide is obtained by distillation and ammonia is regenerated. Any calcium zincate, which may have been formed by the interaction of zinc bisulphite and milk of lime, is added to the precipitated zinc sulphite, during the process in which the latter is re-dissolved in sulphurous acid.—O. R.

Zinc oxide and other zinc preparations; Process for removing lead from commercial ——. S. E. Goldschmidt und Sohn. Ger. Pat. 243,959, May 3, 1911.

The zinc oxide is treated with a solution of alkali zincate, whereby the lead is dissolved in the form of alkali plumbite and an equivalent quantity of zinc oxide precipitated. The solution is afterwards treated with zinc in order to precipitate the lead and regenerate alkali zincate.—A. S.

Oxalates; Method of producing ——. L. W. Andrews, Davenport, Iowa. U.S. Pat. 1,018,092, Feb. 20, 1912.

Sawdust is mixed with a hot, aqueous solution of a caustic alkali, the mixture is immersed and heated in a bath of petroleum, and the latter is finally separated from the solid oxalate which is formed.—O. R.

Alkali metal compounds from minerals containing alkalis; Process of obtaining ——. M. M. Haff, Assignor to T. L. Willson, Ottawa, Canada. U.S. Pat. 1,018,186, Feb. 20, 1912.

A mineral containing an alkali metal is heated with the phosphate of an alkaline-earth metal, such as calcium phosphate, to such a temperature that the alkali metal phosphate, such as potassium phosphate, which is formed, is volatilised and may be condensed from the vapours.
—O. R.

Peroxide paste; Greaseless ——. R. von Foregger, Assignor to The Roessler and Hasslacher Chemical Co., New York. U.S. Pat. 1,018,240, Feb. 20, 1912.

A stable, greaseless peroxide paste is composed of glycerin and a solid alkali metal peroxide.—O. R.

Perborates; Preparation of ——. F. Bergius. Ger. Pat. 243,948, Dec. 7, 1910. Addition to Ger. Pat. 232,001, April 19, 1910 (see Fr. Pat. 427,866 of 1911; this J., 1911, 1160).

Boric acid, borax, or other boron compounds are dissolved in a fused inert solvent, *e.g.*, in a fused alkali, and oxygen is forced through the fused mass under pressure or in presence of a catalyser. Iron-manganese-vanadium compounds may be used as catalysers.—A. S.

Nitrogen [cyanogen] compounds; Method of producing ——. C. E. Acker, Ossining, Assignor to The Nitrogen Co., New York. U.S. Pat. 1,018,802, Feb. 27, 1912.

A nitrogenous reagent, "associated with a carbonaceous substance" (*e.g.*, trimethylamine), is made to react at about a red heat with a nascent alkali metal, produced, for example, by electrolysis from a bath of fused cyanogen salt.—F. Sodn.

Nitrogen compounds [calcium cyanamide]; Process for the manufacture of —— *with the help of metallic carbides.* G. Scialoja. Fr. Pat. 434,953, Oct. 6, 1911. Under Int. Conv., Oct. 8, 1910.

Calcium carbide or other suitable metallic carbide is made to react with air, by heating the mass wholly or in part to the temperature necessary to start the reaction. The heating may be effected by plunging an electrode, consisting of a cartridge of powdered carbon or other semi-conducting substance, which may contain a central rod of carbon or metal, directly into the mass; or, part of the mass of carbide may be brought into contact with already glowing calcium cyanamide. The carbide may be mixed with any substance capable of facilitating the reaction, and the air may be mixed with other gases, if desired.
—F. Sodn.

Tin [bi-] chloride; Method of making anhydrous ——. G. Baillio, Niagara Falls, N.Y., Assignor to Castner Electrolytic Alkali Co. U.S. Pat. 1,018,805, Feb. 27, 1912.

Metallic tin is immersed in liquid anhydrous stannic chloride, and moist chlorine is continuously introduced beneath the surface of the liquid, which may be suitably agitated.—F. Sodn.

Metal oxides [tin oxide]; Process of making ——. H. Foersterling, New York. U.S. Pat. 1,019,004, Feb. 27, 1912.

The metal to be oxidised is heated, in the absence of an excess of gaseous oxidising agent, to a temperature which is above its melting point and near, but below, its boiling point, and the escaping vapours of the metal are brought into contact with a current of an excess of gaseous oxidising agent, which may be heated, the temperature of the vapours being raised by this means and by the heat of the reaction to the boiling point of the metal. The oxidation of tin by atmospheric air is specially referred to.—F. Sodn.

Hydrosulphite of sodium and zinc; Process for the manufacture of a sparingly soluble double ——, *of high percentage strength and very stable.* Chem. Fabr. Griesheim-Elektron. Fr. Pat. 434,511, Sept. 23, 1911. Under Int. Conv., Jan. 5, 1911.

The double salt is deposited on heating and stirring together liquors containing zinc and sodium hydrosulphites respectively. For example, 100 litres of liquor, containing 74 kilos. of zinc hydrosulphite, and 150 litres, containing 33 kilos. of sodium hydrosulphite, are stirred for half-an-hour at 60°—65° C., the mixture is filtered hot, and the residue washed with dilute alcohol and dried *in vacuo* at 60°—70° C. A good yield of a stable white salt, with a strength corresponding to a content of about 90 per cent. of zinc hydrosulphite is obtained.—F. Sodn.

Barium nitrate; Process for the preparation of ——. Chem. Werke vorm. Dr. H. Byk. Ger. Pat. 242,243, Dec. 31, 1909.

Barium carbonate is fused with calcium nitrate. If commercial barium carbonate containing sulphide be used, the fusion is prolonged until hydrogen sulphide is no longer evolved. The further treatment of the product follows according to known methods. The process possesses the advantage over the one described in Ger. Pat. 205,167 (this J., 1909, 140), that the fusion may be effected in open vessels.—A. S.

Gaseous mixtures, particularly atmospheric air; Separation of the constituents of ——. Soc. L'Air Liquide (Soc. Anon. pour l'Étude et l'Exploit. des procédés G. Claude) and G. Claude, Paris. Eng. Pat. 3326, Feb. 9, 1911.

Air is passed in succession through two separate, tubular systems, situated one above the other (see Eng. Pat. 7305 of 1910, this J., 1910, 1251), both liquid portions being produced by applying the principle of liquefaction with backward return; the two liquids are rectified, and part of the gases situated above the plates of the lower part of the rectification column is subjected to liquefaction with backward return by indirect contact with the liquid of the upper part of this column; the portion so liquefied is returned to the lower part of the column, and the unliquefied remainder, rich in argon, is collected outside the column.—O. R.

Silicon; Decarburised —— *and method for making the same.* J. T. H. Dempster, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,019,431, Mar. 5, 1912.

Silicon is freed to a great extent from any carbon, which it may contain, by heating it in the presence of carbon dioxide, as for instance by fusing it in a crucible containing limestone, and pouring off the molten silicon, which is obtained.—O. R.

Sulphuric acid; Process of concentrating ——. F. Girod, Grevenbrück, Germany. Eng. Pat. 17,158, July 26, 1911. Under Int. Conv., Aug. 13, 1910.

See Fr. Pat. 432,873 of 1911; this J., 1912, 127.—T. F. B.

Phosphoric acid; Manufacture of ——. M. Dittmar, Wülfel, Germany. U.S. Pat. 1,018,746, Feb. 27, 1912.

See Fr. Pat. 414,521 of 1910; this J., 1910, 1203.—T. F. B.

Nitric acid; Process for recovering —— *from kieselguhr and other inert absorbent matter.* F. M. Hale and A. C. Scott. Fr. Pat. 435,497, Oct. 17, 1911. Under Int. Conv., Oct. 20, 1910.

See Eng. Pat. 24,379 of 1910; this J., 1911, 1251.—T. F. B.

Aluminium nitride; Process for the manufacture of ——. O. Serpek, Paris. Eng. Pat. 23,514, Oct. 25, 1911.

See Fr. Pat. 430,822 of 1910; this J., 1911, 1382.—T. F. B.

Ammonium carbonate; Manufacture of ——. J. Bulb, Dessau, Germany. U.S. Pat. 1,018,406, Feb. 27, 1912.

See Eng. Pat. 9177 of 1910; this J., 1910, 1378.—T. F. B.

Cyanogen compounds; Process of producing ——. C. E. Acker, Ossining, N.Y., Assignor to The Nitrogen Co., New York. U.S. Pat. 1,019,002, Feb. 27, 1912.

See Fr. Pat. 425,699 of 1910; this J., 1911, 956.—T. F. B.

Formates; Manufacture of ——. O. L. A. Dubosc, A. D. Luttringer, and H. Denis, Assignors to Soc. Le Camphre, Paris. U.S. Pat. 1,019,230, March 5, 1912.

See Fr. Pat. 421,227 of 1909; this J., 1911, 542.—T. F. B.

Zinc formaldehyde-sulphoxylate; Process for producing ——. Badische Anilin und Soda Fabrik. Fr. Pat. 435,260, Aug. 16, 1911. Under Int. Conv., April 8, 1911.

See Eng. Pat. 12,157 of 1911; this J., 1912, 72.—T. F. B.

Sal ammoniac [galvanisers'] skimmings; Process and apparatus for treating ——. New Jersey Zinc Co. Fr. Pat. 435,476, Sept. 28, 1911. Under Int. Conv., Nov. 12, 1910.

See U.S. Pat. 1,002,317 of 1911; this J., 1911, 1160.
—T. F. B.

Hydrogen peroxide solutions; Process for preserving aqueous ——. M. Schlaugk. Fr. Pat. 435,572, Dec. 28, 1910.

See U.S. Pat. 992,265 of 1911; this J., 1911, 747.—T. F. B.

Chemical compounds; Reduction of —— *[Preparation of boron, etc.].* E. Weintraub, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,019,394, March 5, 1912.

See Fr. Pat. 432,189 of 1911; this J., 1911, 1451.—T. F. B.

Boron and boron alloys; Method of making ——. E. Weintraub, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,019,569, March 5, 1912.

See Fr. Pat. 421,831 of 1910; this J., 1911, 488.—T. F. B.

Extraction of sulphur and cyanides contained in spent materials [oxide] used for the purification of illuminating gas. Fr. Pat. 434,673. *See* IIa.

VIII.—GLASS; CERAMICS.

Sintering and fritting. E. Podszus. Arch. Physik. Chem. d. Glases u. d. keram. Massen, 1912, [1], 2. Chem. Zentr., 1912, 1, 776.

Even brittle substances soften near their melting point, as is shown by the deformation of thin rods of pure alumina, thoria, zirconia, silica, and magnesia when these are heated below the melting point. Sintering can be greatly influenced by alteration of the surface energy. Tubes of alumina, thoria, silica, magnesia, or zirconia showed much greater sintering when a mercury vapour arc was produced in them during the heating, than when the exhausted tubes were heated. The sintering of the oxides mentioned is promoted by addition of boric acid, which exerts a solvent action.—A. S.

Salt-glazed stoneware; An interesting cause of loss in the manufacture of ——. E. Berdel. Sprechsaal, 1912, 45, 161—162.

A factory devoted to the making of beer-tankards suffered loss to the extent of 33 per cent. by heavy deposits of undecomposed salt on the ware. The deposits were found to contain iron, but the original salt, though denatured by pyridine in order to pass duty-free, contained less than 0·1 per cent. of iron oxide. Nor was the body at fault, as a white porcelain mixing gave the same result. The loss was ultimately traced to some sand used in making the gear which contained iron hydroxide. In the fire the volatilised salt caused iron chloride to drip on the ware below each piece of gear, thereby preventing the chemical action of salt-glazing. A new source of sand obviated the loss.—H. H. S.

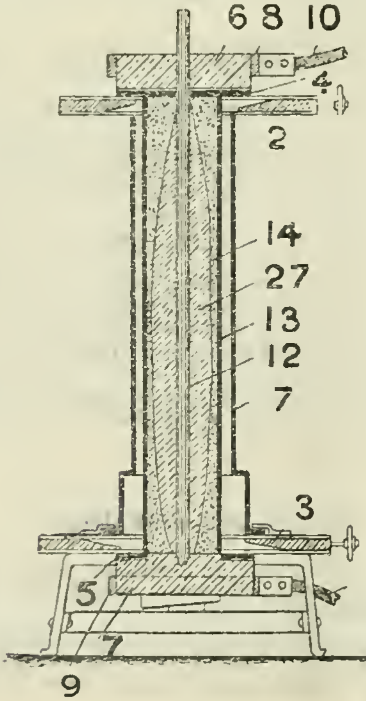
Patents.

Optical coloured glass. Continental Optical and Mechanical Co. Fr. Pat. 434,554, Sept. 25, 1911. Under Int. Conv., Oct. 29, 1910.

Coloured optical glass when shaped by grinding loses its uniformity of colour. It is therefore covered on one or both sides with a layer or layers of ordinary colourless or white glass which may be of equal or varying thickness and of equal or varying indices of refraction. The outer layers of colourless glass are then ground to the desired shape. —H. H. S.

Silica ware; Process for shaping —— fused by heat of electric resistance. Quarz-, Form- und Blasmachinen-Ges. m. b. H. Fr. Pat. 435,037, Aug. 17, 1911.

The improvement claimed on previous processes is the power to withdraw the core without disturbing the shape of the melt. The apparatus is shown in the figure, where 12 is the core, 27 the shaped melt, 14 fused material. The upper electrode, 6, is lifted so as to disengage the mould, 7, and the auxiliary chamber of fusion, 13, which can turn on their own axes and are fitted with longitudinal openings, the shaped article being thereby exposed so that it can be subjected to finishing by blowing.—H. H. S.

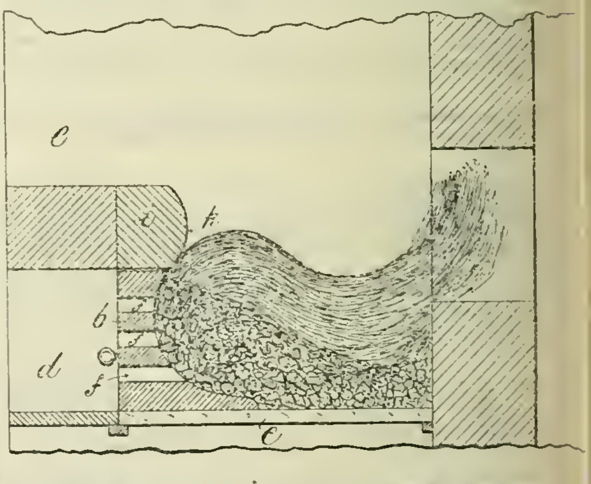


Light-refracting material [colourless silicon carbide]; Manufacture of ——. F. J. Tone, Assignor to The Carborundum Co., Niagara Falls, N.Y. U.S. Pat. 1,015,598, Jan. 23, 1912.

30 per cent. of ground carbon free from metallic oxides, 57 per cent. of silica, 9 per cent. of sawdust, and 4 per cent. of sodium chloride, are heated together in an electric furnace in the same manner as for the ordinary preparation of carborundum; the operation, however, is continued for such a time that the zone of carborundum crystals adjacent to the core is decomposed to a distance of two or three inches, with the liberation of graphite and silicon vapour; the latter combines with the carbon monoxide present in the furnace according to the equation: $3Si+2CO=2SiC+SiO_2$, and builds up large crystals of carborundum just outside the zone of the graphite, which is formed by the decomposition. The crystals thus produced are transparent, colourless, and doubly-refracting, and can be substantially developed in the direction of their optical axes.—O. R.

Furnaces for [potters'] kilns or ovens. C. H. Bowers, Tunstall, Staffs. Eng. Pat. 20,054, Sept. 9, 1911.

The claim is for the use of a removable block, *b*, having the curved form shown (see fig.) and perforations, *f*. The block stands on the firebars, *c*, in the "glut" or space, *d*, below the opening, *e*, for feeding the fuel. Another block, *i*, having a curved portion, *k*, is placed in the position shown and the two together cause the products of combustion to curl over and promote a more complete combustion of the fuel.—W. H. C.



Clay; Apparatus for cleaning ——. M. Bohn. First Addition, dated Sept. 25, 1911, to Fr. Pat. 414,455 April 4, 1910 (this J., 1910, 1206).

To the axle of the endless screw is fixed a conical piece by which the size of the aperture through which the material flows to the second cleaning chamber can be regulated. Blades in the cylinder work concurrently with blades on the fixture to break up stones which can then find an exit. —H. H. S.

Enamel-stripping; Process of —— by heating with alkaline compounds. T. J. Roenelt. Fr. Pat. 434,301, Sept. 16, 1911.

Potassium cyanide is used instead of hydrofluoric acid or potassium nitrate and cryolite frit for removing enamel

from metallic objects. The cyanide is sprinkled on the enamel heated just to redness, and after half a minute the enamel may be lifted off or the object placed in water which will dissolve the alkalis, and thus loosen the enamel.
—H. H. S.

White enamels ; Method for manufacturing ——. Landau und Co., and C. Rosenzweig, Vienna. Eng. Pat. 10,418, April 29, 1911. Under Int. Conv., June 8, 1910.

See Fr. Pat. 429,665 of 1911 ; this J., 1911, 1213.—T. F. B.

Packing means for Gay-Lussac, Glover, and like towers. Eng. Pat. 17,472. *See* VII.

Electric furnace [for melting quartz, etc.] with arcs and resistance for diphase or triphase currents. Fr. Pat. 435,111. *See* XI.

IX.—BUILDING MATERIALS.

Wood-preserving oils ; Value of the higher phenols in ——. S. Cabot. J. Ind. Eng. Chem., 1912, **4**, 206.

It has been stated that the phenols in creosote oils have little or no value for preserving wood on account of their volatility and solubility, and in support of this view, analyses of preservative oils extracted from timber which had been in the ground a long time have been cited, showing that the extracts consisted of heavy oils boiling above 250° C., and containing but a trace of phenols. The author points out, however, that the higher phenols, which have a greater fungicidal power than the lower ones, are practically insoluble and are less volatile than the hydrocarbon oil fractions containing them. For instance, when 2 grms. of heavy creosote oil and of the phenols extracted therefrom respectively were heated on a watch glass for 200 hours at 50°—55° C., the oil lost 36·3 per cent., whilst the phenols lost only 25·75 per cent. The residue from the oil was a viscous fluid, whilst that from the phenols was of the consistence of pitch at 15° C. This phenolic residue appeared insoluble when boiled with 25 or 35 per cent. caustic soda and yielded less than 10 per cent. when dissolved in benzol and extracted with warm 10 per cent. caustic soda solution. It appears therefore that in analysing oils extracted from old timber by the usual method, the greater part of the higher-boiling phenols would be present in the pitchy residue and would escape determination.—A. S.

Refractories. F. A. J. FitzGerald. Met. and Chem. Eng., 1912, **10**, 129—132.

Alundum (fused alumina).—See this J., 1911, 686. Pyrometer tubes of alundum are now being made ; they are more refractory and have a higher heat conductivity than porcelain or fireclay tubes. As a roof for electric steel furnaces alundum bricks resist the high temperature but show a tendency to break off in layers owing to the action of lime vapour arising from the basic slag.

Crystolon (silicon carbide).—Amorphous silicon carbide in the form of "carborundum fire sand" gives good results as a lining for electric resistance furnaces, and is also useful in fuel-fired furnaces in the form of bricks or lining or even as a "wash" applied to firebrick walls. It can also be used for making repairs and as a cement for firebricks. At a very high temperature it becomes somewhat plastic and can be used without a binding agent. At higher temperatures, in a reducing atmosphere, it becomes converted into crystalline silicon carbide. The heat conductivity of amorphous silicon carbide is higher than that of firebrick. Crystalline silicon carbide or crystolon is still more refractory than the amorphous form : it has a higher heat conductivity even than alundum, and a smaller coefficient of expansion than silica. For making shaped articles of crystolon, powdered silicon carbide may be moulded with the aid of a temporary binder, such as glue or dextrin, and then heated in an electric furnace to the temperature of formation of silicon carbide, whereupon crystallisation or re-crystallisation of the carbide takes place and a strong article is obtained. Bricks made in this manner have given very good results as a roof for electric steel furnaces. Owing to the high heat conductivity of such bricks they must be backed with a course of firebrick or other heat insulating material ; the electrodes just fit the openings in the firebrick but have a clearance space when passing through the crystolon, for the latter conducts electricity at high temperatures. Crystolon articles made with a small amount of a clay binder, however, act as insulators for most practical purposes even at high temperatures. In some experiments in an electric furnace with a crystolon brick roof, it was found possible to destroy the magnesite lining of the furnace, and to melt the course of firebrick covering the crystolon, without damaging the latter.

Electrically calcined magnesia.—Magnesia calcined at a very high temperature in an electrical resistance furnace is practically free from the defect of cracking when heated to high temperatures shown by ordinary calcined magnesia. The rate of absorption of carbon dioxide by the electrically calcined magnesia is so slow as to be negligible.

Fused lime.—Lime fused in an electric furnace is a much better heat-conductor than ordinary quicklime, and will withstand sudden cooling after being heated. It is also much less readily hydrated.—A. S.

Cement ; Final report of Special Committee of American Society of Civil Engineers on uniform tests for ——. Proc. Amer. Soc. Civil Eng., 1912, **38**, 103—132.

The description of the methods differs only in a few points from that of last year (this J., 1911, 490) : The sieves for cement and sand are specified as follows :—

No. of sieve.	Diameter of wire.	Meshes, per linear inch.	
		Warp.	Woof.
100	0·0042 to 0·0048 in.	95 to 101	93 to 103
200	0·0021 to 0·0023 in.	192 to 203	190 to 205
20	0·016 to 0·017 in.	19·5 to 20·5	19 to 21
30	0·011 to 0·012 in.	29·5 to 30·5	28·5 to 31·5

The paste for briquettes is said to be of normal consistency when the Vicat cylinder settles to a point 10 mm. below the original surface in half a minute. In the normal and accelerated tests for constancy of volume, 24 hours in moist air precedes each test, whether in air, cold water, or steam. Compression tests may be made with any form of machine provided with means for so applying the load that the line of pressure is along the axis of the test piece. The test pieces as soon as removed from the water are to be placed in the machine, with a piece of heavy blotting paper on each of the crushing faces, which should be those that were in contact with the mould.—J. T. D.

Patents.

Flooring-tiles of cement or other calcareous materials ; Process of manufacturing ——. E. Picha, Ghent, Belgium. Eng. Pat. 25,992, Nov. 21, 1911.

The materials, of which the tiles are to be composed, are thoroughly pulverised, mixed, and submitted to progressive pressures, in order to drive out the air contained in the mass and to produce uniform, dry tiles. The latter are then brought into contact, by their lower surfaces only, with a solution of an alkali silicate, and as soon as the impregnating liquid is visible on about one-fifth of the upper surfaces, the tiles are dipped into water as in the usual processes.—O. R.

Fire-brick ; Process of making ——. C. H. Jaxtheimer, New Wilmington, Pa. U.S. Pat. 1,018,665, Feb. 27, 1912.

Silica sand is mixed with a bond (preferably equal in quantity to the voids in the sand) made of silica flour, slaked lime, and sodium or other alkali carbonate, capable of combining with silica to form a compound which contracts under heat, and the mixture is moulded into bricks and fused.—F. Sodn.

Artificial marble; Process of transforming rock-gypsum into ——. M. J. N. G. de Tholozany. Fr. Pat. 434,864, Dec. 8, 1910.

The gypsum is dehydrated in block form, then plunged into water to re-hydrate and allowed to dry. The resulting product is said to be of sufficient hardness to be worked, sculptured and polished like marble.—H. H. S.

Hydraulic lime; Process of manufacture of ——. E. Bouvier. Fr. Pat. 435,187, Oct. 12, 1911. Under Int. Conv., Oct. 21 and Dec. 21, 1910, and March 27, 1911.

A mixture of lime and clay or silicious material such as sand, slag, etc., is submitted to the action of steam, under pressure, and the product is dried in special drying apparatus which deprives it of part of the water of combination without bringing about complete dehydration, so that a material is obtained, which does not undergo expansion in the using.—F. Sodn.

Cement, mortar, and concrete; Waterproof —— and miscible pastes for making the same and processes of making such pastes and making waterproof cement, mortar, and concrete. H. Abraham, Bound Brook, N.J., and H. W. Haines, New York. Eng. Pat. 5402, March 3, 1911. Under Int. Conv., March 9, 1910.

See Fr. Pat. 426,889 of 1911; this J., 1911, 1061.—T. F. B.

Poles, etc.; Process of preserving ——. A. Kolossváry and S. Haltenberger, Budapesth, and E. Berdenich, Püspök-Ladány, Austria-Hungary. U.S. Pat. 1,018,624, Feb. 27, 1912.

See Eng. Pat. 24,483 of 1910; this J., 1911, 285.—T. F. B.

Wood; Process for preserving ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 435,351, Oct. 16, 1911. Under Int. Conv., Oct. 22, 1910.

See Ger. Pat. 240,988 of 1910: this J., 1912, 283.—T.F.B.

Separation of fibrous material [asbestos] from substances of different specific gravity. Eng. Pat. 8614. *See* I.

Compositions containing pitch. Eng. Pats. 4859 and 20,635. *See* III.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Ferromanganese; Remelting of —— in the electric furnace. R. Korten. Stahl u. Eisen, 1912, 32, 425—426.

Using a Keller electric arc-furnace lined with magnesite nearly 2000 tons of ferromanganese have been remelted at Burbach, Germany, during a period of four months without any deterioration of the lining and the furnace will probably last about nine months. It was found advantageous to use a low voltage current with as short an arc as possible in order to prevent volatilisation of the manganese and to ensure a more uniform heating of the bath. Heating the ferromanganese to redness in another furnace and then charging it into the electric furnace reduced the total cost of melting. A better method of working attended with less cost is the use of an alloy containing 76 per cent. of manganese and 4·0 of silicon. This has a lower melting point and less is required. —A. H. C.

Steels; Formation of osmondite in hypo-eutectic ——. J. Calian. Rev. Mét. 1912, 9, 187—194. (See also this J., 1906, 761, 987.)

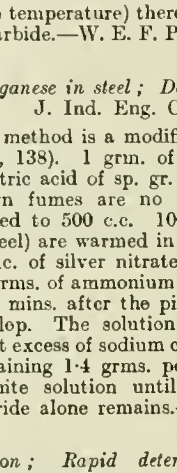
The author has examined the behaviour of three hypo-eutectic steels, containing respectively 0·42, 0·65 and 0·80 per cent. of carbon, and a hyper-eutectic steel containing 1·02 per cent. of carbon, the samples being quenched in water from a temperature of 900° C. and then annealed at temperatures varying from 100° to 600° C. It was found that, for the same steel, the colour produced upon the surface by etching with alcoholic hydrochloric acid was darker as the annealing temperature increased (indicating an increased formation of "free carbon" at the higher temperatures); and that the solubility of the samples in 1 per cent. sulphuric acid also increased with the annealing temperature. The figures for solubility (calculated upon the basis of 100 grms. and 100 sq. mm.) are tabulated and plotted, microphotographs of the etched specimens being also given. The author concludes that in hypo-cutectic steels the transition from martensite to pearlite occurs in the same stages as in eutectic steel, viz., through troostite, osmondite and sorbite; and that osmondite may be formed at any temperature between 300° and 500° C., its formation not being dependent upon the proportion of "free carbon" or carbide present but upon the molecular arrangement and composition of the primary material, since it was found that with a diminution of the carbon content (the steels being at the same temperature) there was an increase in the proportion of carbide.—W. E. F. P.

Manganese in steel; Determination of ——. J. J. Boyle. J. Ind. Eng. Chem., 1912, 4, 202—203.

The method is a modification of that of Walters (this J., 1906, 138). 1 grm. of the steel is dissolved in 100 c.c. of nitric acid of sp. gr. 1·2, and the solution heated until brown fumes are no longer evolved, then cooled and diluted to 500 c.c. 100 c.c. of the solution (=0·2 grm. of steel) are warmed in an Erlenmeyer flask, treated with 15 c.c. of silver nitrate solution (1⅓ grms. per litre) and 1·5 grms. of ammonium persulphate and warmed for about 1—2 mins. after the pink permanganate colour begins to develop. The solution is then cooled, treated with a slight excess of sodium chloride solution (6 c.c. of a solution containing 1·4 grms. per litre) and titrated with sodium arsenite solution until the white colour of the silver chloride alone remains.—A. S.

Carbon; Rapid determination of —— in ferrochrome. F. Gercke and N. Patzukoff. Stahl u. Eisen, 1912, 32, 439—440.

Sodium peroxide (pure for analysis) is shown as the result of six analyses to contain from 0·25 to 0·262 per cent. of carbon dioxide, which increases to 0·31 per cent. during the time required for the following estimation of carbon in ferrochrome. 0·2 grm. of very finely powdered ferrochrome is mixed with 2·0 grms. of sodium peroxide in a 20 c.c. porcelain crucible which is placed in a larger iron or nickel crucible fitting in a hole in an asbestos plate, to protect the melt from the flame. The larger crucible is heated to about 500° C. for ten minutes when the mixture melts quickly. If different proportions be used the mixture either explodes or else melts very slowly. After cooling the melt in a desiccator it is placed in a flask (see fig.) where it is boiled with water to destroy any hydrogen peroxide that may be produced. The funnel, C, is connected with soda-lime tubes, and purified air is drawn through the flask by the water-cooled outlet, B, which is connected with a sulphuric acid water absorber and then with weighed soda-lime tubes and the aspirator. The carbon dioxide in the melt is liberated by dilute sulphuric acid (1 : 1) added by the funnel, C, and allowance is made for that present in the sodium peroxide used.



Six analyses gave results varying from 9·33 to 9·48 per cent. of carbon, and a table is given comparing the results obtained by this method with those obtained by three other methods.—A. H. C.

Concentration by flotation of dry ore pulp. H. C. Parmelee. Met. and Chem. Eng., 1912, 10, 132—135.

A DESCRIPTION of and the results of some tests with H. E. Wood's process of concentration by flotation without the use of oil or acid (see U.S. Pat. 984,633 of 1911; this J., 1911, 309). Sulphides and tellurides, graphite, and metallic gold and silver show the greatest resistance to wetting and hence tendency to float on water, whilst oxidised minerals and gangue substances tend to sink. The ore should be crushed rather than ground and should be used soon after crushing. In the tests described, an ore was used containing chalcopyrite and pyrite, with silver associated with the former, and with a very heavy gangue apparently containing a manganese mineral. The results with regard to copper recovery are summarised as follows :—

Treatment.	Preparation.	Recovery.	Grade.	Concentration ratio.
	Crushed :	Cu, per cent.	Cu, per cent.	
(1) Wilfley table alone.......	30-mesh	46·50	6·28	9·00
(2) Flotation alone.......	40-mesh	59·34	20·60	23·14
(3) Flotation and Wilfley	30-mesh	70·28	11·95	11·34
(4) Flotation and Wilfley	20-mesh	81·27	21·22	5·09
(5) Flotation and Wilfley	16-mesh	90·05	21·13	3·90
(6) Flotation and Wilfley	16-mesh	93·94	16·81	2·47
(7) Flotation and Wilfley	16-mesh	89·21	13·72	3·42
(8) Flotation alone.......	16-mesh	66·49	23·62	5·54
(9) Flotation and Wilfley	16-mesh	88·03	15·77	4·00

—A. S.

Copper-arsenic alloys; Conductivity of ——. N. A. Pushin and E. G. Dishler. J. Russ. Phys.-Chem. Soc., 1912, 44, 125—132.

THE addition of arsenic to copper causes a rapid increase in the specific resistance (in ohms) from 1·708.10^{-6} at 25° (or 1·538.10^{-6} at 0°) to 35·0.10^{-6} at 25° C. (34·8.10^{-6} at 0° C.) for a content of 6 per cent. of arsenic. At this point, the curve of resistance suddenly changes its direction, the resistance continuing to increase, but more slowly, to 63·0.10^{-6} at 25° C. (59·0.10^{-6} at 0° C.) for 28·5 per cent. of arsenic. With higher proportions of arsenic, the specific resistance gradually diminishes to the value 52·6.10^{-6} at 25° C. (49·3.10^{-6} at 0° C.) for 42·0 per cent. of arsenic. These results are not in agreement with those of Friedrich (Metallurgie, 1908, 5. 529). It has been shown by various authors that : (1) for mechanical mixtures, the electrical conductivities of alloys and their temperature coefficients are additive in character; (2) when solid solutions are formed, the conductivity and its temperature coefficient diminish as the concentration of the solid solution increases; (3) an intermetallic compound possesses a characteristic conductivity; (4) the temperature coefficient of the conductivity of an intermetallic compound differs but little from that of pure metals. Consideration of the equilibrium diagram of the system copper-arsenic given by Friedrich and of the resistance curve obtained by the author shows that these two metals form a solid solution with a maximum concentration of 6 per cent. of arsenic. The proportion 28·2 per cent. of arsenic corresponds with the compound, Cu_3As, which also occurs naturally as domeykite. No indication is given by the curves of the existence of a compound, Cu_5As_2, and the constancy of the temperature coefficient of conductivity in the region 28·5—42 per cent. of arsenic indicates the absence of any solid solution. Tempering causes little change in the resistance of copper-arsenic alloys poor in arsenic, but is accompanied by an increase of 60—70 per cent. in the resistance of those containing 32 per cent. and upwards of arsenic; this phenomenon is probably due to a profound change in the chemical nature of the alloys.—T. H. P.

Zinc ores; Treatment of sulphide or oxide ——, in the electric furnace. W. Borchers. Metallurgie, 1912, 9, 153—154.

LATELY, experiments made at the author's suggestion (see next abstract) have shown that by dissolving iron in ferrous sulphide, in which the blende also dissolves on heating them together, the reduction of zinc blende by iron with formation of ferrous sulphide can be made practically complete. Moreover, the melted mixture forms an electric resistance suitable for developing the heat necessary to raise the temperature to the distillation-point of the zinc. This principle has been extended to the reduction of oxide ores, a mixture of blende and carbon being heated to the temperature of reduction and distillation of the zinc effected by the electric heating of the slag produced in the reaction.—J. T. D.

Zinc blende; Effect on ——, of solutions of iron in ferrous sulphide. Eulenstein. Metallurgie, 1912, 9, 154—158.

SOLUTIONS of iron in ferrous sulphide, when heated with zinc blende to 1300° C. and upwards, react, forming ferrous sulphide and metallic zinc which distils off. The effect increases with the concentration of iron in the sulphide and reaches a maximum when a solution containing about 45 per cent. of metallic iron and 55 per cent. of ferrous sulphide is heated with such a quantity of blende that the metallic iron is in slight excess. Under these circumstances about 95 per cent. of the zinc in the blende is obtained as metallic zinc, and the final residue contains about 5 per cent. of metallic iron. The bath of sulphide has sufficient resistance to form itself the resistance of an electric furnace, and the process can be made continuous, iron and blende being added from time to time to the bath, and ferrous sulphide drawn off; this is roasted and reduced to spongy metal to be returned to the bath, whilst the zinc continuously distils over.—J. T. D.

Zinc losses. W. H. Bassett. J. Ind. Eng. Chem., 1912, 4, 164—167.

IN the melting and casting of brass for rolling, about 6 per cent. of the zinc is lost in the form of flue dust and fumes. Analysis of the flue-dust shows that any lead and cadmium present in the zinc volatilise more rapidly than the zinc; practically all of the cadmium is volatilised. The loss of zinc is promoted by the use of chlorides as fluxes. In the annealing of brass there is a loss of about 3 per cent. of the zinc. The author estimates that altogether fully 10 per cent. of the spelter used in making wrought brass is lost, and the losses in the cast brass industry must also be very large. It is suggested that the electrical method of Cottrell (this J., 1911, 1037) may prove satisfactory for the recovery of zinc oxide from the fume, and losses of zinc would also be greatly reduced by the introduction of closed electric furnaces.—A. S.

Aluminium foil and powder; Manufacture of ——. L. Guillet. Rev. Mét., 1912, 9, 147—159.

AN account is given of the processes conducted at La Praz and Charleville-sur-Andelle by the Société française de Couleurs métalliques. In the manufacture of aluminium foil the metal, delivered to the works in the form of ingots, 700 × 320 × 120 mm. (cast at 750°—775° C.) is first hot-rolled at 420° C. to a thickness of 3·5 mm. and then cut into strips 8 cm. wide, which, after being annealed at 420° C., are cold-rolled to 0·04 mm. in six stages, further reduction in thickness being then effected by continued rolling or by hammering. In the former case the metal bands are first greased, then rolled in pairs to 0·02 mm.

and subsequently in fours to the desired thickness of 0·01 mm., the foil thus being obtained in lengths of about 16 m. In the latter case the bands are made into packets of 500 each and beaten by pneumatic hammers, each packet being placed between two thin sheets of zinc; when the thickness of the metal reaches 0·03 mm. the packets are hammered in pairs to 0·02 mm., and then in fours to 0·01 mm. The wastage in either case is very considerable, only about 33—35 per cent. of the 0·04 mm. metal employed being obtained as good foil one sq. m. of which weighs about 27 grms.; the waste foil is used for the production of aluminium powder. Before being finally trimmed and cut to size, the sheets of foil are either mechanically separated, or embossed by means of suitable rolls, since—in the absence of the layers of air thus introduced between the sheets—the metal is liable to become autogenously soldered at the cut edges. In the manufacture of aluminium powder it has been found necessary to employ the foil as the raw material, the powder yielded by other forms of the metal being of too granular a character for use in the preparation of paint. The comminution of the foil is conducted in a series of stamp mills in each of which the closed mortar-box is provided with a circle of 12 stamps actuated from a central shaft to the lower end of which a scraper or plough is attached. Caking of the metal is prevented by the scraper which also causes the charge to be periodically thrown against a screen inserted in the side of the mortar; the screen is provided with an exterior sliding box for collecting the metal passing through. After further classification, the finer portion of this product is mixed with about 2 per cent. of stearine (to prevent agglomeration and autogenous soldering of the particles during the fine grinding) and passed to a second series of stamp mills, the product from which is screened through silk bolting cloth (No. 200). The powder passing through the latter is then classified by a kind of winnowing process in "elevators" each comprising a vertical brass cylinder, 2 m. high and 0·80 m. in diameter, in which a central vertical spindle—to which horizontal wings or paddles are attached—is adapted to rotate, and provided with receptacles arranged at different levels upon a helical rail attached to the interior wall. The powder is fed through a tube into the lower part of the cylinder, the rotation of the spindle being so adjusted that the lighter particles or flakes become suspended in the air and are deposited in the peripheral receptacles at levels corresponding to their weight and physical condition; the coarser particles remaining at the bottom of the cylinder are returned to the fine-grinding mills. The product from the "elevators" is finally treated for ten hours in polishing machines consisting of horizontal, rotatory cylinders of striated sheet steel, 1·20 m. long and 0·60 m. in diameter. The polishing of the metallic powder is effected by means of brushes attached to the axis and bearing upon the interior wall of the cylinder through the whole of its length. Since conditions favourable to ignition or explosion are liable to be developed within the fine-grinding mills, elevators and polishing machines, the various units are of relatively small capacity and are so disposed, both in relation to each other and to the other portion of the works, as to localise any damage that may arise from this cause.—W. E. F. P.

Ores and minerals; Notes on the valuation of ——, and on metallurgical calculations. G. T. Holloway. Inst. Mining and Met., April, 1912. [Advance copy, 16 pp.]

IN a general account of the considerations governing the valuation of ores and minerals for chemical and metallurgical purposes, special reference is made to the association, with ores, of such ingredients as may detract from, or add to, the value of the main constituents, the ores of manganese and tin being dealt with in detail as examples. Tables of factors are appended for facilitating the calculations involved in the valuation of the more important ores and minerals.—W. E. F. P.

Metals; Action of pure distilled water and water containing electrolytes on ——. M. Traube-Mengarini and A. Scala. Z. Chem. Ind. Kolloide, 1912, **10**, 113—119.

FURTHER experiments on the action of water, under different conditions, on metals (iron, zinc, copper, nickel, tin, and lead) are described (see this J., 1909, 857, 1171; 1910, 700; 1911, 219), and in all cases the formation of colloidal solutions of the metals was observed, as shown especially by ultramicroscopic examination.—A. S.

Mineral production of Canada in 1911. Board of Trade J., March 28, 1912. [T.R.]

THE following statistics of the mineral production of Canada during the year 1911, with comparative figures for the preceding year, are taken from a preliminary report issued by the Canadian Department of Mines, Ottawa. The figures for 1910 are definitive; those for 1911 are subject to revision:—

—	1910.		1911.	
	Quantity.	Value.	Quantity.	Value.
Metallic—		Dols.		Dols.
Copper ... lb.	55,692,369	7,094,094	55,848,665	6,911,831
Gold ... oz.	493,707	10,205,835	—	9,762,096
Pig iron ... tons of 2000 lb.	800,797	11,245,622	917,535	12,306,860
Lead ... lb.	32,987,508	1,216,249	23,525,050	818,672
Nickel ... lb.	37,271,033	11,181,310	34,098,744	10,229,623
Silver ... oz.	32,869,264	17,580,455	32,740,748	17,452,128
Other metallic products ...	—	510,081	—	409,674
Total ...	—	59,033,646	—	57,890,884
Less pig iron from imported ore ... tons of 2000 lb.	695,891	9,594,773	875,349	11,693,456
Total metallic ... value	—	49,438,873	—	46,197,428
Non-Metallic—				
Asbestos and asbestic ... tons of 2000 lb.	102,215	2,573,603	126,914	2,943,107
Coal ... lb.	12,909,152	30,909,779	11,291,553	26,378,477
Gypsum ... lb.	525,246	934,446	505,457	978,863
Natural gas ...	—	1,346,471	—	1,820,923
Petroleum ... barrels.	315,895	388,550	291,092	357,073
Salt ... tons of 2000 lb.	84,092	409,624	91,582	443,004
Portland cement ... barrels.	4,753,975	6,412,215	5,635,950	7,571,299
Clay products ...	—	7,629,956	—	8,317,709
Lime ... bush.	5,848,146	1,137,079	7,227,310	1,493,119
Stone ...	—	3,650,019	—	3,680,371
Miscellaneous non-metallic ...	—	1,993,008	—	2,110,313
Total non-metallic ... value	—	57,384,750	—	56,094,258
Grand Total ... value	—	106,823,623	—	102,291,686

Steel.—The production of open-hearth and Bessemer steel was as follows:—

—	1909. Tons of 2000 lb.	1910. Tons of 2000 lb.	1911. Tons of 2000 lb.
Ingots—Open-hearth (basic)	535,988	580,932	651,676
Bessemer (acid) ..	203,715	222,668	209,817
Castings—Open-hearth	14,013	18,085	13,982
Other steels	1,003	599	740
Total	754,719	822,284	876,215

Decomposition of some metallic sulphates at an elevated temperature in a current of air. Hofman and Wanjukow. *See* VII.

Refractories. FitzGerald. *See* IX.

Spontaneous combustion of charcoal. *See* IIa.

Patents.

[*Alloy steel*] *Melting scrap metal; Process of* ——. A. E. Greene, Chicago, Ill. U.S. Pat. 1,018,418, Feb. 27, 1912.

The object of the invention is to prepare alloy-steel without loss of the alloying metal. Molten pig-iron is charged into an electric furnace, and the scrap metal, containing the alloy, added. A gas which has a reducing action on the added metal is blown through the molten mass, which is finally decarburised by blowing with a gas that has an oxidising action on the carbon but not on the added metal. —W. H. C.

Steel; Apparatus for the manufacture of ——. W. R. Walker and J. H. Gray, New York. U.S. Pat. 1,018,644, Feb. 27, 1912.

In a combined electric and gas-fired open-hearth furnace, the hearth—which is provided with vertical electrodes—communicates with regenerators and fuel-supplying flues from which it is adapted to be shut off by vertical, hollow dampers. The latter are provided with suitable openings through which the gases from the hearth escape to the atmosphere when the dampers are down.—W.E.F.P.

Iron; Electro-metallurgical process of manufacture of pure ——, *in a single operation directly from the ore.* La Néo-Métallurgie. First Addition, dated Dec. 7, 1910, to Fr. Pat. 409,844, Feb. 27, 1909 (this J., 1910, 763).

The process described in the principal patent may be used for obtaining various forms of cast iron and steels. The metals or metalloids, necessary to give certain qualities to the iron or steel, may be mixed in a second furnace after pouring the metal, or a charge of scrap iron, followed by one of ore and carbon, may be added to the same furnace, the material being then melted.—B. N.

Iron, steel or steel-alloys; Process for the cementation of articles of ——. Soc. Anon. Italiana G. A. Armstrong and Co. Fr. Pat. 434,443, Sept. 16, 1911. Under Int. Conv., Oct. 17, 1910.

The articles are embedded in a mass of granular charcoal (maintained at a predetermined temperature) through which a slow current of air is continuously circulated. The degree of carburisation of the metal is controlled by the speed of the air current and the duration of the treatment, or by the introduction of gaseous hydrocarbons into the cementation chamber at certain stages of the process.—W. E. F. P.

Iron and steel; Treatment of metals such as ——, *to prevent rusting.* Bontempi Rust-Proofing Co. Fr. Pat. 434,780, Oct. 2, 1911. Under Int. Conv., Sept. 6, 1911.

The heated metal is subjected to the action of the vapour or fumes produced by heating certain "protective materials," *e.g.*, coal, pitch or tar, a pure metal such as zinc or lead, or a mixture of zinc or zinc oxide with tannic acid and an oleaginous substance. In order that the vapour may condense in liquid form upon the metal, the temperature of the former is maintained at about 760° C., that of the latter being between 480° and 650° C. —W. E. F. P.

Alloy; Supermagnetic ——. P. Weiss. Fr. Pat. 434,886, Oct. 4, 1911.

An alloy of iron and cobalt, containing from 30 to 35 per cent. of the latter metal, is claimed for use in the construction of electromagnetic apparatus. The magnetism of the alloy at saturation is stated to be 10 per cent. greater than that of pure iron.—W. E. F. P.

Cast iron of great strength; Process and cupola furnace for the manufacture of —— *from cast iron and scrap of wrought iron or steel.* C. Bingel. Ger. Pat. 243,237, March 18, 1911.

The wrought iron and steel scrap is introduced into a casting ladle previously heated to redness, and then molten cast iron is run into the ladle from a cupola furnace. When the whole of the metal is melted, the ladle is raised and discharged into a movable trough or gutter from which the molten metal flows again into the cupola furnace. A fresh quantity of scrap is then placed in the ladle, and the operations are repeated until a metal of the desired composition and at a suitable temperature for casting is obtained.—A. S.

Iron ores; Preparation of briquettes of fine —— *especially oolitic and brown iron ores.* K. Tillberg. Ger. Pat. 243,427, Aug. 1, 1909.

The ore is ground with water, the slime, composed mainly of hydrated iron oxide, is separated from the coarser portion, and the latter is divided in the usual way into a concentrate and tailings. The concentrate is then mixed with the slime separated previously and formed into briquettes.—A. S.

Precious metals; Process for precipitation of ——, *from cyanide solutions.* J. M. Neil, Assignor to A. M. Hay, Toronto, Canada. U.S. Pat. 1,018,438, Feb. 27, 1912.

The precipitation is effected by the addition of atomised lead, alone or with zinc dust or atomised zinc, to the cyanide solution.—W. E. F. P.

Gold and silver; Precipitation of ——, *from cyanide solutions.* D. Bosqui, Gold Road, Ariz., Assignor to Merril Metallurgical Co., San Francisco, Cal. U.S. Pat. 1,018,604, Feb. 27, 1912.

The apparatus comprises a pair of precipitating tanks adapted to be alternately charged with the solution and discharged after agitation of the latter with a predetermined quantity of zinc dust, the charging of the one and discharging of the other taking place simultaneously. The process is automatic, the operating mechanism being actuated by means of floats.—W. E. F. P.

[*Gold and silver*]. *Metals; Leaching solution for extracting* ——, *from ores.* J. Baxeres de Alzugaray, Assignor to International Metallurgical Co., New York. U.S. Pat. 1,018,955, Feb. 27, 1912.

Claim is made for a solvent—composed of potassium cyanide, ferrocyanide, calcium bromate (or other bromine compound) and sodium chloride—for use with ores containing gold and silver or the sulphides of these metals. —W. E. F. P.

Metals; Composition of matter to be used for the purpose of fluxing ——. M. P. Jewett, Evansville, Ind., U.S.A. Eng. Pat. 4931, Feb. 27, 1911. Under Int. Conv., Mar. 1, 1910.

Claim is made for mixtures of fluorspar, ferruginous clay and dolomite in various proportions, with or without carbonate of zinc, oxide of manganese and carbon. —W. E. F. P.

Zinc distillation. J. C. Moulden, H. W. Webster, and Central Zinc Co., Ltd., Seaton Carew, Durham. Eng. Pat. 5196, Mar. 1, 1911.

IN a process for converting into liquid metal the "blue powder" produced during the distillation of zinc, the material is heated in the presence of a haloid salt such as the chloride of sodium, zinc, or ammonium, the operation being conducted (in a reducing atmosphere or not) at a temperature insufficient to sensibly vaporise the metal. —W. E. F. P.

Blowpipe and charging apparatus for ore-treating furnaces. E. E. Banes, Strathfield, N.S.W. Eng. Pat. 13,989, June 12, 1911. Under Int. Conv., Oct. 27, 1910.

THE apparatus is provided with concentric nozzles, the innermost being fitted with an adjustable, hollow lining through which the powdered ore is conducted by an auger conveyor. The exterior of the lining is spirally grooved to permit of the passage of an air blast which thus issues as a whirling jet at the point where the ore is discharged. By this means, it is claimed, the ore is dispersed throughout the gaseous mixture before ignition of the latter occurs, and is subsequently acted upon while suspended within the flame.—W. E. F. P.

Electroplating or *coating of cylindrical or other revoluble articles.* A. Walker, Stoke-on-Trent. Eng. Pat. 14,140, June 14, 1911.

THE article to be plated is suspended by rotating hoops or rings, driven from an overhead rotating shaft, and to prevent oscillations of the hoop, grooved guide wheels are employed, or a rotating cam may be used to give the hoop a regular transverse oscillating movement in addition to that of rotation.—B. N.

Copper; Process of fusing and purifying ——. W. S. Rockey and H. Eldridge, New York, Assignors to Metallurgical Research Co. U.S. Pat. 1,018,681, Feb. 27, 1912.

THE metal, melted in contact with the fuel in a gas-fired chamber, is conducted into a deep receptacle (contained in a second chamber at a lower level) in which it is heated sufficiently to expel the gaseous impurities. Contact of the molten metal with the furnace gases is prevented by maintaining an atmosphere of preheated nitrogen within the receptacle; and the charge is ultimately withdrawn through a tubulure connecting the lower part of the receptacle with the exterior of the apparatus.—W. E. F. P.

Copper alloy; Process of remelting and refining old or scrap ——. W. S. Rockey and H. Eldridge, New York, Assignors to Metallurgical Research Co. U.S. Pat. 1,019,524, Mar. 5, 1912.

THE alloy is immersed in, and subsequently melted beneath, a molten flux consisting of or containing boron trioxide, carbon being afterwards added to reduce the metallic compounds dissolved in the flux.—W. E. F. P.

Copper ores or copper-ore-mill tailings; Process of treating ——. J. W. Bennie, Clifton, Ariz. U.S. Pat. 1,019,708, Mar. 5, 1912.

THE material is subjected to the action of the sulphurous gases generated in a roast-heap of iron sulphides (cupriferous or not), being spread upon the latter and sprinkled with water, with a solution of ferrous sulphate, or with a solution of ferrous sulphate and sodium chloride. The charge is subsequently leached with dilute acid or with a solution of a ferric salt from which the copper is recovered by precipitation upon metallic iron, the residual liquor being employed for sprinkling further charges of the material.—W. E. F. P.

Copper by electrolysis; Production of ——. R. Douvreleur. Fr. Pat. 434,584, Sept. 26, 1911.

THE electrolyte consists of impure solutions of copper containing sulphurous acid, and is continuously agitated. The acid acts as a depolarising agent, reducing the ferric salts in the solution to ferrous salts, which are without action on the copper deposited at the cathode. The agitation of the electrolyte prevents impoverishment of the solution in contact with the cathode, and renews the layer of sulphurous acid in the region of the anode, the feeble voltage necessary preventing the decomposition of the water and the production of black copper sulphide. The agitation of the electrolyte is produced by movement of the electrodes, or better still a part only of the anodes. The latter are therefore formed of square plates of carbon or lead, the central portion of each being cut out in the form of a disc and mounted on a horizontal axis. The discs are revolved in the planes of the anode plates. Cathodes, consisting of fixed suspended plates of copper or other metal, are arranged alternately with the anodes, and the plates are arranged near to each other to diminish the resistance of the cells.—B. N.

Copper or a copper alloy; Process for plating ——, *upon a ferrous metal.* W. S. Rockey and H. Eldridge. Fr. Pat. 434,971, Oct. 7, 1911.

THE metal is plated by immersion in a bath (or in successive baths) of molten copper or copper alloy which is covered with a flux of boric anhydride and maintained at a temperature just above its melting point. The preheated ferrous metal is passed through the flux into the metallic bath and is withdrawn in the same manner, the flux, it is claimed, serving the double purpose of cleansing the metal before immersion and protecting the plating from oxidation after withdrawal.—W. E. F. P.

Tin-bearing material; Process of treating ——. J. Weber, Assignor to Th. Goldschmidt, Essen-on-the-Ruhr, Germany. U.S. Pat. 1,018,734, Feb. 27, 1912.

THE material, after preparation by washing, is subjected to the action of a highly heated solution containing about 20 per cent. of sodium hydroxide and 10 of nitre. —W. E. F. P.

Titanium and silicon; Compound or alloy of ——. A. J. Rossi, Niagara Falls, Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,019,526, March 5, 1912.

CLAIM is made for an alloy of titanium and silicon with a relatively small proportion of iron or other metal. The alloy is prepared by incorporating the iron or other metal with the oxides of silicon and titanium in the presence of a deoxidising agent, and subjecting the whole to a temperature sufficient to ensure the reduction of these oxides.—W. E. F. P.

Alloys of titanium with (1) *zinc,* (2) *ferrometal,* (3) *lead and* (4) *tin; Process for producing* ——. A. J. Rossi, Niagara Falls, Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pats. 1,019,527, 1,019,528, 1,019,529 and 1,019,530, March 5, 1912.

A MIXTURE of titanium oxide with carbon and calcium oxide is superimposed upon a bath of molten zinc, ferrometal, lead or tin, respectively—or the bath is covered with a layer of molten calcium oxide upon which a mixture of titanium oxide and carbon is placed—and the charge is heated to a temperature sufficient to ensure the liberation of metallic titanium.—W. E. F. P.

Aluminium; Method of treating ——. A. J. Rossi, Niagara Falls, Assignor to the Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,019,531, March 5, 1912.

TITANIUM or its oxide is incorporated with molten aluminium and the charge is heated to a temperature sufficient to ensure combination between the titanium and the nitrogen, carbon and other impurities present. A slight excess of titanium is employed, less than ½ per cent. of this constituent being present in the resulting aluminium product.—W. E. F. P.

Minerals; Process and apparatus for the perfect roasting of —— in furnaces of all systems. E. Bracq. Fr. Pat. 434,491, Sept. 22, 1911.

By means of a rotating rabble arm, to which additional horizontal and vertical movements are imparted, the material under treatment is caused to advance along the hearth of the furnace in a series of thin sections, a continuous mashing of the charge and scraping of the hearth being thus produced throughout the operation. The application of the invention to a furnace of the type provided with an upright helical hearth is illustrated by a series of five drawings.—W. E. F. P.

Metals; Process and apparatus for casting ——, under pressure. F. de Buigné. Fr. Pat. 434,545, Sept. 25, 1911. Under Int. Conv., Sept. 26, 1910.

In a process for the production of hollow castings, the metal is melted in a closed chamber, internally heated by electrical means and adapted for the admission of an inert gas under pressure, provision being made for the sudden release of such pressure and the creation of a partial vacuum within the chamber if necessary. The molten metal is forced into the mould through a pipe extending through the roof of the chamber to the bottom of the metallic bath, the sudden release of the pressure within the chamber (either alone or aided by suction) causing the still molten interior of the moulded body to return to the metallic bath.—W. E. F. P.

[*Metals.*] *Process for the manufacture of ingots free from gas and blow-holes.* Rheinische Metallwaaren und Maschinenfabrik. Fr. Pat. 434,655, Sept. 27, 1911. Under Int. Conv., Jan. 16, 1911.

The molten metal is allowed to cool until just solid and is then reheated rapidly to a temperature only slightly above its solidifying point and poured as soon as the requisite fluidity is attained. The tapping ladle in which the operation is conducted is provided with an annular receptacle for the metal to facilitate the reheating of the latter by external electrical means.—W. E. F. P.

Blast-furnace gas; Utilisation of the heat of combustion of ——. W. Mathesius. Fr. Pat. 434,651, Sept. 27, 1911.

A hot-blast stove comprises a vertical cylindrical casing furnished with concentric interior walls or partitions whereby the gases, during the heating period, are caused to flow in a circuitous path from a central flue forming the combustion chamber through intermediate down-take and up-take flues to an outer down-take flue packed with chequer-brickwork. The upper ends of the two outer flues are enclosed within a dome-shaped roof which makes a tight joint with the outer wall of the two inner flues, and these flues are covered by a central dome, the weight of which is supported by the outer dome which in turn rests upon the iron casing. In this way, the concentric walls are relieved of weight and are free to expand, and radiation from the domes is minimised. The gas and air for combustion are admitted in parallel streams in order to prevent mixing and to extend the zone of combustion.—A. T. L.

Furnace; Regenerative reverberatory ——. J. Maerz Fr. Pat. 434,807, Aug. 29, 1911.

The supply of preheated gas and air is arranged upon the injector principle, the air being drawn in by the velocity of the gas which is passed into the furnace through a channel, downwardly inclined towards the hearth and communicating with the air passage at its lower end. A separate combustion chamber may be provided at the junction of the gas and air channels.—W. E. F. P.

Sulphide ores; Process for the continuous separation of ——. O. Malkemus. Ger. Pat. 243,159, Sept. 7, 1910.

The finely-ground ore is distributed on the surface of a continuously moving stream of liquid in a radial direction, so that by the action of the liquid it travels in a gradually widening circle, and just behind the place where the ore is distributed, a current of air is directed over the surface of the liquid in a similar radial direction.—A. S.

Iron [alloys]; Process of making ——. The International Metal Products Co. First Addition, dated Oct. 28, 1911, to Fr. Pat. 409,531, Nov. 23, 1909.

See Eng. Pat. 5015 of 1911; this J., 1912, 77.—T. F. B.

Ores, metallic residues, and the like; Means for extracting and lixiviating ——. W. Günther, Kassel, Germany. Eng. Pat. 4719, Feb. 24, 1911.

See Ger. Pat. 237,153 of 1910; this J., 1911, 1122.—T. F. B.

Ores [of copper, etc.]; Method of and apparatus for treating ——. C. K. Mills, London. From Bradley Copper Process Co., Jersey City, U.S.A. Eng. Pat. 12,305, May 22, 1911.

See Fr. Pat. 430,692 of 1911; this J., 1911, 1392.—T. F. B.

Ores; Process for roasting ——. C. Gabrielli, Paris. U.S. Pat. 1,018,609, Feb. 27, 1912.

See Fr. Pat. 422,928 of 1910; this J., 1911, 553.—T. F. B.

XI.—ELECTRO-CHEMISTRY.

Liquefied sulphur dioxide; Electrolysis in ——. L. S. Bagster and B. D. Steele. Faraday Soc., March 26, 1912. [Advance proof.]

The authors have carried out a number of experiments with a view to ascertaining the mechanism of electrolysis in liquefied sulphur dioxide. In the case of the iodides of potassium, sodium, tetramethylammonium, and trimethylsulphonium, sulphur is deposited on the cathode and a sulphite is simultaneously formed. The amount of sulphite is that which would be expected on the basis of Faraday's law. With tetramethylammonium and trimethylsulphonium iodides a blood red solution is obtained at the cathode which appears to be caused by some highly reducing substance, formed by interaction of the sulphite with sulphur. On mixing this red solution with the corresponding anode solution in the case of tetramethylammonium iodide, a yellow precipitate with the formula, $Zn_3[N(CH_3)_4]_2(SO_3)_4$ is formed. The changes at the anode are analogous to those in aqueous solution, the halogen being either liberated in the free state or combining with the metal of the electrode when this is zinc or iron. Evidence is further adduced to show that water and hydrogen bromide unite in sulphur dioxide solution to form an oxonium compound which is an electrolyte. The following E.M.F. measurements are given for cells with sulphur dioxide as solvent using saturated solutions of the salts: $Pb/PbCl_2/HgCl/Hg$, 0·435 volt; $Zn/ZnBr_2/HgCl/Hg$, 0·37 to 0·40 volt; $Cd/CdI_2/HgCl/Hg$, 0·42 to 0·445 volt.—W. H. P.

Refractories. FitzGerald. *See* IX.

Patents.

Electrolytic apparatus. H. E. T. Haultain, Toronto, Canada. U.S. Pat. 1,018,901, Feb. 27, 1912.

A tube open at both ends is supported within the containing vessel, with its lower end above the bottom, and its upper end below the top of the vessel. Two electrodes, of similar polarity, are carried on opposite sides of the tube, and a central electrode, of opposite polarity, is supported and guided by suitable means within but independently of the tube. Electrical conductors, connected with the electrodes and suitably supported terminals, are adapted to form a flexible support for the tube, and means are provided for introducing a gas at the lower end of the tube.—B. N.

Electrolytic reactions of oxidation and reduction. G. Kolsky. Fr. Pat. 434,310, Sept. 18, 1911. Under Int. Conv., May 29, 1911.

Both electrodes are made in the form of hollow perforated spheres, and are arranged concentrically, the inner one acting as the anode being submitted to a rapid rotation. The axes of rotation pass through insulating supports fixed in openings in the top and bottom surfaces of the cathode, one axis bringing the current to the anode. —B. N.

Electrodes ; Accumulator ——. H. C. Hubbell. Fr. Pat. 434,938, Oct. 6, 1911.

Reduced or pyrophoric iron is first prepared by reducing certain compounds of iron in hydrogen, the metal being then heated to a higher temperature to convert it into grey or non-pyrophoric iron. This is afterwards oxidised by heating in the presence of a suitable oxidising agent. —B. N.

Furnace [for melting quartz, etc.] ; Electric —— with arcs and resistance for diphase or triphase currents. A. L. Billon-Daguerre. Fr. Pat. 435,111, Dec. 15, 1910.

The crucible, of refractory material when bodies of quartz are to be melted, is made in two parts, 1 and 2, the material being melted in the upper crucible, and by means of a sliding door, L, emptied into the lower compartment. The latter may also be charged through an opening, 4, and emptied through an opening, 5. When a triphase current is employed, each phase is connected to horizontal blocks of graphite, A, B, C, and the common or neutral wire to a fourth block, D, the free space between the four blocks and the crucible being filled with graphite grains. The arcs produced between the horizontal blocks, or between each of these and the block, D, may be utilised, and the furnace may also be employed as a resistance one, through the heat developed in the graphite grains.—B. N.

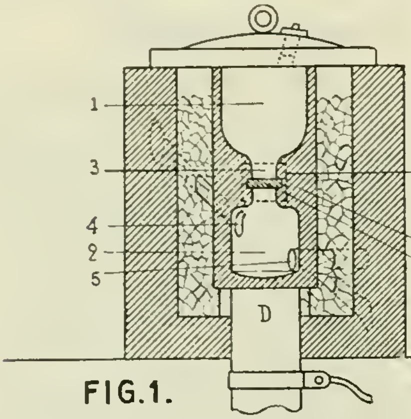


FIG. 1.

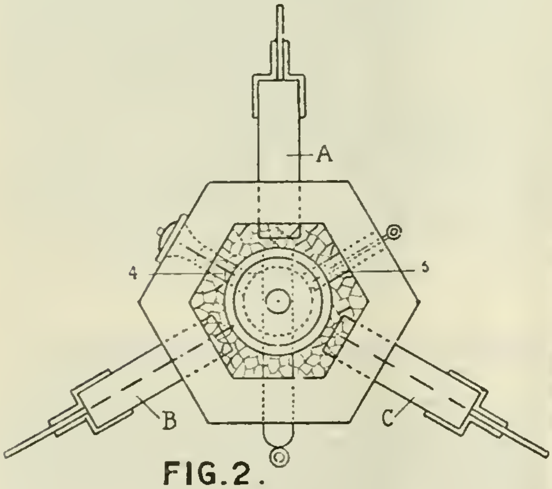


FIG. 2.

Electrodes ; Manufacture of metallic films and filaments for incorporation in the active material of accumulator —— and applicable to other uses. H. C. Hubbell. Fr. Pat. 434,940, Oct. 6, 1911.

Alternate layers of different metals, such as nickel, copper, and iron, are assembled together after the form of a book, the layers being then submitted to a soldering or brazing operation and afterwards to pressure, by rolling, so as to reduce the metals to thin layers. The copper acts as the soldering metal, and the iron as a separating refractory metal for preventing union of the nickel sheets. After compression, the sheets are cut into the form required, and then submitted to the action of acid to remove the iron. To dissolve the copper and thus liberate the nickel sheets, the metals are employed as the anode in a solution containing a double phosphate of sodium and ammonium, with an excess of free ammonia. —B. N.

Ozone producer. J. Moeller. Fr. Pat. 435,023, Dec. 13, 1910.

Quartz tubes are used in place of glass for the support of the electrodes, the inner electrode being placed inside a quartz tube, and the outer electrode within the annular space in a double quartz tube. The latter is arranged concentrically around the inner quartz tube and electrode, thus leaving an annular space between the two electrodes, through which the air to be ozonised is passed. The electrodes are formed as a deposit of metal on the quartz tubes, or by homogeneous and integral soldering of the metal on to the quartz, the space containing each electrode being exhausted. Several such tubes may be mounted in a single apparatus, so as to form a battery for industrial use.—B. N.

Gas reactions in electric arc flames ; Process for effecting ——. Dynamit-A.-G. vorm. A. Nobel und Co. Ger. Pat. 242,210, Feb. 11, 1911.

The gas mixture is introduced into the reaction chamber under pressure and in portions, each separate quantity of the mixture thus introduced being heated by the arc flame until the maximum pressure is attained, whereupon it is caused suddenly to expand and is almost instantaneously greatly cooled, the arc being at the same time ruptured. One of the electrodes is so mounted that by the pressure of the incoming compressed gas it is caused to move away from the other electrode, at first slowly so as to form the arc, and then, as the gas becomes heated and the pressure is increased, more rapidly, whereby the arc is quickly and automatically drawn out to the full predetermined length. The movement of the electrode in the manner described is utilised by means of electro-magnetic or magnetic devices to control the introduction of the compressed gas mixture and the discharge of the reaction products.—A. S.

Carbon electrode for electric furnaces. L. E. Bussey, London. From Planiawerke Akt.-Ges. f. Kohlenfabr., Ratibor, Germany. Eng. Pat. 9652, April 20, 1911.

See Fr. Pat. 421,357 of 1910 ; this J., 1911, 433.—T. F. B.

Storage battery electrodes. H. C. Hubbell, Newark, N.J., U.S.A. Eng. Pat. 21,692, Oct. 2, 1911.

See Fr. Pat. 434,938 of 1911 ; preceding.—T. F. B.

Metal foil, applicable for use in storage battery electrodes ; Process of making ——. H. C. Hubbell, Newark, N.J., U.S.A. Eng. Pat. 21,784, Oct. 3, 1911.

See Fr. Pat. 434,940 of 1911 ; preceding.—T. F. B.

Furnace ; Electric ——. M. Ruthenburg, London. U.S. Pat. 1,018,727, Feb. 27, 1912.

See Eng. Pat. 12,408 of 1908 ; this J., 1909, 248.—T. F. B.

Electric furnace method and apparatus. E. Weintraub, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,019,392, March 5, 1912.

See Addition of Oct. 26, 1910, to Fr. Pat. 377,683 of 1907 ; this J., 1911 423.—T. F. B.

Electrical resistance. Boron-carbon alloy. E. Weintraub, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pats. 1,019,390 and 1,019,393, March 5, 1912.

See Fr. Pat. 421,392 of 1910 ; this J., 1911, 433.—T. F. B.

Boronized conductor and method of manufacture. E. Weintraub, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,019,391, March 5, 1912.

See Addition of Oct. 26, 1910, to Fr. Pat. 421,392 of 1910 ; this J., 1911, 433.—T. F. B.

Resistance material ; Method of making ——. E. Weintraub, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,019,568, March 5, 1912.

See Fr. Pat. 421,391 of 1910 ; this J., 1911, 423.—T. F. B.

Electrolytic gases ; Apparatus for purifying ——. A. E. Knowles. Fr. Pat. 435,721, Oct. 17, 1911.

See Eng. Pat. 21,600 of 1911 ; this J., 1911, 1458.—T. F. B.

Compositions containing pitch. Eng. Pats. 4859 and 20,635. *See* III.

XII.—FATS ; OILS ; WAXES.

Linseed oil ; Composition of —— and distribution of oxygen in dried layers of the oil. II. E. I. Orloff. J. Russ. Phys.-Chem. Soc., 1911, **43**, 1509—1524. (Compare *ibid*, 1910, **42**, 658.)

The author criticises Fokin's work (this J., 1907, 1149), the results of his own experiments being in agreement with Genthe's theory (this J., 1907, 56), except that he finds that with a layer of the oil, 100—108 sq. cm. in area, weighing 0·1—0·15 grm., 15—16 per cent. of oxygen are taken up although setting occurs when only 12 per cent. have been absorbed. Experiments in which a cobalt drier was employed gave for the rate at which oxygen is fixed, results corresponding with the differential equation given by Genthe (*loc. cit.*). But after the oil has combined with 12 per cent. of its weight of oxygen, a solid phase is formed and the velocity of the absorbing process afterwards is expressed by :— $dx/dt=k(A-fx)(B+fx)$ where f, the correction coefficient, is less than unity and kf the constant corresponding with the solid phase. Parallel with this chemical process, there takes place a physical one of diffusion of the oxygen into the oil, the amounts of oxygen in successive layers, starting from the surface, being in the proportions, n, n^2, $n^3 \ldots . n^p$, where n is less than one. The quantity of oxygen combined is related to the factor n according to the expression, $S/Q=n/(1-n)$, where Q is the quantity of combined oxygen corresponding with the iodine value and S is the amount of oxygen found in each separate case. Assuming complete distribution of the oxygen by diffusion, the value of n must be taken as $2/3$.—T. H. P.

Elm-seed oil. A. Pawlenko. Chem. Rev. Fett-Ind., 1912, **19**, 43—44.

On extracting elm-seed with petroleum spirit, 26·1 per cent. of a greenish-yellow oil was obtained which had the following characters :—sp. gr. (20° C.), 0·9559 ; solidif. pt., 3·5° C. ; m.pt., 5·7° C. ; acid value, 5·57 ; saponif. value, 277·3 ; Hehner value, 75·45 ; Reichert value, 3·75 ; iodine value, 32·2. The oil contained 56·2 per cent. of capric acid and smaller proportions of oleic and butyric acids. The shell, which is very brittle, formed 55 per cent. of the whole seed, and contained 2 per cent. of a hard, yellow, wax-like fat melting at 59·5° C. and having a saponification value of 187. The decorticated seed, after extracting the oil, contained 7·5 per cent. of nitrogen.—J. A.

Picramnia Lindeniana ; Fat from seeds of ——. C. Grimme. Chem. Rev. Fett-Ind., 1912, **19**, 51—55.

By extracting the seeds with ether there was obtained 39 per cent. of a yellowish-brown granular fat which had an odour of cocoa. It had the following characters :—sp. gr. (15° C.), 0·9125 ; m.pt., 40°—41° C. ; solidif. pt., 36°—37° C. ; refractive index (50° C.), 1·4608 ; acid value, 3·34 ; saponif. value, 192·7 ; iodine value (Wijs), 56·8. The acids obtained from the fat consisted of 56·82 per cent. of saturated acids (which included 2·72 per cent. of stearic, 31·52 per cent. of palmitic, and 24·06 per cent. of myristic acid), 41·4 per cent. of unsaturated acids (which included 19·96 per cent. of tariric and 20·9 per cent. of oleic acid) and 1·08 per cent. of phytosterol.—J. A.

Unsaturated fatty acids ; Reduction of —— to saturated acids by the action of zinc and water on their halogen derivatives. S. Fokin. J. Russ. Phys.-Chem. Soc., 1912, **44**, 155—165.

Experiments with oleic, elaidic, erucic, undecylenic, ricinoleic, linolic and linolenic acids show that by addition of hydrogen bromide to these acids and treatment of the monobromo-saturated acids thus obtained with zinc dust and water in a sealed tube, the corresponding saturated fatty acids themselves are obtained, *e.g.*,

$$(C_{17}H_{34}Br.CO_2)_2Zn+2Zn+H_2O=$$
$$(C_{17}H_{35}.CO_2)_2Zn+ZnBr_2+Zn(OH)_2.$$

Hydroxy-unsaturated acids may be converted into hydroxy-saturated acids in a similar manner. With monochloro-saturated fatty acids, the reaction with zinc and water proceeds partly in the direction indicated by the above equation, but about one-third of the acid formed consists of the original unsaturated acid from which the chloro-derivative of the saturated acid was obtained. As stated by Lewkowitsch ("Oils, Fats and Waxes"), neither dichloro- nor dibromo-stearic acid gives stearic acid when heated with various metals in presence or absence of water or another solvent.

The following temperatures are those at which mixtures of oleic and stearic acids solidify : 10 per cent. of stearic acid (90 per cent. oleic), 29·5° ; 20 per cent., 40·2° ; 30 per cent., 47·7° ; 40 per cent., 52·9° ; 50 per cent., 56·8° ; 60 per cent., 59·8° ; 70 per cent., 62·3° ; 80 per cent., 64·5° ; 90 per cent., 66·3° ; pure stearic acid, 68·0° C.—T. H. P.

Abnormal beeswax. G. Buchner. Z. öffentl. Chem., 1912, **18**, 90—91.

In addition to the specimens of East African beeswax which the author found to be abnormal as regards the ratio between the acid and ester values (this J., 1910, 705), two similar samples derived from Spain and Italy and three of unknown origin have been examined. These five waxes gave "ratio" values ranging from 2·90 to 3·10, and it is suggested that they may all in the first instance have come from Africa. The different kinds of beeswax may thus be classified into three groups, viz. :—(1) Ordinary normal beeswax with a "ratio" value of about 1 : 3·6 to 4. (2) Those, especially of African origin, with a ratio of about 1 : 3 ; and (3) Indian waxes with a ratio of about 1 : 12.—C. A. M.

Patents.

Tallow substitute ; Raw —— for lubricating purposes and process for manufacturing the same. K. Engel, Hanover, Germany. Eng. Pat. 14,934, June 26, 1911.

Sponges or sponge waste are impregnated with a hot melted fatty mass, which solidifies on cooling. Thus the sponges may be impregnated with a mixture (at about 95° C.) prepared by boiling rape-seed oil with a mixture of milk of lime and caustic soda lye, and incorporating the solid soap with "mineral train oil."—C. A. M.

Fats and fatty acids ; Process of reducing unsaturated ——. Verein. Chem. Werke Aktienges. Fr. Pat. 434,927, Oct. 5, 1911. Under Int. Conv., Feb. 2, 1911.

Solid salts of metals of the platinum group are incorporated with unsaturated fats or fatty acids, and the mixture subjected to the action of hydrogen at a temperature below 100° C. and preferably under a pressure of 2 to 3 atmospheres. The reduction is effected much more readily than through the agency of platinum or palladium black. Thus, for example, a quantity of palladium chloride corresponding to 1 part of palladium will bring about the reduction of 50,000 parts of unsaturated fat. To prevent the liberation of free fatty acids, by *e.g.*, hydrochloric acid from the metallic salts, a neutralising substance, such as anhydrous sodium carbonate, may be added to the powdered salt of the metal of the platinum group in sufficient quantity to combine with any acid that may be set free.—C. A. M.

Wax from the candelilla plant ; Extracting ——. B. Y. Sharp, Uvalde, Tex. U.S. Pat. 1,018,589, Feb. 27, 1912.

The plant is boiled in gasoline, benzine, or naphtha in the presence of fullers' earth, and the liquid clarified before evaporating the oil to recover the wax.—B. N.

Resin soap ; Manufacture of ——. (1) H. G. Schanche, and (2) H. G. Schanche, Philadelphia, Pa., and F. S. Havens, Hartford, Conn., Assignors to Harrison Bros. and Co., Inc., Philadelphia, Pa. U.S. Pats. 1,017,692 and 1,017,693, Feb. 20, 1912.

(1) A desiccated acid resin soap is manufactured by adding to an excess of melted resin, soda combined with an amount of water sufficient to cause diffusion and prevent undue segregation of the soda, but not sufficient to effect solution of the entire mass and not substantially exceeding the percentage of water contained in crystalline sodium carbonate, and thereby forming an acid soap in a state of non-aqueous liquefaction. The product is solidified by cooling. (2) An inert "extending" material is incorporated with the liquefied mass before it is cooled. —H. E. P.

Soap ; Process of making ——. J. Tanne and J. Flüss. Fr. Pat. 434,808, Aug. 30, 1911.

A mixture of sodium carbonate, soap and water is boiled with suitable quantities of fats or oils, such as hydrocarbon, tar, resin, and especially petroleum oils, with or without the addition of soluble glass, starch or other inert substances. —C. A. M.

Oil seed ; Treatment of ——. P. Schneider, Hamburg, Germany. Eng. Pat. 15,961, July 10, 1911.

See Fr. Pat. 432,787 of 1911 ; this J., 1912, 139.—T. F. B.

Fatty acids or their glycerides ; Process for converting unsaturated —— *into saturated compounds.* J. Crosfield and Sons, Ltd., and K. E. Markel. Fr. Pat. 435,249, July 17, 1911. Under Int. Conv., Dec. 30, 1910.

See Eng. Pat. 30,282 of 1910 ; this J., 1911, 1461.—T. F. B.

Furnace for burning commercial residues of different industries, especially in oil works, for the purpose of obtaining wood charcoal. Eng. Pat. 4935. *See* IIb.

XIII.—PAINTS ; PIGMENTS ; VARNISHES ; RESINS.

Paint films and preservative coatings for iron and steel ; New method for testing ——. W. C. Slade. J. Ind. Eng. Chem., 1912, 4, 189—198.

The method consists essentially in immersing two spirals of iron wire, one bare and one coated with the paint, in an electrolyte ($N/1$ potassium chloride solution) and bubbling air continuously through the solution surrounding the coated spiral. The two wires are connected externally and any current which passes when the solution penetrates the paint film is measured. In order more nearly to approach conditions of actual use, a clockwork arrangement is provided whereby the coated wire is at intervals lifted out of the solution for a time, so that during the test there are alternate periods of wetting and drying. A current-time curve (from the average of three tests made simultaneously) is plotted and such curves give indications as to the relative moisture- and air-excluding properties of paint films. Curves plotted from results obtained with wires coated with a number of different paints are given in the paper. These results indicate that two factors are concerned : (1) the depolarising action (on hydrogen ions) of the paint film, due at least in part, to the unsaturated character of linoxyn or oxidised linseed oil (compare Walker and Lewis, this J., 1909, 1255); and (2) the impermeability or excluding power of the paint film. The depolarising action is most pronounced in thin coatings. Zinc oxide, zinc-lead chromate, carbon black, and graphite appear to give the best results in regard to excluding power, but on the other hand carbon black and graphite increase the rate of depolarisation and hence give poor results in thin films. Barytes, silica, and iron oxide show poor excluding power and strong depolarising action. The results with white lead and red lead are not so concordant as with other pigments ; red lead shows better excluding power than white lead, but both are strong depolarisers.—A. S.

Manufacture of aluminium foil and powder. Guillet. *See* X.

Composition of linseed oil and distribution of oxygen in dried layers of the oil. Orloff. *See* XII.

Patents.

Zinc white ; Process for manufacturing a ——. J. E. Booth, Bedford. Eng. Pat. 5740, Mar. 7, 1911.

A solution of zinc sulphate is prepared by dissolving zinc in sulphuric acid, and this solution is precipitated with a hot solution of sodium bicarbonate, the zinc carbonate produced constituting, when dried and ground, the pigment. In the apparatus described the zinc is placed in a number of separate cells, having perforated bottoms, which rest in separate compartments of a flat vessel. In each compartment, beneath the cell, is a plate of copper, carbon, etc., insulated from the cell. Each compartment thus forms when the poles are connected and sulphuric acid is flowing through the cells, a voltaic cell, the current from which can be utilised. The sulphuric acid tanks are arranged to carry a gas bell in which the hydrogen liberated is collected. A valve rod connected with the bell actuates a valve which stops the flow of acid from the tanks to the zinc cells when the gas-bell has risen to its upward limit, and the increasing pressure of the hydrogen is then used to raise the acid sulphate liquors back into the acid tanks to pass again, when the gas-bell falls, to the zinc cells. The hydrogen produced is used to fire two boilers, one for the zinc sulphate solution and the other for the bicarbonate solution. The boiling solutions are mixed in a third vessel, fitted with a stirrer, and when the reaction is complete, the mixture is run into a centrifugal separator from which the zinc white is drawn off as a paste and dried in a steam- or water-heated drying tank. The filtrate is run into an evaporating vessel and Glauber's salts recovered from it.—E. W. L.

Zinc oxide suitable for artists' colours ; Preparation of —— *from metal scrap containing zinc.* E. Flügger. Ger. Pat. 243,653, Feb. 3, 1910.

The metal scrap is treated with such a quantity of alkali lye that more than one-half of the alkali is converted into alkali zincate ; the lye is then separated and zinc oxide precipitated from it in the form of a heavy powder by addition of water and warming.—A. S.

Paint for protecting iron, wood and the like from sea-growths. M. Rappard, Den Helder, Holland. Eng. Pat. 22,802, Oct. 16, 1911.

Finely divided copper or an alloy rich in copper (3 to 6 parts) is mixed with a solution of shellac (1 to 2·5 parts) in alcohol (3 to 7 parts), and with an oil, preferably linseed oil (3·5 to 8·75 parts). The shellac and oil effect sufficient insulation of the copper from the iron of the ship's bottom without interfering with the destructive action of the copper upon sea-growths.—C. A. M.

Minium; Process for the manufacture of ——. J. Mühlbauer, Prague, Austria. Eng. Pat. 25,757, Nov. 18, 1911. Under Int. Conv., Dec. 3, 1910.

The formation of minium (red lead) is greatly accelerated by heating the oxide or carbonate of lead in air or oxygen under pressure. For example, lead oxide heated in iron tubes at 460° C. and at a pressure of 12 atmospheres is within one hour converted into a product containing 60 per cent. of red lead. Under ordinary atmospheric pressure 15 hours would be required. If pure oxygen at 12 atmospheres be employed, the time required for conversion to the same extent is only a few minutes.—E. W. L.

Paint compound. W. N. Blakeman, jun., New York. U.S. Pat. 1,019,415, Mar. 5, 1912.

A pigment deficient in covering power, is incorporated with lead chloride and a fatty oil, which may be a mixture of a non-drying marine animal oil (menhaden oil) and a drying oil.—C. A. M.

Phenolic condensation products. J. W. Aylsworth, East Orange, N.J., U.S.A. Eng. Pat. 3496, Feb. 11, 1911.

A hard infusible condensation product is formed from a resinous fusible condensation product of phenol and formaldehyde and a methylene-amine compound such as hexamethylenetetramine, the mixture being heated sufficiently to cause reaction, say at 200°—240° F. The methylene-amine compound may be in quantity at least sufficient to combine with all the fusible condensation product and free phenol therein. The fusible condensation product may be dehydrated and contain no free formaldehyde, and be incorporated with an anhydrous methylene-amine compound. The fusible resin may contain three molecular parts of phenol to two molecular parts of formaldehyde or equivalent, and 7·6 to 12 per cent. of methylene-amine compound may be added. Substances may be added which will dissolve the final product when hot and remain incorporated therewith when cold. An ammonia-fixing agent may also be added. A solid acid anhydride, having the power of fixing ammonia, may be used to act as solvent of the final product. The process may also be effected by using enough methylene-amine compound to combine with all but a few per cent. of the fusible condensation product, the uncombined portion acting as solid solvent for the final product.
—H. E. P.

Plastic composition for coating surfaces. J. W. Aylsworth, East Orange, N.J., U.S.A. Eng. Pat. 3497, Feb. 11, 1911.

A fusible resinous condensation product of phenol and formaldehyde or the like is incorporated with a substance such as hexamethylenetetramine which combines with it; heat is applied to harden the mass. This product may be dissolved in a suitable solvent to form a hard varnish on subsequent heating. An ingredient may be added which serves as a solid solvent for the final product. The product may be obtained by mixing a resinous phenol-formaldehyde condensation product with a small percentage of a substance reacting therewith to form a hard product on heating, with or without a small amount of a solid solvent, withdrawing the heat before the substance has hardened and forming it into thin sheets. An enamelled surface may be obtained from a thin film by passing a source of radiant heat over but not in contact with the film, to cause the final reaction.—H. E. P.

Phenolic condensation product. J. W. Aylsworth, East Orange, N.J., U.S.A. Eng. Pat. 3498, Feb. 11, 1911.

A hard infusible condensation product is prepared by sufficiently heating a fusible phenol-formaldehyde resin with just enough formaldehyde (say 5 to 10 per cent. by weight) to combine with the resin. The fusible resin may have been made without using a catalyst. The amount of formaldehyde added may depend on the amount of uncombined phenol in the fusible resin. A water-combining agent may be added. A substance such as naphthalene, a halogen derivative thereof, or an organic acid anhydride may also be added which will remain in the final product and impart plasticity to it. The materials used may be anhydrous, as may be the final product. A final product is claimed which is infusible at any temperature but which, as a result of the addition of naphthalene, etc., becomes plastic at 240°—300° F. A hard fusible product may be made by so regulating the conditions without an accelerator that the final product contains no free formaldehyde and a small amount of free phenol, and that none of the product is hardened to the infusible state although it has been preferably dehydrated, *e.g.*, by subsequent heating to about 400° F. The phenol or equivalent may be heated in a closed chamber and compressed formaldehyde gas may be forced in, keeping the temperature at the correct point, till very little phenol is uncombined; the resin is preferably completely dehydrated. A hard fusible product may be obtained from an infusible product by solution in a solvent chemically combining therewith, and heating. A hard fusible product without a sharp melting point, soluble in alcohol and not rendered infusible by heating, is claimed, as is such a product from which no water is evolved on heating to 400° F.—H. E. P.

Varnish. L. H. Baekeland, Yonkers, N.Y., Assignor to General Bakelite Co., New York. U.S. Pat. 1,018,385, Feb. 20, 1912.

The varnish comprises a condensation product of phenols and formaldehyde substantially free from uncombined phenols, together with a solvent containing a readily volatile organic liquid (*e.g.*, acetone) and another organic liquid (*e.g.*, amyl alcohol) miscible with the first but immiscible with water, having a higher boiling point than water, and volatilisable without decomposition when heated at ordinary pressures.—H. E. P.

Uniting objects; Method of ——. L. H. Baekeland, Yonkers, N.Y., Assignor to General Bakelite Co., New York. U.S. Pat. 1,019,407, March 5, 1912.

The surfaces to be joined are treated with a cement composed of such products of the partial condensation of phenol and formaldehyde as are capable, when hardened, of yielding insoluble infusible substances. These condensation products may be dissolved in a suitable solvent, and an addition of a filling material may be made to reduce the strain of shrinkage of the final product.—C. A. M.

Paint and varnish base. R. Lender and A. Koch, Neu-Babelsberg, Germany. U.S. Pat. 1,019,666, March 5, 1912.

See Eng. Pat. 21,667 of 1911; this J., 1912, 81.—T. F. B.

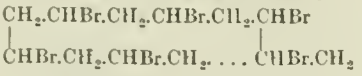
Lakes [from azo dyestuffs]; Manufacture of ——. Wülfing, Dahl, und Co., A.-G. Fr. Pat. 435,705, Aug. 16, 1911. Under Int. Conv., Aug. 16, 1910.

See Eng. Pat. 18,379 of 1911; this J., 1912, 140.—T. F. B.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

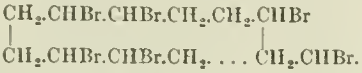
Caoutchouc bromide; Structure of polymerised vinyl bromide and ——. I. I. Ostromisslensky. J. Russ. Phys.-Chem. Soc., 1912, **44**, 204—240.

Polymerised vinyl bromide (*caoupren bromide*) exists in three modifications distinguished by the prefixes α-, β- and γ-. It is a cyclic compound, its nucleus containing an even number of carbon atoms not less than 12 and probably a multiple of 4. Caouprene bromide is either identical with butadiene-caoutchouc bromide (compare Harries, this J., 1911, 1073) or isomeric with it, the isomerism being due to the different disposition of the atoms of halogen in the molecule. The most probable structure of caouprene bromide is expressed by the formula:



$$\begin{array}{l}\mathrm{CH_2.CHBr.CH_2.CHBr.CH_2.CHBr}\\ |\qquad\qquad\qquad\qquad\qquad\quad |\\ \mathrm{CHBr.CH_2.CHBr.CH_2.\ldots\ CHBr.CH_2}\end{array}$$

and that of butadiene-caoutchouc bromide by:

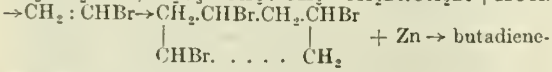


$$\begin{array}{l}\mathrm{CH_2.CHBr.CHBr.CH_2.CH_2.CHBr}\\ |\qquad\qquad\qquad\qquad\qquad\quad |\\ \mathrm{CH_2.CHBr.CHBr.CH_2.\ldots\ CH_2.CHBr.}\end{array}$$

Caouprene bromide represents the simplest homologue of the bromide of natural Para caoutchouc. Natural caoutchouc is also a cyclic hydrocarbon with a nucleus containing not less than 12 carbon atoms, three ethylene linkages and 4 methyl groups.—T. H. P.

Caoutchouc; Regeneration of —— from its bromide: Synthesis of butadiene-caoutchouc. I. I. Ostromisslensky. J. Russ. Phys.-Chem. Soc., 1912, **44**, 240—244.

The action of zinc dust on caouprene bromide (see preceding abstract) and on butadiene-caoutchouc bromide, naphthalene or chlorobenzene being used as solvent, results in the formation of free caoutchouc, the physical and chemical properties being the same, whichever of the two starting products is used. If metallic sodium is used in place of zinc-dust, the reaction is complicated by secondary processes, *e.g.*, the formation of dehydrocaouprene, $(CH)_n$. These results lead to a new synthesis of butadiene-caoutchouc:



$$\begin{array}{l}\mathrm{CH_3.CH_2.OH + Al_2O_3 \rightarrow CH_2 : CH_2 \rightarrow CH_2Br.CH_2Br + KOH.}\\ \mathrm{\rightarrow CH_2 : CHBr \rightarrow CH_2.CHBr.CH_2.CHBr}\\ \qquad\qquad\quad |\qquad\qquad\qquad\ \ |\qquad\qquad \mathrm{+\ Zn \rightarrow butadiene\text{-}}\\ \qquad\qquad\quad \mathrm{CHBr.\ .\ .\ .\ .\ CH_2}\end{array}$$

caoutchouc.—T. H. P.

Manihot rubber. G. Weber. Tropenpflanzer, 1912, **16**, 153—155.

The author refers to the existing opposing tendencies on the one hand to over-estimate the value of plantation *Manihot* rubber, and, on the other, to be unduly pessimistic as to its value and future. A good *Manihot* rubber contains about 3·4 to 4·7 per cent. of protein, 7·3 to 9·5 per cent. of resins and 1·2 to 1·8 per cent. of ash. In composition it is therefore inferior to Para. There will, however, continue to be a demand for good medium rubbers. In this connection the method of preparation is extremely important, and planters are strongly recommended to agree to introduce "standard" qualities. It is suggested that two standards might be set up, one for washed rubber, and another for unwashed, in order to meet the case of the small planter who is not in a position to introduce washing-plant. The washed rubber should be put up in the form of crêpe, and the unwashed in the form of balls, which should be cut through crosswise. The various other forms in which unwashed *Manihot* rubber now arrives on the market—cubes, large and small, sheets, scraps, etc., should be done away with.—E. W. L.

Root-rubber; African ——. H. Hunicke. Gummi-Zeit., 1912, **26**, 813—814.

African root-rubber is obtained from the following species:—*Landolphia Tholonii, L. humilis, Carpodinus leucantha, C. chyllorhiza* and *C. gracilis.* The *Landolphias* are found in the French and Belgian Congo, in Nigeria and in the north of Portuguese Angola. The species of *Carpodinus* occur in Angola and extend into German South-West Africa. They are all bush-like plants. *L. Tholonii* grows only about 10—12 inches high, but its roots extend for many feet, forming a network, from which fresh growths are thrown up at intervals. They are about ½ in. thick where they leave the main root, and run about 3 in. below the surface. The latex is contained in longitudinal vessels in the roots, but it coagulates very rapidly so that it is not possible to extract it as such. In order to obtain the rubber the roots are grubbed up, cut into lengths of about 6 ft. and dried in the sun. They are then soaked in water for several days, after which they are pounded on a block in order to loosen the bark. The bark is then removed in strips and thoroughly dried. When dry the rubber is separated by crushing the bark into powder. Unless the bark be perfectly dry this cannot be done satisfactorily and the fragments of bark have to be removed by kneading the mass under water. None of the other plants are so well suited to this method of extraction as *L. Tholonii.* The yield of roots of this plant from an acre of ground is rarely more than 200 lb. and from this 10 lb. of rubber can be obtained. The plant does not lend itself to cultivation in competition with trees, and is disappearing generally.—E. W. L.

Rubber; Direct determination of nitrogenous matter in raw ——. F. Frank and E. Marckwald. Gummi-Zeit., 1912, **26**, 936—937.

In a preliminary communication the authors state that they are working on a method of determining insoluble matter by boiling the rubber with xylene or the like, and then treating in a Collatz centrifuge at the highest speeds. Filterable solutions can also be obtained by the action of these solvents in the cold with exposure to light. The authors do not accept the factor 6·25 (nor 6 as recently proposed by Hinrichsen and Kindscher) for calculating nitrogen to protein.—H. E. P.

Vulcanised rubber; Desulphurisation of ——. F. W. Hinrichsen and E. Kindscher. Z. Chem. Ind. Kolloide, 1912, **10**, 146—148.

The authors have shown previously (this J., 1910, 891) that by the action of excess of sulphur chloride on rubber in benzene solution, probably a definite compound of the formula, $(C_{10}H_{16})_2S_2Cl_2$, is formed. The product always contained somewhat more than the calculated quantity of sulphur and an attempt was made to remove this excess of sulphur by the action of metals in presence of alcoholic caustic soda. On continuing this treatment for a sufficiently long time, with occasional renewal of the metal (copper), a product was finally obtained free from both sulphur and chlorine. Similar experiments were made with hot-vulcanised rubber, and here in different experiments the content of combined sulphur was reduced from 3·6 to 2, 1·8, and 1·7 per cent. respectively, and these latter figures are probably too high, for the metallic sulphides formed showed a strong tendency to pass into colloidal solution with the rubber. The rubber after the treatment described possessed many of the characters of raw rubber.—A. S.

Balloon fabrics; Causes of deterioration of rubber of ——, and protection by means of colouring matters. F. Frank, Gummi-Zeit., 1912, **26**, 801—802.

Sulphuric acid may be developed in or on the rubber coatings of balloon fabrics, either by direct oxidation of the sulphur in presence of light, or by the catalytic action of certain metals. In the latter category copper is particularly pernicious in its effects, close contact with the metal or its alloys being sufficient to promote the formation of sulphuric acid and consequent deterioration of the rubber. It has been observed that the latex from trees grown in a soil containing copper itself contains copper, and that the rubber prepared from it is liable to rapid deterioration. Metallic iron particles are also converted slowly into iron salts, and these form brownish specks in the rubber, from which radiate streaks. The central speck gradually becomes hard and the rubber eventually gives way. Magnesium chloride has also been found to act detrimentally on rubber. To minimise the simple "sun-cracking" effect, a suitable composition is necessary for the rubber mixing, to reduce microporosity to a minimum. Traces of chemicals such as chlorides sulphites, etc., from the bleaching, dyeing, and other processes through which the fabrics have passed may also act detrimentally upon the rubber. A properly directed use of pigments and of metals, selected for their inertness towards rubber, is of assistance in protecting the fabric. As a yellow pigment which is suitable, though costly, cadmium sulphide is mentioned.—E. W. L.

Patents.

Latex obtained from rubber and analogous trees ; Treatment [coagulation] of ——. G. B. Livingston and W. D. Cairney, Glasgow. Eng. Pat. 25,573, Nov. 3, 1910.

Latex is diluted with water and sprayed or distributed over and into a bath of methylated spirit or ethyl alcohol and acetaldehyde. The coagulated rubber thus obtained may be rinsed in water, and pressed, creped or otherwise prepared, and the spirit may be recovered by distillation. —E. W. L.

Caoutchouc ; Synthetic ——. A. Heinemann, London. Eng. Pat. 1445, Jan. 19, 1911.

Two parts of protein, obtained from vegetable or animal sources, are added to and emulsified with 100 parts of a hydrocarbon, such as isoprene, which is then converted into synthetic caoutchouc, which, it is stated, possesses the elastic and resilient properties peculiar to the natural substance. As an alternative, two parts of protein may be added to 100 parts of synthetic caoutchouc dissolved in benzene, or other suitable solvent, and then gently heated for about 2 hours.—B. N.

Caoutchouc ; Production of substances with the properties of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 434,587, Sept. 26, 1911. Under Int. Conv., Mar. 2, 1911.

Isoprene or homologous substances are heated with organic or inorganic acids, or with compounds having an acid reaction or with sulphur, in proportions so small that they promote the polymerising process without injuring the properties of the products. Thus an addition of 0·2 per cent. of sulphur, or of 0·002 per cent. of sulphuric acid, to the isoprene will greatly increase the yield of crude caoutchouc in the process ; whereas an addition of 2 per cent. of sulphur will lead to a bad yield of a viscid product. —C. A. M.

Rubber waste ; Machinery for reclaiming ——. C. Blair, Stockport. Eng. Pat. 4743, Feb. 25, 1911.

A rotating pan, containing vertical agitators, a steam shaft for supplying the jacket, and means for washing the contents of the drum, are employed.—C. A. M.

Vulcanisation ; Process of ——. E. Taylor, Farmingdale, N.Y., Assignor to Union Clay Products Co., New York. U.S. Pat. 1,017,926, Feb. 20, 1912.

Oil or resin is heated with excess of a vulcanising agent, (*e.g.*, sulphur) at a vulcanising temperature until vulcanisation is complete, and then mixed with oil or resin at vulcanising temperature. Clay, which may contain sulphur, may also be present with the vulcanising agent. —H. E. P.

Leather, canvas or other fibrous material ; Process of impregnating —— *with rubber.* E. N. Quirin, Mansfield, Mass., and J. H. Bannon, Rochester, N. H., U.S.A. Eng. Pat. 2962, Feb. 6, 1911.

Rubber solution is forced into the pores of the material to be impregnated by centrifugal action. The leather or other material is placed in a drum, or other receptacle, containing rubber solution, and the vessel is then rotated at a speed of about 1000 to 5000 revs. per minute, the speed varying with the diameter of the drum.—E. W. L.

Rough rubber or caoutchouc and process for manufacturing the same. Rauhgummi-Verwertungs-Ges.m.b.H., Hamburg, Germany. Eng. Pat. 20,129, Sept. 11, 1911. Under Int. Conv., Aug. 2, 1911.

See Fr. Pat. 434,215 of 1911 ; this J., 1912, 291.—T. F. B.

Substitutes for oils, caoutchouc, or resins and for like substances ; Manufacture of products applicable as ——. L. Lilienfeld, Vienna. Eng. Pat. 636, Jan. 10, 1910.

See Fr. Pat. 417,392 of 1910 ; this J., 1911, 36.—T. F. B.

XV.—LEATHER ; BONE ; HORN ; GLUE.

Hide ; Swelling and solubility of —— *in acids.* A. T. Hough. Leather World, 1912, 4, 192—194.

The amount of swelling which takes place when hide powder is treated with solutions of different concentrations of the common acids, was measured, by determining the gain in weight of the powder after soaking in the acid solution for two hours and allowing to drain. The amount of acid absorbed by the hide was also determined by titration of the liquid which drained off. With hydrochloric, sulphuric, and oxalic acids (acids which have been condemned for use on bookbinding leathers), the swelling increases as the concentration of the solution increases to $N/10$, but on increasing the concentration to $N/1$, the swelling decreases. With all the other common acids, with the exception of lactic acid, the swelling increases as the concentration increases to $N/1$. Lactic and formic acids have the greatest swelling powers. Boric acid is unique in producing the reverse of swelling. The swelling power does not appear to bear a direct relation to the hydrion concentration, but this is probably due to the modifying action of the anion.—J. R. B.

Tannins ; Characteristic reactions of ——. A. W. Hoppenstedt. J. Amer. Leather Chem. Assoc., 1912, 7, 170—173.

In continuation of work already published (see this J. 1912, 241) the author gives some new qualitative tests for the different tannins. *Mangrove.*—To detect mangrove in admixture with any other material, 25 c.c. of the solution are treated gradually with 25 c.c. of a 1 per cent. solution of quinine hydrochloride. The mixture is filtered and 5 c.c. of the filtrate are mixed first with 1 c.c. of concentrated acetic acid and then with 2 c.c. of acetone, and next with 5 c.c. of ethyl acetate. The mixture is allowed to separate. With mangrove the lower layer is coloured a strong yellow brown and with all other tannins the layer is colourless. *Gambier.*—To identify and detect gambier in mixtures, 5 c.c. of the tannin solution are mixed in succession with 5 c.c. of alcohol, 1 c.c. of a 10 per cent. solution of potassium hydroxide, and 10 c.c. of petroleum ether, and allowed to separate. The petroleum ether layer assumes a green fluorescence in presence of gambier. *Hemlock.*—To 50 c.c. of the tannin solution 10 grms. of dry calcium chloride are added and after shaking until the chloride is dissolved, the solution is filtered. 5 c.c. of the clear filtrate are mixed in succession with 1 c.c. of concentrated acetic acid, and 5 c.c. of amyl acetate, and allowed to separate. In the presence of hemlock the upper layer is coloured a strong yellow brown whilst with all other tannins the layer is colourless.—J. R. B.

Patents.

Hides ; Process of unhairing ——. La Maya Bulgare. Fr. Pat. 434,827. Dec. 7, 1910.

A process to unhair hides by treatment with milk fermented with a lactic ferment.—J. R. B.

Hides ; Treatment of —— *with solutions or emulsions of organic compounds.* R. Vidal. Fr. Pat. 434,510, Sept. 23, 1911.

A process to treat, with or without the application of alkali sulphites or polysulphides, hides, haired or unhaired, with solutions or emulsions of organic liquids such as : petrol, turpentine, benzol, etc.—J. R. B.

Hides and products derived therefrom ; Treatment of ——. R. Vidal. Fr. Pat. 435,047, Sept. 23, 1911.

A process to render hides imputrescible and to remove hair or wool by immersion in alkali sulphites, thiosulphates, or polysulphides, followed by wiping, and drying in a warm damp room, and by a complementary treatment in solutions of one or several of the following substances: tannins, polyphenols, naphthols, salts of chromium, aluminium, lead, zinc, magnesium or copper, aluminates, chromates, alkali bichromates, formaldehyde.—J. R. B.

Adhesives [from skim milk]; Process for producing ——. R. Heim, Canastota, N.Y., Assignor to F. Behrend, New York. U.S. Pat. 1,018,559, Feb. 27, 1912.

Skim milk is condensed, *e.g.*, to one-third of its volume, acidified, heated if necessary (*e.g.*, for 2 hours at 38°—49° C.) and then evaporated to dryness.—J. H. L.

Impregnating leather, canvas, or other fibrous material with rubber. Eng. Pat. 2962. *See* XIV.

XVI.—SOILS; FERTILISERS.

Humic acids of Sphagnum turf. S. Odén. Ber., 1912, **45**, 651—660.

Solutions prepared by the action of alkalis on humic acid are shown not to be of colloidal nature and it is incorrect to regard the solution of the humic acid as corresponding to a peptonisation of the colloidal material. Solutions of ammonium humate can be prepared free from colloids and, by precipitation with hydrochloric acid, humic acid is obtained in suspension free from salts. It is proved by means of conductivity measurements that the interaction of ammonia solution and humic acid really occasions salt formation; by following the neutralisation of sodium hydroxide by humic acid in the same manner, the equivalent of the acid is determined as about 339. Humic acid appears to be tribasic, having a molecular weight of approximately 1000. When purified humic acid is dried at 100° C. the jelly-like mass is converted into a hard mass which forms a black lustrous powder: this is no longer soluble in alkali immediately, but, when the treatment is prolonged, it very gradually passes into solution yielding a brown liquid.—E. F. A.

Creatinine: a beneficial organic constituent of soils. 1. *Isolation of creatinine from soils.* E. C. Shorey. 2. *Origin of creatinine in soils.* M. X. Sullivan. 3. *Effects of creatinine on growth and absorption.* J. J. Skinner. U.S. Dept. Agric., Bureau of Soils, Bull. No. 83, pp. 44. (See also this J., 1912, 37.)

Methods of isolating creatinine from soils and of identifying it are described. It is shown to occur in organic fertilisers such as stable manure and it has been found in soils of very different type and from widely separated areas. The quantity present though small is not negligible, being comparable to the quantity of nitrates normally present. Planted soils give larger amounts of creatinine than the same soil unplanted. Both creatinine and creatine are shown to have beneficial effects on plant growth, particularly in the case of plants grown in solution cultures containing only potash and phosphate. They have no appreciable effect on the growth when large amounts of nitrate are present in the culture solutions. Plants growing in cultures, whether high or low in nitrate, showed a much smaller absorption of this ingredient in the presence of creatinine or creatine, whereas the removal of potash and phosphate was normal. Creatinine and creatine appear therefore to replace nitrate in its effect on plant growth.—E. F. A.

Potassium; Determination of small quantities of ——. E. A. Mitscherlich, K. Celichowski, and H. Fischer. Landw. Vers.-Stat., 1911, **76**, 139—155. Chem. Zentr., 1912, **1**, 853.

The authors recommend the cobaltinitrite method (see this J., 1907, 1256; 1909, 163, 615; 1910, 1218), modified in certain details, for the volumetric determination of potassium in soils and fertilisers. The method is simpler than the platinichloride process, and for small quantities is considerably more accurate than the latter.—A. S.

Phosphoric acid; Volumetric determination of —— in phosphate rock. J. G. Fairchild. J. Washington Acad. Sciences, 1912, **2**, 114.

The error in Pemberton's method of titration with caustic alkali solution (about 1·5 per cent. too low), may be obviated by precipitating the soluble phosphate with an excess of barium chloride. Owing to the fact that barium phosphate thus precipitated undergoes hydrolysis, the quantities of precipitate taken for the titration must not be too large. The relative accuracy of the results obtained by this modification and by the ordinary gravimetric method was 99 per cent. as compared with 99·5 per cent. —C. A. M.

Magnesia in green plants; Physiological function of ——. L. Bernardini and G. Morelli. Atti R. Accad. dei Lincei, Roma, 1912, **21**, I., 357—362.

Wheat grains were allowed to germinate in moist quartz sand, in the absence of nutritive substances, in the dark and in the light, and at different stages of growth the proportions of phosphoric acid combined as phosphatides and as phytin, and that soluble in 1 per cent. hydrochloric acid, and the proportions of magnesia soluble in 1 per cent. hydrochloric acid and in water respectively were determined. It was found that in the germination in the dark, whilst the proportion of phosphoric acid soluble in 1 per cent. hydrochloric acid remained fairly constant, the proportion combined as phytin (and as phosphatides) decreased continuously, and at the same time the proportion of magnesia soluble in water reckoned as a percentage of that soluble in 1 per cent. hydrochloric acid increased continuously. In germination in the light the proportion of phosphorus as phosphatides increased when chlorophyll made its appearance, whilst that of phytin-phosphorus decreased; the proportion of magnesia soluble in water increased until chlorophyll made its appearance and then decreased. From these results the authors conclude that magnesia plays an important part in the transference of phosphoric acid from the place where it is stored in the form of phytin (see Bernadini, page 355) to the place where it is utilised; the gradual disappearance of phytin during germination is probably due to its hydrolysis into inositol and magnesium phosphate by the enzyme phytase (see this J., 1907, 1061). Further, the decrease in the proportion of magnesia soluble in water after the appearance of chlorophyll indicates that whilst the phosphoric acid of the magnesium phosphate is utilised for the building up of nucleoproteins, etc., the magnesia is utilised in the synthesis of chlorophyll, which has been shown by Willstätter (compare this J., 1908, 185) to be a magnesium compound.—A. S.

Arsenic in commercial lead arsenates; Determination of soluble ——. B. E. Curry and T. O. Smith. J. Ind. Eng. Chem., 1912, **4**, 198—201.

A quantity of the moist sample equivalent to 2 grms. of dry substance is stirred with 500 c.c. of water and the solution agitated continuously for 18 hours in a thermostat at 20° C. and then filtered. A portion of the filtrate is tested for arsenious oxide and if this be present, it is determined in 200 c.c. of the filtrate by adding sodium bicarbonate and starch and titrating with iodine. The solution is then treated with 5 c.c. of sulphuric acid and 1 grm. of potassium iodide, concentrated to 40—50 c.c., cooled, and diluted to about 150 c.c. Any excess of iodine is removed by careful addition of $N/20$ sodium thiosulphate until the yellow colour is just destroyed. The solution is now made slightly alkaline with sodium hydroxide, then acid with a few drops of dilute sulphuric acid, and next alkaline again with sodium bicarbonate, and the arsenite titrated with iodine solution using starch as indicator. The result gives the total soluble arsenic. Solubility determinations showed that under the conditions described, the solubility of lead arsenate is 0·151 per cent., whilst under the conditions of the method of the Assoc. of Official Agric. Chemists (U.S.A.) it is 0·605 per cent. If 0·151 be deducted from the results obtained by the authors' method, the percentage of soluble arsenic other than that combined with lead is given, and if 0·605 be added to the figures thus obtained, the results agree well with those for total soluble arsenic obtained by the A.O.A.C. method which requires 10—11 days.—A. S.

Fertilising action of calcium sulphate in sugar beet cultivation. Briem. *See* XVII.

PATENTS.

Fertiliser from sulphite liquors; Process of obtaining a ——. Hoesch et Cie. Fr. Pat. 434,943, Oct. 6, 1911.

Waste sulphite cellulose liquors are treated direct, or after concentrating or evaporating to dryness, with nitrogen-fixing bacteria, the material forming an advantageous medium for the culture of the bacteria, and the product is applied to the soil as a fertiliser. Or, the liquor, after preliminary treatment, such as neutralising, drying, and grinding, is applied directly to the soil, to be acted upon by the nitrogen-fixing bacteria naturally present.—F. Sodn.

Sulphur capable of remaining in suspension and its process of manufacture. Thomsen Chem. Co. Fr. Pat. 435,197, Oct. 13, 1911. Under Int. Conv., Oct. 14, 1910.

Sulphur is very finely ground whilst adding a solution of glue or other colloid in a neutral liquid, such as water (for example, 50 pts. by weight of sulphur and a solution of 5 pts. of glue in 50 pts. of water), or it is ground with the dry colloid and then mixed with the liquid. The product, which is not coagulated by diluting and adding sulphuric acid, may be employed for sprinkling plants to destroy fungi, or, with the addition of lead arsenate, for destroying insects. Other colloids specially suitable for use in the process are extract of quillaja bark, Irish moss, gum tragacanth, and gum arabic.—F. Sodn.

XVII.—SUGARS; STARCHES; GUMS.

Sugar beet cultivation; Fertilising action of calcium sulphate in ——. H. Briem. Z. Zuckerind. Böhm., 1912, **36**, 325—329.

Calcium sulphate is of importance in the fertilisation of the sugar beet, not only in inducing the absorption of the plant nutrients, but also in diminishing the amount of injurious nitrogen compounds (this J., 1905, 808; 1906, 385; and 1911, 701). Störmer, on manuring with calcium sulphate at the rate of 200 kilos. per hectare (178 lb. per acre) in the presence of a sufficiency of other nutrients, found that the yield was increased by 800 kilos. per hectare (712 lb. per acre), and the sugar content by 1·10 per cent. It was moreover shown by Störmer that the special advantage of gypsum is the suppression of the dry rot of the beet, the percentage of diseased plants being for different plots as follows: With nitrogenous fertiliser alone, 60·8; with a sufficiency of nutrients, 34·7; with a sufficiency of nutrients, with the exception of phosphorus, 45·7; with a sufficiency of nutrients with the exception of potassium, 58·7; with a sufficiency of nutrients, with the exception of calcium, 64·9; with a sufficiency of nutrients, with the addition of gypsum, nil. Both calcium carbonate and calcium sulphate are of value in ensuring the healthy condition of the soil, the former correcting the acidity, which induces the dry rot disease, and the latter the alkalinity, which is likewise injurious.—J. P. O.

Marc in the beetroot; Determination of the ——. H. Pellet. Intern. Sugar J., 1912, **14**, 163.

As an improvement on the ordinary method of determining the marc or insoluble matter of the beetroot, the author recommends the following procedure: Using either the Pellet rasp, in conjunction with the Keil disc, or the "Sans Pareille" press, a quantity of pulp is prepared; 20 grms. of it are placed in a small cylindrical vessel, 55—60 mm. in height and 45—50 mm. in diameter, made of finely perforated metal, and equipped with a well-fitting lid. Extraction of the soluble substances is now carried out by repeatedly pouring suitable amounts of cold water into the vessel, and allowing it to pass through the pulp. After a time, a little of the water is tested with α-naphthol, and when the reaction indicates the absence of sugar, the water is expressed from the wet pulp by means of a round plate, which has a slightly less diameter than the circular vessel, and is provided with a handle. Alcohol is then passed through the pulp, and the compressor again used to expel as much of the liquid as possible. Finally, the circular vessel, which had previously been tared, and its contents, are placed in the oven, and heated to constant weight.—J. P. O.

Invert sugar; Volumetric methods of determining —— for sugar factory practice. K. Radlberger. Österr-Ungar. Zeits. Zuckerind., 1911, **40**, 889—898.

Recognising that Herzfeld's gravimetric method of determining reducing sugars, although very accurate, is too tedious for factory routine work, the author has examined a number of volumetric processes for the purpose of ascertaining the most suitable. The following general conclusions were arrived at: (1) Winter's method (see Bohle, D. Zuckerind., 1909, 202) yields very accurate results, but demands as much time as the Herzfeld gravimetric process. (2) Scholvien's method, as modified by Bohle (*loc. cit.*), is accurate, the end-point in the titration being very sharp and rapid. (3) De Haën's method (see Duschky, D. Zuckerind., 1909, 521) leaves much to be desired, as regards accuracy, as well as rapidity. (4) Müller's method (see Duschky, this J., 1909, 847) is readily carried out, and gives results that are fairly comparable with Herzfeld's process. (5) Bang's method (this J., 1907, 161) is the most suitable of the five examined, as it not only gives the most accurate figures, but in addition is very rapid.—J.P.O.

Sucrose; Comparison between the double polarisation method of determining —— and the direct polarisation after destruction of the reducing sugars. H. Pellet. Intern. Sugar J., 1912, **14**, 161—162.

A number of comparative determinations with the Pellet-Lemoland (this J., 1911, 1400) and other methods of determining sucrose have been carried out, the following results being obtained: direct polarisation, defecating with basic lead acetate, 33·7; direct polarisation, using hypochlorite and normal lead acetate for clarification, 28·9; direct acid polarisation, using hydrochloric acid and urea (Andrlik), 30·9; sucrose by double polarisation, using the neutral direct polarisation, and verified constants, 38·9; sucrose by double polarisation, employing the acid (Andrlik) direct polarisation, and verified constants, 38·6; direct polarisation, after destruction of the reducing sugars, by the Pellet-Lemeland procedure, 38·8; sucrose by double polarisation, using the solution in which the reducing sugars had been destroyed by the Pellet-Lemeland process, 38·5; sucrose by determining the reducing sugars before and after inversion, and operating directly on the sample, 38·3. Six other samples were also examined by the double polarisation method, and the results compared with those found by direct polarisation after the destruction of the reducing sugars by the Pellet-Lemeland method, the following being the figures obtained: By the double polarisation method, using for the direct reading the solution clarified with hypochlorite and defecated with normal lead acetate: (1) 45·3; (2) 39·4; (3) 39·7; (4) 35·9; (5) 40·2; and (6) 37·5; and by direct polarisation, after destruction of the reducing sugars: (1) 46·3; (2) 39·4; (3) 37·5; (4) 35·5; (5) 39·0; and (6) 38·4.—J. P. O.

Reducing sugars; New method for the determination of ——. E. C. Kendall. J. Amer. Chem. Soc., 1912, **34**, 317—341.

A study of various reagents for the gravimetric determination of reducing sugars showed that for the preparation of the copper solution potassium carbonate is the most suitable alkali, whilst for keeping the copper in solution, salicylic acid is most satisfactory, having itself no reducing action on cupric salts. The method finally adopted is as follows: The sugar solution is made up to 100 c.c. in a 200 c.c.

Erlenmeyer flask and 5 grms. of salicylic acid are added, followed by 15 c.c. of a solution of copper sulphate (133⅓ grms. of the crystallised salt per litre) and 25 c.c. of a solution of potassium carbonate (600 grms. of the anhydrous salt per litre), without agitation. (The reagents must be added in the order given.) After shaking with a rotary motion until the copper carbonate and salicylic acid are dissolved, the flask is placed in a bath of boiling water, the flame under which must be of such size that the water begins to boil again within 1½—2 mins. after introducing the flask. After heating for 20 minutes in this bath, the solution is filtered with the aid of suction through an asbestos felt, ;6—8 mm. thick, supported on a porcelain disc in a glass funnel; the cuprous oxide is washed with hot water, the funnel is fixed in a clean suction-flask, and the cuprous oxide dissolved in not less than 10 c.c. of hot nitric acid (1 : 3), the asbestos being subsequently washed with successive portions (10—12 c.c.) of water. The copper in the solution is determined by the author's modification of the iodide method (this J., 1912, 48). The following equations show the relation between the weight of sugar (Y) and the weight of copper reduced (X) under the conditions described :—

Dextrose : $X = -0{\cdot}17 + 3{\cdot}0923Y - 0{\cdot}002026Y^2$.
Invert sugar : $X = -1{\cdot}30 + 3{\cdot}2918Y - 0{\cdot}002455Y^2$.
Lactose (hydrate) : $X = -0{\cdot}59 + 1{\cdot}5786Y - 0{\cdot}000217Y^2$
Maltose (hydrate) : $X = -1{\cdot}69 + 1{\cdot}5988Y - 0{\cdot}000187Y^2$.

A table is given showing the weights of the four reducing sugars for quantities of copper from 30 to 450 mgrms. in steps of 1 mgrm.

The author states that all samples of Rochelle salt examined by him showed a notable cupric-reducing power in alkaline solution and hence in using Munson and Walker's method (this J., 1906, 656), this should be determined and allowed for.—A. S.

Beet molasses ; Examination of the precipitate produced by mercuric acetate in ——. Stoltzenberg. Z. Ver. deut. Zuckerind., 1912, 318—322.

For the clarification of beet sugar factory products, Neuberg and Ishida have recommended the use of mercury salts, followed by phosphotungstic acid (this J., 1911, 1463), which procedure has now been examined by the author, more especially for the purpose of determining whether optically active protein decomposition products are actually precipitated. An approximately half normal sugar weight solution of beet factory molasses was defecated with basic lead acetate in the ordinary way, and the resulting filtrate treated successively with solutions of mercuric acetate (33 per cent.) and phosphotungstic acid (50 per cent. in 5 per cent. sulphuric acid), the precipitates obtained with the last two reagents being separately examined for the presence of optically active compounds. In the case of the precipitate obtained by means of mercuric acetate, decomposition was effected by hydrogen sulphide, and the liquid filtered, a solution being obtained that was optically inactive in neutral, but slightly dextro-rotatory in acid solution. Further examination showed that this solution contained a small amount of an optically active amino-acid, strongly resembling aspartic acid. The phosphotungstic acid precipitate was decomposed by barium hydroxide, and the solution obtained after elimination of the excess of barium hydroxide was also found to be inactive in neutral and slightly dextro-rotatory in acid solution. This solution was found to contain an appreciable amount of adenine, and of another optically inactive base, the nature of which was not identified.
—J. P. O.

Sucrose ; Inversion of —— *by means of honey.* O. Achert. Z. Untersuch. Nahr. Genussm., 1912, 23, 136—139.

Aqueous solutions of sucrose were mixed with pure honey, and the proportion of sucrose in the mixture determined at the beginning of the experiments and again at intervals of two months for a year. When the mixture was first heated for 30 minutes at 100° C., the enzyme in the honey was almost completely destroyed, and the initial amount of sucrose (22·68 per cent.) only fell to 21·35 per cent. in 12 months. After being heated for 30 minutes at 50° C. or 55° C., the mixtures still underwent rapid inversion. Thus, for example, in one experiment the sucrose fell from 22·05 per cent. to 2·21 per cent. in 4 months. Chilling the mixture below 0° C. did not affect the subsequent completeness of the inversion. These results disprove the assertion of Witte that inversion does not take place in honey at the ordinary temperature. The fact that, after neutralisation of the mixtures, the inversion proceeded somewhat more energetically than before showed that the acid in the honey does not play the part in the process commonly assigned to it. Certain kinds of honey derived from chestnut blossoms contained appreciable quantities of iron and manganese. Almost all the samples of conifer honey from the Schwarzwald yielded in the mean, from 0·8 to 0·99 per cent. of ash, which is considerably higher than previously recorded figures for conifer honey.—C. A. M.

Patents.

Sugar cane ; Process and apparatus for macerating crushed ——. J. C. and W. A. McNeil, Govan, Scotland. Eng. Pat. 5431, Mar. 4, 1911.

In the treatment of sugar cane by passing it through a number of mills in succession and macerating it between each pair of the series, the weak juice from the macerated megass which flows back over the front roller of the second mill of each pair, or which may be obtained by passing the macerated megass through a preliminary pair of drying rollers (Cp. Eng. Pat. 3937 of 1873) before it enters the second mill, is led back into the maceration bath and so used over and over again until of sufficient density to go to the evaporators. Apparatus for macerating the megass between successive mills is also claimed.—J. H. L.

Sugar ; Manufacture of refined ——. M. Naswanoff, Jaltushcovo, Russia. Eng. Pat. 5705, Mar. 7, 1911.

In the manufacture of hard refined sugar it is customary not to allow the whole of the liquor to drain away from the crystals but to leave a certain amount which is afterwards distributed uniformly throughout the mass and on drying serves to bind the sugar into a hard cake or loaf. The drawback to this method is the difficulty of regulating the quantity of liquor remaining in the mass, particularly when the latter is drained by centrifugal means. The process now claimed consists in the removal of practically the whole of the liquor from the crystals and the subsequent addition, in a separate operation, of the amount of liquor necessary to obtain the requisite degree of hardness on drying. An apparatus by which the required quantity of liquor can be added to well-drained sugar loaves is described. (Reference is directed to Eng. Pats. 164 of 1869, 575 of 1871, 2820 of 1883 and 8593 of 1898 ; see this J., 1899, 597.)—J. H. L.

Sugar cane and maize juices ; Process for preparing ——. F. L. Stewart, Murrysville, Pa., Assignor to Maize Sugar and Cellulose Co., Pittsburgh, Pa. U.S. Pat. 1,018,994, Feb. 27, 1912.

Claim is made for the treatment of the juice of immature maize or immature sugar cane by rendering the juice alkaline with lime, magnesia or other base, removing impurities if necessary, and then acidifying with sulphurous acid, after which the juice may be heated, filtered and evaporated.—J. H. L.

[*Sugar.*] *Centrifugal machine with a co-axial screw conveyor in the basket.* S. von Grabski, Ger. Pat. 240,186, March 30, 1910. Addition to Ger. Pat. 220,701, July 10, 1908.

The screw conveyor is mounted on a hollow shaft from which hollow arms extend to openings in the edges of the screw. A suitable medium such as steam, water, or syrup is supplied to the hollow shaft and forced out through these openings in order to prevent or remove incrustations on the perforated drum.—A. S.

Crystals from sugar solutions; Process for obtaining large well formed ——. W. Ohle. Ger. Pat. 242,027, June 29, 1910.

Lifting devices are provided by means of which the minute crystals which act as nuclei for the growth of larger crystals are raised through the sugar solution and then allowed to fall again. These lifting devices are so disposed that the crystals which are being raised do not meet the descending crystals, thus facilitating a rapid uniform increase of size.—A. S.

Betaine hydrochloride from molasses, vinasses, or other residues from beet-sugar manufacture; Process for obtaining ——. H. Stoltzenberg. Ger. Pat. 243,332, May 17, 1911.

The molasses or other by-product is saturated with hydrochloric acid gas, the mixture is filtered, and the solution is allowed to stand for a long time in order to allow the alkali chloride and the glutamic acid hydrochloride to separate; the solution, which contains the betaine, is then evaporated to a syrupy consistency, preferably in a vacuum, and the betaine hydrochloride is precipitated by the addition of alcohol. It is stated that the yield of betaine hydrochloride amounts to about 100 grms. per litre of vinasse.—T. F. B.

Manufacture of a [starch] product for sizing, stopping, filling, etc. Eng. Pat. 5269. *See* VI.

XVIII.—FERMENTATION INDUSTRIES.

Yeasts and other budding fungi: Ethyl acetate as a source of carbon for ——. H. Will and R. Heuss. Z. ges. Brauw., 1912, **35**, 128—129.

This paper contains a preliminary announcement of some results obtained in investigating the behaviour of yeasts and other budding fungi towards esters. A number of such organisms (torulæ, mycoderma-yeasts, etc.) were cultivated in artificial nutrient liquids containing 0·5, 1, 3 and 5 per cent. of ethyl acetate and small quantities of ammonium and magnesium sulphates, dipotassium phosphate and potassium chloride. After a time, signs of growth were apparent in all cases, even in the media containing 5 per cent. of the ester, and film-formation occurred slowly to an extent apparently depending on the quantity of ester present, at least when the latter was small. Budding fungi of the most diverse groups are therefore capable of assimilating ethyl acetate and multiplying in the absence of other organic matter. —J. H. L.

(*Beer-cloudiness*). *Caution in using formaldehyde as disinfectant.* F. Schönfeld and G. Himmelfarb. Woch. Brau., 1912, **29**, 125—127.

Certain cases of cloudiness in beers have been attributed to small quantities of formaldehyde remaining in casks, pipes, etc., after disinfection. The authors found that a pale lager beer, treated with 0·3 mgrm. of formaldehyde per 100 grms., developed a faint cloudiness within 5 days at 0° C., but remained clear at ordinary temperatures (10°—15° C.). Addition of 0·8 mgrm. and larger amounts produced cloudiness even at ordinary temperatures, and in a more pronounced degree at 0° C. A dark lager beer, similarly treated, was found to be much less sensitive towards formaldehyde. Addition of the largest quantity used (2·4 mgrms. per 100 grms.), produced no cloudiness within five days at ordinary temperatures, but at 0° C. the beer lost its clarity after treatment with 0·8 mgrm. or more per 100 grms. The cloudiness produced was found to consist mainly of albuminous matter. It disappeared partly and sometimes completely (especially in the case of the dark beer) on warming to 25°—30° C. It is evident that the use of formaldehyde for disinfecting brewing vessels requires caution, for the quantities remaining in such vessels, after washing them with even weak solutions of formaldehyde and draining, are sufficient to give rise to cloudy beers.—J. H. L.

Tannin in wines; Convenient and rapid method of determining ——. P. Malvezin. Bull. Assoc. Chim. Sucr., 1912, **29**, 539—541.

To 10 c.c. of the wine are added 10 c.c. of ammoniacal zinc acetate solution, prepared by dissolving 10 grms. of zinc oxide in acetic acid, adding 80 c.c. of ammonia solution, and making up to a litre. After boiling for 5 minutes, the precipitate is filtered off, washed with distilled water, and then dissolved from the filter in 2·5 per cent. sulphuric acid. The resulting solution is heated to 60°—70° C., and titrated with recently prepared *N*/10 permanganate solution, the number of c.c. required being multiplied by 0·12 to give the result in grms. of tannin per litre. It is important to add the permanganate in small amounts, say 5 drops at a time, especially towards the end-point, and the pink colouration should persist for three minutes. In this way the determination of tannin may be carried out in 35 minutes, and the error is less than 1 per cent. of the amount present.—J. P. O.

Zinc; Detection of traces of —— *in wine.* A. Straub. Z. Untersuch. Nahr. Genussm., 1912, **23**, 140.

From 100 to 200 c.c. of the wine are heated to boiling, treated with hot sodium carbonate solution, and boiled for some time. The precipitate is collected, washed with hot water, and dissolved in the smallest possible quantity of hydrochloric acid, and the solution is treated with a few granules of potassium chlorate and heated until all chlorine is expelled. It is next boiled with an excess of sodium acetate to eliminate any iron, aluminium, or remaining traces of calcium phosphate, then filtered and the filtrate tested for zinc with hydrogen sulphide.—C. A. M.

Tartaric materials; Exports of —— *from Italy.* Board of Trade J., March 28, 1912. [T.R.]

The following figures show the quantity and value of the exports of tartaric material from Italy during the year ended 30th September, 1911.

—	Year ended 30th Sept., 1911.	
	Tons.	£
Half-refined argols	435	27,185
Vinaccia argols	1,707	90,385
Crude argols	4,285	185,125
Lees	3,832	71,055
Total	10,259	373,750

Patents.

Fermentable substances [Yeast]; Treatment of ——. J. A. Stevenson, Acton, Middlesex. Eng. Pat. 27,782, Nov. 29, 1910.

This invention relates to the incorporation of sugar, malt-extract, or similar materials with "fermentable substances" such as yeast, and the subsequent pressing of the yeast. The process claimed consists in placing the yeast and the nutrient matter, in liquid form, separately under pressure, and using such pressure to deliver the two, in any desired proportion, to a filter press or other apparatus for removing the liquid. The pressure employed may be hydrostatic or produced by a double pump or by gases. Various devices are described for effecting the admixture of the yeast and the nutrient liquid, in any desired, adjustable, proportion on their way to the filter press.—J. H. L.

Yeasts; Apparatus for the manufacture of pure —— *for rum distilleries.* R. Domergue. Fr. Pat. 434,593, Aug. 22, 1911.

The apparatus includes an upper and a lower chamber separated by a horizontal partition and connected by a pipe extending downwards from this partition. The upper chamber contains a vertical, hollow, rotatable shaft carrying a series of annular plates with a screw-propeller between the lowest plate and the partition. The outer and inner edges of the plates are slightly raised, and each plate is provided with a number of ridges so arranged that the mixture of wort and yeast that is caused to descend from plate to plate traverses the whole surface of the plate in a layer not exceeding 2 mm. in thickness. During this descent, the thin layers of liquid are exposed to a strong current of sterilised air, introduced through the hollow shaft. The wort is fermented in the lower chamber, the carbon dioxide formed being expelled through an outlet near the top of this chamber. This outlet is subsequently closed, and air is pumped into the lower chamber whereby the liquid is forced into the upper chamber. On rotating the shaft, the screw-propeller causes the liquid to ascend through the space between the wall of the upper chamber and the outer edges of the annular plates, and to descend centrally; the eddies produced in the liquid remove the yeast deposits on the plates, and on opening the outlet for carbon dioxide in the lower chamber, the mixture of liquid and yeast descends into the latter, from which it is subsequently withdrawn through a discharge-pipe.—L. E.

Alcohol; Process for separating the —— entrained by the air in the manufacture of yeast or barm. A. Zeckendorf and Maschinenbau Akt.-Ges. Golzern Grimma. Fr. Pat. 434,949, Oct. 6, 1911.

A certain quantity of water in a finely divided form, or of the vapour of water or other medium capable of absorbing alcohol, is mixed with the air that has been passed through the wort in the process of manufacturing yeast. The mixture is passed into the apparatus used for condensing the alcohol, practically the whole of the latter being deposited with the water.—L. E.

Breweries; Means for cooling ——. Heenan and Froude, Ltd., and W. Wheal, Manchester. Eng. Pats. 7793, Mar. 29, 1911 and 20,842, Sept. 21, 1911.

Rotatory air coolers, such as those claimed in Eng. Pats. 1468, 6452, 20,880 and 28,656 of 1909 (see this J., 1910, 9, 1145 and 1446) are connected with suitable ducts to convey the cool air to any desired parts of fermenting or refrigerating rooms. Germicides may also be used in such rotatory coolers.—J. H. L.

Beer; Process for rendering harmless the coagulable proteins and the like contained in ——. H. Wernaer. Ger. Pat. 242,294, June 15, 1909.

The beer before filtration or pasteurisation is subjected to the action of yeast which has been treated by known methods so as to destroy its zymase-activity and enhance its proteolytic activity, or to the action of permanent preparations or expressed juice prepared from such yeast. In this way the coagulable proteins are decomposed and hence prevented from producing turbidity or causing deterioration of the flavour of the beer.—A. S.

Beer, distillers' wort and the like; Apparatus for separating alcohol from ——. O. G. C. L. J. Overbeck, Gt. Grimsby. Eng. Pat. 5170, Mar. 1, 1911.

The removal of alcohol is effected by passing carbon dioxide through the beer or other liquid previously heated to 90° F. The heating is continued until the temperature finally reaches about 120° F. in the case of beers, or 140°—150° F. in the case of distillers' worts. The apparatus claimed comprises a gasometer for holding carbon dioxide, a condenser for liquefying the alcohol carried off, a pump and a device by which the gas can be passed in either direction through a number of cylindrical vessels (seven) arranged in a tank containing water of adjustable temperature. The cylindrical vessels are connected with each other "in series," the short exit tube of one being in union with the long inlet tube reaching to the bottom of the next, and so on. One of these vessels is filled with the liquid to be de-alcoholised. On starting the current of gas this liquid is converted into froth which in time is carried over into the other vessels. When, by means of a glass sight-tube, the froth is seen in the pipe leading from the last vessel of the series, the direction of the gas is reversed, whereby the froth is driven back and liquefied. The gas current is again restored to the original direction as soon as the liquid begins to be driven back up the inlet tube of the first vessel of the series. Various subsidiary devices are also claimed.—J. H. L.

Wash-distilling apparatus; Continuous ——. H. A. Kuester. Ger. Pat. 242,734, Aug. 24, 1910.

The wash is caused to take a zig-zag path through the still, which is divided into compartments by concentric cylindrical partitions communicating alternately above and below. Annular steam pipes are arranged in the places where two adjacent compartments communicate at their lower ends, so that the steam from each pipe serves to heat the contents of two compartments of the still.—A. S.

Rectifying apparatus; Washing device for the alcoholic vapours mixed with steam in ——. H. A. Kuester. Ger. Pat. 242,735, Aug. 24, 1910.

The vapours are conveyed to a receptacle containing water, in the lower part of the rectifying apparatus, and are forced through a screen in order to attain a state of fine division. The screen is disposed in a hood or bell below the level of the water, so that the vapours have to overcome the resistance of the water when passing through the screen, and hence leave the screen in the form of minute bubbles. An overflow device is provided in the receptacle for the purpose of running off the fusel oil which collects on the surface of the water. This overflow device may be in the form of a pan or trough disposed on the top of the bell and provided with a discharge pipe.—A. S.

Sauce consisting chiefly of soja grains. Yu Ying Li, Valées, France. Eng. Pat. 30,351, Dec. 31, 1910.

See Fr. Pat. 424,125 of 1910; this J., 1911, 827.—T. F. B.

Saccharifying apparatus. V. Raisin, Assignor to Comp. Industrielle des Alcools de l'Ardèche, Paris. U.S. Pat. 1,018,778, Feb. 27, 1912.

See Fr. Pat. 391,057 of 1908; this J., 1908, 1126.—T.F.B.

XIXa.—FOODS.

Flour; Composition of dry gluten and its relation to the protein content of ——. G. A. Olson. J. Ind. Eng. Chem., 1912, 4, 206—209.

Gluten as separated from flour in the ordinary way has a variable nitrogen, ash, starch, and moisture content. On the average the crude gluten contains about 75 per cent. of the total nitrogen of the flour. In the determination of starch in the crude gluten by hydrolysis and reduction of Fehling's solution, flocculent precipitates of light yellow to dark brown colour are frequently produced, due evidently to some substance other than the products of hydrolysis of starch. Flours of low protein content when treated by the usual method yield relatively much less gluten than those of medium or high protein content. This is due to the fact that with such flours "scattering" takes place during the gluten determination and some gluten is lost. By mixing a low-protein flour with a known weight of a "strong" flour of known gluten content, yields of gluten comparable to those obtained with medium- and high-protein flours can be obtained.—A. S.

Flour improver [and its detection and determination]. E. Hinks. Analyst, 1912, 37, 90—91.

A substance, sold as a flour improver, was found to consist of potassium persulphate. Its presence in flour may be detected by means of the benzidine reaction; the test fails to give a reaction when applied to the aqueous extract of a flour containing persulphate, but 1 part of the latter in 100,000 parts of flour may be detected by mixing 10 grms. of the flour with a small quantity of water and pouring a 2 per cent. alcoholic solution of benzidine over the paste. A blue coloration develops around each particle of the persulphate. Mixtures of persulphate with flour give the reaction with no apparent diminution of intensity after standing for three months, but the persulphate appears to be destroyed completely in the baking process. The quantity of the salt present in a flour may be determined by suspending the flour in carbon tetrachloride, submitting the mixture to centrifugal action, treating the deposit with a small quantity of water, and separating any remaining starch by filtration or further centrifugal action. The solution is then heated with potassium iodide and titrated with thiosulphate solution in the usual way.—W. P. S.

Rice embryos; Chemical composition of ——. L. Bernardini. Atti R. Accad. dei Lincei, Roma, 1912, 21, I., 283—289.

THE author determined the phosphoric acid in different forms of organic and inorganic combination and the composition of the ash of rice embryos. The content of total phosphoric acid (P_2O_5) was 6·20 per cent. (referred to the dry substance) of which 82·90 per cent. was combined as phytin, 12·28 as nuclein, 3·54 as lecithides, 0·64 as lecithin, and 0·64 per cent. as inorganic compounds. The embryos are much richer in phosphorus than the whole grains, resembling in this respect and also in the high proportion of phytin, the aleurone grains separated by Posternak from the seeds of other plants (see Comptes rend., 1906; also this J., 1902, 1464; 1904, 126; 1905, 39). The ash of rice embryos has the following composition, the figures giving percentages referred to the dry substances before incineration: silica, 0·25; ferric oxide, 0·06; manganese oxide, traces; lime, 0·279; magnesia, 1·389; potash (K_2O), 1·691; soda (Na_2O), traces. Here also there is considerable resemblance to the results obtained by Posternak with aleurone grains: in both cases the ash contains a notable quantity of silica and a high proportion of magnesia. It is probable that phytin is a magnesium salt rather that a double calcium-magnesium salt.—A. S.

Benzoic acid; Detection of —— in foods. O. Biernath. Apoth.-Zeit., 1912, 27, 192.

TWENTY c.c. of water, 25 grms. of the substance to be tested (butter, for instance), a small quantity of pumice-stone, and 0·5 c.c. of sulphuric acid are placed, successively, in a flask and distilled. Fifteen c.c. of distillate are collected and tested as described by Jonescu (this J., 1909, 670). Should a colouration not be obtained within 15 minutes, water should be added to the contents of the distillation flask and four further quantities of distillate collected and tested. The reaction is retarded by the presence of mineral acids, volatile organic acids, and alcohol. If salicylic acid be present it must be destroyed by treatment with potassium permanganate (see this J., 1910, 367), and the mixture redistilled before the above-mentioned test is carried out.—W. P. S.

"Crude fibre"; Determination of —— in finely powdered materials [cocoa, etc.]. W. Greifenhagen. Z. Untersuch. Nahr. Genussm., 1912, 23, 101—102.

IN determining "crude fibre" in cocoa, etc., the hot liquid may be rapidly filtered, without dilution, through a layer of asbestos. This is arranged in a special filter or upon a porcelain plate placed in a funnel, and suction is applied.—C. A. M.

PATENTS.

Vegetable milk [from soya beans] and its derivatives. Y. Y. Li, aux Valées, France. Eng. Pat. 30,275, Dec. 30, 1910.

CLEANED and decorticated soya beans are ground up and mixed with water before and during grinding, then pressed in a filter press, and the resulting liquid strained and heated in a boiler or digester in a hot-water bath. The "vegetable milk" thus obtained may be used in the preparation of "humanised" milk, cheese, milk powder, casein, etc. Claim is made for a special form of apparatus for this process.—C. A. M.

Fruit extracts; Apparatus for making ——. E. C. Ressencourt, Assignor to E. H. Chamberlain, St. Louis, Mo. U.S. Pat. 1,017,800, Feb. 20, 1912.

A RETORT is provided with a cylindrical perforated container, the upper end of which rests on the restricted opening at the top of the retort. The lower portion of the latter is provided with a water-jacket which is heated by means of a burner situated in a casing which surrounds the bottom of the retort. Pipes leading from both the retort and the water-jacket are connected with water-gauges, and the jacket is supplied with water from a tank. A cover clamps over the opening at the top of the retort and a pipe leads from this cover to a suitable condenser. —W. P. S.

Bran; Process of treating —— and a product obtained thereby. J. H. Quine, Rochester, N.Y. U.S. Pat. 1,018,441, Feb. 27, 1912.

BRAN is extracted alternately with water, dilute acid, and dilute alkali; the extracts are then neutralised, mixed, and concentrated to form a product which contains approximately 10 per cent. of mineral matter.—W. P. S.

Producing adhesives [from skim milk]. U.S. Pat. 1,018,559. *See* XV.

XIXB.—WATER PURIFICATION; SANITATION.

Metropolitan Water Board. Seventh Research Report. A. C. Houston. 1911.

THIS report deals mainly with a continuation of the work described in previous reports (see this J., 1911, 305). It is divided into seven sections. I. A continuation of experiments as to recovery of pathogenic microbes added to the river water in the laboratory. The methods of recovery used were sufficiently delicate to detect one typhoid bacillus per 17·7 c.c. of water and one Gärtner bacillus per 12·4 c.c. As only one typhoid-like bacillus was detected out of 7991 colonies examined in an uninfected sample of the water, it confirms the conclusion that pathogenic microbes are not habitually present in small amounts of river water. II. Repetition of experiments as to rapidity of death of uncultivated typhoid bacilli in river water, using bacilli from a different source than on the first occasion. It was again found that these bacilli died in three weeks at most, and much sooner than a laboratory culture of the organism. Thus storage of river water for a month is tantamount to sterilisation as far as typhoid is concerned. III. Samples of river water were inoculated with typhoid bacilli and kept at different temperatures from freezing point upwards. It was found that the bacilli lived considerably longer at temperatures below 41° F. than at higher temperatures, but even at freezing point only one bacillus survived after four weeks' storage. IV. An investigation of the cultural characters of the *B. coli* isolated from raw and filtered river water. It is shown that the quality of the *B. coli* isolated as well as their quantity should be taken into account. V. The river water was passed through small reservoirs holding less than a day's flow before being passed into the storage reservoirs. It was found that there was a considerable improvement both chemically and bacteriologically after the water had passed through the small reservoirs. VI. Experiments were made with addition of "alumino-ferric" to the river water as it passed through a small reservoir. The use of the coagulant considerably enhanced the results obtained in the previous section.—J. H. J.

Spontaneous combustion of charcoal. *See* IIA.

Patents.

Sewage; Treatment of ——. J. S. Cordy, Tye's Cross, Sussex. Eng. Pat. 26,313 of 1910; date of appl., Feb. 15, 1911.

The sewage is introduced through a pipe provided with a trap into a closed chamber, in which the solid matters are decomposed and rendered soluble; the liquid then flows into a second chamber adjacent to the first, an M-shaped pipe at the upper part of the dividing wall affording communication between the two chambers. Air pipes enter the top of the limb of the M-pipe situated in the second chamber so as to aerate the liquid in the latter. The liquid from the second chamber may be utilised as a manure, or the purification may be allowed to proceed until the liquid is fit to be discharged into a river.—W. P. S.

Water; Treatment of ——. W. E. Evans, London. From C. Neff and A. Brandes, Hanover. Eng. Pats. 26,877 and 26,878, Nov. 19, 1910.

(1) Jets of water under pressure are caused to impinge upon plates or surfaces of aluminium or similar metal. (2) The water is forced under pressure over or through plates, corrugated sheets, gratings, rods, or tubes composed of impure aluminium or of an alloy consisting of 1 part of tin and 25 parts of aluminium. Blocks of aluminium, or of the alloy, may also be suspended in the boiler, the object of the treatment being the prevention of incrustation.—W. P. S.

Water; Treatment of ——. W. E. Evans, London. From C. Neff and A. Brandes, Hanover. Eng. Pats. 25,632 and 25,633 of 1911, date of appl., Nov. 19, 1910.

(1) Water suitable for washing and for use in boilers is obtained by causing the water to flow rapidly through aluminium tubes, or tubes of aluminium-tin alloy, under such conditions that disintegration of the surface of the metal is effected by friction due to the rapid flow of the water. (2) The water is caused to flow rapidly through or over baffle-plates or gratings composed of aluminium or similar metal. The water may be aerated before or after treatment.—W. P. S.

Water; Softening of ——. W. E. Evans, London. From J. D. Riedel Akt.-Ges., Berlin. Eng. Pat. 3870. Feb. 15, 1911.

The water is filtered through a bed of hard crystalline zeolites, a preliminary and final filtration through sand being also carried out; means are provided for stirring the layer of zeolites and for introducing sodium chloride solution in order to regenerate them when exhausted.
—W. P. S.

Liquids; Apparatus for sterilising —— by the action of ultra-violet rays. T. Nogier, Lyons, France. Eng. Pat. 9660, April 20, 1911. Under Int. Conv., Dec. 22, 1910.

The mercury lamp which is employed is fitted in a casing through which the liquid to be treated flows, being secured in position by means of pointed devices which fit into the ends of the lamp; one of these devices is provided with a screw. An automatic valve is also provided for controlling the flow of liquid through the apparatus; it consists of a hollow, soft iron core and a solenoid placed in the electric circuit. When the current is passing through the lamp and solenoid, the core is moved so as to allow the liquid to flow through the apparatus, but when the current is switched off, the pressure of the liquid forces the core against the end of the channel and cuts off the supply of liquid.—W. P. S.

Liquids; Apparatus for sterilising —— by rays of short wave-length. R. Renoncé. Fr. Pat. 434,784, Dec. 6, 1910.

The liquid is circulated around a mercury vapour lamp fitted in a constricted portion of a cylindrical vessel. The lamp is surrounded by metallic gauze which is held in position by means of supports attached to a movable cover at one end of the cylinder.—W. P. S.

Liquids; Apparatus for sterilising —— by means of ultra-violet rays. A. Helbronner and M. von Recklinghausen. Fr. Pat. 434,855, Oct. 3, 1911. Under Int. Conv., Oct. 5, 1910.

Previous to entering the lamp chamber the liquid is conducted upwards through a vertical pipe at the lower end of which is a valve; this valve is kept closed by means of an electro-magnet placed in the circuit which operates the lamp. Should the current fail and the lamp cease to act, the valve opens and allows the supply of liquid to pass away through a discharge pipe without entering the lamp chamber. In a second form of the apparatus the liquid passes down a vertical pipe and into the lamp chamber through a side pipe. Two valves are provided in the vertical pipe, one above and the other below the side pipe; these valves are fixed to a rod and their movement is controlled by an electro-magnet in the lamp circuit. When the lamp is alight the upper valve is open and the lower one closed; any interruption in the current causes the upper valve to close and the lower one to open, so that liquid which may leak through the upper valve is allowed to flow into a waste-pipe.—W. P. S.

Water; Process and apparatus for the purification of ——. [Removal of calcium and magnesium salts, etc.] E. Delhotel. Fr. Pat. 435,104, Oct. 10, 1911.

The water is passed through a vessel in which it is aerated and heated to a temperature of from 70° to 100° C. by means of a current of air and steam injected through a pipe reaching to the bottom of the vessel. The heated water leaves through a pipe at the bottom and is caused to circulate through passages in a second vessel where it parts with its heat to cold water which is delivered to the first vessel for treatment. If required, chemicals may be added to the water after it leaves the preliminary heating vessel and before it enters the final aerating and heating vessel.—W. P. S.

Sterilising liquids by ultra-violet rays; Apparatus for ——. A. Helbronner and M. von Recklinghausen, Paris. Eng. Pat. 23,078, Oct. 5, 1910.

See Fr. Pat. 434,855 of 1911; preceding.—T. F. B.

Sterilising water by ultra-violet rays; Apparatus for ——. T. Nogier. First Addition, dated Dec. 22, 1910, to Fr. Pat. 420,281, Nov. 18, 1909.

See Eng. Pat. 9660 of 1911; preceding.—T. F. B.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Purine bases [caffeine, theobromine] and sodium salicylate; Existence of complex compounds of ——. G. Pellini and M. Amadori. Atti R. Accad. dei Lincei, Roma, 1912, 21, I., 290—295.

Cryoscopic determinations were made on solutions of sodium salicylate of different concentrations, first alone and then with varying additions of caffeine or of theobromine. The results, which are tabulated, indicate that complex compounds are formed in solution, the differences between the observed and calculated depression of freezing point being considerable, especially in the case of caffeine. The authors also determined the mutual solubility of caffeine and sodium salicylate in water at 25° and 40° C. The solubility of each compound increases in presence of the other, but it was not found possible to construct the complete solubility curve. The work is being continued in order to decide definitely whether the pharmaceutical product is a mixture of caffeine and sodium salicylate or a compound.—A. S.

Digitalis; Chemical assay of ——. J. Burmann. Bull. Soc. Chim., 1912, **11**, 221—228.

To determine the total amount of the glucosides in a dialysed extract of digitalis (20 per cent. alcohol), 100 grms. are treated with 60 grms. of absolute alcohol, and then made up to 190 grms. with 50 per cent. alcohol. To this is added a mixture of 30 grms. of a solution of basic lead acetate (sp. gr. 1·240) and 30 grms. of absolute alcohol. After shaking and filtering, 125 grms. of the clear liquid are saturated with hydrogen sulphide to remove the lead. The precipitate is filtered off and washed with 50 per cent. alcohol. The filtrate is concentrated to about 50 c.c. under reduced pressure and at a temperature not above 50° C. The residue is mixed with 2 c.c. of 10 per cent. ammonia solution, and placed in a specially constructed extraction apparatus. This is made entirely of glass, the condenser, holder for the liquid to be extracted, and the flask for the solvent all being connected by ground joints. The liquid is extracted with chloroform for 1½—2 hours. The chloroform solution is filtered into a 200 c.c. conical flask and evaporated to dryness at 100° C. The residue is taken up with 3 grms. of chloroform and 7 grms. of absolute ether added. The glucosides are precipitated by the addition of 50 grms. of light petroleum. After standing, the clear liquid is decanted and the solid covered with light petroleum. This is poured off, after shaking, and the insoluble matter in the flask dried on the water-bath and weighed. The residue can be crystallised from absolute alcohol and water, when the two glucosides, ψ-digitoxin (hydrogitalin) and digitoxin can be recognised by their crystalline form (see this J., 1911, 709, and 1910, 1329). The difference between the total amount of glucosides and that found by Keller's method gives the amount of digitoxin.—F. Shdn.

Caesalpina bonducella; The glucoside and oil of ——. K. Bhaduri. Chem. Soc. Proc. 1912, **28**, 53.

The seeds of *Caesalpina bonducella* yield an alkaloid, for which the author suggests the name *natin*. The oil has D^{27} 0·9132, iodine value 96·1, and saponification value 292·8.

Vernonia anthelmintica; Constituents of ——. *Part. I.* K. Bhaduri. Chem. Soc. Proc., 1912, **28**, 53.

The seeds of *Vernonia anthelmintica* contain a glucoside, to which the name *shomerajin* is assigned. The oil has D^{25} 0·9731, iodine value 91·7, and saponification value 305·7.

Apoharminecarboxylic acid, apoharmine and some of the derivatives of this base. V. Hasenfratz. Comptes rend., 1912, **154**, 704—706. (See this J., 1912, 201.)

When harmic acid, an oxidation product of harmine or harmaline, is heated to 250°—280° C., it loses one molecule of carbon dioxide with the formation of apoharminecarboxylic acid, $C_8H_7N_2COOH$. If the temperature is raised to 330° C. a further molecule of carbon dioxide is split off and apoharmine, $C_8H_8N_2$, results. The reaction can be carried out by placing small quantities of the substance in horizontal tubes fitted into a cast iron block, which is then heated. The base melts at 186° C. Iodo-apoharmine, $C_8H_7N_2I$, is produced by the action of iodine in potassium iodide solution on the base. It crystallises from alcohol in long colourless needles, m.pt. 158° C. Methyl iodo-apoharmine melts at 155°—156° C. Both harmaline and apoharmine when dissolved in concentrated sulphuric acid yield sulphonic acids, which are converted into the corresponding hydrochlorides by boiling with concentrated hydrochloric acid. Harmic acid evidently contains two carboxylic acid groups in the *a*- and *β*- positions relative to the nitrogen atom of apoharmine.—F. Shdn.

Adaline. K. W. Rosenmund and F. Herrmann. Ber. deuts. Pharm. Ges., 1912, **22**, 96—103.

The constitution of adaline is given by the formula $(C_2H_5)_2CBr.CO{\cdot}NH{\cdot}CO{\cdot}NH_2$. When heated with water or pyridine, *a*-diethylhydantoin is formed. By treatment with boiling solutions of alkalis, an unsaturated ethylcrotonylurea is produced. After repeated crystallisations from water and alcohol, adaline melts at 117°—118° C. The solubility in cold water is 0·05 per cent., but it is more soluble in hot water, and easily soluble in alcohol, acetone and benzene. For use it can be dissolved in hot water, but the solution must be rapidly cooled to avoid decomposition. It dissolves in cold dilute aqueous potassium hydroxide solution with evolution of ammonia; if the solution be gently warmed, hydrocyanic and hydrobromic acids are produced.—F. Shdn.

Storax. C. A. Hill and T. T. Cocking. Chem. and Drugg., Mar. 16, 1912, 52—53.

The authors suggest the following modifications of the assay process proposed by Umney (this J., 1911, 832):—(*a*) Cinnamic acid cannot be completely extracted from the mixed organic acids by shaking for three or even for five times with hot water; it is preferable to boil with water under a reflux condenser. (*b*) Cinnamic acid cannot be dried to constant weight at 100° C.: it should either be dried *in vacuo* over sulphuric acid or dissolved in alcohol and titrated with standard alkali. A sample of storax which yielded 28 per cent. of cinnamic acid by Umney's method, gave 30·68 per cent. by the method modified as described.—A. S.

Chrysarobin of commerce. O. Hesse. Annalen, 1912, **388**, 65—96. (Compare Tutin and Clewer, this J., 1912, 253.)

The author finds that the constituents of commercial chrysarobin are chrysophanol and its methyl ether, emodinol and its methyl ether, and chrysarobol. Chrysophanol, to which the formula, $C_{15}H_{12}O_3$, is assigned, yields chrysophanic acid when it is dissolved in alkali hydroxide in the presence of air. The acid is also formed by direct oxidation with chromic acid. When heated with acetic anhydride, chrysophanol furnishes a hexa-acetyl derivative. Emodinol, $C_{15}H_{12}O_4$, melts at 230°—240° C. and forms mono-, tri- and tetra-acetyl derivatives: octa-acetyldiemodinol is also formed in the acetylation. Chrysarobol, $C_{15}H_{12}O_4$, forms white needles, m.pt. 250°—252° C. and forms mono- and tetra-acetyl derivatives. Jowett and Potter's dichrysarobin (Chem. Soc. Trans., 1912, **81**, 1575) is probably a mixture of chrysophanol, emodinol and chrysarobol.—J. C. C.

Betulin. J. Traubenberg. J. Russ. Phys.-Chem. Soc., 1912, **44**, 132—138.

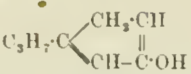
Determination of the molecular weight of betulin and investigation of its diacetyl- and dibenzoyl- derivatives and of its colour reactions indicate that it is a dihydric alcohol, $C_{24}H_{38}(OH)_2$, belonging to a group of dextrorotatory phytosterols comprising onocol, arnidiol, and faradiol. Betulin melts at 251° C., and has the specific rotation $[a]_D = +15{\cdot}68°$. Oxidation of betulin with alkaline permanganate gives acetic acid, whilst with chromic acid it yields a ketone, $C_{24}H_{36}O_2$.—T. H. P.

Kawa resin in mixtures with sandalwood oil; Determination of ——. Aufrecht. Pharm. Zeit., 1912, **57**, 92—93. Chem. Zentr., 1912, **1**, 858—859.

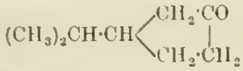
Kawa resin obtained by extraction of the dried root with absolute alcohol and treatment of the alcoholic extract with ether (yield 5·7 per cent.) is a brownish yellow, viscous mass of pleasant aromatic odour. The resin is soluble in ether, alcohol, wood spirit, benzene, chloroform, glacial acetic acid, fatty and essential oils, and light petroleum spirit. It contains 4·60 per cent. of unsaponifiable matter. For the determination of kawa-resin in admixture with sandalwood oil, 2—3 grms. of the material are saponified with 50 c.c. of alcoholic potassium hydroxide solution, the alcohol is expelled from the solution, the residue dissolved in water, acidified with 5 c.c. of dilute sulphuric acid, and subjected to distillation under diminished pressure with superheated steam, the residual resin acids being subsequently weighed. The results are stated to be accurate to within 1·5 per cent.—A. S.

Terpenes and essential oils. O. Wallach. Annalen, 1912. **388**, 49—62.

Tanacetophorone.



is readily prepared from *a*-tanacetonedicarboxylic ester which is also a convenient material from which to obtain 1 : 3-*iso*propylpentanone. Several derivatives of tanacetophorone are described. 1 : 3-*iso*Propyl*cyclo*pentanone



is also characterised.—J. C. C.

Terpenes ; Importance of the absorption method for the chemistry of ——. A. Hantzsch. Ber., 1912, **45**, 553—559.

The author shows by means of a number of examples, including *a*-pinene, *d*-, *l*-, and *i*-limonene, dipentene, *l*-*a*-phellandrene, *β*-phellandrene, sylvestrene, caryophyllene, *m*- and *p*-cymene, *d*- and *l*-camphor, and *d*- and *l*-borneol, that the absorption spectra in the ultra-violet are superior to the refractive powers as a means of characterising and determining the degree of purity of terpenes, both with regard to simplicity and certainty.—A. S.

Lavender oil ; A new adulterant for ——. T. Delphi-Svensk Farmaceutisk Tidskrift, 1912, No. 5. Apoth-Zeit., 1912, 27, 212—213.

A sample of lavender oil from the South of France had the following characters : sp. gr. 0·896 ; optical rotation, +1·9° ; refractive index, 1·465 ; soluble in 2·6 parts of 70 per cent. alcohol ; saponification value after an hour, 86·67—88·41 ; after another half-hour, 89·44—90·5. The oil was found to be adulterated with phthalic acid ester. The use of this substance as an adulterant is due to its solubility in 70 per cent. alcohol, its high ester value, and its relatively feeble odour.—F. Shdn.

Alcohols ; Action of potassium hydroxide upon tertiary ——. *New method for the identification of the alcohols.* M. Guerbet. Comptes rend., 1912, **154**, 713—715.

When heated to about 230° C. with potassium hydroxide, primary alcohols give rise to the corresponding acids. Secondary alcohols partly decompose into two acids with the evolution of hydrogen, but the greater portion condenses to higher alcohols. Tertiary alcohols are hardly attacked at this temperature. In order to distinguish between these types, 3 c.c. of the alcohol to be tested are sealed in a tube with 3 grms. of fused potassium hydroxide. The tube is then heated to 230° C. for 16 hours. With primary or secondary alcohols, a considerable volume of gas escapes on opening the tube. If a tertiary alcohol has been heated, little, if any, gas is evolved. On treating the contents of the tube with water, the products will dissolve if the alcohol tested was primary. If secondary or tertiary alcohols have been heated, an oily layer separates on the addition of water, practically equal in volume to that of the alcohol taken.—F. Shdn.

Patents.

Quinine esters of aromatic acids and process of producing same. H. Thron, Assignor to Verein. Chininfabr. Zimmer und Co., Frankfort on Maine, Germany. U.S. Pat. 1,019,285, March 5, 1912.

Quinine esters of aromatic nitro acids, prepared by the action of acidylising agents containing the nitroacidyl radical of an aromatic nitrocarboxylic acid on quinine, are reduced to the corresponding esters of amino acids. Thus, *p*-aminobenzoylquinine is produced by the reduction of *p*-nitrobenzoylquinine, which results from the action of *p*-nitrobenzoyl chloride on quinine.—T. F. B.

4-Methylamino-1-phenyl-2.3-dimethyl-5-pyrazolone ; Preparation of a derivative of ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 243,197, April 1, 1910.

Isovaleric acid, or its anhydride or chloride, is caused to act on 4-methylamino-1-phenyl-2.3-dimethyl-5-pyrazolone, or 4-isovalerylamino-1-phenyl-2.3-dimethyl-5-pyrazolone is treated with methylating agents. The new compounds are stated to be of therapeutic value.—T. F. B.

p-Hydroxyphenylisopropylamine ; Process for preparing ——. K. W. Rosenmund, C. Mannich, and W. Jacobsohn. Ger. Pat. 243,546, Oct. 21, 1909.

The oxime of *p*-methoxybenzylmethylketone is treated with reducing agents, and the resulting base is saponified by means of a mineral acid, preferably hydriodic acid. The product, *p*-hydroxyphenylisopropylamine, is applicable in pharmacy, its action being similar, both in character and strength, to that of *p*-hydroxyphenylethylamine.—T. F. B.

Urea ; Manufacture of ——. H. Immendorff and H. Kappen, Jena, Germany. Eng. Pat. 17,018, July 25, 1911.

See Fr. Pat. 433,457 of 1911 ; this J., 1912, 257.—T. F. B.

Anhydrides of fatty acids ; Process of manufacturing ——. J. Weber, Essen on Ruhr, Germany. U.S. Pat. 1,018,733, Feb. 27, 1912.

See Addition of Dec. 29, 1910, to Fr. Pat. 407,046 of 1909 ; this J., 1911, 768.—T. F. B.

Formaldehyde compounds and products [*with sugars*] *; Manufacture of* ——. P. Alsleben, Assignor to J. A. von Wülfing, Berlin. U.S. Pat. 1,018,736, Feb. 27, 1912.

See Eng. Pat. 29,907 of 1910 ; this J., 1911, 982.—T. F. B.

Obtaining betaine hydrochloride from molasses, vinasses, etc. Ger. Pat. 243,332. *See* XVII.

XXII.—EXPLOSIVES ; MATCHES.

Explosives authorised for importation into British India. Board of Trade J., March 28, 1912. [T.R.]

The "Gazette of India" of 2nd March, 1912, contains a Notification (No. 408 of 1912), dated 1st March last, which has been issued under Rule 9 (i) of the Explosive Regulations, giving a list of explosives that are at present authorised for importation into British India for general sale. The list may be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

Sulphuric, nitric, and nitrous acids ; Determination of —— *in waste and mixed acids.* G. Finch. Z. ges. Schiess- und Sprengstoffw., 1912, 7, 113—115.

Total acidity is determined by titration. Nitrous acid is determined by potassium permanganate. About 8 grms. of the acid are diluted with water to 1 litre. For the determination of nitric acid, 50 c.c. of this liquid are treated with excess of barium carbonate. The barium sulphate and the excess of carbonate are filtered off and a known excess of sodium carbonate is added to the filtrate. After filtering off the barium carbonate the excess of sodium carbonate is determined by titration, thus giving, by difference, the amount of nitric acid.—G. W. McD.

[*Explosives*] *Accident ; Circumstances attending an* —— *which occurred on 25th November, 1911, at the factory belonging to the M.B. Powder Company, Limited, situated at Clayknowes, near Bonnybridge, in the County of Stirling.* Major T. H. Crozier, H.M. Inspector of Explosives. [Cd. 6115.]

By this accident three men were injured so severely that they subsequently died. The explosive present in the building was M.B. Powder No. 1, consisting of a mixture of potassium nitrate, potassium perchlorate, sulphur and charcoal. The amount of powder in the building at the time was believed to be 400—500 lb., and the operations in progress were the incorporation of the ingredients and the sifting of the finished powder. The ingredients, after a preliminary mixing were taken to the incorporating house. A certain quantity of water was placed in the steam-jacketed incorporator, and the dry mixture added, the paddles revolving all the time. The mixture, which was a thick liquid, was heated by means of steam. The paddles were then stopped and swung up out of the liquid and adhering liquid cleaned off them. The mixture was then ladled out and placed in trays, at which stage it had solidified, but was still damp, in which condition it was rubbed through a sieve by means of a flat piece of wood. Major Crozier, who watched the operation of incorporation at a later date found that there was a considerable incrustation of explosive formed round the inside of the incorporator above the level of the liquid. This incrustation would be highly heated by the steam in the jacket, which would probably be at a temperature of from 138°—150° C., and it would be capable of giving a very large and fierce flame. The trays also had a certain amount of dry incrustation upon them, and the other trays into which the explosive was rubbed through the sieves also had a small amount of explosive dust upon them. He considers that the flame produced from this dry incrustation and dust together was sufficient to account for the extensive injuries sustained by the men. The explosive when taken from the incorporator hardened almost immediately and experiments showed that this solid powder, although still moist, was inflammable, but burned very slowly. All the ingredients were found, on examination, to be of good quality, but experiments showed that this powder is more sensitive to percussion than gunpowder. It is considered possible that the ignition of the explosive might have been caused by the wooden scraper used in the incorporator having been caught by the revolving arms and scraped along the side of the incorporator; or, perhaps the whole of the arms might have been thrown out of line and brought into contact with the side of the incorporator, thus causing friction of iron against iron. Major Crozier considers that it is not impossible that undue force with the wooden scraper alone might have ignited the explosive in its heated condition.—G. W. McD.

[Coal dust explosions] Outside tamping with non-combustible dust. Watteyne and Lemaire. Z. ges. Schiess- und Sprengstoffw., 1912. 7, 21—23, 43—45, 72—76.

The object of the experiments was to investigate the effect of heaping a non-combustible powder round the mouth of the bore-hole, as a means of preventing the ignition of coal dust and firedamp. A gallery 30 m. long and 2 sq. m. in section was employed and a mortar with a bore-hole of from 50—75 mm. in diameter. The axis was 40 cm. above the floor of the gallery. The non-combustible powder was placed on a shelf in front of the mortar and heaped up so as to close the mouth of the bore-hole; no internal tamping was used in the bore-hole itself. Taking 600° C. as the temperature to which the gases from the explosive must be cooled to prevent ignition of coal dust, the amount (P) of powder required is given in the formula: $P = \frac{Q}{600\,C}$, where Q = heat in large calories which must be absorbed in cooling the gases from the temperature of explosion to 600° C., C = specific heat of the non-combustible powder. The materials experimented with were schist, chalk, and sand, and the specific heat was taken as 0·2. The formula then becomes: $P = \frac{Q}{120}$. The explosives employed were: *Gelatin dynamite No.* 1, composed of nitroglycerin (42·5 parts), collodion cotton (1·5), sodium nitrate (45·5), woodmeal (3·0), flour (5·0), dinitrotoluene (2) and sodium carbonate (0·5 part): *Favier explosive No.* 1, composed of ammonium nitrate (44 parts), nitronaphthalene (6), barium nitrate (32) and trinitrotoluene (18 parts). Experiments with coal dust using gelatin dynamite and a mixture of chalk and sand gave the following results:—

Explosive.	Charges of explosive (grms.)	Amount of non-combustible powder according to formula $P = \frac{Q}{120}$ (kilos.)	Amount of non-combustible powder which prevents ignition of coal dust (kilos.)	Ignitions were obtained when using non-combustible powder in kilos.
Gelatin dynamite No. 1.	200	1·3	2·0, 1·0, 0·5	—
	300	2·0	4·0, 1·0	0·5
	400	2·6	1·0, 3·2, 2·1, 2·4	—
	500	3·3	4·0, 3·0, 2·4, 1·8, 1·6	0·8
	600	4·0	4·0, 3·0, 2·0, 1·5	—
	700	4·6	3·0, 1·5	—
Favier explosive No. 1.	220	1·2	1·0	—
	420	2·3	1·0	—
	625–650	3·5	3·0, 1·0	—
	720	4·1	4·5	—
	770–910	4·7	4·0, 3·0, 2·4	1·0, 2·0, 3·0

In two experiments with 640—650 grms. and 3 kilos. of flue dust and 18 per cent. of coal dust, the dust was ignited. In experiments with firedamp (8 per cent. mixture with air) using gelatin dynamite No. 1 and red schist the following results were obtained:—

Explosive used (grms.)	Weight of non-combustible powder (kilos.).	Result.	Diameter of bore-hole.
			mm.
100	—	Ignition	70
200	3·0	no ignition	70
300	2·0	no ignition	70
400	4·0	no ignition	55
400	2·0	no ignition	55

—G. W. McD.

Gases produced on explosion; Method and apparatus for investigating ——. A. Wilhelmi. Z. ges. Schiess- und Sprengstoffw., 1912, 7, 112—113.

Three small lead, or steel, cylinders with central holes are charged with 13 grms. of the explosive. The cylinders are placed in a gasometer, filled with air, and fired, and a sample of the air containing the gases of the explosion is analysed.—G. W. McD.

Spontaneous combustion of charcoal. See IIa.

Patents.

Signal-fusees; Compound for time-burning railway ——. L. S. Ross, Newtonville, Mass. U.S. Pat. 1,019,190, Mar. 5, 1912.

A railway signal fusee burning with brilliancy and not liable to spontaneous ignition, is made from a mixture of a metallic nitrate, sulphur, a carbohydrate, potassium chlorate, and a substance to neutralise the acidity (*e.g.*, calcium carbonate or other carbonate), the proportion of the last ingredient being less than that of the sulphur and not sufficient to retard combustion.—C. A. M.

Fumes resulting from the combustion of nitroglycerin explosives; Apparatus for reducing or neutralising the noxious ——. E. Macaulay, Paignton. U.S. Pat. Pat. 1,019,502, March 5, 1912.

See Eng. Pat. 2820 of 1911; this J., 1911, 925.—T. F. B.

Detonating compositions for annular percussion cartridges and shells. W. Meyer. Fr. Pat. 435,049, Sept. 23, 1911.

See Eng. Pat. 21,337 of 1911; this J., 1912, 303.—T. F. B.

Explosive. V. L. Bedier, G. C. Israel, and C. M. Cole. Fr. Pat. 435,608, Oct. 24, 1911. Under Int. Conv., Nov. 7, 1910.

See U.S. Pat. 981,969 of 1911; this J., 1911, 241.—T. F. B.

Prevention of coal dust explosions in coal mines. Eng. Pat. 4227. *See* IIa.

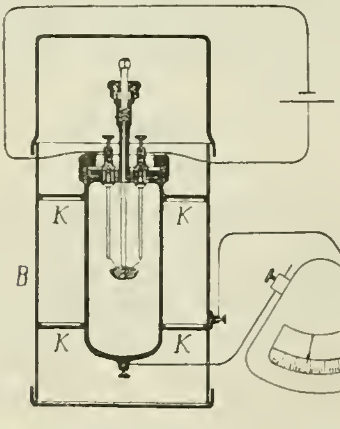
XXIII.—ANALYTICAL PROCESSES.

Ultrafiltration; Application of —— in analytical chemistry. R. Zsigmondy, E. Wilke-Dörfurt, and A. von Galecki. Ber., 1912, **45**, 579—582.

The authors suggest that the collodion membrane, which is a valuable aid to ultrafiltration in colloid chemistry, should be generally applied to the filtering of fine suspensions, etc., in analytical chemistry. The film is prepared by pouring a little diluted commercial collodion on to a glass plate, tilting the plate to get uniform distribution, and allowing evaporation to take place till most of the ether is removed. On immersing in water the film will become detached from the plate. It is then placed in a porcelain filter funnel which already contains an ash-free filter paper. By means of a water pump and by pressing the film against the walls and bottom of the funnel it may be caused to adhere and to provide a filtering apparatus which works with reasonable rapidity though somewhat slower than a filter paper alone. Solutions of colloidal gold, colloidal ferric hydroxide, etc., can be satisfactorily separated in this way. The authors give examples of the use of the collodion film for colloidal gold and ferric hydroxide, for silver chloride, and for barium sulphate. Incidentally they show that barium sulphate if precipitated cold and filtered at once is not completely separated, and that it is necessary to allow to stand for some time before all the sulphate has separated from its supersaturated solution. —W. H. P.

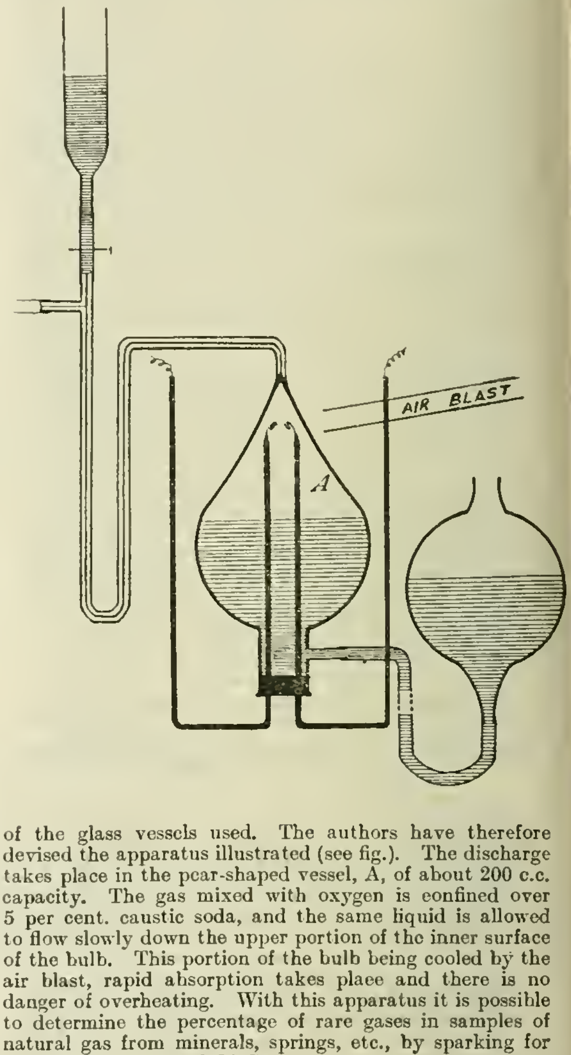
Combustion calorimeter; New thermoelectric ——. C. Féry. Comptes rend., 1912, **154**, 691—693.

The author has modified the Berthelot-Mahler calorimetric bomb so that the calorific power can be read directly from a millivoltmeter. As shown in the diagram the bomb is mounted in two discs of constantan, K,K, which connect it with the outer jacket of metal, B. The bomb therefore forms the hot junction, and the jacket the cold junction of a thermoelectric circuit. The loss of heat by conductivity of the discs of constantan is considerable, but it is a linear function of the temperature, and therefore does not affect the ratio between the numbers given by various combustible materials. The losses by convection and radiation are in comparison very small and may be neglected.—W. H. P.



Nitrogen; Apparatus for the rapid quantitative removal of —— from gaseous mixtures by sparking. [*Determination of rare gases*]. F. Henrich and W. Eichhorn. Z. angew. Chem., 1912, **25**, 468—470.

The method of Travers for the removal of nitrogen from mixtures containing rare gases, is very slow and must often be interrupted to prevent overheating and fracture of the glass vessels used. The authors have therefore devised the apparatus illustrated (see fig.). The discharge takes place in the pear-shaped vessel, A, of about 200 c.c. capacity. The gas mixed with oxygen is confined over 5 per cent. caustic soda, and the same liquid is allowed to flow slowly down the upper portion of the inner surface of the bulb. This portion of the bulb being cooled by the air blast, rapid absorption takes place and there is no danger of overheating. With this apparatus it is possible to determine the percentage of rare gases in samples of natural gas from minerals, springs, etc., by sparking for only a few hours.—W. H. P.



Copper; Quantitative separation of —— from arsenic, aluminium, zinc, and tin in saccharine alkaline solution by means of hydrogen peroxide. P. Jannasch and O. Routala. Ber., 1912, **45**, 598—604.

Determination of copper: about 0·3 grm. of crystallised copper sulphate is dissolved in 75 c.c. of cold water, 3 grms. of cane-sugar are added, followed by 10 c.c. of 10 per cent. solution of sodium hydroxide, then 20—25 c.c. of 6—8 per cent. hydrogen peroxide. The liquid is heated for 15 minutes on the water bath; it turns green, then blue, finally becomes colourless whilst cuprous oxide separates. The precipitate is filtered off, washed with hot water, and ignited in a platinum or quartz crucible till completely converted into cupric oxide and hence constant in weight. *Separation from arsenic:* the copper is precipitated and determined as above; the filtrate is concentrated to about 50 c.c., and the arsenic precipitated as magnesium ammonium arsenate—the precipitate on the filter is preferably dissolved in acid and re-precipitated.

Separation from aluminium: about 6 grms. of sodium hydroxide must be used to keep the alumina dissolved, when the precipitation of the copper is carried out as above. The filtrate is boiled down once with fuming nitric acid, then twice with a mixture of 65 per cent. nitric acid and 15 per cent. hydrogen peroxide, when the organic matter is almost completely destroyed. After igniting the residue over the Bunsen burner, solution in hot water, addition of a little nitric acid, and filtration, the alumina is precipitated by ammonia. *Separation from zinc:* about 3 grms. of sodium hydroxide are requisite. The copper is precipitated as above, and the residue twice evaporated with fuming nitric acid, then with the nitric acid and hydrogen peroxide mixture, finally ignited over the Bunsen burner. The zinc is then precipitated by sodium carbonate. When much sulphate is present it is desirable to dissolve the precipitate, when collected on the filter, in dilute nitric acid, and reprecipitate. Thorough ignition is also necessary. *Separation from tin:* after precipitating the copper, the organic matter may be destroyed as above, and the tin determined as stannic oxide by evaporation with nitric acid; or the filtrate from the copper may be treated directly with ammonium sulphide, and the tin precipitated by acidifying with acetic acid. The filtration and washing of the cuprous precipitate must be continuous, to avoid possible oxidation and solution.—J. T. D.

Thorium; Method for the separation of ——. T. O. Smith and C. James. Chem. News, 1912, **105**, 109.

Thorium in neutral solution is completely separated from accompanying rare earth metals by adding a boiling solution of sebacic acid; this gives a voluminous granular precipitate of thorium sebacate, which settles readily and is easily filtered. The method is proposed for the separation of thorium on a large scale, since the sebacic acid is readily recovered. Thorium is precipitated almost quantitatively from a neutral solution by phenoxyacetic acid, completely, on boiling, by pyrotartaric acid, and from slightly acid solution, by oxanilic acid, the rare earth metals giving no precipitates under these conditions.
—F. Sodn.

Hydrogen peroxide; Use of a mixture of nitric acid and ——, in analytical work. P. Jannasch. Ber., 1912, **45**, 605—607.

In destroying organic matter in analytical work, a mixture of concentrated (65 per cent.) nitric acid and 15—20 per cent. hydrogen peroxide is very efficient; especially after one or two evaporations with fuming nitric acid. One or two evaporations with this mixture are more than equivalent to a great many with nitric acid alone. In using Lawrence Smith's method of destroying ammonium salts by evaporation with nitric acid, the addition of hydrogen peroxide expedites the operation, especially in the case of ammonium sulphate.—J. T. D.

Sulphur and halogens in small quantities of organic substances; Determination of ——. J. Donau. Monats. Chem., 1912, **33**, 169—176.

The substance (1—4 mgrms.), weighed on a micro-balance, is introduced, together with excess of silver nitrate or barium chloride, into the closed end of a tube, about 9 cm. long by 8 mm. external diameter, which is expanded into a bulb near the closed end. Two drops of concentrated nitric acid are introduced into the bulb, and the tube is sealed, being held in a horizontal position, after which it is placed upright in a cavity bored in a block of copper, which is then covered with a sheet of asbestos. The tube is kept at about 300° C. for 1—3 hours, by heating the block with a Bunsen flame, and, after cooling, it is withdrawn and opened, being held vertically, and the upper portion cut off at the middle of the bulb. A lip is then made to the lower portion of the tube, and the upper portion is several times rinsed into the little cup thus formed, with a few drops of water. The mixture, in a sulphur determination, is repeatedly evaporated in the cup with hydrochloric acid, the residue taken up with 3—4 drops of water containing hydrochloric acid, and the barium sulphate, collected on the author's micro-filter (Monats. Chem., 1911, **32**, 1115), is washed with 4—6 drops of hot water, dried, gently ignited, allowed to cool for 30 seconds in a desiccator, and weighed. In a halogen determination, the liquid is evaporated to 2—3 drops, diluted with a few drops of water, filtered, the residue washed with a few drops of water, exposed for a minute in an atmosphere of chlorine (or bromine), and dried at about 130° C. The method is claimed to be quicker, cheaper, and less dangerous than that of Carius.—F. Sodn.

Nitrogen; An unrecognised source of error in the Kjeldahl-Gunning method for the determination of ——. P. A. W. Self. Pharm. J., 1912, **88**, 384—385.

It is shown that loss of ammonia by volatilisation occurs when the temperature of the mixture of sulphuric acid and potassium sulphate rises above a certain point; such loss of ammonia is accelerated as the boiling mixture becomes more and more concentrated owing to the escape of acid from the flask, and this acceleration is very marked as the liquid approximates to the composition of potassium acid sulphate. In the case of a very concentrated mixture it is possible to volatilise nearly the whole of the ammonia present in a very short length of time, and the loss takes place even when care is taken to prevent the flame of the burner touching the surface of the flask above the level of its contents. To avoid loss of ammonia it is recommended that the amount of sulphuric acid employed should be such that at least 15 grms. remain in the free state at the end of the digestion process. Not more than 3·5 grms. of a cereal or other substance consisting chiefly of carbohydrates, or more than 3 grms. of a substance containing from 5 to 10 per cent. of fat, should be digested with the usual quantities of 25 c.c. of sulphuric acid and 12 grms. of potassium sulphate.—W. P. S.

Examination of paraffin wax. Epstein and Polonyi. *See* IIa.

Iodometric method of determining small quantities of selenium in sulphur and pyrites. Klason and Mellquist. *See* VII.

Valuation of fluorspar. Bidtel. *See* VII.

Determination of magnesia in magnesium carbonate and in admixture with asbestos. Fortini. *See* VII.

Reduction of vanadic acid in concentrated sulphuric acid solution by hydrogen peroxide and by persulphates. Cain and Hostetter. *See* VII.

Final report of Special Committee of American Society of Civil Engineers on uniform tests for cement. *See* IX.

Determination of manganese in steel. Boyle. *See* X.

Determination of carbon in ferrochrome. Gereke and Patzukoff. *See* X.

Notes on the valuation of ores and minerals and on metallurgical calculations. Holloway. *See* X.

New method for testing paint films and preservative coatings for iron and steel. Slade. *See* XIII.

Direct determination of nitrogenous matter in raw rubber. Frank and Marckwald. *See* XIV.

Characteristic reactions of tannins. Hoppenstedt. *See* XV.

Determination of small quantities of potassium. Mitscherlich and others. *See* XVI.

Volumetric determination of phosphoric acid in phosphate rock. Fairchild. *See* XVI.

Determination of soluble arsenic in commercial lead arsenates. Curry and Smith. *See* XVI.

Determination of the marc in beetroot. Pellet. *See* XVII.

Volumetric methods of determining invert sugar for sugar factory practice. Radlberger. *See* XVII.

Comparison between the double polarisation method of determining sucrose and the direct polarisation after destruction of the reducing sugars. Pellet. *See* XVII.

Determination of reducing sugars. Kendall. *See* XVII.

Determining tannin in wines. Malvezin. *See* XVIII.

Detection of traces of zinc in wine. Straub. *See* XVIII.

Composition of dry gluten and its relation to the protein content of flour. Olson. *See* XIXA.

Flour improver [*and its detection and determination*]. Hinks. *See* XIXA.

Detection of benzoic acid in foods. Biernath. *See* XIXA.

Determination of "crude fibre" in finely powdered materials [*cocoa, etc.*]. Greifenhagen. *See* XIXA.

Chemical assay of digitalis. Burmann. *See* XX.

Storax. Hill and Cocking. *See* XX.

Determination of kawa resin in mixtures with sandalwood oil. Aufrecht. *See* XX.

Action of potassium hydroxide upon tertiary alcohols. New method for the diagnosis of the alcohols. Guerbet. *See* XX.

Determination of sulphuric, nitric, and nitrous acids in waste and mixed acids. Finch. *See* XXII.

Method and apparatus for investigating gases produced on explosion. Wilhelmi. *See* XXII.

PATENT.

Liquids; Apparatus for the continuous examination of ——. E. C. R. Marks, London. From "Hydro" Apparatebauanstalt, J. von Geldern und Co., Düsseldorf, Germany. Eng. Pat. 4910, Feb. 27, 1911.

SEE Ger. Pat. 239,886 of 1910; this J., 1911, 1471. The volume of the gas generated may be ascertained by measuring its heat of combustion.—T. F. B.

XXIV.—MISCELLANEOUS ABSTRACTS.

Uranium nitrate; Explosion of ——. W. N. Iwanow. Chem.-Zeit., 1912, 36, 297.

A SAMPLE of Merck's pure uranium nitrate, $UO_2(NO_3)_2,6H_2O$, had been standing in the dark for three years. When the crystals were being weighed a small detonation occurred similar to that obtained with nitrogen iodide, and, on shaking in a flask with water, a rapid series of detonations took place. In the dark the detonation was accompanied by a bright flash of light.—G. W. McD.

Books Received.

SMOKE. A STUDY OF TOWN AIR. By JULIUS B. COHEN, Ph.D., F.R.S., Professor of Organic Chemistry in the University of Leeds, and A. R. RUSTON, B.A., B.Sc., Edward Arnold, 41 and 43, Madox Street, London, W. London. 1912. Price 5s. net.

8vo volume, containing 86 pages of subject matter with 35 illustrations, and an alphabetical index. The subject matter is subdivided as follows: I. Solid products of combustion. II. Gaseous impurities. III. Town fog. IV. Dispersal of soot. V. Influence of coal-smoke upon health. VI. Analysis and manuring value of soot. VII. Analyses of Leeds rainwater. VIII. The sootfall of London.

EINFÜHRUNG IN DIE PROBIRKUNDE. Zum Gebrauche beim Unterricht an Bergakademien, technischen Hochschulen, Berg- und Hüttenschulen und verwandten Anstalten. Von C. SCHIFFNER, Professor der Hüttenkunde, Electrometallurgié und Probirkunde an der Königl. Bergakademie zu Freiberg. Wilhelm Knapp's Verlag. Halle a. S. 1912. Price M. 6. Bound M. 6.60.

8vo volume, containing 171 pages of subject matter, with 20 illustrations. The subject matter is arranged and grouped as follows: I. GENERAL. (i.) Introductory. (ii.) Literature. (iii.) The assayer's work. A. Mechanical. B. Chemical. C. The assaying apparatus. D. Reagents. II. SPECIAL. (i.) The silver assay. A. Dry assay. B. Wet assay. (ii.) The gold assay. (iii.) Platinum assay. (iv.) Lead assaying. (v.) Copper assaying. (vi.) Tin assaying. (vii.) Zinc assaying. (viii.) Plattner's nickel-cobalt assay. (ix.) Eschka's mercury assay. (x.) The bismuth assay; (*a*) with pure oxidised ores; (*b*) with impure ores. (xi.) Sulphur assaying. (xii.) The Freiberg arsenic assay. (xiii.) Testing of fuels. (*a*) Moisture. (*b*.) Ash. (*c*.) Coke yield, etc. (*d*.) Calorific value, Berthier's test.

*New Books.

[The Roman numerals, both here and under "Dissertations," refer to the similar classification followed in the abstracts under "Journal and Patent Literature," and in the List of Patent Applications.]

I. *Leask*, A. R.: Refrigerating Machinery, its Principles and Management. 5th Ed. Cr. 8vo, pp. 310. Simpkin. London. 1912. Net 5s.

Voorhees, G. T.: The Absorption Refrigerating Machine. Cr. 8vo. Spon. London. 1912. Net 8s. 6d.

IIA. *Shaw*, E. W., and M. J. *Munn*: Coal Oil and Gas of the Foxburg Quadrangle, Pennsylvania. (U.S. Geological Survey, Bull. 454.) 2 Maps, 9 Plates, and 15 Engravings. 8vo. sd., pp. 85. Wesley. London. 1912. Net 3s.

IV. *Binz*, Dr. A.: Die Mission der Teerfarben-Industrie. Festrede. (Korporation der Kaufmannschaft v. Berlin. Handels-Hochschule Berlin.) (13 S.) 8°. Berlin, G. Reimer. 1912. 70 Pf.

V. *Banks*, C. S.: A Manual of Philippine Silk Culture. 20 Plates. Imp. 8vo, sd., pp. 53. Wesley. London. 1912. Net 4s.

VI. *Beaumont*, R.: Colour in woven design; being a treatise on the science and technology of textile colouring (woollen, worsted, cotton and silk materials); with 36 coloured plates, containing 187 illustrations and 280 figures in the text. 2nd ed., rewritten and enlarged with numerous additional original illustrations. N.Y., Van Nostrand, 24+272 p. O. 1912. $6.

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Eppendahl, Fr.: Die Echtheitsbewegung u. der Stand der heutigen Färberei. (27 S.) 8°. Berlin. J. Springer. 1912. M. 1.

VII. *Klein*, O.: Ueber die Löslichkeit von Zinkhydroxyd in Alkalien. [Aus. "Meddelanden f. k. vetenskapsakad. Nobelinstit."] (15 S. m. 1 Fig.) 8vo, Uppsala. 1912. Berlin, R. Friedlaender u. Sohn. 60 Pf.

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Riesenfeld, E. H., u. W. *Mau*: Die Unterscheidung v. echten Peroxysalzen u. Salzen m. Kristall-Wasserstoff-superoxyd. [Aus: "Meddelanden f. k. vetenskapsakad. Nobelinstit."] (8 S.) 8°. Uppsala. 1911. Berlin, R. Friedländer und Sohn. 60 Pf.

VIII. *Föppl*, A.: Die Sprödigkeit v. Glas. [Aus: "Sitzungsber. d. bayer. Akad. d. Wiss."] (S. 505—522.) gr. 8. München, G. Franz' Verl. 1911. 40 Pf.

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XX. *Charabot*, E.: Industrie des parfums naturels. Les principaux odorants des végétaux, méthodes de dosage, d'extraction, d'identification, fig. (Encycl. scient. Bibl. des industries biologiques), in-18, cart. Paris. 1912. 5 fr.

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XXIV. *Directory, Chemical Manufacturers*——, of England, Wales, and Scotland, with some of the firms in Ireland. 1912. 8vo, boards. Simpkin. London. 1912. Net 2s. 6d.

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ANNUAL GENERAL MEETING, 1912.

In accordance with the provisions of By-law 64, notice is hereby given that the Annual General Meeting will be held in the Rumford Hall of the Chemists' Club, 50, East 41st Street, New York City, at 10 a.m. on Tuesday, September 3rd, 1912. A programme of the proceedings will be issued later.

Under Regulation 5, all elections to the Committees and all elections of officers of local sections, with the exception of those to fill up unforeseen vacancies, must take place so that they can be reported to the Council in time to be considered at the meeting held under By-law 24 not less than two months prior to the Annual General Meeting.

In accordance with the provisions of By-law 24, those members whose names are printed in *italics* in the List of Council will retire from their respective offices at the forthcoming Annual Meeting. Prof. Marston T. Bogert has been nominated to the office of President under By-law 20; Mr. E. Grant Hooper, Prof. W. J. Pope, F.R.S., and Dr. Maximilian Toch have been nominated Vice-Presidents under By-law 21, and Dr. Rudolph Messel has been nominated a Vice-President under By-law 20. Mr. Thos. Tyrer and Dr. J. Lewkowitsch have been re-appointed Hon. Treasurer and Hon. Foreign Secretary respectively.

In accordance with the provisions of By-law 72, notice is hereby given that the Council has awarded the Society's Medal to Sir William Crookes, O.M., F.R.S., for his conspicuous services to Applied Chemistry.

Members are hereby invited to nominate, on or before June 21st next, fit and proper persons to fill four vacancies among the Ordinary Members of Council. Forms for this purpose can be obtained, on application, from the Secretary of the Society.

By-law 23:—An ordinary member of Council shall be nominated by ten or more members upon Form B in the Schedule, a copy of which form shall be furnished by the Secretary upon the written or verbal request of any member, but a member shall not be eligible to sign more than one such nomination form, and the member nominated shall sign the declaration set forth on the form. A nomination shall be declared invalid by the Council if:

a. The member thereon nominated is disqualified for election, or ineligible to be elected, as provided by the By-laws.

b. The nomination is not made on the authorised printed form or substantially not in the manner directed thereon.

c. The nomination form is signed by less than ten members not disqualified or not ineligible to nominate as provided by the By-laws.

d. The nomination form is not received before or upon the day appointed therefor.

e. The member nominated has not signed the declaration printed upon the form.

A member whose nomination aforesaid is declared to be invalid, shall receive notice thereof from the Secretary, and shall not be submitted for election.

Charles G. Cresswell,
Secretary.

REMOVAL OF THE OFFICES OF THE SOCIETY.

Foreign and Colonial Members, Learned Societies, Institutions, and others are requested to take notice that on June 24th next the offices of the Society will be removed to Broadway Chambers, Westminster, S.W., opposite St. James' Park Station.

London Section.

Meeting held at Burlington House on Monday, April 1st, 1912.

MR. E. GRANT HOOPER IN THE CHAIR.

THE THEORY OF SULPHURIC ACID MANUFACTURE.

BY W. C. REYNOLDS AND W. H. TAYLOR.

In a recent communication to this Society, Raschig (this J., 1911, 166) has explained his view of the changes occurring in the leaden chambers during the manufacture of sulphuric acid.

He supposes that an unstable body, nitrososulphonic acid, is first formed by the action of sulphur dioxide on nitrous acid as follows:—(1) $HNO_2+SO_2=ON.SO_3H$, and that this nitrososulphonic acid is at once transformed by more nitrous acid, with loss of nitric oxide, into another unstable compound nitrosisulphonic acid:—(2) $ON.SO_3H+HNO_2=H_2N{\cdot}SO_5+NO$, and that this acid then breaks down into sulphuric acid and nitric oxide:—(3) $H_2N\ SO_5=H_2SO_4+NO$. Raschig states that his nitrosisulphonic acid is identical with the violet acid discovered in 1896 by Sabatier (Comptes Rend., 1896, **122**, 1417, 1479 and 1537; **123**, 255; see this J., 1896, 616, 662), which is formed when a solution of nitrososulphuric acid ("chamber crystals") in sulphuric acid is reduced by sulphurous acid, mercury, hypophosphorous acid, or other substances. He endeavoured to prove that the violet acid is formed by the action of sulphur dioxide on nitrous acid in sulphuric acid containing less than 80 per cent. of H_2SO_4, and that as chamber crystals could not exist in solutions containing less than 80 per cent. of H_2SO_4, the violet acid could not have been formed under these conditions by reduction of chamber crystals.

After an experimental examination of the evidence produced by Raschig in support of these views, the present authors, for reasons given below, have come to the following conclusions:—

1. Nitrososulphonic acid has no existence.
2. The evolution of nitric oxide in the experiments described by Raschig in support of equation (2) above is due to the action of nitrous acid on hydriodic acid (liberated from the potassium iodide which is present as an indicator).
3. That chamber crystals can exist in 60 per cent. sulphuric acid.
4. That the violet acid can only be formed in solutions which contain chamber crystals.

Nitrososulphonic acid. Dilute solutions of nitrous and sulphurous acids mutually decompose one another with evolution of nitrous oxide. Raschig found that in order that nitrous acid should not be in excess after the reaction, equivalent solutions must be mixed, and remarks that this "shews that one molecule of nitrous acid reacts on one molecule of sulphurous acid, the proportions needed to form nitrososulphonic acid."

It is unnecessary for us to go into this reaction in any detail, as the correct interpretation of it has since been given by Divers (this J., 1911, 594), who pointed out that the reaction probably proceeded in two stages, hydroxylamine disulphonic acid being first produced and then decomposed by another molecule of nitrous acid thus:—

$$HNO_2+2H_2SO_3=HON(SO_3H)_2+H_2O. \quad \ldots. \ (1)$$
$$HON(SO_2H)_2+HNO_2=2H_2SO_4+N_2O. \quad \ldots. \ (2)$$

A repetition of Raschig's experiments under various conditions led us independently to the same conclusion as Divers. In very dilute solutions the reaction can, indeed, as Divers indicated, be divided into the two stages. If one molecular proportion of nitrous acid in very dilute solution at 0° C. is added to two molecular proportions of sulphurous acid also at 0°, the first equation is immediately realised and no gas is evolved. On quickly adding another molecular proportion of nitrous acid decomposition ensues, according to Divers' second equation, and nitrous oxide is evolved, the solution being then indistinguishable from one in which equimolecular solutions are at once mixed, both containing small proportions of other decomposition products of hydroxylamine disulphonic acid. If instead of adding more nitrous acid the ice cold solution is immediately neutralised the hydroxylamine disulphonate can be isolated on concentration.

The supposed formation of nitrosisulphonic acid from nitrososulphonic acid. According to Raschig, when his nitrososulphonic acid is formed in a strongly acid solution containing excess of nitrous acid, it at once undergoes decomposition according to his equation (2) above. In support of these conclusions he carried out two experiments in which sulphurous and nitrous acids were allowed to react together, in one of which excess of sulphuric acid was present and nitric oxide was evolved, in the other where free sulphuric acid was absent nitrous oxide was liberated. In these experiments potassium iodide was added to the solutions to indicate whether excess of nitrous acid was present or not.

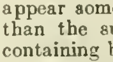
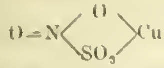
Raschig's experiments were repeated with small modifications. The reactions were carried out in a flask exhausted by a Sprengel pump, the solutions being introduced through a stopcock (no potassium iodide was added). After reaction the evolved gases were pumped off and examined. The gases had the same composition (whether excess of sulphuric acid was present or absent), consisting of nitrous oxide accompanied by traces of sulphur dioxide and nitric oxide (gases evolved from or passing through solutions of nitrous acid always contain traces of nitric oxide, and if the strength of the solution of nitrous acid at 15° C. exceeds $3N/20$ nitric oxide is spontaneously evolved). Reversing the order of admixture made no difference to the result. When the experiments were repeated with potassium iodide present as in Raschig's experiments, we obtained substantially the same gases as he did, although the nitric oxide is always accompanied by more or less nitrous oxide, the quantity varying inversely as the amount of iodide added. The phenomena may be simply explained as follows:—Nitrous acid in presence of a mineral acid and potassium iodide reacts according to the well-known equation, $2HNO_2+2HI=2NO+2H_2O+I_2$. When sulphurous acid is also present it is oxidised by the liberated iodine:—$H_2SO_3+H_2O+I_2=H_2SO_4+2HI$, and the cycle is repeated. A trace of potassium iodide acts as a catalyst and converts sulphurous acid into sulphuric acid at the expense of the nitrous acid. As Divers' reactions proceed simultaneously with the above, nitrous oxide is also formed, hence the mixed composition of the gases collected. In the absence of a mineral acid free hydiodic acid is not present and nitrous acid does not appreciably attack potassium iodide. In this case the nitrous acid and sulphurous acid react, in the presence of potassium iodide just as in its absence according to Divers' equations above, and nitrous oxide is liberated. In the absence of potassium iodide Divers' equations are realised both in faintly and strongly acid solutions, until the sulphuric acid reaches about 60 per cent., when chamber crystals are formed as is shown below, and their reduction by sulphur dioxide is accompanied by increasing proportions of nitric oxide. If phosphoric acid is employed instead of sulphuric acid, nitrous oxide is the only gas evolved, even where the acid is of high concentration.

The conditions of formation of Sabatier's violet acid. Raschig attached great importance to the violet acid discovered by Sabatier. He detailed experiments purporting to prove that although this compound is produced in the reduction by mercury of a solution of chamber crystals in 85—100 per cent. sulphuric acid, it is not formed in more dilute acid in this way, and he concluded that chamber crystals could not exist in acid containing less than 80 per cent. of sulphuric acid. Hence as he gave as he believed an experimental proof that the violet acid can be formed by the action of sulphur dioxide on nitrous acid in 70 per cent. sulphuric acid, he maintained that the violet acid is the direct product of the interaction of nitrous and sulphurous acids, and that it could not have been formed under these conditions by the reduction by sulphurous acid of chamber crystals, because the latter were non-existent.

The following simple experiments, however, prove that contrary to Raschig's belief, chamber crystals can exist in even 60 per cent. sulphuric acid.

Small quantities of a nitrite (or chamber crystals) are added to samples of sulphuric acid of strengths varying from 60 per cent. and upwards, which are rapidly boiled down in porcelain basins. The water and a proportion of the nitrous acid, varying with the dilution, is boiled off, and a stable solution of chamber crystals in boiling sulphuric acid results. This solution is yellow whilst hot, but becomes colourless at the ordinary temperature. When several per cent. of chamber crystals are present in solution the compound can be isolated by adding glacial acetic acid, in which it is only slightly soluble, and allowing the solution to crystallise in a stoppered bottle. Traces may be detected by immersing strands of clean copper or iron wire in the cold solution; on standing, a deep violet or amethyst colour respectively develops, especially if the solution is warmed and exposure to air is avoided; or the solution may be freely diluted with water and the presence of nitrous acid in the resulting solution rendered evident by the addition of *m*-phenylenediamine or potassium iodide. Had the original nitrogen compound, in the 60—80 per cent. sulphuric acid, been present entirely as nitrous acid as Raschig supposed, on boiling it would have been entirely expelled and a nitrogen free acid would have been left, a result which rapidly ensues if the sulphuric acid is replaced by phosphoric acid. Again, if a little sodium nitrite is added to 80 per cent. sulphuric acid and the nitrous acid removed by a current of carbon dioxide at 80—90° C., the resulting solution of chamber crystals in hot acid is rapidly reduced by a stream of sulphur dioxide, and Sabatier's violet acid is formed. Small quantities of chamber crystals can in fact be boiled with 80 per cent. sulphuric acid under a reflux condenser for some hours, undergoing decomposition but very slowly. Compare Raschig's statement "in 70 per cent. it is completely decomposed . . . . this is true for the ordinary temperature. At higher temperatures—say 50° to 100° C.—we may be sure that the decomposition would go farther, and that even in 80 per cent. acid—Glover acid—no trace of nitrosulphonic acid can exist."

There is a further assumption made by Raschig which, apart from the above facts, invalidates his proof of the formation of Sabatier's violet acid from nitrous and sulphurous acids. He took it for granted that the intense violet colour seen when a solution of copper sulphate in strong sulphuric acid is treated with a nitrite and sulphur dioxide or other reducing agent, is due to the copper salt of Sabatier's acid. It is highly improbable that this is the case. As long ago as 1835, Desbassayns de Richemont (Journ. Chem. Méd., 1835, 505) shewed that when nitric oxide is passed into a solution of an iron or copper salt in sulphuric acid a deep amethyst or violet colour respectively is produced. Manchot (Annalen, 1910, 372, 153; 1910, 375, 308; Z. angew. Chem., 1910, 23, 2113; and 1911, 24, 13; see this J., 1910, 563, 1202, 1374), who has recently studied the phenomena, has shown that the colour is due to the formation of compounds of the salts and nitric oxide, $FeSO_4.NO$ and $CuSO_4.NO$, and he has also prepared similar compounds with ferrous and cupric chlorides in organic solvents (compare also Kohlschütter, Ber., 1904, 37, 3044). Whenever, therefore, copper is present in sulphuric acid, and reactions in which nitric oxide is liberated occur, a deep violet colour is seen. It certainly cannot be regarded as proof of the presence of the copper salt of Sabatier's acid. It would, indeed, appear somewhat improbable that any copper salt other than the sulphate could exist in strong sulphuric acid containing but a trace of a second acid.

Raschig, ignoring these facts and the compounds of nitric oxide with salts other than the sulphates, has elsewhere (Ber., 1907, 4580; see this J., 1907, 1276) put forward the view that Sabatier's acid has the constitution  $\mathrm{HO}.-\overset{\mathrm{O}}{\underset{\mathrm{N}}{\|}}-\mathrm{SO_3H}$, and that when nitric oxide is passed into a solution of copper sulphate in strong sulphuric acid the salt  $O=N\langle{}^{O}_{SO_3}\rangle Cu$ is formed.

It has been pointed out by Wentzki (Z. angew. Chem., 1911, **24**, 392: see this J., 1911, 418) and Divers (*loc. cit.*) that Sabatier's acid cannot have such a composition because its formation from chamber crystals, $O.NO.SO_3H$, would require the addition of hydrogen, whereas by the action of mercury on sulphuric acid only sulphur oxide is evolved, and we may add that when a metal like magnesium which does furnish hydrogen reduces a solution of chamber crystals in sulphuric acid, no violet colour is observed, either in the presence or absence of copper sulphate. Although the composition of Sabatier's purple acid is not known with certainty, that put forward by Wentzki (*loc. cit.*) appears most probable. He describes its formation as follows:—$2ONO.SO_3H+H_2SO_3=O(NO.SO_3H)_2+H_2SO_4$. According to this view it is formed by the removal of an oxygen atom from two molecules of chamber crystals and not the addition of an atom of hydrogen to each.

A simple explanation of the oxidation products of hydroxylamine monosulphonic acid can be given in lieu of the cumbersome ones advanced by Raschig. The initial products both in alkaline and acid solutions are the same:—$2HON\ H.SO_3H+O=2NO+2H_2SO_3+H_2O$; in *alkaline* solution the nitric oxide of course combines with the sulphite to form Pelouze's salt, which Divers for many years described as a nitrososulphonate, but has more recently termed a nitroxysulphite.

In strong sulphuric acid solution in presence of copper sulphate, the violet compound of nitric oxide and copper sulphate is formed and not, as Raschig states, Sabatier's acid.

The evidence which we have produced proves *firstly*, that the only gaseous product of the interaction of sulphurous and nitrous acids is nitrous oxide. *Secondly*, that Sabatier's violet acid is only formed in solutions containing chamber crystals.

The first conclusion indicates the futility of all attempts to account for the formation of the bulk of the sulphuric acid in the chambers as due to the intermediate formation of nitrogen sulphonic acids, whether in the sense of Raschig's equations, or the modification since put forward by Divers who has apparently been misled by Raschig's presentation of the facts.* We believe that the views current several decades ago as to the course of the chamber reactions, *i.e.*,

$$SO_2+H_2O=H_2SO_3$$
$$H_2SO_3+NO_2=NO+H_2SO_4$$
$$2NO+O_2=2NO_2$$

substantially represents the course of the exchanges. The nitrous oxide which escapes may be a measure of the extent to which nitrous and sulphurous acids have reacted with formation of nitrogen sulphonic acids, although the recent work of Moser (Z. anal. Chem., 1911, 401; see this J., 1911, 802), leaves it uncertain as to whether this may not have been partly derived from the decomposition of nitric oxide in contact with water locally. It must be regarded as doubtful if nitrososulphuric acid (chamber crystals) plays an important part in the exchanges in the chambers themselves. Divers has, as we think rightly, expressed a doubt as to whether it is ever formed except by the action of sulphuric acid on one of the oxides of nitrogen, but as sulphurous acid reacts with solutions of chamber crystals, some sulphuric acid is possibly formed in this manner.

THE ESTIMATION OF SULPHIDES IN LIME LIQUORS.

BY J. R. BLOCKEY, M.SC., AND P. V. MEHD, M.A., B.SC.

The objects of the experiments recorded in this paper were threefold. (1) To devise a rapid and sufficiently exact method for the estimation of sulphides in lime liquors. (2) To determine, if possible, what is the mechanism of the reactions by which the epidermis is dissolved and the hair rendered loose. (3) To determine what the differences are between lime and sulphide pastes made in the different ways which are used in practice.

Method of estimating sulphides in lime liquors.—Several attempts were made to obtain a rapid method for the estimation of small quantities of sulphides in lime liquors. One method, which seemed promising at first but which was found to fail in certain respects, was a colorimetric method, based on matching the colour obtained with a solution of sodium nitroprusside and a standard solution of sodium sulphide, similar to the colorimetric method for the estimation of small quantities of iron.

The method which was finally adopted as being the most reliable was a volumetric method, using a solution of zinc sulphate. Zinc sulphate alone cannot be used to determine the amount of sulphide in a liquor containing lime or caustic alkali, because the zinc is precipitated not only as sulphide but also as hydroxide. If, however, the zinc sulphate solution contains an excess of ammonium chloride, the precipitation of hydroxide is prevented, and the only precipitate is, therefore, zinc sulphide and and the ordinary end point with lead acetate or sodium nitroprusside can be obtained with accuracy.

Procter states (Leather Industries Laboratory Book, pp. 55, 87) that sulphides in lime liquors can be estimated by a zinc sulphate solution made by dissolving in water and adding ammonia until the precipitate just redissolves. We find that this gives abnormal results, due to the precipitate of zinc as hydroxide. This solution can be used, however, if an excess of ammonium chloride be added to the liquor to be titrated.

For the estimation of the sulphides in lime liquor, a $N/10$ solution of zinc sulphate, to which has been added 50 grms. per litre of ammonium chloride, is used. With the concentrations of the liquors in use in practice, it was found that sodium nitroprusside as external indicator gave better results than lead acetate.

The following table shows what sort of accuracy may be expected by the method, and what the error is if zinc sulphate solution, prepared by adding ammonia until the precipitate just redissolves, is used.

Solution.	Titrated with $N/10$ zinc sulphate made alkaline with ammonia.	Error.	Titrated with $N/10$ zinc sulphate to which has been added 50 grs. per l. of ammonium chloride.	Error.
Sodium sulphide 0·2%	0·2	0	0·2	0
Saturated lime water + 0·2% sodium sulphide	0·23	14%	0·2	0
Saturated lime water + 0·1% sodium sulphide	0·118	18%	0·103	3%
Saturated lime water + 0·05% sodium sulphide	0·066	32%	0·051	2%

When using a sulphide lime liquor in the yard, it is often of advantage to be able to use it over again, and it is sometimes difficult to know how much sodium sulphide to add to bring it to the original strength. By a simple titration therefore in this way, it is possible to strengthen up again to the desired extent.

Alkalinity of lime liquors containing sulphide.—The alkalinity of a lime liquor furnishes valuable information with regard to the age or mellowness of the liquor. A fresh pure lime liquor has an almost constant alkalinity, being merely that of a saturated solution of lime. As the hides pass through the liquor, some of the nitrogenous organic matter of the hides is decomposed and split up into soluble amino compounds, which thereby increase the alkalinity of the solution. In this way the alkalinity gives an indication of the age of the liquor, and is often taken as a guide to the condition of the liquor, and in practice it is common to use the liquors until a certain alkalinity is reached, and then run them down the drain.

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* (1) Divers imagined a compound, $H_2N_2SO_6$ (possibly identical with Sabatier's violet acid), formed and decomposed as follows:—
$2HNO_2+SO_2=H_2N_2SO_6$. $H_2N_2SO_6=2NO+H_2SO_4$.

This measurement of alkalinity is not applicable in the presence of sodium sulphide, because of the additional alkalinity given by the sodium sulphide, and therefore the alkalinity of a sulphide liquor gives no indication of the age or mellowness, unless account be taken of the amount of sulphide.

If, however, the amount of sulphide be determined and the alkalinity corresponding to it, be subtracted from the total alkalinity, the resulting alkalinity is no criterion as to the mellowness of the liquor, as might be expected to be the case. This arises from the fact that the addition of sodium sulphide to a saturated lime liquor, throws out of solution some of the lime. The addition of hydroxyl ions from the sodium sulphide increases the solubility product and causes the precipitation of some calcium hydroxide similar to the precipitation of sodium chloride from a saturated solution, by the addition of hydrochloric acid.

The alkalinity, therefore, of a sulphide lime liquor does not correspond to the sum of the alkalinities of the lime and the sulphide, and a sulphide lime liquor contains less lime than a pure lime liquor.

The following figures show how the total alkalinity varies as the amount of sodium sulphide increases. (The alkalinity was determined with methyl orange as indicator, phenolphthalein only indicates half the sulphide.)

Solution.	Total alkalinity of 100 c.c.s. $N/10$ hydrochloric acid methyl orange.	Alkalinity due to lime.
Saturated lime liquor ..	44·0	44·0
Saturated lime liquor + $N/10$ sodium sulphide	136·2	36·2
Saturated lime liquor + $N/5$ sodium sulphide	225·0	25·0

Reactions between lime and sodium sulphide.—The reactions which may take place when sodium sulphide is added to a lime liquor are numerous, and it is not easy to say which compounds are the effective ones in loosing the hair. If a piece of skin be placed in a fresh lime liquor or in a solution of sodium sulphide in water, the loosening of the hair takes place very slowly, but when the skin is placed in a solution containing both lime and sulphide the hair is loosened very quickly. The active unhairing agent is therefore not lime or sodium sulphide. Stiasny has shown (Der Gerber, 1906,) that when lime and arsenic sulphide are used together for depilation, the active agents are calcium sulphydrates. Experiments were therefore undertaken to determine what the active constituents are in mixtures of sodium sulphide and lime.

Two series of experiments were carried out, the first to determine what is formed when sodium sulphide and lime are mixed in various ways, and the second to determine what changes take place in a sulphide lime liquor when pieces of hide are placed in.

Reactions between lime and sodium sulphide.—To determine what the compounds are which are formed when sodium sulphide and lime are mixed together, the following plan was adopted.

When sodium sulphide and lime are mixed the following compounds might be formed or present: sodium sulphide, sulphydrate and hydroxide, calcium hydroxide, sulphide, sulphydrate, hydroxysulphydrate, or polysulphides. Of these compounds, the sodium salts and calcium sulphydrate, sulphide, and polysulphides are soluble in absolute alcohol; the others are insoluble. Pastes of lime and sodium sulphide were made with as little water as possible, and then extracted with absolute alcohol, and the solution so obtained analysed for the amount of sulphur present and for the amount of calcium present.

With pastes made with the proportions of sodium sulphide and lime which are commonly used in practice, there was no calcium salt present in the alcohol extraction. This excludes, therefore, calcium sulphide, sulphydrate, and polysulphides as the active principle; since these are not formed, the only other compounds are calcium hydroxide and hydroxy-sulphydrate and the sodium compounds. Of these the latter is the only one possible, since the sodium compounds are all present in a pure sodium sulphide solution when no unhairing takes place, and the calcium hydroxide alone has no action.

The calcium hydroxysulphydrate is probably formed in some such way as the following :—

$$Ca(OH)_2+Na_2S+H_2O=Ca(SH)(OH)+2NaOH.$$

The resulting compounds therefore will be sodium hydroxide, sulphydrate and calcium hydroxide, and hydroxysulphydrate. This applies to the pastes which are used in practice in which the proportion of sodium sulphide to lime does not reach higher than one of sulphide to two of lime. (In practice the proportion of sulphide to lime is much less than this.)

Having determined what compounds are possible, it was attempted to determine to what extent these compounds are formed. The amount of sulphur in the alcohol extraction gives a measure of this extent. The only sulphur compounds soluble in alcohol are the sodium compounds, and therefore the original amount of sulphur minus the amount of sulphur present in the alcohol extraction, gives the amount of the Ca(SH)(OH) compound which is formed. With the mixtures which were taken in these experiments, nearly one-half of the sodium sulphide was reacted upon to form the calcium hydroxysulphydrate. It remains to be proved whether under different conditions of mixing the sulphide and the lime, different results are obtained, and experiments are now being made to determine what differences there are in the lime and sulphide pastes prepared in different ways.

In practice it is usually thought better to mix the unslaked lime and the sodium sulphide together, and add water to the mixture, rather than to add a solution of sodium sulphide to already slaked lime. So far the experiments have shown no difference in the results.

That the reaction between the lime and the sulphide is to form calcium hydroxysulphydrate, confirmatory evidence was given by the fact that the total alkalinity of the alcohol extractions, just corresponded to the total amount of sodium compounds, and this is in accordance with the above reaction.

One point in connection with the mixing of lime and sodium sulphide is the production of a green colour. This green colour is due to traces of iron, and it was found exceedingly difficult to obtain lime free from iron. The green colour is much more accentuated when the sulphide and lime are slaked together, than when the two are dissolved separately and mixed. In fact, quite a large amount of iron may be present before a green colour is obtained, when the two are dissolved separately and mixed, whereas the merest trace of iron will be revealed if they are slaked together.

In comparative experiments on the length of time required to loosen the wool from sheepskins, using pastes made up in these two different ways, there was no apparent difference, neither was any difference found in the amount of calcium hydroxysulphydrate which was formed.

The above experiments could only be carried out on lime and sulphide pastes such as are used by fellmongers for removing the wool from sheepskins. It was impossible to determine if the same sort of result obtains, in the weak sulphide liquors which are used for unhairing heavy hides.

Experiments on the absorption of alkali by pelt in lime liquors containing sulphides.—To determine, if possible, what changes take place when hides are placed in lime liquors containing sulphide, experiments were carried out by suspending pieces of hide in liquors made in different ways, and estimating the total alkalinity and the sulphur content of the liquor from time to time.

Pieces of washed soaked hides were placed in the following liquors: *A.* milk of lime; *B.* *N*/20 sodium sulphide; *C.* milk of lime + *N*/20 sodium sulphide. The last one represents the sort of sulphide liquor which is used in practice for heavy hides.

The following table shows the alkalinity of 100 c.c. of the liquor using *N*/10 hydrochloric acid:—

		Originally.	After 24hrs.	After 72 hrs.	After 120 hrs.	After 192 hrs.
A.	Phenolphthalein	44·0	42	42	44	46
	Methyl orange	44·1	43	44	48	52
	Difference ..	0·1	1	2	4	6
B.	Phenolphthalein	26·0	10	8	9	9
	Methyl orange	49·5	32	30	31	34
	Difference ..	23·5	22	22	22	25
C.	Phenolphthalein	59·2	55	58	62	64
	Methyl orange	83·6	75	85	88	95
	Difference ..	24·4	20	27	26	31

It will be seen that the alkalinity of the milk of lime very slowly increases. The alkalinity of the soda sulphide alone, diminishes at first very rapidly and then increases again, but it is only the alkalinity with phenolphthalein which diminishes at all. This seems to point to the fact that sodium hydroxide is absorbed very rapidly at first, and that sodium sulphydrate or sulphide is only very slowly absorbed; this is confirmed by the sulphur determinations.

The increase in alkalinity is due to the decomposition products of the hide, namely, the amino compounds.

With the mixture of sulphide and lime the alkalinity decreases rapidly at first, and then begins to increase slowly, and finally increases very rapidly. The very rapid increase of alkalinity shows the vigorous action of the mixture as compared with the action of the lime and sulphide alone. It appears as though the sodium hydroxide is rapidly absorbed, and that the sulphur compounds are only slowly absorbed. This is confirmed by the sulphur determinations, which were as follows:—

	Originally 100 c.c.s. *N*/10 zinc sulphate.	After 24 hrs.	After 72 hrs.	After 120 hrs.	After 192 hrs.
B.	49·5	45	34	27	22
C.	49·0	40	33	30	20

The hair was loose in *C* in two days, in *B* in five or six days, and not at all in *A*.

Amount of hide substance lost.—Determinations of dissolved hide substance were also made in the above liquors from time to time. At the end of eight days the amounts of hide substance in solution in the different liquors were:—*A.* 0·056 per cent.; *B.* 0·128 per cent.; *C.* 0·296 per cent. This explains the rapid increase in alkalinity with the sulphide and lime together, and also the rapid loosening of the hair.

Experiments were also made on the same lines as above, but with the sulphide and the lime mixed in different ways. In one case slaking the sulphide and lime together, in another case slaking the lime with a strong solution of the sulphide, and in another case slaking the lime with water, then adding the solution of sodium sulphide. The three mixtures, made in the above way, were then diluted with water to the required strength and pieces of hide immersed in the weak liquors. No differences could be detected, in the decrease or increase of alkalinity, in the absorption of sulphur, or in the amount of hide substance dissolved.

DISCUSSION.

The CHAIRMAN asked why caustic soda should not do the work better than a mixture of lime and sodium sulphide? The effect produced by the latter reagents might actually be due to the fact that there was a formation of caustic soda.

Dr. GORDON PARKER said that the whole process of liming hides and skins preparatory to tanning had been much neglected by chemists in the past. More attention had been given to the constitution of the tannins and the tanning process in general, and the processes whereby the hides and skins were prepared for tanning had, with but few exceptions, been left severely alone. He thought now that chemists had begun to realise that one of the most important processes in connection with leather manufacture was the preparation of the raw pelt prior to the subsequent tanning. There were more chances of loss and more likelihood of trouble than in the tanyard proper. Years ago it used to be the general impression that the sole object of liming hides was to dissolve the hair-roots, swell the fibres, and kill the grease, so that the hair could be pushed off by mechanical means, and it was generally believed that the lime and the lime alone was responsible for this action. Payne and Pullman, in order to save the usual lengthy period of liming hides, patented a process by which lime was formed in the interior of the hide, by first placing it for a few hours in a solution of caustic soda, and afterwards in a bath of calcium chloride. By this means any proportion of lime could be rapidly and accurately introduced, and by this process the hides swelled rapidly. They were beautifully limed, but the hair remained as firmly fixed as ever, and it could only be removed by subsequently placing the hides into a solution of sulphide of sodium or into a pit containing a stale lime. To overcome this difficulty the hides were soaked prior to the patent liming process in an old stale soak to produce bacterial action. By this means hides could then be limed and unhaired in about 48 hours. It was now fully realised that bacteriological action played an important part in the unhairing of hides, and that the action of old limes was largely bacterial and that hides could not be unhaired from a sterilised lime. He had been much interested in Mr. Blockey's experiments, which he thought had not been carried far enough as regarded the various compounds which were formed in the mixture of sodium sulphide in different proportions, and under different conditions. From the experiments it was impossible to detect any difference, but in practice one found, as far as one could gauge it technically, that there were differences. He believed that when the sulphide was mixed with the lime during slaking a better result was obtained, for he had generally found that the compounds, whatever they were, would unhair hides quicker than if sodium sulphide was mixed in the same proportion with the lime after it was slaked. A good way was to slake the lime with a solution of sodium sulphide in water. There were other methods whereby sulphide crystals were mixed with the lime and they were slaked together, but either of those methods in his opinion seemed to give better results than when the two materials were mixed cold and separate The heat appeared to assist in forming some compound which had a greater or quicker depilating effect on the hides. One point referred to, the titration of the lime liquors, was very important. It was a very important matter nowadays when one understood how much hide substance could be lost by careless liming, to be able to titrate the lime liquor quickly, so that one could tell the foreman at once when to order the liquor to be run away. The zinc sulphate method hitherto used had not been found very satisfactory, and Mr. Blockey's modification would be of great assistance in the tannery. It would be also of great value if they could find out which of the possible materials was the active unhairing agent. If they knew that no doubt they would be better able to control the process.

Dr. H. G. COLMAN asked if there was definite evidence that the polysulphides were not more active substances than the sulphides in the process, and whether any experiments had been made as to the effect of increasing the amount of polysulphides in the mixtures used.

Dr. S. Rideal asked if spent gas lime ("Blue Billy") had ever been used as a depilatory in tanning, to get over the difficulty of any free caustic soda, which might have an adverse effect. In the gas industry small quantities of sulphuretted hydrogen were determined colorimetrically with a sugar solution of lead acetate, which kept the lead sulphide in solution instead of precipitating it. If sugar was added to the tanning liquor a similar reaction might be used in determining the sulphide.

Mr. Blockey, in reply, said he thought it could be stated pretty definitely that caustic soda was not the active principle in the removal of the hair. It probably showed its effect in the extra swelling of the pelt; there was no loosening of the epidermis or the hair cells.

The Chairman asked with regard to the amount of hide substance that passed into the solution, whether the same effect was produced if it were placed in caustic soda. Had that been measured?

Mr. Blockey said that some was dissolved, but nothing like the amount which went into solution when a mixture of sodium sulphide and lime was used. He believed that in practice differences were obtained between the pastes made in different ways. These experiments were not meant to be taken as conclusive against that idea; they were done to determine, if possible, which were the active substances. They hoped to determine what the actual differences were between these compositions made in different ways. So far they had obtained no differences whatever in the chemical analyses. He did not think calcium polysulphide was at all likely to be formed, using the proportions commonly used in practice; qualitative reactions for polysulphides furnished no evidence whatever. He did not know whether any experiments had ever been tried on the actual unhairing action of calcium polysulphides, but he saw no reason why they should not have the power of loosening hair. The compound formed when sulphuretted hydrogen was passed into lime was known to leather chemists, and he understood from Dr. Parker that it had been used as a depilatory in bygone days.

Yorkshire Section.

Meeting held at Leeds, on Monday, March 25th, 1912.

MR. GEORGE WARD IN THE CHAIR.

THE ANALYSIS OF INDIGOS CONTAINING STARCH.

BY G. H. FRANK, M.SC., AND A. G. PERKIN, F.R.S.

In an interesting paper Thomson (J. Soc. Dyers and Col., 1911, **27**, 49; see this J., 1911, 411) has pointed out that the indigotin value of samples of indigo which have been adulterated with starch cannot be accurately estimated by the methods of sulphonation and titration with permanganate recommended by Rawson or Bloxam. The analytical results given by such mixtures, are not, as one would anticipate, higher than the theoretical, but are, curiously enough, too low. It was found, for instance, that whereas a commercial indigo containing starch gave by Rawson's method 18·8 per cent. of indigotin, when the starch had been previously removed by means of boiling 4 per cent. hydrochloric acid, the residue when analysed gave results indicating the presence of 35·01 per cent. of indigotin in the original sample. Distinct estimations also of one and the same sample from which the starch had not been removed gave discordant results varying from 16·80 to 21·23 per cent., indicating that the error does not lie in the salting out or titration of the indigo disulphonic acid solution, but must occur during the actual sulphonation itself.

Employing Bloxam's tetrasulphonate method of analysis with indigo containing starch, the results, though too low, are much higher than those given by Rawson's process and the figure given by the sample above referred to was 29·07 per cent.

Thomson, in his paper, deals mainly with the application of Rawson's method to the solution of this difficulty, and it thus appeared of value to obtain more detailed evidence of the effect of Bloxam's tetrasulphonate process.

As a standard indigotin for his investigation Thomson employed two samples of commercial synthetic indigo, which analysed according to Rawson gave respectively 100 and 100·73 per cent. of indigotin, whereas in the present work samples of indigotin prepared by the sublimation process of Bloxam (this J., 1906, **25**, 735; and 1907, **26**, 1174) have been employed.

Known weights of this preparation in the finely ground condition and starch were well mixed, sulphonated with 25 per cent. fuming sulphuric acid, and analysed by salting out with potassium acetate in the usual manner.

Indigotin.	Starch.	Found.	Calculated.
0·75 grams (98·5)	0·25 gram	67·6	73·87
0·50 ,, (98·5)	0·50 ,,	44·0	49·25

These results are in agreement with those given by Thomson, and show that it is not possible to accurately estimate indigotin when mixed with starch in this way. Bearing in mind that the under-estimation is considerably greater by Rawson's method, in which ordinary sulphuric acid is employed, it seems evident that the destruction of indigotin during the sulphonation is due to a reducing action of the starch degradation products and that this is inhibited to a considerable extent by a counter oxidation when the fuming acid is present.

Bergtheil and Briggs (this J., 1906, 25, 733) were evidently unaware of the effect of starch in this respect, for they, as one of the proofs of the accuracy of their modification of Rawson's method, give the results of analysis of indigotin admixed with known weights of starch and vegetable gluten. Thus a sample containing 24·75 of indigotin and 75·25 of the added impurity gave an indigotin value of 25·05 per cent.

In order to remove starch from the indigo mixture Thomson experimented with boiling 4 per cent. hydrochloric acid, and found that the weight of product recovered after this treatment was the same as that of the synthetic indigo originally present in the mixture. An analysis of this residue curiously enough, however, indicated a loss of 7·3 per cent. of indigotin by Rawson's process, a point which suggests that when indigotin is boiled with a dilute hydrochloric acid either simultaneous reduction and chlorination, or hydrolysis, may occur with the production of substances the sulphonic acids of which are less readily attacked by permanganate than indigotin disulphonic acid itself.

Employing pure indigotin, 2·9686 grams at 99·6 per cent. in a finely powdered condition and 150 c.c. of 4 per cent. hydrochloric acid, and boiling the mixture under a reflux condenser for three hours, no confirmation of this result was obtained. Thus the product when washed and carefully dried weighed 2·9674 grams, whereas an analysis by the tetrasulphonate method gave figures indicating the presence of 99·6 per cent. of indigotin. Pure indigotin is therefore not affected by this treatment.

The effect of 100 c.c. of 4 per cent. hydrochloric acid (*a*) and 100 c.c. of 4 per cent. sulphuric acid (*b*) on distinct mixtures each containing 2 grams of the pure indigotin and 0·5 gram of starch, at the boiling point for half an hour, was now studied. In each case the residue collected, washed and carefully dried, weighed exactly two grams, and appeared to consist of the original indigo. One gram of each of these products, (*a*) and (*b*), was sulphonated with 5 c.c. of 20 per cent. fuming acid, and when analysed by the tetrasulphonate process gave values of 99·8, and 100 per cent. before salting out, and 100 per cent. and 99·62 after the employment of the potassium acetate. It thus appeared evident that pure indigotin is unaltered when digested with a mixture of starch and dilute hydrochloric acid.

Through the kindness of a local firm of dyers, a trade sample of synthetic indigo of recent manufacture was procured, and submitted to examination. An analysis by the tetrasulphonate process showed 96·2 per cent. of indigotin, whereas by Rawson's method the higher figure, 99·78 per cent., was obtained. On incineration this product gave an ash of 0·98 per cent., consisting chiefly of sandy particles admixed with oxide of iron, and in two experiments by digestion with boiling 4 per cent. hydrochloric acid losses respectively of 1 per cent. and 0·925 per cent. were experienced. As by extraction also with boiling nitrobenzene the presence of a trace of fibrous matter was detected, it was evident that the value 96·2 per cent. could not be far from exact.

1·5 gram of this synthetic indigo (*a*) and a mixture of 2 grams of the same with 0·5 gram of starch (*b*) were respectively submitted to the action of boiling 4 per cent. hydrochloric acid for half an hour, the products filtered, washed, and carefully dried. As a result (*a*) weighed 1·485 gram and (*b*) 1·9805 gram, and on analysis by the tetrasulphonate method gave respective values of 96·2 and 96·4 per cent. of indigotin. These figures indicate a slight loss of indigotin, approximately 1 per cent. in each case, which is of little moment and considerably less than the figure, 7·3 per cent., found by Thomson when working by the Rawson method. There is accordingly no reason to doubt that mixtures of starch and commercial indigos can be satisfactorily estimated by an extraction with boiling dilute hydrochloric acid and analysis of the residue by the tetrasulphonate process.

A point difficult to understand in Thomson's paper is the great difference in apparent indigo content found when one and the same sample of synthetic indigo is analysed by Bloxam's, as against Rawson's, method. Thus whereas by the latter, 100 and 100·73 per cent. were the values given by two synthetic indigos, these same preparations gave by the former process but 84·37 and 81·35 per cent. Though it is well known that even synthetic and pure indigos, estimated according to Rawson do give higher figures than by the Bloxam method (thus the 100 per cent. sample referred to earlier yielded by the former process the number 104 per cent.), this difference is rarely found to be greater than 4 per cent. In the discussion following Mr. Thomson's paper (*loc. cit.*, p. 51), Mr. Crowther, referring to this point, said that he had never found such low results as had been given by this chemist when employing the tetrasulphonate process, and this has been the experience of the present authors after an elaborate acquaintance with the method.

The only way indeed by which such low figures can be obtained when using Bloxam's process, and one which is clearly against the directions given, is to boil the mixture of precipitant (potassium acetate) and the tetrasulphonic acid solution for long periods. Experiments have shown in the case of a sublimed indigotin that when this was sulphonated and the solution treated with potassium acetate in the usual manner, if this mixture was boiled for one hour but 86·1 per cent. of indigotin was found to be present on concluding the analysis. Again, after one and a half hours' boiling the liquid exhibited a reddish-violet colour, whereas finally by a six hours' digestion the blue colour had entirely disappeared. In carrying out the analytical process there is, on the other hand, no necessity to even raise the mixture to boiling point: all that is required being to obtain a clear solution, for which purpose a temperature of about 90° is very rapidly effective.

That under these latter circumstances the potassium acetate causes no alteration in the potassium tetrasulphonate can be determined by adding to the hot dilute tetrasulphonic acid solution, the precipitant, which has also been previously heated, and at once cooling the clear liquid. As a result no perceptible difference in the analytical results is to be detected by the adoption of this modification, so that such a procedure is evidently unnecessary.

Obituary.

EDWARD DIVERS.

Edward Divers was born in London on November 27th, 1837, and was educated at the City of London School, and at the Old College of Chemistry, Oxford Street, where he studied chemistry under A. W. Hofmann. In 1860 he graduated as M.D. at Queen's College, Galway. He also acted as Lecturer in Materia Medica at Queen's College, Birmingham, and was afterwards Lecturer in Medical Jurisprudence at Middlesex Hospital Medical School. In 1873, at the invitation of the Public Works Department of Japan, he, with ten other Englishmen, went to that country to establish a College of Engineering, and on Dr. Hy. Dyer's retirement Dr. Divers was appointed Principal. Later the College was united with the Imperial University (Tokyo), and Divers became Professor of Chemistry in the Department of Science. He carried out many investigations and by an explosion in the laboratory in 1886 he lost the sight of one eye. He became a Fellow of the Royal Society in 1893. So highly was he esteemed in Japan, that a bronze statue was erected in the college courtyard as a memorial of his distinguished services, and on his retirement in 1899 he was made Emeritus Professor, and received the Second Class of the Order of the Sacred Mirror, having previously received the Order of the Rising Sun. Returning home, he took an active part in chemical affairs, especially in the proceedings of the Chemical Society and Society of Chemical Industry, whilst his house was described as the "Mecca" of Japanese students visiting London.

He was Vice-President of the Chemical Society in 1900; President of the Chemical Section of the British Association in 1902; President of the Society of Chemical Industry, and Vice-President of the Institute of Chemistry, in 1905.

His researches include his work on the ammonium carbonates and carbamates (J. Chem. Soc., 1871, 171), the discovery of the hyponitrites (Proc. Royal Society of 1871), on which he did further work with Haga in 1884, and an investigation in conjunction with T. Shimidzu, on the calcium hydrosulphides, presented to the Chemical Society in 1884 (this J., 1884, 481); this paper showed, *inter alia*, the constitution of the compound formed [viz., $Ca(OH)(SH)$], from slaked lime in sulphide purifiers. He devised a method for preparing hydroxylamine from nitric acid (J. Chem. Soc., 1883). He also discovered an interesting interaction between the sulphites and nitrites (this J., 1887, 663). In conjunction with Kawakita he investigated the constitution of the fulminates (J. Chem. Soc., 1884). Divers may be described as a master on the subject of the oxides of nitrogen and sulphur, and hence it was natural that on the reactions in the sulphuric acid chambers (this J., 1904, 1178; 1911, 594), and the composition of alkali waste (this J., 1884, 550), his authority should be conspicuous (this J., 1887, 663). In conjunction with Shimose, he investigated tellurium monoxide, and was the first to show that when heated in hydrochloric acid gas, it is converted into tellurium dichloride. He took great interest in Pharmaceutical chemistry, and described the Japanese method of manufacturing calomel, in a contribution to this Journal in 1894 (p. 108). Divers' interest in the Society of Chemical Industry was constantly shown. He regularly attended the meetings of the London Section, the Council, and the Publication Committee, of which he was an active and zealous member to the last. He died Monday evening, April 8th, 1912, and was interred at Brookwood, Surrey.

Journal and Patent Literature.

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I.—GENERAL PLANT; MACHINERY.

Patents.

Concentrating or crystallising solutions; Tube belts of apparatus for ——. E. W. Tate and J. Wyllie, Liverpool. Eng. Pat. 4775, Feb. 25, 1911.

The upper tube plate or "belt" is dished conically and is provided on the under-side with stepped bosses to take the tops of the vertical tubes. The lower tube plate or belt is stepped from the periphery to the centre to correspond with the bosses on the upper plate.—W. H. C.

Evaporation, concentration, desulphitation and distillation in vacuo of liquids. J. J. A. Crolbois. First Addition, dated Dec. 27, 1910, to Fr. Pat. 424,990, March 26, 1910 (this J., 1911, 879).

The improvements claimed are first :—the liquid to be treated is preheated by being caused to pass through a coil immersed in the liquid in the water bath which surrounds the upper compartment of the apparatus. Secondly, in order to reduce the quantity of liquid in each compartment, and to increase the surface exposed, the lower basin of each compartment is provided with vertical, spiral, or concentric ribs or blades which cause the liquid to flow down to the central portion of the basin in a series of cascades.—W. H. C.

Rotary drying apparatus; Means of ventilating ——. G. T. Walker, Birmingham, F. C. Sharp and T. A. Stevens, Wolverhampton. Eng. Pat. 4825, Feb. 27, 1911.

Short truncated cones open at both ends are attached by their larger ends to the ends of the drying cylinder. Each cone has a vane attached to it which acts as a fan blade in such a manner that as the cylinder rotates, some of the cones are drawing air from the interior of the cylinder whilst others are forcing external air into it.—W. H. C.

Drying apparatus especially for drying sticky or pitchy bodies. E. Disdier. Fr. Pat. 436,057, Nov. 7, 1911.

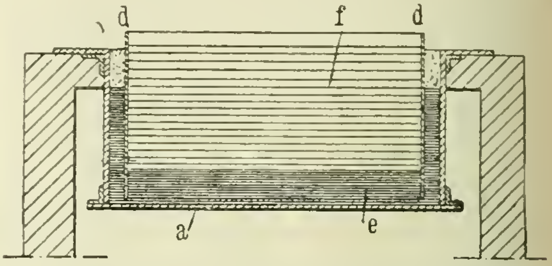
The material is fed into one end of a rotary drying drum, within which two rotating shafts, carrying blades, are arranged parallel to the axis of the drum. From the further end of the drum the partially dried material is discharged into a second stationary drum, provided with a central shaft carrying stirring and conveying blades, which throw the material backwards against the gas current. The drying is effected by furnace-gases, the circulation of which through the drums may be either in the same or the reverse direction to the material being treated. Dampers are provided to regulate and alter the direction of the gases.—W. H. C.

Extracts from vegetable substances of all kinds; Apparatus for obtaining alcoholic, aqueous, or other ——. A. Horowitz. Ger. Pat. 243,210, Jan. 18, 1911.

The material to be extracted is held in a perforated drum or basket formed of wire, which rotates in a second drum adapted to be heated by a liquid or gas. The spindle carrying the drum is perforated and is connected with a still from which solvent vapours are supplied to the material. If desired, further perforated tubes may be fitted to the spindle to secure a more general action of the solvent.—T. F. B.

Tanks or receivers for corrosive liquids; Arrangement for protecting ——. P. Robert. Fr. Pat. 435,463, Dec. 26, 1910.

The tank, *a*, is provided with an inner, bottomless tank or liner, *d*, which does not quite reach the bottom of *a*. A protective layer of non-corrosive liquid, *e*, is maintained as shown by the dark shading and prevents the corrosive liquid, *f*, within the inner tank, from coming into contact with the outer walls. In the case of galvanising vats the liquid, *e*, is molten lead which protects the sides of *a* from the action of the molten zinc, *f*.—W. H. C.



Gases; Apparatus for the purification of industrial —— [*from dust*]. E. Asbrand. Ger. Pat. 243,787, Feb. 17, 1910.

The apparatus consists essentially of a centrifugal turbine-wheel surrounded by a kind of paddle-wheel rotating in the opposite direction. The whole is mounted in a casing containing water up to such a level that the outer paddle-wheel is kept moistened with water. The paddle-wheel is open on both sides, and is so arranged that the gas ejected by the inner turbine-wheel strikes the blades of the paddle-wheel approximately at right angles. The blades of the paddle-wheel, which may be composed of a number of cylindrical or prismatic bars fixed tightly one against the other, have guide-plates for the gas at their inner edges in order to avoid the formation of eddies.—A. S

Air, gases, and vapours; Apparatus for the treatment of —— *with liquids.* W. Bliemeister. Ger. Pat. 243,838, Jan. 8, 1909.

The apparatus consists of a casing in which rotates a washing-drum composed for example of several series of parallel bars mounted around a central shaft. The drum is provided with several parallel series of arms or bars, carried by a nave on the shaft, and inclined at a suitable angle to the latter; the bars in one series are opposite the spaces between the bars in the adjacent series. Alternate series of bars may be fixed to the casing instead of to the shaft. The drum is kept moistened with liquid sprayed in through a series of nozzles, and the gas in passing through the casing becomes divided into a large number of separate streams, thus ensuring intimate contact with the liquid.—A. S.

Lixiviation of raw materials of all kinds; Apparatus for the ——. A. Schmidt. Ger. Pat. 243,949, April 24, 1910.

The apparatus consists of a number of inclined vessels arranged in series and provided with worm conveyors. The material to be lixiviated travels in an upward direction through the vessels and meets the liquid flowing in the opposite direction. The liquid is led into each vessel at some distance from the upper end, and the portion of the floor of the vessel above the liquid-inlet is perforated. When the material in the trough reaches this part of the vessel, it is washed by means of jets of liquid, the washings draining through the perforated floor into a receptacle. The apparatus is intended especially for minerals with a gangue which readily slimes and so interferes with the extraction. The slime is removed by the washing at the upper end of each vessel, and the residual granular material then passes to the next vessel of the series for further lixiviation.—A. S.

Hardening, roasting, and drying materials of any kind such as briquettes, potatoes, or the like; Means for ——. W. E. Lake, London. From Diamant Brikett-Werke G. m. b. H., Berlin. Eng. Pat. 2704, Feb. 2, 1911.

See Fr. Pat. 425,442 of 1911; this J., 1911, 882.—T. F. B.

Settling tank. A. J. Arbuckle, Johannesburg. U.S Pat. 1,020,013, March 12, 1912.

See Eng. Pat. 24,403 of 1909; this J., 1910, 702.—T. F. B.

Absorbent product. V. Raisin, Assignor to Comp. Industrielle des Alcools de l'Ardeche, Paris. U.S. Pat. 1,021,477, March 26, 1912.

See Fr. Pat. 400,736 of 1908; this J., 1909, 1023.—T. F. B.

Evaporating apparatus having multiple evaporation. W. Rusiecki, Rakitnaja, Russia. U.S. Pat. 1,021,486, March 26, 1912.

See Fr. Pat. 428,107 of 1911; this J., 1911, 1148.—T. F. B.

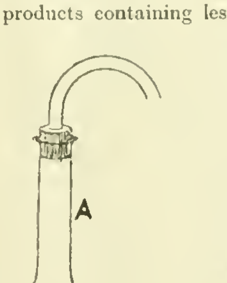
IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Fire damp and black damp; Testing for —— *by means of a safety lamp.* H. Briggs. Trans. Min. Inst. of Scotland, 1912, 34, 84—99.

An ordinary safety lamp is fitted with a device which allows of a loop of No. 22 B.W.G. copper wire being swung horizontally into or out of the flame. The loop is one-eighth inch wide and of the same length as the width of the wick. In testing for firedamp the flame is adjusted so as to have the greatest possible bulk with a uniform but slight luminosity. When the loop is swung into the flame, the luminosity disappears without appreciably altering the size of the flame. If inflammable gas is present in the air, a blue cap is observed over the flame, and the height of the tip of the cap measured from the top of the wick is a useful measure of the amount of firedamp present. In the author's lamp 1¼ per cent. of methane gave a cap just over 1¼ inches high. The measurements can be made with great accuracy, and the caps are four times the height of those obtained in the usual method of testing with a lowered flame. The results obtained under given conditions are remarkably concordant. The curve showing the connection between the height of the cap and the percentage of methane in the atmosphere, shows a definite discontinuity or flattening which does not however affect the value of the method, if the lamp has been previously standardised. In testing for black damp the flame is adjusted to a height of nine-sixteenths of an inch which is just the height of the pin carrying the loop when it is pushed up as far as it will go. The pin has a certain freedom of motion in a vertical direction, and the loop is now brought into the flame and brought down as near the wick as possible without extinguishing the flame. In this position it is possible to get rid of the portion of the flame above the loop. The loop is then raised till it is about one-eighth of an inch above the wick. If in this position the flame succeeds in bursting through the loop, the air is fresh enough to satisfy the provisions of the Mines Act (1911). With the same lamp as was used for the other experiments it is possible to distinguish with certainty between atmospheres containing 8¾ and 9½ per cent. of a "standard" black damp (containing 1 volume of carbon dioxide to 6·4 volumes of nitrogen). The test for firedamp is not interfered with by the presence of black damp, the only effect being that the original flame must be turned higher to get the maximum volume, owing to the effect of the black damp in reducing the size, both of flame and cap. The influence of firedamp on black damp determinations is however rather inconvenient, and the method is not available with more than 1 per cent. of firedamp. In discussion C. J. Wilson remarked that a strip of brass 0·004 inch gauge, ¼ inch wide, and one-eighth of an inch longer than the mouth of the wick tube is an equally efficacious device for removing the luminosity of the flame. It is necessary however, that the strip should be fastened to its pin by a connection with minimum cross section.—W. H. P.

Sulphur in petroleum; Determination of ——. J. M. Sanders. Chem. Soc. Trans., 1912, **101**, 358—365.

Total sulphur in kerosene. (A) *With the Parr calorimetric bomb.* 2–3 grms. of the sample are weighed into a 100 c.c. porcelain dish, 1 cgrm. of potassium bromide is dusted over the surface, and 4 c.c. of pure fuming nitric acid are added. After the energetic reaction has ceased, the dish is heated on the water-bath until the liquid becomes dark brown and somewhat viscous. It is then well mixed with 0·5 grm. of pure light magnesia, and whilst continuing the stirring, is heated over a small flame until the mass shows a tendency to solidify on cooling. The granular mass thus obtained is brushed into a Parr calorimetric bomb, any trace of oily matter left in the dish being removed by warming with a little more magnesia. The standard quantity (1 measure full) of sodium peroxide is also introduced into the bomb, and after mixing, the combustion is effected in the usual way. A few seconds after firing, the bomb should be removed from the water in the calorimeter, and its temperature allowed to rise, but not high enough to injure the rubber washer. After about 45 seconds, the bomb is cooled, opened, and the fused mass transferred to 25 c.c. of water in a 200 c.c. nickel beaker, to which the washings are also added. The solution is made slightly acid with hydrochloric acid, filtered through cotton wool if necessary, boiled to expel chlorine, neutralised with ammonia, acidified with hydrochloric acid, and the sulphur precipitated as barium sulphate in the boiling solution. The method is rapid and the results agree with those obtained by the use of the Mahler calorimetric bomb. (B) *Modified lamp method.* This method is more accurate than the preceding for products containing less than 0·01 per cent. of sulphur. The lamp, B (see fig.) consists of a very small platinum crucible filled with asbestos, in which a small asbestos wick is fixed. The wick passes through the central perforation of a Rose's crucible lid and through a small piece of pipe-clay tubing, which projects a little above the upper rim of the annular cavity in the lower part of the chimney, A; this cavity holds a mixture of 6 grms. of sodium peroxide and 0·5 grm. of anhydrous cobalt chloride. 4—5 grms. of the sample are weighed into the lamp, which is placed in position and lighted, a rapid current of air being drawn by means of a filter pump through the lamp chimney and a Meyer absorption apparatus connected therewith; three or four of the absorption bulbs contain water in which a small quality of sodium peroxide has been dissolved. When nearly all the oil has been burnt, the lamp is heated, at first gently and finally to dull redness. The chimney, after cooling, is disconnected and placed in a 250 c.c. beaker, into which the liquid from the absorption bulbs and the washings are poured. After the peroxide has



decomposed, the chimney is washed out, the solution is acidified with hydrochloric acid, boiled to expel chlorine, and precipitated with barium chloride as usual.

"*Loosely combined sulphur*" *in lamp oils.* Commercial lamp oils sometimes contain small quantities of hydrogen sulphide and of sulphur in the form of unstable compounds, which are decomposed by rise of temperature or by contact with metals. For the determination of such loosely combined sulphur, finely cut copper turnings are warmed with a 10 per cent. solution of potassium cyanide until the metal has a salmon-pink colour, and are then washed once with air-free distilled water and twice with methyl alcohol. The "sensitised" turnings are packed in a 100 c.c. Erlenmeyer flask so as to fill it, and 50 c.c. of the sample are introduced. The flask is then fitted with a cork carrying a long vertical tube and heated for 10 minutes, after which the cork is removed, and the petroleum allowed to boil away until about 10 c.c. remain; by this treatment the unstable sulphur compounds are decomposed, forming a deposit of sulphide on the copper. After cooling, 50 c.c. of a 2 per cent. solution of potassium cyanide are run in and warmed with the copper in order to dissolve the copper sulphide. The solution is filtered through cotton wool, and if necessary, after washing the copper with hot water, it is cleaned from oily matter by washing with absolute alcohol and water, and then again washed with cyanide solution. The solution is either boiled with bromine water and hydrochloric acid and precipitated with barium chloride; or titrated with ammoniacal silver nitrate until a portion of the filtered liquid begins to show a faint turbidity on acidifying with hydrochloric acid. The method of determining sulphur in petroleum by distilling over metallic potassium or sodium, was found not to be accurate in the case of certain Mexican and Texan oils, nor could any direct relation between the amount of sulphur thus determined and the total sulphur be observed.—A. S.

Petroleum stills, Deposits in ——. M. Freund. Chem.-Zeit., 1912, **36**, 353.

CONSIDERABLE quantities of deposits are frequently found in the stills in refineries in which benzine, lamp oils, etc., up to a sp. gr. of 0·845 to 0·880 (corresponding to b. pts of 240° to 300° C.) have been distilled, leaving a liquid residue of 30 to 60 per cent. with a sp. gr. of 0·900 to 0·960. These deposits may consist of salt, sand, clay, etc., but as a rule are in the form of hard coke-like layers, which adhere to the sides of the still. According to Engler (Ber., 1897, 2908) it is only in the case of the constituents boiling above 300° C. that any material pyrogenic decomposition takes place, but since, in the author's experience, the temperature of the stills could not have exceeded 300° C. to more than a slight extent, and the distillation was effected by superheated steam (200° C.) it would appear that the decomposition of the residue may take place at considerably lower temperatures than observed by Engler. It is suggested that contact with the superheated surface of the still may have produced a sort of cracking process, and that possibly the hot iron may have had some catalytic action. The uncondensable inflammable gases which pass into the condensing coils are to be regarded as the decomposition products at the other end of the scale in this process, for the gases originally present in the crude petroleum escape completely at the beginning of the distillation. The occurrence of clay and salt deposits is easily obviated by the use of modern apparatus for preliminary distillation. In the older types of apparatus, however, the emulsion of 20 to 30 per cent. of brine, which is found in some oils, is not completely thrown down, although the deposition takes place more rapidly in the case of salt than of fresh water. For this reason Legrand (Austrian Pat. 47,955 of 1907) claimed the addition of sodium chloride or carbonate in the dehydration of crude petroleum. Recently, Galician petroleum oils have also formed emulsions owing to an influx of salt water into the oil-fields in this district. A deposit obtained in the distillation of one of these oils consisted in the main of sodium chloride, with about 5 per cent. of calcium chloride, and traces of iron, magnesium and silica, but no sulphate, carbonate, phosphate, or nitrate of potassium. The analyses of Potiliztzin (Chem.-Zeit., 1883, 600) who found 0·01 per cent. of sodium iodide and 0·012 per cent. of sodium bromide in the salt water of the Caucasian oil-fields indicate the possibility of the technical utilisation of these salts.—C. A. M.

Petroleum lamp oils; Flash-points of mixtures of ——. H. F. Wiebe and P. Hebe. Petroleum, 1912, **7**, 655—656.

THE flash-points of mixtures of lamp oils of widely differing composition were determined in several of the official English and German instruments. After making the necessary corrections the results obtained with the two types of apparatus agreed within the limits of experimental error. With regard to the relationship of the flash-point of a mixture of lamp oils to the flash-points of its components, it was found by Harker and Higgins (Nat. Phys. Lab., Collected Researches, 1911, **8**, 37) that for mixtures of American petroleum oils the following formula could be used :—

$$F = \frac{m.x.A + y.B}{m.x + y}$$

where F represents the flash-point of the mixture of two oils, having the respective flash points A and B; x and y, the relative proportions of the components in the mixture; and m, a constant, which in the case of the mixtures examined was 0·40. With mixtures of other oils this constant had a different value, and this is confirmed by the author's results with mixtures of American with Galician, Russian, and French oils, which gave *e.g.*, the respective values of 0·43, 0·91 and 0·24 for m.—C. A. M.

Petroleum output of the world. Ch. of Comm. J., April, 1912. [T.R.]

THE United States Geological Survey states that the total output of crude petroleum in 1910, for the world, was 327,472,256 barrels of 42 gallons each, against 298,326,073 barrels in 1909. Of this amount the United States produced 209,556,048 barrels. The Canadian production has been decreasing steadily since 1907, while the imports into that country have been on the increase. Production of oil did not increase greatly in Mexico during 1910, but the results of explorations in that year made large supplies certain. Mexico's production of crude petroleum rose from 1,000,000 barrels in 1907 to over 3,000,000 in 1910, while the Mexican imports of crude and refined petroleum from the United States increased from 19,207,159 gallons in 1908 to 43,381,272 gallons in 1910. The increased production of crude oil in Russia during 1910 was due to the increased production of the Grosny, Surakhany, and other new fields. The Baku district, which contributed the greater part of the product, remained almost stationary. In Galicia the production declined for the first time for years, on account of low prices for crude and refined oil, due to sharp competition for a market insufficient for the supply. The production of the leading countries for 1909 and 1910 is given in the following table, in barrels of 42 gallons :—

Countries.	1909. Barrels.	1910. Barrels.
United States	183,170,874	209,556,048
Russia	65,970,350	70,336,574
Galicia	14,932,709	12,673,868
Dutch East Indies ..	11,041,852	11,030,620
Roumania	9,327,278	9,722,958
India	6,676,517	6,137,990
Mexico	2,488,742	3,332,807
Japan	1,889,563	1,930,661
Peru	1,316,118	1,330,105
Germany	1,018,837	1,032,522
Canada	420,755	315,895
Italy	42,388	42,388
Other countries	30,000	30,000
Total	298,326,073	327,472,256

Patents.

Fuel; Agglomerated ——, and process and apparatus for manufacture of same. W. Smith. Fr. Pat. 435,885. Nov. 2, 1911. Under Int. Conv., Mar. 22, 1911.

Small coal is forced through an externally heated tube, either continuously or intermittently, so as to become partially coked whilst under pressure. In this way, the core becomes agglomerated whilst the outer part is coked. If desired the fuel may be cooled by bringing it into contact with a solution of potassium nitrate, the burning quality being improved thereby. A suitable apparatus for carrying out the process comprises an elongated pipe arranged horizontally in a suitable furnace and projecting beyond each end. The heated part of the tube may be of metal or of refractory material, and may have outlets for the gases distilled from the coal. The prolongation of the tube beyond the furnace is of enamelled metal to facilitate the passage of the fuel. The small coal is forced into and through the tube by a rotating worm, and the agglomerated fuel is cut into pieces of the required size as it is forced out at the other end of the tube. The part of the tube beyond the furnace is perforated, and is arranged over a tank containing the solution of potassium nitrate. This solution is caused to flow over the perforated part of the tube by means of a circulating pump.—A. T. L.

Coke ovens; Horizontal or inclined regenerative ——. R. Fabry, Sheffield. Eng. Pat. 23,562, Oct. 25, 1911.

The principle of fractional combustion described in Eng. Pat. 21,593 of 1907 (this J., 1908, 1010) is applied to regenerative coke ovens of the type having several groups of vertical heating flues in each wall which are traversed in succession by the burning gases. The heated air for combustion is admitted at one end of each heating wall only, and in passing through the successive groups of flues, meets with a regulated quantity of combustible gas delivered at the top of each set of flues by means of burners fed by pipes arranged on the top of the ovens.—H. H.

Coke suitable for use in zinc distillation; Process for preparing ——. H. Koppers. Ger. Pat. 243,141, Jan. 24, 1911.

Ordinary non-coking, bituminous coal is partially gasified in a rotary retort, yielding as residue a fine-grained coke. In order to allow of a partial cooling of the coke before leaving the retort, the air and gases used for heating are introduced at some distance from the mouth of the retort. The fine-grained coke is suitable for use as carbonaceous matter in zinc distillation.—T. F. B.

Vertical retort settings. W. J. B. Leech, Leeds. Eng. Pat. 13,319, June 2, 1911.

The air supply to vertical gas-heated retorts, particularly of the type mounted back to back with the regenerator chambers between, is led to the regenerators through passages arranged in the outer walls of the retort setting in order to minimise loss of heat by radiation therefrom. —H. H.

Gasification or coking of coal and carboniferous substances; Process for the ——. E. Enke. Fr. Pat. 436,081, Nov. 8, 1911.

The process consists in first briquetting or otherwise compressing the coal, etc., with or without a binding material, and coking the briquettes by passing them continuously through a chamber which is heated internally by means of superheated steam or other fluid.—A. T. L.

Carburetting gases. H. W. Moss and J. S. Carroll, Dublin. Eng. Pat. 5343, March 3, 1911.

The gas to be carburetted is saturated with water vapour and passed over calcium carbide, the quantity of acetylene thus introduced being regulated by controlling the temperature of the gas as it passes through the water saturator. —H. H.

Carburetted hydrogen gas; Process of manufacturing ——. W. J. Watkins, Assignor to O. C. Hurdleston, Fort Worth, Tex. U.S. Pat. 1,019,705, March 5, 1912.

A quantity of scrap zinc is placed upon the bottom of an enclosure and covered with alternate layers of "fibre" and scrap iron. A mixture of manganese dioxide, ammonium carbonate, sodium hyposulphite and copper sulphate is introduced into the enclosure in contact with the layers of scrap metal and "fibre." The whole mass is treated first with an acid and then with a liquid hydrocarbon, and air under pressure is blown through the mass.—W. H. C.

Gas producers. A. E. Pratt, Farnborough, Kent. Eng. Pat. 5286, March 2, 1911.

The invention relates to gas producers of the type in which the fuel is fed from below through a central tube containing a screw feeding device from the top of which it passes in a downward and radial direction over the grate to a peripheral discharge opening, and consists (1) in constructing the grate as a blast-box having apertures through which the air supply is led so as to effect the combustion of the whole layer of fuel passing over the surface of the grate; and (2) in forming the grate in two or more superposed sections capable of rotary movement, so that the distribution of the blast can be varied for the purpose of regulating the proportion of hydrocarbon in the gas produced.—H. H.

Gas producer; Double-zone down-draught ——. E. Ragot and P. Pierre-Hervotte. Fr. Pat. 435,691, Oct. 26, 1911.

The producer is suitable for burning waste fuels such as sawdust, wood waste, charcoal dust, coke dust, etc. The producer chamber is formed with upper and lower combustion zones, each part being tapered outwards down to the level of the tuyères and inwards below that level. The fuel column is supported on a grate with removable centre section, and the space within the casing and below the grate contains water over which the gases pass on their way to the outlet connection. A free outlet for the gases is also provided in the base portion of the producer, normally sealed by the water and serving as a safety vent. The blast of air or air and steam is admitted from four tuyères spaced 90 degrees apart, at the level of the widest section of the upper combustion zone, and four tuyères spaced at 45 degrees to the former ones at the level of the widest section of the lower combustion zone. These tuyères are connected with a single blast main, and cocks are provided for regulating the blast so that the fire is hottest in the lower combustion zone. Steam for the blast is generated when required in a casing arranged at the top of the producer. One tuyère of each set is made large enough to provide access for poking, etc. Clinkers are removed from the lower part of the producer by withdrawing the centre section of the grate whilst the fuel column is supported on bars inserted through the largest tuyère of the lower set.—A. T. L.

Water gas; Generation of ——, and apparatus for use therein. J. Stephenson, Leeds. Eng. Pats. 6849, March 18, and 17,220, July 27, 1911.

The generator is of the type in which the air blast is admitted beneath the grate for heating the fuel to incandescence, and the steam blast for gas-making is sent twice in succession upwards from beneath the grate and finally once downwards from above the fuel column. The steam-boiler is heated by the waste gases during the "air-blow," and by gas burners during the gas-making period. The whole of the operations, including the supply of fresh fuel, are controlled automatically from camshafts which rotate at a constant speed, controlled by a governor mechanism. The clinkers and ashes are removed continuously from the water-sealed ash-pit by means of a conveyor, and the grate is of any suitable moving type for the automatic discharge of clinker into the ash-pit. The top of the generator is closed by a hinged lid and surmounted by a vertical flue leading to the steam-boiler. This flue is provided with air inlets to ensure complete combustion of the gases during the "air-blow." A feeding-hopper, with a rotating measuring valve, delivers fuel into the flue through a lateral channel when the hinged lid of the producer is raised. The various valves, etc., are controlled so as to give the following sequence of operations. The hinged lid of the generator is raised and the air-blast turned on beneath the grate for one minute, whilst the gas supply to the burners beneath the boiler is nearly cut off. During this minute the measuring device delivers a charge of fuel into the generator. At the end of one minute, the air-blast is shut off, the lid closed, and gas turned on for heating the boiler. The steam-blast is then turned on beneath the grate, and a gas-outlet valve at the top of the generator is opened, for 4 minutes. During the next 5 minutes the same operations are repeated, and during the third 5 minutes the operations differ in that the steam is admitted at the top of the producer and a gas-outlet valve is opened beneath the grate. After the 15 minutes the whole of the operations are repeated.—A. T. L.

Gaseous combustible hydrocarbons which are stable and can be liquefied by pressure; Manufacture of ——, by means of water and petroleum or other liquid hydrocarbons. F. R. W. Schroeter. Fr. Pat. 435,451, Oct. 19, 1911.

The gas is made by passing a mixture of petroleum vapour and steam over iron turnings at a bright red heat. The apparatus comprises a horizontal retort, one end of which is filled with iron turnings and heated in a furnace. The steam is generated in an open vessel in the cool end of the retort, and liquid petroleum is introduced at this end. The gases from the hot end of the retort are passed through a condenser to separate tarry matter. The gas has sp. gr. 0·77 (air = 1), and calorific value 14,000—16,000 cals. per cb. m. It may be compressed, liquefied and stored without decomposing, and is suitable for lighting, for use in engines, and for burning with oxygen for autogenous soldering.—A. T. L.

Separating tar, dust, and other solid bodies from gases; Centrifugal machines for ——. T. W. S. Hutchins, Stockton-on-Tees. Eng. Pat. 11,653, May 15, 1911.

A number of discs having perforations near the periphery and attached vanes, are mounted on a horizontal shaft within a cylindrical casing. A stationary, annular, imperforate disc is interposed between each of the perforated discs and the latter are rotated at a high speed. The gas to be treated is passed through the apparatus and jets of water are caused to impinge upon the rotating discs.—W. H. C.

Purifying gas and recovering by-products; Process of ——. F. H. Wagner, Baltimore, Md. U.S. Pat. 1,020,168, March 12, 1912.

The cyanogen compounds are first removed from the gas, after which the ammonia is condensed. The gas is next scrubbed with a solution of sulphur dioxide in water to purify it from hydrogen sulphide. The condensed ammonia liquor is then mixed with the liquor from the hydrogen sulphide scrubber and the mixture is treated to obtain ammonium sulphate.—W. H. C.

Producer gas; Apparatus for purifying ——. E. Ragot and P. Pierre-Hervotte. Fr. Pat. 435,692, Oct. 26, 1911.

The apparatus comprises a scrubber and a purifier. The gas from a producer is introduced at the lower part of the scrubber through a vertical pipe with its open lower end, which has a serrated edge, dipping into water. After bubbling through the water the gas passes up through perforated horizontal trays, through which the scrubbing water passes in the opposite direction. The gas from the scrubber is admitted to the lower part of the purifier beneath an elongated hood, of which the lower edges are serrated and dip into a bath of milk of lime. After bubbling through this the gas passes up through purifying material supported on horizontal trays.—A. T. L.

Carbon dioxide; Extraction of —— from the exhaust gases of a gas-engine. Maschinenfabrik Sürth G.m.b.H. Fr. Pat. 435,926. Nov. 3, 1911.

The patent relates to the production of liquid carbon dioxide from the exhaust gases of the engine which drives the compressor of the liquefying plant, and the invention consists in so regulating the working of the engine that the power of the engine at any instant is just sufficient to liquefy the carbon dioxide in the exhaust. The pressure attained in the compressor, and the temperature of the condenser are chosen so as to give the best results, and the gases not liquefied are tested for carbon dioxide; if all the carbon dioxide has not been liquefied, the power of the engine is increased without altering the quantity of carbon dioxide in the exhaust. This may be done, for example, by advancing the ignition. If the power of the engine is more than sufficient, then the quantity of carbon dioxide in the exhaust is increased by using more fuel whilst the power is kept the same by retarding the ignition.—A. T. L.

Petroleum or like oils; Solidified ——. R. Demuth, London. Eng. Pat. 6165, Mar. 11, 1911.

Petroleum and like oils are solidified by mixing them with a thick gelatinous solution in ammonia of a salt-forming nitrogenous substance such as casein. In an example, 1 or 2 parts of powdered casein are formed into a thin paste with 5 to 7 parts of cold water which is then warmed with slight excess of ammonia to form a thick gelatinous solution. This is emulsified with an equal volume of neutral fatty oil, or of petroleum oil or spirit, and the base so obtained is mixed in a powerful mixing machine with 10 times its weight of petroleum oil or spirit. The product may be used as a jelly or it may be air-dried to form solid blocks. A harder material is obtained by incorporating an alkaline-earth with the mixture.—H. H.

Aromatic mono- and polycyclic hydrocarbons from mineral oils or their distillates; Process for obtaining lower homologues of ——. Allgem. Ges. f. Chemische Industrie m.b.H. Ger. Pat. 243,904, July 7, 1910.

The fractions containing heavy hydrocarbons, obtained by extracting with solvents mineral oils or their distillates, are transformed by heating to high temperatures into mixtures of aromatic mono- and polycyclic hydrocarbons, which are then fractionated.—T. F. B.

Compound gases [ethylene, etc.]; Synthetical production or manufacture of ——. H. Lane, Birmingham. Eng. Pat. 10,724, May 3, 1911.

See Fr. Pat. 429,301 of 1911; this J., 1911, 1244.—T. F. B.

Coal; Process for recovering as ammonia the volatile nitrogen of ——. H. L. Doherty, New York. Eng. Pat. 11,383, May 11, 1911.

See U.S. Pat. 997,908 of 1911; this J., 1911, 1005.—T.F.B.

Gas producers. W. Climie, Bo'ness. Linlithgowshire. Eng. Pat. 17,469, Aug. 1, 1911.

See Fr. Pat. 434,027 of 1911; this J., 1912, 220.—T. F. B.

Bottoms of stills used in gas, tar, and the like works. Eng. Pat. 4144. *See* III.

Furnace for the combustion of sulphuretted oxide of gas works and the like. Eng. Pat. 5751. *See* VII.

Apparatus for estimating the percentage of a combustible gas in a gaseous mixture. Eng. Pat. 20,692. *See* XXIII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

Ovens for carbonising wood and similar substances. W. Hart and J. M Deschamps. Fr. Pat. 435,368, Oct. 17, 1911. Under Int. Conv., Mar. 14, 1911.

The oven consists of a vertical brick chamber having a number of sliding doors arranged at spaced intervals in the sides for the admission of a regulated quantity of air and for inspection purposes. A removable cover suspended by pulleys closes the top of the chamber, and the lower portion of the chamber, which is conical, communicates by a sliding door with a trench into which the charcoal is discharged.—H. H.

Products from solid carbonaceous matters; Preparation of —— [by distillation]. Anglo-Cuban Oil, Bitumen and Asphalt Co., Ltd. Fr. Pat. 435,794, Oct. 30, 1911. Under Int. Conv., Aug. 18, 1911.

VOLATILE products are distilled off from solid carbonaceous materials by heating them in a current of gas, for example, coal gas, which is heated to the same temperature as the material before it comes into contact therewith. The temperatures may be gradually raised in order to give a series of products of different volatility.—H. H.

Electrical conductor for lighting purposes. I. Ladoff, Schenectady, N.Y., Assignor to W. D. Edmonds, Boonville, N.Y., P. C. Peck, New York, and A. M. Ladoff, Schenectady, N.Y. U.S. Pats. 1,019,902 and 1,019,970, March 12, 1912.

THE arc-light electrode is formed of a mixture of metallic iron with either silica or titanium dioxide.—W. H. C.

Electrodes for arc lamps; Use of metallic tungsten and uranium in the construction of ——. Banque du Radium. Third and Fourth Additions, dated Jan. 2 and Jan. 11, 1911, to Fr. Pat. 418,280, July 15, 1910 (this J., 1911, 77 and 1305; 1912, 221).

(1) A NEGATIVE electrode of mercury is substituted for the tungsten or uranium electrode employed according to the principal patent, and the globe is rendered vacuous, inert gases being dispensed with. In order to prevent the arc from flickering, a thin stem of a difficultly fusible metal insoluble in mercury is arranged to project from the surface of the mercury just below the positive electrode. (2) The stem referred to above may be dispensed with by arranging a narrow silica cup in the lower part of the lamp globe to contain the portion of the mercury upon which the arc plays, a hole at the bottom of the cup serving to establish communication with the larger body of mercury contained in the lower part of the globe.—H. H.

Luminescent tubes for rare gases. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Proc. G. Claude, Paris. Eng. Pat. 24,164, Oct. 31, 1911. Under Int. Conv., Nov. 28, 1910.

SEE Fr. Pat. 434,525 of 1910; this J., 1912, 325.—T. F. B.

Incandescence bodies for gas lighting; Manufacture of ——. C. R. Böhm, Berlin. U.S. Pat. 1,020,255, March 12, 1912.

SEE Fr. Pat. 400,444 of 1909; this J., 1909, 973.—T. F. B.

III.—TAR AND TAR PRODUCTS.

PATENTS.

Stills used in gas, tar, and the like works; Bottoms of ——. C. Benn, Leeds. Eng. Pat. 4144, July 6, 1911.

THE still bottom comprises a central dished crown plate, an intermediate sloping annular plate or set of segmental plates, forming with the crown plate the dome-shaped bottom of the still, and an outer annular plate or set of segmental plates which rests on the brickwork and is riveted to the outer shell of the retort and to the intermediate annular plate. To facilitate renewal of the intermediate annular plate, without removal of any of the brickwork setting, the outer annular plate is formed as a shallow channel or trough with horizontal bottom, and with side flanges of a depth about one-third the width of the trough. The outer flange is vertical, and the inner flange is inclined outwards to suit the slope of the raised bottom. The outer flange may be replaced by an angle iron ring. The brick foundation has an inside diameter slightly less than the inner flange, and the angle thus formed is filled in with fireclay to protect the riveted joint.—A. T. L.

Halogenphenol alkali salts and a process for the manufacture of same. P. Flemming, Hamburg, Germany. Eng. Pat. 21,203, Sept. 26, 1911.

SEE Fr. Pat. 434,548 of 1911; this J., 1912, 277. The complex sodium and potassium salts of *p*-chloro-*m*-cresol are especially claimed.—T. F. B.

Alkyl ethers of a hydroxyanthraquinones; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 243,649, Aug. 30, 1910.

ALKYL ethers of α-hydroxyanthraquinones are obtained by heating a salt of the necessary hydroxyanthraquinone with an alkyl ester of an arylsulphonic acid, water being excluded: the reaction may be carried out with or without the addition of a substance which will combine with an acid.—T. F. B.

Anthranilic acid; Process for preparing chloro-substitution products of ——. Badische Anilin und Soda Fabrik. Ger. Pat. 244,207, March 2. 1910.

POLYCHLOROBENZOIC acids or their salts, in which at least one chlorine atom is in the *o*-position to the carboxyl group, are treated with ammonia in presence of copper or a copper compound; if the reaction is not effected too energetically, a chlorine atom is replaced by an amino group, with the formation of a chloro-anthranilic acid. —T. F. B.

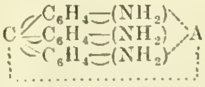
IV.—COLOURING MATTERS AND DYES.

Triphenylcarbinols. III. H. Kaufmann and P. Pannwitz. Ber., 1912, 45, 766—776.

THE authors have compared the reducibility of certain substituted triphenylcarbinols by means of formic acid and alcoholic hydrochloric acid. It is found that a methoxy-group in the ortho position with respect to the methane carbon atom is highly favourable to reduction. In the para-position less influence is exerted, but this influence is increased with the number of methoxyl groups. In the meta-position the methoxyl group exerts no influence or perhaps even a slightly retarding one. Triphenylcarbinol itself is only very slowly reduced. The hydroxy-group behaves like the methoxyl and the presence of halogens in the ring does not alter the action of the methoxy-group. Triphenylmethane dyestuffs, such as Magenta, Malachite Green, Rosolic Acid and Fluorescein are practically unattacked by alcoholic hydrochloric acid. —J. C. C.

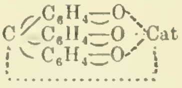
Triphenylmethane dyestuffs; Constitution of the ——. H. Kaufmann. Ber., 1912, 45, 781—786.

THE author discusses, in a theoretical paper, the many advantages which his new formulation of the triphenylmethane dyestuffs has over the quinonoid formulæ. As an example the formulæ for Paramagenta and Aurin are the following:—



$$C\begin{cases} C_6H_4=(NH_2) \\ C_6H_4=(NH_2) \\ C_6H_4=(NH_2) \end{cases} An$$

Paramagenta.

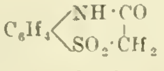


$$C\begin{cases} C_6H_4=O \\ C_6H_4=O \\ C_6H_4=O \end{cases} Cat$$

Aurin.

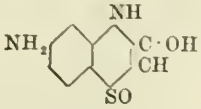
"An" and "Cat" are short for anion and cathion and indicate univalent ions. The dotted lines express the breaking valencies of these ions, and each of them represents a bundle of linkings.—J. C. C.

Sulphazone dyestuffs. M. Claass. Ber., 1912, 45, 747—756.

SULPHAZONE 

$$C_6H_4\begin{cases} NH\cdot CO \\ SO_2\cdot CH_2 \end{cases}$$

(the formula may also be written in the enolic form) is prepared from *o*-nitrothiophenol by condensing it with monochloroacetic acid to nitrophenylthioglycollic acid, oxidising this with hydrogen peroxide to the corresponding sulphon-acetic acid and treating the latter with acid reducing agents. When 1 : 3-dinitro-4-thiophenol is used as the starting point, 6-amino-sulphazone



is produced. Sulphazone crystallises in shining, brownish leaflets melting at 207°—208° C. In alkaline solution it combines with diazonium salts to give azo-dyestuffs. When the intermediate compound produced from tetrazotised benzidine and one mol. of salicylic acid is mixed with sulphazone, the resulting disazo-dyestuff dyes cotton in gold-orange shades. The monoazo-dyestuff obtained by combining diazotised 1-naphthylamine-5-sulphonic acid with sulphazone dyes wool in pale to brownish yellow shades. A dyestuff producing reddish orange shades on wool or silk is obtained by diazotising sulphanilic acid and combining with o-aminobenzenesulphonic acid, diazotising the product and combining with sulphazone; and the dyestuff produced from diazotised 2 : 8-aminonaphthol-6-sulphonic acid with the same compound dyes wool yellowish brown and cotton violet brown. 6-Amino-sulphazone is readily diazotised and the diazo-compound gives azo-dyestuffs with amines and phenols. When the amino-compound is combined with tetrazotised benzidine a black dyestuff is obtained and when this is diazotised and combined with β-naphthol, a chestnut brown colouring matter results.—J. C. C.

PATENTS.

Vat [anthracene] dyestuffs; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F Bayer und Co., Elberfeld, Germany Eng. Pat. 14,225, June 15, 1911.

SEE Addition of June 14, 1911, to Fr. Pat. 362,140 of 1906; this J., 1912, 119. Similar dyestuffs are obtained by the use of dihalogen-xanthones or other compounds containing two halogenated benzene nuclei united both by oxygen and a CO group.—T. F. B.

Triarylmethane dyestuffs; Process for preparing chrome ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 243,749, Feb. 25, 1911.

POLYALDEHYDES of the benzene or diphenyl series are condensed with aromatic hydroxycarboxylic acids or mixtures of these, and the resulting leuco compounds are oxidised to chrome dyestuffs.—T. F. B.

Azo dyestuffs; Manufacture of brown ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 22,691, Oct. 14, 1911.

BROWN acid dyestuffs, which dye evenly, are obtained by the action of the diazo derivatives of m-amino-γ-arylaziminobenzenesulphonic acids or of m-amino-γ-arylbenziminazolesulphonic acids on 2-arylamino-8-naphthol-6-sulphonic acids in alkaline solution. The m-amino-γ-arylaziminobenzenesulphonic acids are produced by the action of nitrous acid on the partially reduced products of the action of 2·4-dinitro-1-chlorobenzene on aromatic aminosulphonic acids, and subsequent reduction; the m-amino-γ-arylbenziminazolesulphonic acids are obtained by the reduction of the corresponding nitro compounds, which may be prepared by the action of formic acid on the p-nitro-o-aminophenylarylaminosulphonic acids produced by partial reduction of the condensation products of 1-chloro-2·4-dinitrobenzene with aminoarylsulphonic acids. The new dyestuffs produce brown shades, fast to washing, milling, and light.
—T. F. B.

Anthraquinone derivatives [vat dyestuffs]; Manufacture of nitrogenous ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 11,426, May 11, 1911.

SEE Fr. Pat. 429,096 of 1911; this J., 1911, 1205.—T. F. B.

Disazo dye and process of making the same. P. Volkmann, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,020,670, March 19, 1912.

SEE Eng. Pat. 11,253 of 1909; this J., 1910, 749.—T. F. B.

Ortho-oxyazo colouring matters; Manufacture of ——. Kalle und Co. Akt.-Ges., Biebrich on Rhine, Germany. Eng. Pat. 20,072, Sept. 9, 1911. Under Int. Conv., Dec. 9, 1910.

SEE Fr. Pat. 434,405 of 1911; this J., 1912, 327.—T. F. B.

Cotton [azo] dyestuffs and process of making same. R. Gast, Fechenheim, Germany, Assignor to Cassella Color Co., New York. U.S. Pat. 1,020,756, March 19, 1912.

SEE Eng. Pat. 6153 of 1910; this J., 1911, 16.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Wool; Two analytical aids for controlling the manipulation of ——. M. Becke. Färber-Zeit., 1912, 23, 45—48, 66—71.

(1) To indicate the degree to which wool was attacked, *i.e.*, hydrolysed and dissolved, by the various reagents employed in mordanting, dyeing, and carbonising wool, and similar operations, the author made use of the biuret reaction. As standards he prepared a colorimetric scale by dissolving 1 grm. of wool yarn in caustic soda, neutralising with hydrochloric acid, boiling to expel free hydrogen sulphide, and adding a definite quantity of $N/1$ caustic soda and $N/20$ copper sulphate to progressive quantities of the wool solution. After standing one hour he obtained eleven violet solutions of increasing depths of tint, corresponding to a content of from 0 to 0·01 grm. of dissolved wool. These eleven standards were easily distinguishable and comparable, as regards the extent of the biuret reaction, with the various liquors in which wool had been treated in the course of any of the operations mentioned above. It was found that neutral soaps had practically no dissolving effect on the wool fibre, whereas caustic alkalis and alkali carbonates dissolved the fibre in amounts roughly proportional to their concentrations, the destructive action increasing markedly with rise of temperature. In mordanting with bichromate it was found that the use of bichromate alone, or of equal parts of bichromate and oxalic acid, was considerably more destructive than bichromate used in conjunction with lactic acid, sulphuric acid, cream of tartar, or formic acid. Wool that had been "carbonised," *i.e.*, impregnated with 4 per cent. sulphuric acid and dried at 80° C., was found to lose 3—4 times the weight of fibre as compared with "uncarbonised" wool, when the two were subjected to similar subsequent treatments with dilute sulphuric acid and sodium sulphate. (2) Wool heated in a bath of stannous chloride slightly acidified with acetic acid, retained its natural colour; on the other hand when wool had been acted on by an alkali, a portion of its sulphur was dissolved in the form of alkali sulphide, and a portion was retained by the fibre in the form of an insoluble compound of a sulphide nature. The latter, when such wool was treated with stannous chloride as above, gave rise to a brown colouration owing to the formation of stannous sulphide, and the depth of this coloration was a rough index to the extent of the decomposition, that had been brought about by the destructive action of the alkali on the wool.—O. R.

Sulphite digestion of spruce wood; Volatile oil obtained in the ——. H. Bergström. Papierfabrikant, 1912, **10**, 359—361.

The vapours condensed from the digesters in the manufacture of sulphite wood pulp yield an aqueous distillate containing methyl alcohol, acetone, aldehyde and traces of acetic and formic acids, together with a brown oil which floats on the surface. This oil was formerly supposed to consist entirely of cymene, but the author's investigations show that it is a complex mixture. Fractional distillation of the oil between the limits of 150° and 270° C. yielded 7 per cent. of a fraction, b.p. 150°—160° C., having sp. gr. 0·845, optically inactive; this fraction was identical with that boiling at 149° C. obtained from sulphate cellulose oil; it contains no terpene and is probably an oxygenated compound. The main product, distilling between 160° and 190° C., amounted to 55 per cent. of the original oil and consisted mainly of cymene. The fraction 190°—210° C., amounting to 17 per cent. of the oil, showed the maximum specific gravity of 0·951 and $a_D = -1·95°$; it was a thick, pale yellow oil. The distillate coming over between 205° and 250° C. solidified in the condenser to a mass of white crystals of the composition, $C_{10}H_{18}O$. The fraction 190°—210° C. probably contained also an acid body of the terpene series. Above 250° C. a fraction having sp. gr. = 0·925 and a slight dextrorotatory power distilled over; this fraction contained a sesquiterpene. —J. F. B.

Maize starch in writing papers; Use of ——. H. Wrede. Wochenbl. Papierfab., 1912, **43**, 1004—1006.

The advantages to be derived from the addition of maize starch in writing papers are somewhat neutralised by the difficulty of retaining the starch in the web of paper on the wire of the machine. If the starch is added raw the granules, in the case of maize starch, are so small that a large proportion passes through the meshes of the wire. If the starch be previously cooked, a portion is lost in solution in the back waters. Better results are obtained when a mixture of cooked starch and raw starch is used, care being taken in cooking not to heat the mass longer than is just sufficient to burst the granules. The author has found that it is still better to swell the starch by means of an alkali, preferably soluble sodium silicate. The cooked mass thus obtained, when added to the stuff in the beater is entirely precipitated by the action of the excess of alum employed with the size. A tank of about 50 gallons' capacity is half filled with water and the necessary quantity of soluble silicate is dissolved therein. Steam is injected for half a minute to agitate the solution, and 80—100 lb. of starch are then added. Full steam is now turned on, and as soon as the temperature reaches 70° C. the starch swells; at this moment the steam is shut off and the tank filled up with cold water; thus waste of starch by over-cooking is avoided. The starch paste is added to the stuff in the beater after the size and alum, and the excess of the latter ensures the complete precipitation of the starch and silicate. It is claimed that starch prepared in this manner is retained in the paper to the extent of at least two-thirds of the quantity employed and that it improves the strength and quality of the paper, whilst affording a marked economy in the quantity of rosin size required.—J. F. B.

Patents.

Retting flax straw, and the like; Method of ——. J. Bradshaw, Bolton. Eng. Pat. 21,841, Oct. 4, 1911.

The flax straw is put into a receiver from which air can be withdrawn at will and there treated for about an hour with a dilute solution of caustic potash or soda. The straw is then passed between rollers to expel the gum resin, returned to the receiver and immersed for an hour in a dilute solution of sodium sesquicarbonate. After another squeezing the material is treated for half an hour with a dilute solution of sulphuric acid, then squeezed for a third time and finally washed and dried.—P. F. C.

Paste used as a weaver's glue; Process for producing a ——. P. Reimann, Vogtland, Germany, and F. W. Rogler, Vienna. Eng. Pat. 19,689, Sept. 4, 1911.

A decoction or extract of the ordinary onion or of similar plants such as the leek, garlic or scallion is added to the usual dressing substances such as potato starch or flour, wheaten starch or meal or dextrin. In addition there may also be added matter such as oils, glycerin, or wax in order to render the dressed thread soft and flexible. The addition of the extract of onion, etc., produces a distinct change in the starch or flour paste, rendering it transparent and homogeneous and viscous, whereby it is possible to draw it out into threads. As an example, 0·5 kilo. of onions is boiled for 30 minutes in 2 litres of water, the decoction pressed off and 18 grms. of linseed oil added. The mass is then boiled to produce an intimate mixture. Half a litre of this mixture is added to a paste made of 100 litres of water and 8 kilos. of potato flour prepared in the usual manner for the manufacture of dressing material and the whole is boiled again and is then ready for use.—D. J. L.

Cellulose from fibrous materials; Manufacture of ——. T. Knösel. Fr. Pat. 435,895, Nov. 2, 1911.

Fibrous materials, such as straw, esparto, bamboo or textile wastes are digested by the soda or the "sulphate" process, using the same or rather less than the usual proportions of alkali, but having at least 25 per cent. of the total alkali in the form of sodium carbonate and largely diluting the lye so that it amounts to 5—10 times the weight of the material. The digestion is carried out at a temperature of 100° C. or very little higher for about four hours. The partially resolved material is then treated with a quantity of bleaching powder solution equal to about two-thirds of the quantity usually employed by the ordinary method, but the temperature of this bleaching liquor is raised to the boiling point. After bleaching and washing, the fibre is treated with a boiling solution containing 0·5—1·0 per cent. of sodium carbonate. A more perfect bleaching is obtained by using only one-half the above specified quantity of bleach liquor in the first operation and completing the bleaching of the pulp with the second half after the material has been extracted with sodium carbonate.—J. F. B.

Imitation horsehair; Process of manufacturing ——. C. M. Sanlaville. Fr. Pat. 435,989, Oct. 31, 1911.

Imitation horsehair is prepared from esparto or cleansed agave by digesting 100 kilos. of the material for six hours under a pressure of three atmospheres with a solution consisting of 23 litres of caustic soda lye of 36° B. and 1500 litres of water. After rinsing, the fibres are steeped for 15 minutes in a bath containing 1 litre of sulphuric acid per 100 litres of water; they are then washed, dried and put through a carding machine. For a bleached product, the material is steeped for about 8 hours in a solution of 600 grms. of bleaching powder per 100 litres of water before the treatment with acid. Curly fibres are obtained by steeping the degummed fibres in a solution of caustic soda at 18° B. for about an hour.—J. F. B.

Celluloid; Process for glazing ——. P. J. F. Pommier. Fr. Pat. 435,417, Dec. 23, 1910.

In the process of glazing celluloid a terpene compound is added to the glazing agent in which the celluloid is steeped, this addition having the effect of suppressing the opalescence which is apt to appear in damp weather. Suitable terpene compounds are oil of turpentine, terpenes, terpinols or terpineols and the products derived by the action of glacial acetic acid upon oil of turpentine. Examples of suitable mixtures are: 6 parts of glacial acetic acid and 4 parts of oil of turpentine, or 8 parts of acetone and 2 parts of oil of turpentine.—J. F. B.

Cellulose or hydrocellulose esters of organic acids; Process for preparing ——. A. Wohl. Ger. Pat. 243,581, Aug. 26, 1908.

It is stated that all kinds of cellulose or hydrocellulose can readily be esterified within a considerable range of temperature, provided the time of the reaction and the amount of sulphuric acid used as catalyst are properly regulated. When treating cellulose containing no ash, 0·2 per cent. or less of sulphuric acid is sufficient, whilst with ordinary filter paper about 0·4 per cent. is necessary, and correspondingly higher percentages for celluloses containing more ash. With these amounts of acid, the whole of the cellulose will be converted by acetic anhydride into the acetate after one to two hours at a temperature of 100°—120° C.—T. F. B.

"*Pergamyn*" *papers ; Manufacture of fancy* ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 435,589, Oct. 23, 1911. Under Int. Conv., Oct. 26, 1910.

FANCY "pergamyn" papers, having greater translucency in certain parts than in others, are manufactured by preparing a pulp refined in the manner usual in the case of "pergamyn" papers, and disturbing the moist felt of fibres on the wire of the machine, so as to obtain flaky deformations or more compact agglomerations of the fibres, and finally submitting the paper to heavy pressure at an appropriate stage of the drying process. The desired deformation is produced by a press roll placed at a suitable position above the wire, which is supported at this place by an arrangement situated underneath. Owing to the irregular distribution of the fibres, only the projecting lumps become compressed under the heavy pressure subsequently applied, so that the paper becomes translucent at these points.—J. F. B.

Paper ; New [*untearable*] ——. Soc. Financière et Industrielle. Fr. Pat. 435,815. Oct. 30, 1911.

AN extremely resistant and practically impermeable paper is prepared by treating paper made in the ordinary way from extremely long and strong fibres with a vegetable gum which forms a solution or emulsion with water, without the assistance of chemicals. Suitable gum is obtained from plants of the family of Colocasia and is a commercial article, particularly in Japan. The gum may be incorporated with the pulp during manufacture or may be applied to the surface of the finished paper, or both methods may be combined. A hygroscopic substance is also used. For instance a paper of substance of 50 grms. per sq. m. may be heated with 20 grms. of the gum and 0·5 grm. of glycerin per sq. m. The fixation of the gum may be improved by treating the impregnated paper with a dilute solution of an alkali at a high temperature.—J. F. B.

Paper ; Process of manufacture of untearable and impermeable ——. Soc. Financière et Industrielle. Fr. Pat. 435,816, Oct. 30, 1911.

AN example of the process for treating paper so as to produce the result specified in Fr. Pat. 435,815 (see preceding abstract) consists in preparing a mixture by adding a solution of 10 grms. of gum arabic in 100 c.c. of water to a solution of 200 grms. of colocasia gum in 4 litres of water, containing 10 grms. of glycerin and a few grms. of a hygroscopic salt, *e.g.*, 2 grms. of calcium chloride. A sheet of extremely strong paper is steeped in this mixture, dried at the ordinary temperature, again steeped and dried at 50°—80° C. The prepared paper is placed in a 3 per cent. solution of "soda" at 100° C., then dried at the same temperature as before and moistened with a solution of equal weights of water and glycerin, so that its weight is increased by about 25 per cent.—J. F. B.

Vegetable fibres and materials ; Treatment of ——. W. Schewelin, Assignor to Soc. Anon. Wolokno Schewelin, Moscow, Russia. U.S. Pat. 1,020,625, March 19, 1912.

SEE Eng. Pat. 17,898 of 1910 ; this J., 1911, 678.—T. F. B.

Textile fabrics ; Manufacture of ——. J. Wilkinson, Assignor to The Bradford Dyers' Assoc., Ltd., Bradford. U.S. Pat. 1,021,712, March 26, 1912.

SEE Eng. Pat. 10,186 of 1910 ; this J., 1911. 679.—T. F. B.

Paste used as weavers' glue or for other similar dressing purposes ; Process for preparing ——. P. Reimann. Trehwitz, Germany. Assignor to F. W. Rogler, Vienna. U.S. Pat. 1,021,744, March 26, 1912.

SEE Eng. Pat. 19,689 of 1911 ; preceding.—T. F. B.

Celluloid or like substitutes and process for manufacturing the same. L. L. T. Labbé. Oisnieres, France. Eng. Pat. 12.746, May 26, 1911.

SEE Fr. Pat. 430,035 of 1911 ; this J., 1911, 1308.—T. F. B.

Filler for rubber, rubber substitute, celluloid, etc. Eng. Pat. 5712. *See* XIV.

VI.—BLEACHING ; DYEING ; PRINTING ; FINISHING.

Paranitraniline red ; Production of —— *with blue and green reserves, by mordanting with naphthol vapour.* C. Schœn and E. Schweitzer. Sealed Note No. 1242, dated April 1st, 1901. Report thereon by H. Schmid. Bull. Soc. Ind. Mulhouse, 1912, **82**, 71—73.

THE oiled fabric is printed with a blue or green tannin colour reserve (avoiding excess of tannin) and steamed; it is then exposed for about 5 min. to steam saturated with β-naphthol (by previously passing the steam over naphthol in pieces or through impregnated cloths). Naphthol is thus deposited on the cloth, which is then passed into the diazotised paranitraniline bath. Red, black, and white effects are obtained by printing Aniline Black and a tin or sulphite reserve, on the oiled fabric, developing with steam saturated with β-naphthol and then passing into the diazo bath. H. Schmid reports that the process is novel but hardly of practical value now, in view of the colour effects obtainable with paranitraniline by means of hydrosulphites.—A. SBLD.

Red reserve under Aniline Black by means of the nitrosamine of p-nitro-o-anidisine. Fabr. de Prod. Chim. de Thann et de Mulhouse. Sealed Note No. 2058, dated Dec. 23, 1910, and Report thereon by H. Schmid. Bull. Soc. Ind. Mulhouse, 1912, **82**, 73—76.

THE process given is that of Ger. Pat., 240,197 of 1911 (see this J., 1911, 1448). It is reported upon as being practical and easily executed. The reserve cannot, however, be applied after application of the Aniline Black solution like ordinary reserves in Prud'homme's process.
—A. SBLD.

Two analytical aids for controlling the manipulation of wool. Becke. *See* V.

Decolourising and clarifying tanning extracts, and clarifying extracts for dyeing. Lepetit and others. *See* XV.

PATENTS.

Cotton fabrics ; Apparatus for treating ——. S. M. Krosnowski, St. Petersburg. U.S. Pat. 1,020,294, Mar. 12. 1912.

THIS apparatus for the continuous treatment of fabrics in the open form comprises three chambers, the two end ones being used as charging and delivery chambers, whilst the middle one, which is kept under pressure, is used as a treating chamber. The charging and delivery chambers can be connected with the atmosphere or with the treating chamber at will. The charging chamber is first cut off from the treating chamber, then opened to the atmosphere and cotton pieces are plaited down in it. The chamber is then closed to the atmosphere and opened to the treating chamber, so that the fabric can be continuously passed into and through the treating chamber and then into the delivery chamber which is closed to the atmosphere. Finally the communication between the treating and delivery chambers is closed and the delivery chamber is opened to the atmosphere for the removal of the goods.
—P. F. C.

Dyeing; New process of —— and new compounds for applying the process. Act. Ges. f. Anilinfabr. First Addition, dated Oct. 17, 1911 ((Under Int. Conv., Mar 2 and 6, 1911) to Fr. Pat. 421,564, Oct. 18, 1910. (See Eng. Pat. 25,007 of 1910; this J., 1911. 280.)

SHADES on wool fast to washing, milling and potting are obtained by the fixation and subsequent development on he fibre of the leuco-compounds prepared by condensing ither an aldehyde unsubstituted in its ortho position or a hydrol with an o-hydroxycarboxylic acid. The leuco-compounds can be fixed in an acid bath and then developed by an after-treatment with a chromium compound either n the same bath or in a new one. Or, if preferred, the ixation and development can be carried out in one bath containing in solution an ammonium salt and a normal chromate. A number of examples are given describing hose processes in detail.—P. F. C.

Dyeing vegetable and animal fibres; Process of ——. F A. Bernhardt. Fr. Pat. 435,252, Aug. 7, 1911.

SUBSTANTIVE dyestuffs, when prepared in the form of a neutral gel, have a great affinity for animal and vegetable ibres. Example: A solution containing 30 grms. of Para Blue, and 5 c.c. of caustic soda (41° B.) in 300 grms. of hot water, is mixed with a solution of 20 grms. of wheat starch and 5 c.c. of caustic soda (41° B.) in 200 grms. of cold water. The mixture is then further diluted with 435 c.c. of hot water and 11·8 c.c. of hydrochloric acid of 21° B. are added. The fabric to be dyed is padded in the neutral gel preparation thus obtained, then steamed for 2—3 minutes, afterwards calendered and allowed to lie for about one hour. A final treatment with a solution of diazotised paranitrani-ine completes the process.—P. F. C.

Dyeings obtained with direct dyestuffs, sulphide dyestuffs, or vat dyestuffs; Process for increasing the fastness of ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 242,987, March 10, 1911.

THE fastness of dyeings produced by direct, vat, or sulphide dyestuffs may be considerably increased by precipitating on the dyed fibre an insoluble compound of nickelous oxide or hydroxide. The after-treatment of such dyeings with soluble nickel salts is without effect on their fastness o washing and light.—T. F. B.

Stiffening permeable materials; Process of ——. Le Feutre-Cuir. Fr. Pat. 435,382. Dec. 22, 1910.

THE felt or other material is impregnated with a solution of gelatin or casein, then dried and after-treated with ormaldehyde, tannic, gallotannic acid or some other uitable substance. Or, if desired, the process can be completed without after-treatment by adding formaldehyde o the gelatin solution. The addition of a "solution of varnish" to the impregnating bath renders the felt mpermeable.—P. F. C.

Tanning and rendering impermeable vegetable or animal fibres in all forms; Process for ——. G. Buret. Fr. Pat. 435,577, Oct. 23, 1911.

THE material to be treated is first impregnated with a warm aqueous solution of glycerin and agar-agar, then worked in a bath containing potassium bichromate, ormaldehyde and alum in suitable proportions and finally well dried. Such substances as gelatin, dextrin and sugar may be added to the first impregnating solution and any other similar vegetable preparation may be substituted or agar-agar.—P. F. C.

Finishing, filling, coating or sizing; Process of ——. L. Lilienfeld. Fr. Pat. 436,087, Nov. 8, 1911. Under Int. Conv., Nov. 12, 1910.

PREPARATIONS containing viscose penetrate into the fibre much better if they contain caustic alkali in a quantity at least equal to the amount of cellulose or hydrocellulose ontained in the viscose.—P. F. C.

Cleaning, washing, or dyeing woollen, cotton, and other yarns; Apparatus for ——. P. Fincato, Milan, Italy. Eng. Pat. 19,433, Aug. 31, 1911.

SEE Fr. Pat. 420,946 of 1910; this J., 1911, 486.—T. F. B.

ERRATA.

This J., 1912, 280, col. 2, l. 11 from top; *for* "animal" *read* "vegetable."

This J., 1912, 280, col. 2, l. 18 from top; *for* "dyeing" *read* "reserving."

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Ammonia; Catalytic oxidation of ——. I. D. Meneghini. Gaz. chim. ital., 1912, 42, I, 126—134.

A CURRENT of air saturated with ammonia and dried by means of quicklime was passed through a tube containing a coil of thin platinum wire heated electrically. It was found that no reaction occurred until the platinum reached a temperature of about 350° C. Above 400°—450° C., the oxidation of the ammonia proceeds more rapidly and increases considerably with rise of temperature, but at a temperature which could not be determined exactly but which is above 550° C., decomposition of ammonia into nitrogen and hydrogen also occurs; this latter reaction is more pronounced, the lower the velocity of the current of air. With burnt pyrites mixed with asbestos as contact substance, instead of platinum, similar results were obtained. Analysis of the gaseous reaction products showed that only a small proportion of the ammonia is oxidised to nitric acid, up to 60 per cent. of the oxygen consumed being utilised in forming nitrous acid. A larger yield of nitric acid may be obtained by using excess of air, but this increases the difficulty of recovering the reaction products by condensation.—A. S.

Nitrogen; Oxidation of —— and active nitrogen. F. Russ. Z. angew. Chem., 1912, 25, 586.

HABER and König (this J., 1908, 27, 1070) have shown it to be highly probable that the formation of nitrogen oxides in the arc is not a purely thermal phenomenon, but depends on the collisions of electrons. Ehrlich and Russ (see this J., 1911, 1393) found that nitric oxide and ozone, primarily formed, react to produce nitrogen pentoxide, and Strutt (see this J., 1911, 1264) showed that the green flame surrounding the arc in air is due to a purely chemical reaction between nitrogen oxides and ozone. It would seem that the primary reactions in all cases of discharge are qualitatively the same: the possibilities (leaving ionic reactions out of the question) are $N+O=NO$; $N+O_2=NO_2$; $O+O_2=O_3$; $O+N_2=N_2O$; $O_3+N=NO_3$. The final result will be dependent on the temperature and pressure of the zones surrounding the arc, and their gradients: and in all cases there must be regarded the distinction between primary reactions arising through electron-collisions or radiation, and secondary reactions amongst the primary products, occurring in these surrounding zones. Here, too, is formed, in mixtures poor in oxygen, the so-called active nitrogen of Strutt (this J., 1911, 683; 1912, 70). The part which this plays in the oxidation of nitrogen is not yet understood: Strutt's suggestion is worthy of notice:—$2NO+\text{active } N=NO_2+N_2$. Possibly the active nitrogen dissociates the unstable nitric oxide into nitrogen and oxygen, which then oxidises further nitric oxide to trioxide or peroxide. It may be that the formation of active nitrogen is harmful to the oxidation of nitrogen.—J. T. D.

Nitrogen; Oxidation of atmospheric —— in presence of ozone. T. M. Lowry. Chem. Soc. Proc., 1912, 28. 64.

WHEN air under the ordinary pressure is driven over a series of spark-gaps a product is obtained which gives an increased yield of nitrogen peroxide if mixed with ozone. It is suggested that this product may contain a chemically active form of nitrogen.

Potassium nitrate mother liquors; Working up of ——. J. Milbauer. Chem.-Zeit., 1912, 36, 331—332.

A MOTHER-LIQUOR obtained when preparing potassium nitrate by treating sodium nitrate with potassium chloride had the following composition in grms. per litre: sodium chloride, 317·2; potassium chloride, 16·74; potassium nitrate, 138·3; potassium iodide, 2·28; potassium iodate, 14·33; magnesium sulphate, 10·02; potassium sulphate, 80·06; and the liquid was brown owing to the presence of free iodine. Sodium sulphite was added to the solution which was then concentrated to separate a quantity of potassium nitrate and the liquor after being acidified with sulphuric acid was treated with copper sulphate and soda-ash. The cuprous iodide thus precipitated contained cuprous chloride and oxychloride, which were removed by boiling with a solution of potassium iodide. The purified cuprous iodide was converted into potassium iodide by treatment with potassium carbonate. The copper carbonate separated by this operation was dissolved in sulphuric acid and used again as a precipitant, whilst the potassium iodide solution was freed from traces of copper by means of hydrogen sulphide. The various solutions containing iodine which were obtained during the process were returned and worked up along with fresh quantities of the original mother liquor.—J. A.

Barium nitrate, sodium nitrate, and water; Equilibrium in the ternary system ——. A. Coppadoro. Gaz. chim. ital., 1912, **42**, I., 233—242.

THE author has made a physico-chemical study of mixtures of barium nitrate, sodium nitrate, and water, one of the four ternary systems which play a part in the common method of preparing barium nitrate by the interaction of solutions of barium chloride and sodium nitrate. The experiments were carried out at 0° C. and the results are given in a table and in a triangular diagram. In the latter there is only one multiple point, indicating that barium nitrate and sodium nitrate do not form a double salt. The saturated solution contains 1·55 per cent. of barium nitrate and 41·30 per cent. of sodium nitrate, and the solid phase in contact with it may contain the two salts in any proportions. The saturated solutions of the two pure salts contain respectively 4·74 per cent. of barium nitrate and 42·47 per cent. of sodium nitrate. If to a saturated solution of barium nitrate a saturated solution of sodium nitrate be added in successively increasing quantities, solid barium nitrate separates at first, then later this redissolves and an unsaturated solution results. On the other hand if increasing quantities of a saturated solution of barium nitrate be added to a saturated solution of sodium nitrate, the mixed solution is at first unsaturated, but subsequently solid barium nitrate separates.—A. S.

Nitrates; Action of acetic anhydride on ——. E. Späth. Monats. Chem., 1912, **33**, 235—251.

CRYSTALLINE nitrates, containing stably attached water of crystallisation, readily react with acetic anhydride, to give the corresponding anhydrous acetates, in good yield (compare Vanino; this J., 1911, 1159); the reaction is accelerated catalytically by acids, but only small yields are obtained with nitrates which do not combine with water or which lose their water of crystallisation at a low temperature. Anhydrous magnesium, cadmium, ferric, cobalt, manganic, cupric, chromic, and cerous acetates have been prepared for the first time and are described. —F. SODN.

Magnesium; Action of nitrogen and oxygen on ——. C. Matignon and Lassieur. Bull. Soc. Chim., 1912, **11**, 262—264. (See also this J., 1912, 126.)

MAGNESIUM nitride may be obtained in crystalline form by heating the metal in a crucible almost completely closed and placed in a muffle at such a temperature that volatilisation occurs. The magnesium vapour combines slowly with nitrogen of the air forming crystalline nitride. —J. H. L.

Lead silicates. II. Optical and thermal analysis of the system, $PbO—SiO_2$. H. C. Cooper, E. H. Kraus, and A. A. Klein. Amer. Chem. J., 1912, **47**, 273—285.

FURTHER investigation (chiefly microscopical) of the lead silicates has established the existence of the "pyrosilicate" $Pb_3Si_2O_7$, and (probably) the compound, Pb_4SiO_5, besides the ortho- and metasilicates previousl indicated (this J., 1910, 22). The metasilicate and pyr silicate occur in nature as the minerals alamosite ar barysilite respectively. "Lead silicate" crystals foun under the hearth of a lead smelting furnace, proved to l of indefinite composition, being probably a complex soli solution of lead and other silicates. The system of lea silicates exhibits extensive analogies with the systems calcium, manganese, and lithium silicates.—F. SODN.

Stannous chloride; Reducing power of —— in the fuse condition. C. Sandonnini and P. C. Aureggi. Ga: chim. ital., 1912, **42**, I., 227—233.

ON fusing mixtures of stannous chloride with the sulphat of barium, silver, copper, and cadmium respectively, i each case the stannous chloride was converted into stanni chloride which distilled over. Apparently in all cases th first action is the reduction of the sulphate to sulphit according to the equation:

$$2MSO_4+2SnCl_2=SnCl_4+SnO_2+2MSO_3.$$

In the case of barium, the sulphite decomposes int sulphate and sulphide, and the sulphate is attacked by further quantity of stannous chloride. In the case c silver, the sulphite decomposes into sulphate, metalli silver, and sulphur dioxide. In the case of copper an cadmium, the sulphites decompose into sulphide an oxide and sulphur dioxide, and probably some sulphat also is formed. In all cases other secondary reaction also occur. The reaction may be utilised in qualitativ analysis for converting barium sulphate into solubl compounds. The barium sulphate is heated to fusion i a porcelain crucible with five molecular proportions o stannous chloride, and when white fumes of stanni chloride are no longer evolved, the mass is digested wit water acidulated with hydrochloric acid. Excess o stannous chloride is removed by passing hydrogen sulphid through the solution, and after filtering, the solution which contains the barium, is boiled to expel hydroge sulphide.—A. S.

Oxysulphides of antimony. E. Quercigh. Atti R. Accad dei Lincei, Roma, 1912, **21**, I., 415—419.

THE results of a thermal study of mixtures of antimon trioxide and antimony trisulphide are given in a table an curve-diagram. They show that the two compound are miscible in all proportions in the fused state. compound, Sb_4OS_5 or $5Sb_2S_3,Sb_2O_3$, is formed, whic decomposes at 522° C., with separation of crystals o antimony trisulphide and formation of a liquid phase The compound, Sb_4OS_5, and the trioxide, form two serie of solid solutions, the concentrations of which are comprised within the limits, 0—18 mols. per cent. of antimon trisulphide, and 16·66 to 23 mols. per cent. of antimon trioxide. The eutectic mixture is composed of the trioxid and the compound, Sb_4OS_5, and has the same compositio as kermesite, Sb_2OS_2, whence it follows that kermesit cannot be formed by the fusion method, which is confirme by the fact that all natural occurrences of kermesite are o sedimentary origin.—A. S.

Chromic salts; Oxidation of —— by silver oxide [Detection and determination of chromium.] I. D Meneghini. Gaz. chim. ital., 1912, **42**, I., 134—138.

WHEN chromic hydroxide is boiled with silver oxide an caustic alkali, an alkali chromate is produced. A simila reaction occurs when a chromic salt is precipitated wit alkali hydroxide in presence of a silver salt, the black suboxide of silver, Ag_4O, being precipitated in each case This reaction may be utilised for the detection of chromiun in systematic qualitative analysis. A small portion o the precipitate obtained in the usual way with ammoniun chloride and ammonia is dissolved in nitric acid, treate with a few drops of silver nitrate solution and then wit a slight excess of alkali hydroxide. If chromium b present, a heavy black precipitate of silver suboxide i produced and the solution acquires the yellow colou characteristic of alkali chromates. The reaction may als be used for quantitative purposes. 10 c.c. of a solutio of chrome alum were treated with 5 c.c. of a 10 per cent lation of silver nitrate and 8—10 c.c. of a 10 per cent. olution of alkali hydroxide. After separating the silver hoxide, the solution was acidified with hydrochloric cid, then treated with 1—2 grms. of potassium iodide nd 10—15 c.c. of hydrochloric acid (1 : 5). After standg for some time, the solution was diluted to 500 c.c. ad the liberated iodine titrated with thiosulphate. esults showing the accuracy of the method are cited. he presence of iron has no influence.—A. S.

lver chloride and bromide; Solubility of —— in sodium sulphite solution. R. Luther and A. Leubner. Z. anorg. Chem., 1912, **74**, 389—391.

rom the solubility data for the silver halides in solutions f sodium sulphite of varying concentration, the authors onclude that a salt with the complex anion, $Ag(SO_3)_2'''$, formed. The solubility of a silver halide in sodium lphite solution (containing no halide) is proportional the sulphite concentration. The constant $\frac{[Ag(SO_3)_2''']}{[Ag^{\cdot}][SO_3'']^2}$ about $2{\cdot}5 \times 10^8$ at 25° C.—W. H. P.

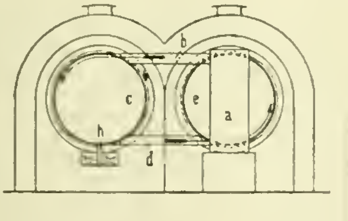
etermination of phosphoric acid in presence of colloidal silicic acid. Mélikoff and Becaia. *See* XXIII.

Patents.

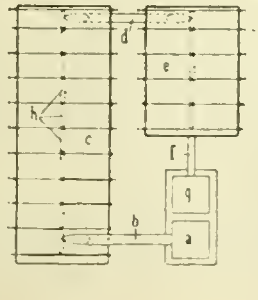
urnace for the combustion of sulphuretted oxide of gas works and the like. W. Wyld, Birmingham. Eng. Pat. 5751, Mar. 8, 1911.

he furnace is particularly suitable for the combustion f sulphuretted oxide for obtaining sulphur dioxide for a lover tower, but may also be used for other processes which the material in the furnace requires stirring. he furnace comprises an elongated horizontal chamber ivided by a horizontal partition so as to form upper and ower hearths, the material being fed on to the upper earth, taken along it by scrapers carried on an endless hain, and discharged on to the lower hearth along which travels in the opposite direction. The chain has ectangular links in which are mounted rollers to reduce iction. The scrapers project above and below the level f the chain so as to work on both hearths, and the scrapers or the lower hearth have the greater number of teeth o as to remove the material more rapidly.—A. T. L.

ulphuric acid chamber. G. Lüttgen. Ger. Pat. 244,402, Nov. 23, 1910.



he chambers have roofs of semicircular or polygonal ross-section and lso floors of the ame form, provided ith openings, so hat the acid flows ontinuously out of he chamber. The as-inlet pipe is angential, and the as-exit pipe is either angential or central. he gases from the lover tower, *a* (see ig.), pass through he pipe, *b*, into the irst chamber, *c*, and fter taking a spiral ourse through this hamber, pass hrough the pipe, *d*, nto the second hamber, *e*, whence hey pass through he central exitipe, *f*, to the Gay-ussac tower, *g*. The acid flows out f the chambers hrough the openngs, *h*.—A. S.



Ammonia; Manufacture of ——. Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 26,749, Nov. 29, 1911. Under Int. Conv., Nov. 29, 1910. (See also this J., 1911, 1115.)

In the manufacture of ammonia by passing a mixture of nitrogen and hydrogen over a catalyst consisting essentially of manganese, the gaseous mixture must be freed from all traces of oxygen, whether free or combined, by passing it over metallic sodium, magnesium nitride, or some similar substance which will decompose water and fix oxygen.—W. C. H.

Ammonia and formic acid; Process for producing —— by the decomposition of alkali or alkaline-earth cyanides. H. Sulzer-Rieter. Ger. Pat. 243,797, Feb. 23, 1911.

Alkali or alkaline-earth cyanides, or melts containing cyanide obtained from calcium cyanamide, are heated with alkalis or their carbonates or chlorides and carbon, under pressure at 130°—200° C.; the mass is not allowed to come in contact with metal during the reaction, which may be carried out in an enamelled iron autoclave or in an iron or copper vessel lined with glass or porcelain.—T. F. B.

Cyanogen and compounds of cyanogen; Preparation of ——. Soc. Générale des Nitrures. Fr. Pat. 435,308, Dec. 20, 1910.

A mixture of powdered carbon and aluminium nitride (or material yielding such at a high temperature) is strongly heated in a current of air or other gas containing nitrogen.—F. Sodn.

Separating gaseous mixtures [nitrogen and oxygen from air]; Process for ——. J. E. Lilienfeld. Fr. Pat. 435,357, Oct. 16, 1911.

The process, which is specially designed for the separation of atmospheric nitrogen and oxygen, consists in allowing the air, previously compressed and cooled, to expand into a chamber maintained at a low temperature by suitable cooling coils, where the gas (oxygen) having the higher boiling point condenses to a liquid and the gas (nitrogen) having the lower boiling point remains in the gaseous state. Both the products of the separation are utilised for cooling the air and the partially separated products so long as their temperature remains lower than the bodies to be cooled. Further, by systematic and progressive cooling, the formation of intermediate products, consisting of mixtures of nitrogen and oxygen which would require rectification, is avoided. —W. H. C.

Atmospheric nitrogen [and ammonia]; Process of oxidising —— by autoxidation. K. Kaiser. Fr. Pat. 435,397, Oct. 18, 1911. Under Int. Conv., Dec. 24, 1910.

Oxidation of atmospheric nitrogen is brought about, simultaneously with that of ammonia, by passing a mixture of the latter gas and heated air through a tube containing, as contact substance, a network of metallic threads (of platinum-palladium, platinum-iridium, or other metal of the platinum group), which occupy the whole section of the tube, forming a layer about 0·1 to 2 mm. in thickness, the transverse section of the tube presenting a free space of at least 100 mm.—F. Sodn.

Products [oxides of nitrogen] formed in gases at high temperature; Process for obtaining ——. C. F. R. von Koch. Fr Pat. 435,733, Oct. 23, 1911. Under Int. Conv., Oct. 28, 1910.

In order to prevent the decomposition of the products (oxides of nitrogen) formed at high temperatures, the gases and the products formed, are aspirated from the furnace chamber through a narrow passage, the walls of which are cooled by a water jacket, into a chamber maintained at a relatively low pressure. If the source of heat is the electric flame-arc it is caused to penetrate some distance into the low-pressure chamber.—W. H. C.

Formates of chromium or aluminium; Process for preparing ——. A. Wolff. Fr. Pat. 435,446, Oct. 19, 1911.

Solid sodium formate is allowed to react, in the cold, with a concentrated solution containing the equivalent quantity of chromium or aluminium sulphate (a little sodium carbonate or hydroxide being preferably added, or commercial sodium formate used, to prevent the separation of basic salts), and the resulting solution of chromium or aluminium formate, almost free from sodium sulphate, is separated from the sodium sulphate, which is precipitated, or (for mordanting) the mixture is diluted to the desired strength and used directly. By evaporating the solutions under reduced pressure at 35°—40° C., the salts are obtained in the solid state; as thus prepared they are soluble in water.—F. Sodn.

Cream of tartar and tartaric acid; Extraction and manufacture of ——. H. Cornette and L. Faucheux. Fr. Pat. 435,915, Jan. 9, 1911.

Lees or other crude materials containing tartrates, which may have been partially purified to remove colouring matter, etc., are treated with water and steam, under pressure, in an apparatus fitted with a rotating steam coil, so as to dissolve the contained cream of tartar, and the solution is then cooled by passing water or liquor to be heated through the coil, and the cream of tartar, which crystallises, is separated in a centrifugal apparatus with non-filtering wall (preferably fitted with circular partitions, so that, the material separating according to its density, the cream of tartar may be collected almost pure). The salt may be recrystallised in vessels fitted with regenerative cooling coils, below which is placed wire gauze to receive the crystals. For the preparation of tartaric acid, the cream of tartar and calcium tartrate obtained are dissolved in hydrochloric acid, and the whole is precipitated as calcium tartrate. Grape marcs and moist lees may be systematically treated with hot water, for the extraction of cream of tartar, in rotating barrels, as used for expelling the contained alcohol.
—F. Sodn.

Barium aluminate; Process for obtaining ——. C. A. Beringer. Ger. Pat. 244,221, March 29, 1911.

A mixture of an aluminous material (bauxite) and barium sulphate is heated strongly in a current of moist hydrochloric acid gas; or a mixture of an aluminous material, barium sulphate, and a chloride (calcium chloride) is heated strongly, preferably in a current of steam. It is stated that a yield of about 90 per cent. of barium aluminate is obtained.—A. S.

Formates of chromium, aluminium, and iron; Process for the manufacture of ——. A. Wolff, Koln, Germany. Eng. Pat. 23,190, Oct. 20, 1911.

See Fr. Pat. 435,446 of 1911; preceding.—T. F. B.

Phosphates of potash and ammonia; Process of making ——. C. Klingbiel, Duisburg, Germany. U.S. Pat. 1,020,293, March 12, 1912.

See Ger. Pat. 229,913 of 1910; this J., 1911, 438.—T. F. B.

Nitric oxide; Process of manufacturing pure ——. R. Müller von Berneck, M. Moest, and H. Graf, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,021,234, March 26, 1912.

See Eng. Pat. 10,522 of 1911; this J., 1911, 955.—T. F. B.

Hydrogen; Process for the production of —— from gaseous mixtures containing hydrogen. C. von Linde, Munich, Germany. U.S. Pats. 1,020 102 and 1,020,103, March 12, 1912.

See Fr Pat. 427,983 of 1911 and Addition thereto; this J., 1911, 1212 and 1253.—T. F. B.

Extraction of carbon dioxide from the exhaust gases of a gas-engine. Fr. Pat. 435,926. *See* IIa.

Apparatus intended for the volumetric determination o liquefied gases, especially sulphurous anhydride. Fr. Pat 435,763. *See* XXIII.

VIII.—GLASS; CERAMICS.

Porcelain manufacture; Cheap raw materials for ——. E Büttner. Sprechsaal, 1912, 45, 179—181, 195—197.

Porcelain bodies of the usual rational composition: clay 50, spar 25, quartz 25 per cent., were made from fourteen sources of raw material hitherto unused in porcelain manufacture. The following ten were found suitable and are recommended on the score of cheapness in Germany—clays of Bunzlau, Colditz and Ullersdorf; kaolins of Altenburg, Pomeisel and Saarau; pegmatite from Tirschenreuth, Cornish stone, Birkenfeld felspar, and Bunzlau gravel. English blue ball clay, North Carolina kaolin, Meissen clay, and Dölau kaolin sand are stated to be unsuitable. The rational analyses of these raw materials, with the linear shrinkage at cone 13 of the bodies formed from them, are as follows:—

Raw material.	Clay.	Felspar.	Quartz.	Shrinkage of body.
	per cent.	per cent.	per cent.	per cent.
Bunzlau clay	57·5	1·3	41·2	10·0
Colditz clay	86·0	1·0	13·0	12·66
Altenburg kaolin	27·24	3·49	68·47	14·0
Meissen clay	71·43	1·79	20·78	17·33
Tirschenreuth pegmatite	15·05	52·97	31·98	12·0
Cornish stone	25	50	25	13·83
Ullersdorf clay	88·1	0·5	11·4	9·33
N. Carolina kaolin	95·97	3·28	0·75	11·83
Berkenfeld felspar	24·94	32·42	42·64	13·0
Pomeisel kaolin	25·03	7·42	67·55	12·17
Bunzlau gravel.........	16·92	7·22	75·80	11·66
Dölau kaolin sand......	37·73	26·57	35·70	13·50
English blue ball clay ..	92·76	0·24	7·0	12·0
Saarau kaolin	57·48	2·01	40·51	11·49

—H. H. S.

Transparent tin-oxide glazes. A. Lomas. Trans. Eng. Ceram. Soc, 1911—1912, 11, 118—143.

The discovery of transparent tin glazes is due to J. Burton, who in the early 'nineties used one containing 8 per cent. of tin oxide. Starting with the transparent glaze: $0{\cdot}7Na_2O$, $0{\cdot}3CaO$, $0{\cdot}5B_2O_3$, $2{\cdot}0SiO_2$, $0{\cdot}15SnO_2$, the author finds that lime may be replaced by magnesia, zinc, lead, strontium or barium, but that the solubility of the tin oxide is proportional to the soda content. Potash may replace soda partially. Alumina lowers solubility of tin, and $0{\cdot}67Al_2O_3$ causes the solubility to cease, so that when the alumina-soda ratio is greater than 2:3, transparency fails. The converse deduction is of importance to enamellers, viz., that for opacity the alumina-alkali ratio should not be less than 2:3. When lime and alumina are added together, their effect is cumulative, and adverse to transparency. Boric oxide increases the solubility of tin oxide to a certain point, further additions making no difference. Thus $Na_2O,0{\cdot}5B_2O_3$ dissolves 0·1 equivalent of SnO_2, and $Na_2O.2B_2O_3$ dissolves the same amount. Again, $Na_2O,2SiO_2,0{\cdot}5B_2O_3$ dissolves $0{\cdot}25SnO_2$ while increasing the boric anhydride to one or to two equivalents only raises the tin solubility to 0·3. Silica added to compositions that contain none promotes the solution of tin oxide, but after a time further additions appear to retard it. Difference in firing temperature makes no appreciable difference if the glass be properly fused at the lower temperature. Transparent glazes may be made by adding tin oxide to the mill mixture of frits containing no tin oxide.—H. H. S.

Chromium red glaze; Notes on the ——. C. E. Ramsden. Trans. Eng. Ceram. Soc., 1911—1912, 11, 29—37.

The subject is treated under the two heads: stain and glaze. The stain composition given by Seger is: Stannic oxide 50, calcium carbonate 25, flint 18, borax 4, potassium bichromate 3. Rodgers and Mellor (this J., 1905, 1305) used the same mixture with the addition of 4 parts of white lead. Borax and white lead may be omitted, however, and also the flint either wholly or in part. The use of a soluble chromium salt is preferable because of the greater uniformity of the mixture. The author confirms Rodgers and Mellor, and differs from Purdy and Brown (this J., 1909, 1129), in stating that the tint is independent of the source of chromium if the calcining be properly conducted at a high temperature (1300° C.) and for sufficient time (four days to fire up, followed by slow cooling). Lightly baked stains can be obtained at 1050° C. if the lime exceed the tin oxide in equivalents. After calcination the stain is ground and washed. Tin oxide is essential and cannot be replaced by zirconia or titania. Calcium carbonate may be replaced by equivalents of calcium sulphate or fluoride, but calcium phosphate inhibits the formation of pink. Turning to the glaze, the usual majolica glaze is too high in silica and too low in lime, while the ordinary earthenware glaze contains too much alumina and silica and not enough lead. The author states that the chrome red cannot be obtained in a leadless glaze. He suggests for the glaze without the stain the formula—PbO 0·53, CaO 0·24, K_2O 0·28, Na_2O 0·15, Al_2O_3 0·09—0·15, SiO_2 1·49—2·0, B_2O_3 0·26, fritted together except the lead oxide and 0·9 equivalent of silica. To prevent scumming zinc oxide may be added up to 3 per cent., and an oxidising atmosphere should be maintained in the earlier stages of the firing.—H. H. S.

Ceramic art; List of books on the history and technology of the ——. M. L. Solon. Trans. Eng. Ceram. Soc., 1911—1912. **11**, 65—104.

A SUPPLEMENT to Solon's bibliography "Ceramic Literature" (1909).—H. H. S.

Lead silicates. II. Optical and thermal analysis of the system, PbO-SiO_2. Cooper and others. *See* VII.

PATENT.

Porcelain and similar products; Process and apparatus for firing ——. Soc. Anon. des Faienceries de Creil et Montereau, and E. G. Faugeron, Montereau, France. Eng. Pat. 22,830, Oct. 16, 1911. Under Int. Conv., Oct. 24, 1910.

SEE Fr. Pat. 421,765 of 1910; this J., 1911, 424.—T. F. B.

IX.—BUILDING MATERIALS.

Plaster industry; Open questions and new methods in the ——. M. v. Glasenapp. Chem.-Zeit., 1912, **36**, 362.

ORDINARY plaster of Paris, containing from 0·1 to 0·4 per cent. of water, consists of a fast-setting and a slow-setting constituent. As plaster on the whole sets too fast, it is desirable to retard the fast-setting constituent; this may be done: (1) by "overstirring" the initial set, *i.e.*, by using an excess of water and stirring vigorously, thereby producing a plastic and slow-setting paste; (2) by the use of dead-burnt plaster in conjunction with alum solution. For this purpose plaster burnt at 200°, 500°, or 800° C. may be used, and the alum solution may vary from 2 to 8 per cent. strength. Plaster so made is slow-setting and acquires greater strength and greater hardness than ordinary plaster. Flooring-plaster, unlike ordinary plaster, sets too slowly. To accelerate setting the author recommends raising the temperature of burning to above 1200° C., the temperature of decomposition of calcium sulphate, whereby a small percentage of free lime is obtained. The resulting mass hydrates more quickly than ordinary flooring-plaster, and as the hydrated lime, which it contains, absorbs carbon dioxide in the course of time, the mass attains greater strength and hardness than flooring-plaster which contains no free lime. To render flooring-plaster more water-resisting, the author calcined 80 parts by weight of ordinary plaster with 20 parts by weight of kaolin at 1200° C. for 10 hours. The resulting product set in seven days and ultimately became stone-hard. To render flooring-plaster impervious to water, the author recommends the addition of "aquabar" or other lime-soap. Regarding the utilisation of anhydrite, the author found that the pulverised raw material, mixed with a cold, saturated solution of alum, set gradually to form a very hard mass. Heated to 1200° C., anhydrite, like gypsum, gave rise to a basic sulphate which set with water; the resulting plaster did not swell and the yield was superior to that obtained from gypsum.—O. R.

Lime-mortar in masonry made of ordinary bricks and of sand-lime bricks; Hardening of ——. H. Burchartz. Tonind.-Zeit., 1912, **36**, 511—514. (See also this J., 1911, 363.)

Two walls, each 2 m. high, 2 m. long, and one brick thick, were erected in November, 1905, the one being composed of sand-lime bricks and the other of Rathenow machine-made bricks. The same mortar, consisting of 1 part by volume of slaked lime and 3 parts by volume of Berlin building sand, was used for each wall by the same two masons. After periods varying from 4 months to 6 years, samples of mortar from each wall were drawn at corresponding points of the two walls, both from their outer surfaces and from various points of the same depths within each structure. The samples were placed in wide-mouthed glass bottles fitted with ground stoppers, and were immediately analysed for moisture and carbon dioxide. The bricks, immediately above each mortar sample, were also removed, carefully freed from any accompanying mortar, and similarly examined. It was found that lime-mortar set between sand-lime bricks behaved in exactly the same way as lime-mortar set between any other kind of bricks, of whatever nature and properties.—O. R.

Portland cement clinker; Constitution of ——. E. Jaenecke. Z. anorg. Chem., 1912, **74**, 428. (See this J., 1911, 1453; 1912, 74.)

THE optical characters of the compound, $8CaO,2SiO_2,Al_2O_3$, are described. It can be readily distinguished in thin sections of rotary kiln cement, in which it is the chief constituent. It can also be distinguished in thin sections of cement after setting.—A. S.

Portland cement; The change in setting properties of ——. G. Hentschel. Tonind.-Zeit., 1912, **36**, 557—558.

IN the author's opinion change of cement from slow to quick setting is due to the presence of alkali carbonates, which as positive catalysts have an accelerating influence on the setting process. The addition of only 0·01 per cent. of sodium carbonate in one case reduced the time of setting from about 6½ hours to 20 minutes. On the other hand, the addition of varying amounts of calcium sulphate retards the time of setting, and the cements remain slow setting. The power of catalysts should be determined by comparative experiments: sodium and potassium carbonates exert an extraordinarily strong positive effect, whilst calcium sulphate possesses a relatively smaller negative catalytic effect. The positive effect also is much more marked with finely ground cements. By the burning any alkali present in the raw materials is converted into an alkali silicate which exerts no effect on the setting, but by exposure to the air these silicates after the clinker has been ground, are slowly decomposed into silicic acid and carbonate, especially under the influence of heat. Experiments on a particular cement showed that the time of setting was accelerated by heat, with free access of air, but when carbon dioxide was excluded, the time of setting was unchanged after heating the cement on a water-bath for an hour. The pronounced effect of carbon dioxide and heat explains why rotary kiln cement changes much more easily than cement burnt in other kinds of kilns, and often leaves the mill in a quick setting condition. Rotary kiln clinker tends to be hard, and is consequently heated to a considerable extent by grinding—a temperature of 87° C. has been noted—and on cold days there is less danger of producing a quick setting cement through the grinding. Rotary kiln cement also generally contains a rather larger amount of alkali than cupola-furnace cement, probably derived from the ash of the fuel, of which a larger amount is required in rotary kilns. The change in the time of setting produced by the addition of calcium sulphate is independent of the presence or absence of water of crystallisation in the calcium sulphate. In order to test the likelihood of change in the time of setting, a brisk stream of carbon dioxide is passed for 10 minutes over 200 grms. of cement contained in an Erlenmeyer flask, provided with a ground stopper. The cement and gas are shaken well, and the operation repeated three times. Finally the closed flask is heated for an hour on a water-bath, care being taken that no condensed water can enter the neck of the flask. The cement is spread in a thin layer to acquire the room temperature and the setting test applied in the usual way. If the time of setting is less than an hour, the cement is open to suspicion. In order to avoid this fault in cement the content of calcium sulphate should be raised to the permissible limit, and also the content of lime, so that the clinker will crush easily and not being steel-hard will not become so hot during grinding; for the same reason the use of still moist clinker must be avoided, and in some cases the grinding must be only coarse.—W. C. H.

Iron-Portland cement and Portland cement; Comparison of ——. H. Passow. Stahl und Eisen, 1912, 32, 477—480.

Experiments lasting over varying periods up to five years have conclusively proved that the tensile and crushing strengths of iron-Portland cement mortars, for different proportions of iron-Portland cement and sand, vary in an analogous manner to the tensile and crushing strengths of similarly constituted Portland cement mortars. The only apparent superiority of Portland cement over iron-Portland cement was in the case of mortars exposed to air only for short periods, and intimate mixtures of 70 parts of Portland cement and 30 parts of blast-furnace slag were found to be invariably stronger than intimate mixtures of 70 parts of Portland cement and 30 parts of fine sand.—O. R.

Patents.

Heat insulating material; A new compound applicable as a —— and for other purposes. P. Ferra, Lyons, France. Eng. Pat. 28,667, Dec. 9, 1910.

A mixture of sulphur, kaolin or some substance with similar properties, and cuprous or cupric sulphide is melted, allowed to cool and the fused mass reduced to a fine powder which is forced under pressure into moulds, envelopes or casings. The compressed mass is further indurated and made ready for use by heating to about 800° C. in a closed vessel. The product may be used as a heat-insulating material, or as a thermo-electric element. For the latter purpose it may be used in the form of bars, or may be enclosed completely and hermetically in a casing, preferably of brass, which has the same coefficient of expansion as the compound, and forms one terminal of the element.—W. C. H.

Wood; Preserved —— and process of making same. C. Ellis, Montclair N.J., Assignor to Copper Oil Products Co., New York. U.S Pat., 1,020,643, March 19, 1912. (See also this J., 1912, 283.)

A vulcanised asphalt oil, containing an excess of sulphur and an antiseptic material is injected under pressure into the wood in amount sufficient to coat the fibres. The amount of the antiseptic is adjusted to exert its preservative action practically as long as the railroad tie or wood will last. After being subjected to the action of the oil, the excess of the latter is removed and the wood is subjected to a higher pressure of a gaseous body. Wood so treated is claimed as a new article of manufacture. —W. C. H.

Wood and other organic substances; Preservation of ——. H. Monseur. Fr. Pat. 435,732, Oct. 23, 1911.

Wood is impregnated with ammoniacal solutions of copper, zinc, nickel, cobalt, or cadmium salts to which phenol, gum arabic, sugar, or formic, oxalic, lactic or boric acids have been added for the purpose of preventing the corrosive action of such impregnated wood upon iron and of reducing its electrical conductivity.—H. H.

Mortar for use in lining kilns for burning cement and the like. J. H. Schütt. Ger. Pat. 243,933, March 21, 1911. Addition to Ger. Pat. 220,383, Dec. 12, 1908.

The mortar described in the chief patent (this J., 1910, 568) consisted of a mixture of cement clinker, cement, and slaked lime. According to the present patent, the cement clinker is omitted, whereby the proportion of slaked lime may be increased from 20 to 50 per cent., being adjusted so that the sintering of the mortar occurs at the maximum temperature of the rotary kiln in which it is used. The mortar may be applied to the walls of the kiln by stamping, or it may be moulded into blocks, which are used in the unburnt state to line the kiln.—A. S.

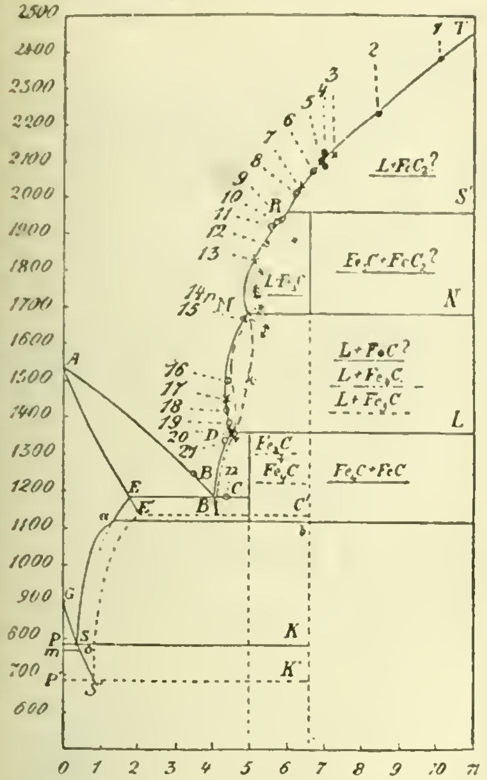
Artificial stone; Process for the dehydration of masses of —— on moving endless metal bands. A. Hermann. Ger. Pat. 244,203, Nov. 2, 1910.

The patent relates to the dehydration of masses of artificial stone composed of fibrous matter suspended in water and mixed with a mineral filling material such as cement, lime, etc. The mixture is fed on to an endless wire screen, and owing to its high specific gravity the mineral matter quickly settles and water exudes to the surface of the mass. According to the present patent, one or more bands of absorbent material are caused to travel above the wet mass in the same direction and at the same speed, the absorbent material resting on the wet mass by its own weight. Subsequently the metal band and the absorbent band with the mixture between them pass over a roller and then between this roller and a lower press roll, whereby water is expressed from the mass of artificial stone and absorbed or led away by the band of absorbent material.—A. S.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron-carbon alloys containing more than 4 per cent. of carbon; Primary crystallisation and subsequent physico-chemical transformations in ——. N. Wittorff. J. Russ. Phys.-Chem. Ges., 1911, **43**, 1613—1690. Chem. Zentr., 1912, **1**, 1091—1094.

The author's investigation was concerned primarily with the determination of the nature of the crystalline phase formed on cooling iron-carbon alloys containing more than 4·2 per cent. of carbon, in order to gain an insight into the properties of electro-steel. The results of thermal, micrographic, and analytical determinations led to the following conclusions: (1) Liquid alloys containing from 6·2 to 10 per cent. of carbon begin to solidify at 2000°—2380° C., a crystalline phase rich in carbon, probably FeC_2, separating. This is attacked only very slowly by nitric acid (1 : 4) and leaves a black residue; it separates copper immediately from very dilute copper sulphate solution. On an unetched surface with a magnification of 100/1, it appears light gray with a silvery lustre. (2) The same carbide crystallises on heating the alloys up to 2600° C. during the solution of graphite therein. (3) From somewhat below 2000° C. down to 1700° C. the primary crystallisation is of cementite (see also Hanemann, Stahl u. Eisen, 1911, 31, 333). (4) From 1650° to 1330° C., liquefaction of the alloy takes place, this being specially notable at a carbon content of about 7 per cent. (5) On stirring the mass during the liquefaction, thin plates, probably FeC, float to the surface. (6) In alloys quenched at 1600° C., these crystals have the shape of arrows with acicular outgrowths: they are darker than the crystals which separate at 2000° C., and lose their colour on rubbing with a piece of leather moistened with alcohol. (7) Alloys quenched below 1700° C. always contain a metallic phase surrounding the arrow-like crystals (FeC ?), or a carbon-containing phase (5·02 per cent. of carbon, corresponding to Fe_4C) which appears in the form of dendrites on an eutectic ground-mass. This latter constituent (Fe_4C) is not attacked by a 4 per cent. alcoholic solution of picric acid or by sulphuric acid (1 : 10 parts by weight) so long as the alloys are quenched at temperatures not below 1160° C.; it differs from cementite in being strongly attacked by nitric acid (1: 4). (8) The quantity of the primary separation of this constituent increases from 0 to 100 per cent. as the carbon content increases from 4·1 to 5 per cent. In an alloy containing 6—7 per cent. of carbon, this constituent forms the ground-mass, the remainder being composed of the arrow-like crystals (FeC ?). (9) The carbide, Fe_4C, decomposes into the γ-solution and graphite below 1130° C. (10) The crystallisation of the stable eutectic takes place at 1180° C. in alloys containing more than 4·1 per cent. of carbon. Crystallisation of the cementite proceeds at the same time on cooling melts of 120—200 grms. in the crucible. (11) Those phases which separate above 2000° C. (FeC_2 ?) and between 1600° and 1400° C. (FeC ?) decompose with separation of graphite. The author's results are represented in the accompanying diagram, in which also the results of Hanemann (*loc. cit.*) are marked by asterisks.—A. S.



Steel castings ; Importance of the annealing of ——. P. Oberhoffer. Chem.-Zeit., 1912, **36**, 392.

Experiments as to the most suitable annealing temperature for steel castings showed that the resistance to impact and the hardness attain a maximum after annealing at the temperature of the upper critical point.—A. S.

Ferro-tungsten ; Rapid determination of tungsten in ——. R. Fieber. Chem.-Zeit., 1912, **36**, 334.

0·5 grm. of the extremely finely powdered ferro-tungsten is placed in a 250 c.c. beaker, treated with 10 to 15 c.c. of bromine and gently warmed until oxidation is complete. 30 c.c. of concentrated hydrochloric acid are now added and if any unattacked metal is seen, a further 5 to 10 c.c. of bromine are added. The excess of bromine having been removed by careful heating on an asbestos plate, 1 to 2 c.c. of concentrated nitric acid and later 2 to 3 drops of hydrofluoric acid are added and the liquid evaporated as far as possible. The residue is boiled with 40 c.c. of hydrochloric acid (1: 5), the separated precipitate filtered off, washed with dilute hydrochloric acid and after treatment with ammonium nitrate, dried, ignited, and weighed. The tungstic acid thus obtained is pure yellow in colour, and may be freed from associated silicic acid by treatment with mixed hydrofluoric and sulphuric acids.—J. A.

[*Gold and silver*]. *Cyaniding weathered pyritic tailing.* H. R. Edmands. Eng. and Min. J., 1912, **93**, 605—606.

An account of the testing, and subsequent treatment (in a temporary leaching plant comprising two vats, each of 200 tons capacity), of 2300 tons of highly acid tailing containing marcasite, blende, arsenical pyrites, and the decomposition products of these minerals, together with gold to the value of £2 3s. 6d. per ton. About one-third of the material was finer than 150-mesh, less than 3 per cent. being coarser than 30-mesh. The "total acidity" was equivalent to 35·2 lb., and the "soluble acidity" to 12·2 lb. of lime per ton, the latter including ferrous iron equivalent to 3·3 lb. of ferrous sulphate per ton. Neutralisation with soda was found to be unsatisfactory; and, in the treatment finally adopted, the material was well mixed with slaked lime (50 lb. per ton) and passed through a ½-inch-mesh screen (to break up the lumps of agglomerated slime) before being placed in the vats. The charges were then leached with water or barren solution, the ferrous hydroxide at first produced being subsequently oxidised by alternately washing (with well aerated water) and thoroughly draining the material; about ½ ton of wash water per ton was thus employed, the washing operation extending over 4 or 5 days. The washed and oxidised charges were finally leached with cyanide solution of 0·05 per cent. strength, of which from 50 to 80 tons per day were pumped into the two vats, this treatment being continued for 40 days. The quantity of solution employed per ton of material averaged 6 tons, the value of the dissolved gold per ton of solution varying from 18s. or 20s. at the commencement to 1s. or less at the end, of the treatment. A total extraction of 88 per cent. was obtained, the consumption of cyanide (NaCN) being rather less than 4 lb. per ton.—W. E. F. P.

Tin-bearing silver bullion ; Wet assay of ——. L. E. Salas. Trans. Amer. Inst. Min. Eng., March, 1912, 267—278.

The presence of as little as 0·05 per cent. of tin was found to be sufficient to cause obscuration of the end point in the ordinary "Gay Lussac" method of determining silver, while 0·5 per cent. rendered the assay impossible. In order to prevent the formation of a precipitate of metastannic acid the following procedure is recommended:—A quantity of bullion (about 1 grm.) slightly more than sufficient to neutralise 100 c.c. of sodium chloride solution, is placed in the assay bottle. 2 grms. of tartaric acid and 3 or 4 c.c. of water are added, and the bottle is heated till the acid is dissolved. After cooling, 10 c.c. of nitric acid (1 : 1) are added, and after the silver has dissolved, the solution is titrated as usual. The liquid must be kept cool during and after the solution of the silver. If the bullion contain more than 5 per cent. of tin, a smaller quantity than 1 grm. should be taken for the assay and some pure silver added. —B. M. V.

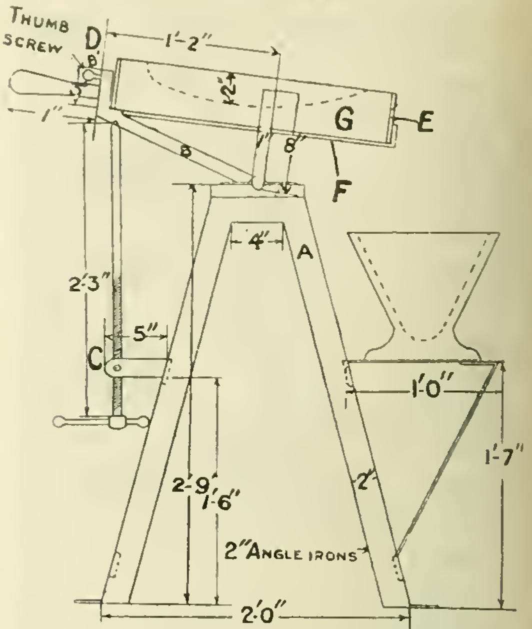
Cupellation of gold precipitate [*from cyanide process*]. C. J. Brooks. Mining Mag., 1912, **6**, 193—196.

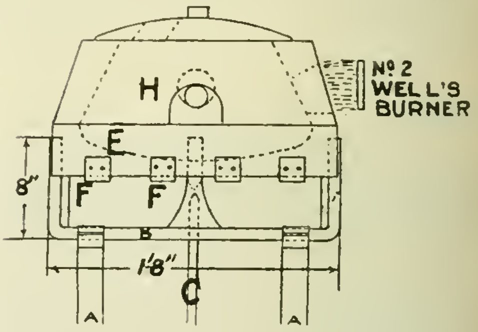
The gold-bearing ore treated by the cyanide process at Bau (Borneo) consists partly of rock matter and partly of clay, roughly in the proportion of one to two. These are treated together, with the addition of much lime to induce settlement of the clay. The precipitate in the zinc-boxes is contaminated with calcium carbonate, and with fine clay even though filters are used. A considerable quantity of arsenic—as metal and sulphide—and of antimonite being present in the ore, arsenic and antimony are also found in the zinc-box precipitate. At the monthly "clean-up" the contents of the zinc-boxes are first rinsed, the unbroken zinc being returned for further use; the remainder is again washed on a 10-mesh sieve, about half the broken zinc, which remains on the sieve, being returned to the first two compartments of the boxes, whilst the other half goes forward for sulphuric acid treatment. The portion passing the sieve is agitated and filtered, being kept in agitation during filtration. The coarse zinc which settles, is at once subjected to sulphuric acid treatment. The following are analyses of average samples of filter-press cakes, obtained at this stage:—

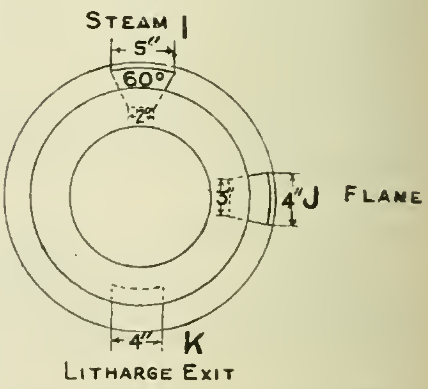
	(1)	(2)	(3)
	Per cent.	Per cent.	Per cent.
Silica and gangue . . .	17·66	2·82	38·00
Iron	3·32	0·76	3·12
Alumina	3·98	1·63	10·23
Zinc (fine—100)	23·78	30·65	12·66
,, (coarse + 100)	1·14	4·36	
Lime	6·69	9·17	5·32
Magnesia	0·17	0·39	—
Alkalis	2·27	4·00	—
Gold	8·044	19·629	9·00
Silver	2·276	5·124	5·45
Copper	2·47	2·82	1·61
Lead	4·80	7·86	3·28
Tin	0·10	0·18	0·62
Antimony		0·11	
Arsenic	1·68	1·67	0·42
Sulphur	0·62	0·87	10·29
Selenium	0·34	0·08	
Carbonic acid (and organic matter)	10·28	6·29	
Moisture	8·79	—	
Oxygen, loss, etc.	1·59	1·257	
	100·000	99·970	100·00

(1) Sample from Bidi (Borneo) coarse-crushing and leaching plant.
(2) Sample from Bau (Borneo) coarse-crushing and leaching plant, in every way of excellent quality.
(3) A low grade precipitate caused by turbid solution.

To remove the calcium carbonate (which would form objectionable matte during the smelting) from these press-cakes, they are treated with water followed by hydrochloric acid until hydrogen commences to be evolved. The residue is washed by decantation—only the supernatant liquors being filtered,—and is then treated with sulphuric acid together with the coarse zinc products previously mentioned. To keep the copper in solution, the combined residues are added to the dilute acid in small quantities at a time; the insoluble portion is then filtered, washed, steamed, dried and smelted with suitable leadless fluxes in coke-fired Faber du Four furnaces. From this melt, bullion running 800—900 "fine" in gold plus silver, slag, and a little matte, are produced. The slag, after grinding, is smelted with 15 per cent. of litharge, with sufficient carbon, and, towards the end, a little iron powder, with production of lead bullion and a poor slag from which a little further bullion is extracted on a Wilfley table. The matte is smelted similarly but separately. The practice of refining the two bullions separately in crucibles with nitre has been replaced by cupellation in the furnace illustrated. A stand (A) of 2-inch angle iron supports the cupel holder together with a conical mould to receive the fused litharge or bullion. The cupel-holder (B) rocks upon the stand, being adjusted by a hand-screw (C). It is made of T-shaped metal with upwardly bent arms, one being fitted with a thumb-screw (D) and gripping the cupel- or "test" ring (E) at 3 points. The cupel ring is of half-inch iron, 21 inches in diam. and 4 inches deep. Four strips (F) of ⅜-inch iron, 2 inches wide, are fitted to support the cupel bottom (G) which is composed of a mixture of 75 lb. of Portland cement, 10 lb. of fireclay and 12 lb. of firebrick, and is tamped in, layer by layer, while moist enough to bind. A cavity 2 inches deep, 17 inches in diam. is scooped out to hold the bullion. A cover (H), made from a mixture of 50 parts of asbestos, 40 parts of fireclay and 20 parts of powdered firebrick, is formed with 3 openings for the steam jet (I), for the flame of a "No. 2 Wells'" oil burner (J), and for the litharge exit (K) respectively. The open top of the cover is closed by a "Salamander" crucible lid. A steam jet is used to promote oxidation as an air blast is not available. The cupel must be heated up very slowly and when bright red, a charge of about 50 lb. of bullion containing about 50 per cent. of lead, is introduced. The litharge is run off as formed by tilting the furnace, but the bullion is not poured until the cupel is nearly full as the result of several charges. A typical 12 hours' run gave the







following result:—150 lb. of gold bullion 836 "fine" (gold plus silver per 1000 parts) refined with 170 lb. of lead bullion containing gold 685 and ailver 268, total 953 fine. The resulting litharge contained 599 oz. of bullion per ton and was used to smelt further slags. About 6·5 galls. of kerosene are used per 100 lb. of lead cupelled.—B. M. V.

Copper; Influence of small quantities of phosphorus, manganese, and tin on the physical properties of ——. E. Münker. Metallurgie, 1912, 9, 185—198.

The author has made an investigation of the effect of phosphorus, manganese, and tin in small quantities on the tensile strength, hardness, electrical conductivity, and specific gravity of copper, after varying thermal and mechanical treatment. The phosphorus alloys contained quantities of phosphorus varying up to 1 per cent., the tin and manganese alloys up to 1·5 per cent. of these metals. The direction of the changes produced is the same for all three substances, the tensile strength and hardness being increased, while the extension, the electrical conductivity and the specific gravity are diminished. The mechanical properties are most considerably affected (for a given percentage of impurity) by phosphorus, tin coming next and manganese last. In the case of conductivity and specific gravity the order is phosphorus, manganese, tin. In the case of the hardness, the order is phosphorus, tin, manganese, but on heating the alloy to 500° C. and allowing to cool slowly, the hardening effect of the phosphorus falls below that of tin and manganese. In general, the effect of thermal treatment is similar for all the alloys, the tensile strength and hardness being diminished, while the extension is increased, in other words the effect of the impurity on the copper is greatest in the unheated condition, after mechanical working (rolling). The effect of heating on the conductivity and specific gravity is very small. The paper contains tables and curves for each alloy and a series of microphotographs illustrating the connection between the change in properties on heating and the development of crystalline structure.—W. H. P.

Cobalt-nickel speiss; Metallurgical treatment of a roasted —— containing much lead. O. Barth. Metallurgie, 1912, 9, 199—216.

Laboratory experiments were made to determine the best treatment for a material of the following composition: cobalt oxide, 25·79; nickel oxide, 18·78; silver oxide, 0·30; lead oxide, 24·53; arsenic, 5·66; antimony, 2·08; ferric oxide, 17·66; copper oxide, 0·24; and lime, 1·95 per cent. The material is a partly roasted speiss still containing arsenic and antimony in combination with some of the nickel and cobalt in a very resistant form. Preliminary experiments showed that a convenient process consists in heating the material at 550°—600° C. in a current of air containing sulphur dioxide, which converts the oxides of nickel and cobalt into soluble sulphates. It is not possible to do this in such a way as to get any considerable separation of nickel from cobalt, but it is a satisfactory first process and converts about 67 per cent. of the nickel and cobalt into the soluble form, along with traces of silver, copper and iron. The silver is then precipitated by metallic copper, and the copper by metallic iron. After precipitating the hydroxides of nickel, cobalt, and iron with milk of lime, and filtering, the nickel and cobalt are washed out by means of hot ammonium chloride, thus producing a nickel-cobalt solution free from other metals. The insoluble residue after the sulphate roasting, which atill contains nickel and cobalt in combination with arsenic and antimony, as well as lead sulphate and ferric oxide, is smelted with a suitable amount of galena. This quantity is calculated from the amounts of lead sulphate and ferric oxide in the residue so as to reduce them according to the equations: $6Fe_2O_3+2PbS=12FeO+2PbO+2SO_2$; $2PbO+PbS=3Pb+SO_2$; $PbSO_4+PbS=2Pb+SO_2$. This operation yields three products: (1) lead (containing silver), which may be treated in the ordinary way; (2) slag containing the bulk of the iron as silicate with a little lead, nickel and cobalt. This slag should contain 10—14 per cent. of silica and either the galena must be chosen so as to provide for this or else silica must be added. If it is melted with any sulphur-containing material the slag gives its more valuable material as an infusible nickel cobalt lead sulphide which may be added to the original roasted speiss before the sulphating process; (3) nickel cobalt speiss containing quantities of arsenic and antimony which are now so great as to be partly removable by roasting, the product being then sulphated by the air sulphur dioxide method as before.—W. H. P.

Nickel; Expansibility of commercial ——. C. E. Guillaume. Comptes rend., 1912, 154, 748—751.

Examination of a number of specimens of commercial nickel, of dates from 1891 to 1911, has shown that the expansibility of the modern metal is distinctly lower than that of earlier specimens. The average values of the first power term in the coefficient of expansion were found to be: 1891, 12·695.10^{-6}; 1895, 12·583.10^{-6}; 1896-7, 12·546.10^{-6}; 1898-1900, 12·539.10^{-6}; 1911 12·517.10^{-6}. Unless an exactitude beyond 0·4 μ per metre is necessary, correction for temperature within a range of 20° C. may be neglected, when nickel standards of length are used.—J. T. D.

Metallic alloys; Behaviour of —— when heated in a vacuum. C. R. Groves and T. Turner. Chem. Soc. Proc. 1912, 28, 62—64.

The authors have heated a number of binary alloys in a porcelain boat under a pressure not exceeding 1 mm. of mercury. The boat was contained in a porcelain tube, and heated in an electric resistance furnace to temperatures ranging from 500° to 1200° C. It is concluded that the alloys may be divided into five groups as follows: (1) *The metals are not appreciably volatile when heated in a vacuum for a moderate time at or below* 1200° C. As examples of this class may be mentioned the alloys of copper with iron, aluminium, tin, or nickel. It may also be assumed that any mixtures of these four metals in any proportions would also be non-volatile. (2) *The constituent metals are quantitatively separable.* Thus the alloys of the copper-bismuth, copper-lead, and copper-zinc series all separate at the melting point of copper. The bismuth, lead, or zinc volatilise, whilst pure copper remains. Iron-zinc alloys can be quantitatively separated at 500° C. (3) *Any excess of the more volatile metal is removed, and a chemical compound remains.* The gold-zinc series yields AuZn; the copper-antimony, Cu_3Sb; the gold-cadmium, AuCd; and the magnesium-zinc, $MgZn_2$. (4) *The excess of the more volatile metal is removed, but the residue is not a chemical compound.* Thus in the copper-arsenic series the arsenic retained diminishes as the temperature rises. At 1200° C. the composition remains constant with about 20 per cent. of arsenic, which does not correspond with any simple atomic proportions. (5) *Two (or more) metals may volatilise together.* Thus lead and zinc tend to pass over together. In the iron-zinc series also there is an increasing proportion of the iron carried over as the temperature rises above 500° C. In the silver-zinc series, although separation is nearly quantitative at 700° C., there is an increased loss of silver with higher temperatures. It was possible to make brass by heating bright copper in an exhausted glass tube containing zinc at a temperature 50° below the melting point of zinc, or, say, 375° C.

The platinum in the resistance furnace was in the form of a spiral of thin sheet. It lasted well so long as the temperature did not exceed 1200° C., but deteriorated rather rapidly with greater heat. The separation of metals in a vacuum was usually effected at the melting point of the less fusible metal, but in some cases, as in the zinc-iron series, the alloy was solid throughout the experiment. Various substances were tried for making the joints at the cold ends of the porcelain tube, and ordinary red sealing-wax was found to give the most satisfactory results.

Metals; Degrees of purity of commercial ——. F. Mylius. Z. anorg. Chem., 1912, 74, 407—427.

It is suggested that instead of the existing irregular nomenclature (pure, "puriss." etc.) for indicating the degree of purity of commercial metals, a system of numerical classification should be adopted. In this system the first degree of purity would represent a metal where the total true impurity (excluding oxygen and the products of atmospheric corrosion) was from 1 to 10 per cent., the second degree from 0·1 to 1 per cent., and so on to the sixth degree. As technical products of the fourth degree and upwards (less than 0·01 per cent. impurity) the following metals may be obtained:—gold, silver, platinum, mercury, copper, tin, lead, cadmium, and zinc. It is noteworthy that zinc, cadmium, and tin (Kahlbaum) have all risen from the third to the fourth degree since 1895. As examples of the special analytical methods which must be adopted in dealing with metals of the higher grades, the author gives details of the investigation of Kahlbaum's zinc, cadmium, tin, and lead. In these as in many other cases the analysis can only be carried out successfully when the bulk of the principal metal is removed by fractional crystallisation as a pure salt. In the case of zinc, starting with the metal dissolved as sulphate, a small quantity of sulphide containing a good deal of the impurity is first precipitated from ammoniacal solution, and then most of the zinc is removed by fractional crystallisation as zinc ammonium sulphate. In this way the impurities can all be concentrated into the small sulphide precipitate and about 50 c.c. of mother liquor, in which they can be estimated by the usual methods. Cadmium is analysed by crystallising its nitrate, which can easily be obtained in a state of absolute purity leaving all the impurities in the three per cent. which is left in the mother liquor. In the case of tin the crystalline product is stannic ammonium chloride, which in the presence of ammonium chloride is relatively insoluble. The results of the various analyses, apart from oxygen, and improbable impurities which were not sought for, are collected in the following table of percentages.

	Zinc.			Cadmium.		Tin.		Lead.
	I.	II.	III.	I.	II.	I.	II.	
Lead ..	0·003	0·0033	0·0033	0·005	0·003	0·0013	0·0015	
Cadmium	0·001	0·005	0·005	—	—	—	—	—
Iron ..	lost	0·0005	0·0005	0·001	Trace	0·0009	Trace	0·0006
Copper	—	—	—	—	—	0·0012	0·0013	0·0010
Zinc ..	—	—	—	Trace	Trace	—	—	—
Sulphur	—	—	—	—	—	Trace	Trace	—
Insoluble	—	—	—	—	—	0·0024	—	—
Total ..	0·007	0·0088	0·0088	0·006	0·003	0·006	0·003	0·002

A sample of electrolytic zinc costing ten times as much as the above redistilled sample contained 1·3 per cent. of zinc sulphate and about 6 per cent. of zinc hydroxide and water, as well as 0·02 per cent. of insoluble silicate and 0·04 per cent. of metallic impurity.—W. H. P.

Mineral production of Germany in 1911. Board of Trade J., April 11, 1912. [T.R.]

THE "Deutscher Reichsanzeiger" (Berlin) of 26th March publishes a provisional statement of the mineral and metal production of Germany and Luxemburg in 1911, as compared with the figures for the preceding year. The following are the principal items:—

	1910.		1911.	
	Quantity.	Value.	Quantity.	Value.
I. *Minerals*—	Metric tons.	1,000 marks.	Metric tons.	1,000 marks.
Coal	152,827,777	1,526,604	160,747,580	1,572,769
Lignite	69,547,299	178,618	73,760,867	183,357
Asphaltum	81,208	627	81,902	651
Petroleum	145,168	10,146	142,992	10,045
Rock salt	1,424,063	6,440	1,436,492	6,570
Kainit	4,249,667	53,395	4,425,497	57,804
Other raw potash salts	4,062,004	37,962	5,181,379	49,556
Iron ore	28,709,700	106,809	29,879,361	114,531
Zinc ore	718,316	45,185	699,970	49,324
Lead ore	148,497	14,061	140,154	14,132
Copper ore	925,957	23,406	868,600	21,531
Silver ore and gold ore	6,646	640	4,890	518
Manganese ore	80,560	981	87,297	1,048
Pyrites	215,708	2,047	217,459	2,014
II. *Salts from solutions*—				
Sodium chloride	668,980	19,254	645,991	17,825
Potassium chloride	741,259	72,984	838,420	83,409
Magnesium chloride	32,206	668	36,764	776
Sodium sulphate	84,786	2,109	82,664	2,004
Potassium sulphate	84,584	12,561	107,631	16,670
Potassium-magnesium sulphate	37,438	2,807	42,253	3,273
Magnesium sulphate	57,314	941	55,179	951
Aluminium sulphate	58,349	3,642	*	*
III. *Products of reduction works*—				
Pig iron	14,793,601	802,851	15,280,527†	850,511†
Zinc	221,396	99,399	235,776	114,359
Lead, pigs, bars, etc.	159,851	42,012	161,287	44,152
Copper, refined	34,926	42,389	37,452	44,014
Tin	11,394	31,272	12,412	39,496
Sulphuric acid, undistilled‡	1,547,174	41,514	1,464,281†	37,841†
,, distilled	69,162	2,830	70,184	2,780
	Kilogs.		Kilogs.	
Silver	420,003	30,654	439,580	32,133
Gold	4,625	12,919	4,967	13,875
IV. *Products from pig iron*—	Metric tons.		Metric tons.	
Castings, second fusion	2,651,612	474,363	2,722,028†	495,561†
Wrought iron and steel—				
Crude blooms, mill bars and cement steel for sale	26,039	2,873	21,556	2,479
Finished wrought iron products	436,265	65,500	316,842†	46,889†
Cast iron and steel—				
Ingots for sale	708,778	59,680	740,732	64,256
Slabs, billets, etc., for sale	2,262,963	198,749	2,601,606	231,856
Finished cast iron products	9,721,025	1,373,676	10,703,535†	1,510,016†

* Not yet available. † Returns incomplete. ‡ Sulphuric acid from ores only.

Sulphur in metallurgical products; Modification of the method of Arnold and Hardy for the rapid determination of ——. F. Giolitti and M. Marantonio. Rassegna Min., Met., e Chim., 1911, **35**. Chem. Zentr., 1912, **1**, 1250.

Arnold and Hardy's method (Chem. News, 1888, **58**, 41) consists in converting the sulphur into hydrogen sulphide, passing this through a series of vessels containing a solution of lead acetate of known concentration, and noting the number of vessels in which separation of lead sulphide takes place. The authors' modifications consist in using absorption vessels of different shape so that they can be easily cleaned, and in inserting in the train of apparatus a tube or vessel of refractory glass, which is heated to redness in order to decompose organic sulphur compounds which do not react with lead acetate.—A. S.

China; Mineral production and resources of ——. T. T. Read. Trans. Amer. Inst. Min. Eng., March, 1912, 293—343.

The following minerals are dealt with :—coal, iron, gold, silver, copper, nickel, tin, lead, zinc, antimony, quicksilver, arsenic and petroleum. Their sources, methods of production, qualities and markets are briefly described and where possible statistics are given. As regards the most important mineral, coal, a conservative estimate of production is 15,000,000 tons per annum, while Willis' estimate that the anthracite resources are equal to those of Pennsylvania is probably also conservative, but the proportion of bituminous coal to anthracite is smaller in China than in America. The trade in iron produced by native methods is steadily dwindling on account of the unsatisfactory nature of the product. However, pig iron can be produced at a very low cost by modern methods, the Hanyang ironworks being able to sell their product in New York and San Francisco. The Chinese Empire is the greatest producer of antimony—8000 tons of regulus and 2000 tons of ore were shipped from Hunan in 1908—and is a notable producer of tin, accounting for say, 5 per cent. of the world's supply, which proportion is likely to increase with the erection of smelting and mining machinery at the principal group of mines. The production of copper and zinc is already appreciable, that of petroleum is small but shows promise of expansion, while it does not seem that gold, silver, mercury and other metals will benefit so greatly by the introduction of modern methods. A bibliography of 58 works is appended.—B. M. V.

Lead silicates. II. Optical and thermal analysis of the system, $PbO\cdot SiO_2$. Cooper and others. *See* VII.

Oxysulphides of antimony. Quercigh. *See* VII.

Patents.

Iron and steel; Process of purifying ——. B. L. Bonnafoux dit Reyer, Paris. Eng. Pat. 6301, March 13, 1911.

Sufficient pure or nearly pure oxygen to eliminate the impurities without producing superoxygenation is introduced into the molten metal, after the usual blowing and as nearly as possible at the moment of casting.
—W. E. F. P.

Iron and steel; Manufacture of ingot ——. G. Hatton, Brierley Hill, Staffs. Eng. Pat. 16,601, July 19, 1911.

To effect a better separation of the slag and a more thorough mixing of the charge before the final pouring, the molten metal is allowed to settle in the tapping ladle from which it is transferred, free from slag, to a second ladle containing the required metallic alloy or metalloid. The charge is subsequently poured into a third ladle before being finally cast into ingots.—W.E.F.P.

Furnace for reduction or smelting of [*iron*] *ore with electric current.* Aktiebolaget Elektrometall, Stockholm, Sweden. Eng. Pat. 25,862, Nov. 20, 1911. Under Int. Conv., Nov. 25, 1910.

The electrodes or groups of electrodes, in electric shaft furnaces for the smelting of iron ore, are supplied with current from two or more circuits, or with polyphase current, the tensions in the different circuits or phases being regulated independently of each other. A single phase transformer is interposed in the different circuits, so that the terminals of the primary coils are each connected with one phase of a polyphase alternating current system, and the terminals of the secondary coils are each connected with an electrode or groups of electrodes of the furnace. The transformers are so arranged that the tensions in the secondary coils may be regulated by switching in or out any desired number of turns of the primary coils. In an alternative form, one terminal of each secondary coil is connected with an electrode or group of electrodes, the other terminals of the secondary coils being connected with each other, and the tension in each is regulated as before.—B. N.

Iron and steel; Process and high pressure furnace for the direct production of ——. J. Herrmann and C. Otto. Fr. Pat. 435,854, Oct. 31, 1911.

A process in which the ore, mixed with a small proportion of wood or peat, is partly reduced without fusion and then subjected to the action of a descending stream of molten iron in which carbon monoxide is dissolved under pressure. By this means, it is claimed, the reduction is completed, the metal being thus liquated from the gangue of the ore. The reduction is effected in a closed chamber centrally disposed within a vertical casing of refractory material mounted upon hollow trunnions communicating with the heating flues. The reduction chamber is heated externally, the temperature of the middle portion being lower than that of the top but higher than that of the bottom. The upper end of the chamber projects into, and communicates with, an enclosed space or "carbon chamber" charged with coke or charcoal and heated electrically by means of an annular resistance coil; the middle portion is heated by the combustion of producer-gas under pressure in an annular, spiral flue; and the lower part or crucible is heated electrically. For initiating the descending stream of metal, means are provided for the admission of the necessary quantity of ore to the carbon chamber.
—W. E. F. P.

[*Iron and steel.*] *Cementation furnace with vertical muffle for use with solid and gaseous carburising agents simultaneously.* G. Ansaldo Armstrong & Co. Fr. Pat. 435,970, Oct. 28, 1911. Under Int. Conv., Nov. 23, 1910 and Aug. 30, 1911.

To facilitate the introduction and withdrawal of the metal and carburising material, the vertical cementation chamber (or chambers) is provided with a movable cover at each end and is so disposed that both ends project from the body of the furnace. The carburising gas is admitted at the lower end, and, at the conclusion of the operation, the carburised metal is withdrawn from the top, the solid carburising material being discharged at the bottom, of the chamber.—W. E. F. P.

Iron and steel; Process for preparing waste wood of all kinds for the cementation of ——. M. Gräf. Fr. Pat. 436,145, Nov. 10, 1911.

The wood waste (sawdust, etc.) is impregnated with suitable wood-products ("essences") and with a substance known to exert a retarding effect upon the carbonisation of the material.—W. E. F. P.

[*Iron and steel.*] *Oscillating Siemens-Martin furnace.* Ateliers de Constructions Electriques du Nord et de l'Est. Fr. Pat. 436,020, Jan. 11, 1911.

The hearth of the furnace is mounted upon a metal platform, the latter being supported by rollers upon which it is adapted to oscillate about a vertical axis. The flues communicating with the regenerating chambers are attached to the hearth and move with it, connection with the chambers being effected by means of hydraulic joints.
—W. E. F. P.

Metals; Electrolytic deposition of —— particularly upon iron and steel surfaces. P. and Q. Marino, London. Eng. Pat. 22,141, Oct. 7, 1911.

The electrolyte, for electrolytic deposition of gold, silver, platinum, copper, zinc, nickel, etc., or alloys of the same, is prepared by dissolving a salt of the metal, or the salts of the metals constituting the alloy, in an aqueous solution of sodium or potassium glycero-borobenzoate.—B. N.

Iron, steel or other metals; Process for coating articles of ——, with another metal. C. Penner. Fr. Pat. 435,445, Oct. 19, 1911.

Before immersion in a bath of molten metal for the final coating, the articles are treated with various solutions by means of which a preliminary metallic coating is produced upon them. The solutions comprise: (1) mixed chlorides of copper, tin and lead, prepared by the action of hydrochloric acid upon an alloy of these metals in the proportions of 2, 1 and 1, respectively; (2) mixed chlorides of tin and zinc; (3) zinc chloride. The cleaned articles are treated with a mixture of the three solutions or are immersed in the first solution and then in a mixture of the other two. As a means of coating iron and steel articles with copper, claim is made for the use of the first solution only. —W. E. F. P.

Iron or steel; Process for assuring the adherence of copper or copper-alloys to plates of ——, and for soldering the same together. W. G. Clark. Fr. Pat. 435,605, Oct. 24, 1911.

After being coated with copper or copper alloy by electrolytic or other means, the surface of the plate is covered (by immersion or otherwise) with a molten flux consisting of borax, boric anhydride or sodium carbonate, or a mixture of these, and heated to the melting point of the covering metal. The latter, it is claimed, thus becomes soldered to the plate in a continuous layer, the thickness of which may be increased by melting further quantities of the metal upon the flux-protected surface. In soldering such plates together, a layer of the flux is interposed between the coated surfaces, the plates being then heated to the melting point of the covering metal and pressed into contact.—W. E. F. P.

Metals; Process of precipitating and recovering —— from hydro-metallurgical solutions. C. W. Merrill, Berkeley, Cal., U.S.A. Eng. Pat. 2801, Feb. 3, 1911.

See U.S. Pats. 1,006,865 and 1,006,866 of 1911; this J., 1911, 1320. The precipitant may consist of an emulsion of zinc, *e.g.*, zinc fume or dust ground up in a liquid. —T. F. B.

Tungsten and tin; Smelting of ores or other mineral matters containing ——. G. T. Holloway and W. G. Wagner, London. Eng. Pat. 6837, March 18, 1911.

The material is smelted, under reducing conditions, with sodium sulphate and carbonaceous matter in the presence of iron oxide, for the production of metallic tin and sodium tungstate; the latter is subsequently recovered from the slag by solution in water. The process is primarily intended for the treatment of highly ferruginous ores or separated products.—W. E. F. P.

Metal articles; Method of cleaning ——. J. D. Phillips and C. Hambuechen, Madison, Wis., U.S.A. Eng. Pat. 15,715, July 6, 1911.

For removing the tarnish from silver, gold, copper and other articles, the latter are subjected to electrolytic action in a solution of sodium carbonate and chloride whilst in electrical connection with a more electropositive metal such as zinc. The articles, contained in a perforated zinc vessel (in which they are supported by a tinned metal grid soldered to the bottom of the vessel) are lowered into the electrolyte, which is heated and agitated by the injection of steam, and maintained therein until clean. The container and its contents are then removed bodily and plunged into a bath of water similarly heated. —W. E. F. P.

Aluminium and its alloys: Direct nickeling of ——. M. Chirade and J. Canac. Paris. Eng. Pat. 24,019, Oct. 30, 1911.

After being immersed successively in tepid water and a 2 per cent. solution of potassium cyanide, the metal is washed and placed in a scouring bath composed of hydrochloric acid (1 : 1) containing 0·1 per cent. of iron chloride. It is then washed and treated for five minutes in a nickel plating bath, a current of 3 volts being employed. The metal is finally washed with boiling water.—W. E. F. P.

Metals; Treatment of ——. W. H. Kelly, Los Angeles, Cal. U.S. Pat. 1,019,965, March 12, 1912.

Steam is subjected to a temperature above its dissociation point, and the superheated steam containing nascent hydrogen and oxygen at a comparatively low pressure is passed at different points into the mass of molten metal to be treated.—B. N.

Electrostatic separation; Process of ——. H. M. Sutton, W. L. and E. G. Steele, Dallas, Tex. U.S. Pat. 1,020,063, March 12, 1912.

The finely divided material to be separated is fed on to a vibrating table or other support by which a motion forward in a definite direction is imparted to it. A static electric charge is maintained on the table in a direction at right angles to the normal path of the material. This charge varies in strength and is weakest on that side at which the material is fed on the table. The charge causes any susceptible particles of matter in the material treated, to deviate from the normal path, and to move in an inclined path towards that part of the table where the strongest charge is located.—W. H. C.

Vanadium; Process for recovery of ——. B. D. Saklatwalla, Bridgeville, Pa., Assignor to The American Vanadium Co., Pittsburgh, Pa. U.S. Pats. 1,020,224 and 1,020,312, March 12, 1912.

(1) The ore is subjected to the action of a solvent, such as an acid, afterwards neutralising if necessary the excess of acid, and then precipitating the vanadium by means of an oxidising agent, such as an oxy-acid compound of chlorine. (2) Ammonium persulphate is added to the solution, in order to precipitate vanadium oxide free from other metals.—B. N.

(1) *Zinc*, (2) *nickel*, (3) *lead*, (4) *tin, and method of purifying and improving the same.* A. J. Rossi, Niagara Falls. Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pats. 1,020,512 to 1,020,515, Mar. 19, 1912.

Titanium, either alone or alloyed with the metal under treatment, is added to the molten zinc, nickel, lead or tin in such quantity as to ensure the presence of not more than one per cent. of this constituent in the resulting product. —W. E. F. P.

Titanium and lead; Article composed essentially of ——, and method of producing the same. A. J. Rossi, Niagara Falls, Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,020,516, Mar. 19, 1912.

The alloy is prepared by heating either a bath of molten lead and aluminium with which titanium oxide has been previously incorporated, or a mixture of lead oxide, titanium oxide and aluminium, to a temperature sufficient to effect the reduction of the titanium oxide by aluminium. —W. E. F. P.

Titanium and aluminium; Method of producing the binary alloy of ——. A. J. Rossi, Niagara Falls, Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,020,517, Mar. 19, 1912.

The necessary quantity of titanium oxide, alone or mixed with powdered aluminium, is introduced, all at once or in small quantities, into a bath of molten aluminium, the latter being maintained at a temperature sufficient to initiate the alumino-thermic reaction.—W. E. F. P.

Metal from ore or matte; Furnace for obtaining ——. J. J. Anderson, Vancouver, B.C. U.S. Pat. 1,020,531, Mar. 19, 1912.

A SHALLOW combustion chamber is provided at the top with a charging opening into the lower part of which a cone, centrally disposed within the chamber upon a raised horizontal base, extends so as to restrict the opening. The charge, thus distributed upon the sides of the cone and upon the ledge at the base of the latter, is subjected to the action of a reducing blast projected horizontally from tuyères at the sides of the chamber.—W. E. F. P.

Ores; Process of smelting —— and apparatus therefor. R. Fleming, Westfield, N.J. U.S. Pat. 1,020,546, March 19, 1912.

A CHARGE, comprising an oxidised ore, which in the manufacture of ferro-metals is an iron ore, and carbonaceous reducing material, is passed downward through a vertical furnace chamber, of the blast-furnace type, provided with a constricted portion. At the latter part a heating current is passed transversely through the material, from a number of electrodes connected with a source of polyphase current. The electrodes are spaced apart so as to be out of direct contact with the charge, but are "arranged to allow the building up of false electrodes of limited length from products of the charge."—B. N.

Alloy; Metallic ——. G. Hartmann, San Francisco, and R. J. Busch, Los Angeles, Cal. U.S. Pat. 1,020,757, Mar. 19, 1912.

CLAIM is made for an alloy containing 15·5 per cent. of aluminium, 7 of antimony, 9 of bismuth, 0·25 of vanadium, 2·25 of magnesium and 66 of tin. The vanadium is melted in a covered graphite crucible, the bismuth, aluminium, antimony and magnesium being successively added in the order named, each addition being followed by a thorough stirring. The charge is then covered with powdered charcoal, the tin is added, and the whole is maintained at a uniform temperature until it assumes an orange colour, when the scum and charcoal are removed and the alloy poured.—W. E. F. P.

Ores; Process for roasting finely divided ——. J. Gayley. Fr. Pat. 435,405, Oct. 18, 1911. Under Int. Conv., June 8, 1911.

A MIXTURE of the ore with carbonaceous material is disposed in a continuous layer upon an endless band provided with a perforated bottom and adapted to travel over an open suction chamber. The mixture is progressively ignited from above by a flame impinging transversely upon it at a point immediately above one end of the suction chamber, the passage of the conveyor over the latter being so regulated that the down-draught produced through the material by the suction serves to accelerate the combustion of the mixture and also to cool the roasted product.
—W. E. F. P.

Furnace; Electric —— with heating by radiation, designed more particularly for the fusion of metals. J. M. Bocuze. Fr. Pat. 435,493, Oct. 14, 1911.

THE crucible, which is arranged within the furnace, receives a movement of rotation, and is heated by pairs of electrodes which penetrate through apertures in the furnace body, the ends of the electrodes being between the crucible and the walls of the furnace. By means of an eccentric, the electrodes may be given an up-and-down vertical movement along the length of the crucible, so that their position may be regulated. A cover is provided for the crucible, which retains the latter in its position on the support, during the time that the furnace is given a tilting movement when the metal is to be poured.—B. N.

Furnace; Electrometallurgical —— with electrodes. J. Westly. Fr. Pat. 435,941, Nov. 4, 1911. Under Int. Conv., Nov. 5, 1910.

THE furnace comprises a bath provided with hollows in the ends of the base in which the molten metal collects, the hollows being separated by a bridge, and both the bridge and the molten metal are covered by melted slag. The electrodes are arranged above the hollows of molten metal, but dip down for a short distance only below the slag, the bath being heated by the resistance offered by the slag to the passage of the current. The charge is fed through openings in which the electrodes are placed, so that the latter are continually surrounded by solid material.—B. N.

Tin; Electrolytic refining of —— applicable to any conducting material containing tin. G. Michaud and E. Delasson. Fr. Pat. 435,936, Nov. 4, 1911.

THE electrolyte is prepared by dissolving stannous chloride in water, and acidulating with sulphuric acid until the hydroxide is just dissolved, one per cent. each of magnesium chloride and boric acid being then added. The tin to be refined is supported as the anode in a basket in the upper part of the bath, and immediately above the sheet of copper acting as the cathode, which is countersunk in asphaltum in the bottom of the bath. The tin, deposited in crystals on the copper, is continually removed by a scraper into troughs arranged at each end of the bath. The latter is also in connection with a second vessel containing scrap tin, and by circulating the electrolyte by means of a pump, the saturation of the liquid may be maintained.—B. N.

Flue dust; Process for the briquetting of ——. Deutsch-Luxemburgische Bergwerks- und Hütten-A.G. Ger. Pat. 243,549, June 17, 1909.

THE flue-dust is mixed with a binding agent, such as manganese dioxide or "roll cinder" which gives off oxygen on heating, and the mixture is heated very quickly to the requisite temperature (about 800° C.)—A. S.

Copper; Process for improving —— by alloying. W. Borchers and O. Barth. Ger. Pat. 243,663, July 22, 1911.

COPPER is alloyed with cobalt and tin in such proportions that the products have a composition within the limits:—copper, 80; cobalt, 8; and tin, 12 per cent.; and copper, 95; cobalt, 2; and tin, 3 per cent. The alloys have a high resistance to chemical influences and also good mechanical properties with respect to filing, boring, turning, etc.—A. S.

Ores of iron; Process for treating pulverulent ——. Soc. Anon. des Ciments Portland Artificiels de Buda, Haren, Belgium. Eng. Pat. 9901, April 24, 1911. Under Int. Conv., April 23, 1910.

SEE Fr. Pat. 428,366 of 1911; this J., 1911, 1166.—T. F. B.

Iron, steel, and steel alloys; Case hardening processes for articles of ——. Soc. Anon. Italiana Gio. Ansaldo Armstrong & Co., Genova, Italy. Eng. Pat. 22,778, Oct. 16, 1911. Under Int. Conv., Oct. 17, 1910.

SEE Fr. Pat. 434,443 of 1911; this J., 1912, 341.—T. F. B.

Martin-Siemens furnace; Tilting ——. Atel. de Constructions Electriques du Nord et de l'Est, Paris. Eng. Pat. 637, Jan. 9, 1912. Under Int. Conv., Jan. 11, 1911.

SEE Fr. Pat. 436,020 of 1911; preceding.—T. F. B.

Roasting furnaces; Muffled ——. H. M. Ridge, London. Eng. Pat. 3981, Feb. 16, 1911. Under Int. Conv., July 1, 1910.

SEE Fr. Pat. 426,647 of 1911; this J., 1911, 962.—T. F. B.

Zinc; Furnace for extracting ——. O. Schneemilch, Wilhelminehütte, Germany. Eng. Pat. 18,008, Aug. 8, 1911.

SEE U.S. Pat. 1,009,863 of 1911; this J., 1912, 31.—T.F.B.

Aluminium foil; Production of ——. E. R. Lauber and R. V. Neher, Emmishofen, Switzerland. Eng. Pat. 21,157, Sept. 25, 1911. Under Int. Conv., July 7, 1911.

SEE Fr. Pat. 434,400 of 1911; this J., 1912. 288.—T. F. B.

Anticorrosive alloy or metallic compound. G. Jacquier, Belgravia, Transvaal. U.S. Pat. 1,019,963, March 12, 1912.

SEE Eng. Pat. 20,601 of 1910; this J., 1911, 494.—T. F. B.

Electrolysis of metallic solutions. F. Lacroix, Paris. U.S. Pat. 1,019,969, March 12, 1912.

SEE Fr. Pat. 400,262 of 1909; this J., 1909, 990.—T. F. B.

Electroplating apparatus. T. R. Canning, Birmingham. U.S. Pat. 1,020,262, March 12, 1912.

SEE Eng. Pat. 18,695 of 1910; this J., 1911, 553.—T. F. B.

Sulphide ores, etc.; Process of treating and subsequently separating ——. E. J. Horwood, Broken Hill, N.S.W. U.S. Pat. 1,020,353, March 12, 1912.

SEE Fr. Pat. 399,272 of 1909; this J., 1909, 942.—T. F. B.

Sulphide ores; Process of smelting ——. A. Haggenmiller, Tarica, Peru. U.S. Pat. 1,021,096, March 26, 1912.

SEE Eng. Pat. 9958 of 1909; this J., 1910, 1063.—T. F. B.

Ores; Apparatus for roasting and sintering ——. A. S. Dwight, New York, Assignor to Dwight and Lloyd Metallurgical Co., Jersey City, N.J. U.S. Pat. 1,021,509, March 26, 1912.

SEE Eng. Pat. 25,985 of 1907; this J., 1908, 1024.—T.F.B.

Arrangement for protecting tanks or receivers for corrosive liquids. Fr. Pat. 435,463. *See* I.

Preparing coke suitable for use in zinc distillation. Ger. Pat. 243,141. *See* IIA.

Utility of the mercury cathode, especially for the analytical separation of metals. Baumann *See* XXIII.

XI.—ELECTRO-CHEMISTRY.

PATENTS.

Accumulators; Manufacture of [electrodes for] electrical ——. P. Marino, London. Eng. Pat. 23,265, Oct. 21, 1911.

LEAD oleate is dissolved in turpentine, benzene or carbon bisulphide, sufficient to form a semi-fluid solution, and a carbon-containing organic body or bodies, equal in amount to the quantity of lead oleate, is added. The aluminium grids or supports, for use in electrical accumulators, are coated with the mixture, and the grids then heated to dull redness. A second composition is prepared by taking equal parts of guttapercha and indiarubber, and melting this with Syrian asphaltum, in the proportion of 8 per cent. of the weight of the former, under the action of heat in a drying oil, impalpable lead powder being then added until the mixture acquires the consistence of a syrup. The mixture, whilst warm, is applied to the grid, and when dry forms an acid-resisting but electrically conductive coating.—B. N.

Battery; Alkaline ——. W. Morrison, Des Moines, Iowa. U.S. Pat. 1,020,568, March 19, 1912.

THE positive pole electrode, for reversible alkaline batteries, comprises a conductor or support, and a mechanically-applied intimate mixture of finely divided compounds, such as oxides, of copper, silver and mercury on the support, the proportion of mercury oxide in the mixture being relatively large.—B. N.

Furnace; [Electric] Induction ——. R. Fleming, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,020,688, March 19, 1912.

THE furnace comprises a magnetic core, with a charge-receiving chamber in the form of an annular crucible, the contents of which form the secondary. The primary winding is placed around one limb of the core in inductive proximity below the crucible, and is movable along the core toward or away from the crucible. The winding is carried by a support fixed to a lever, which also carries a counter-weight, so that the relative position of the elements may be automatically varied, in accordance with the variations in the resistance of the charge in the crucible.
—B. N.

Metallic salts; Electrolysis of aqueous solutions of ——. Siemens und Halske A.-G. Fr. Pat. 435,890, Nov. 2, 1911. Under Int. Conv., Nov. 3, 1910.

THE circulation of the mercury cathode, employed in the electrolysis of solutions of metallic salts, is obtained by calorific effects. The mercury may be disposed in a ring closed hydrostatically, *e.g.*, in a conduit connecting the two sides of the element, the mercury being heated in the neighbourhood where it enters the conduit, or cooled where it leaves.—B. N.

Induction-furnace; Electric ——. J. H. Reid, Newark, N.J., Assignor to G. Goodwin, Ottawa. U.S. Pat. 1,021,478, March 26, 1912.

SEE Fr. Pat. 425,720 of 1911; this J., 1911, 962.—T. F. B.

New compound applicable as a heat-insulating material and for other purposes. Eng. Pat. 28,667. *See* IX.

XII.—FATS; OILS; WAXES.

Copra; Analysis of ——. W. Hoepfner and H. Burmeister. Chem.-Zeit., 1912, **36**, 333—334.

FOR the purpose of obtaining a representative sample at least one kilo. of the copra is broken into small pieces and an average portion of this is rasped down, the fine material being collected in a glass or porcelain vessel. Moisture is estimated by mixing 5 grms. with freshly ignited sand in a nickel basin and heating for two hours at 60° C., the mixture being occasionally stirred. The percentage of oil is determined by placing 5 grms. of the raspings in a 150 c.c. Erlenmeyer flask and adding thereto 50 c.c. of a mixture in equal parts of ether and low-boiling petroleum spirit. After being thoroughly shaken up, the solvent is poured off from the copra through a small folded filter paper into a 150 c.c. graduated flask and the residue re-extracted with solvent. The operation is repeated until the copra is free from fat and after washing the filter paper, the flask is filled to the graduation mark and the contents thoroughly mixed. A little calcium chloride is added to absorb any water extracted along with the fat and after standing overnight an aliquot portion of the solution is drawn off with a pipette and run into a small weighed flask, from which the solvent is removed by heating in a water-bath to 60° C. and drawing a current of air through. The heating is continued until no odour of solvent is detectable, when the flask is cooled and weighed after the fat has solidified.
—J. A.

Olive oil. G. Sani. Atti R. Accad. dei Lincei, Roma, 1912, 21, I., 364—367.

IF olive oil as it comes from the press be mixed with a saturated solution of sodium chloride and after some time centrifugalised, a clear pale-coloured oil is obtained directly, rendering unnecessary the usual long process of settling and clarifying, during which the quality of the oil may be depreciated by the action of the suspended impurities. The author also discusses the formation of free fatty acids in olive oil. Of a sample of sound ripe olives collected on Nov. 17, 1911, one-half was preserved in a refrigerator, and the remainder under ordinary conditions. After different periods, oil was prepared from test-samples and the acid value determined. In the case of the olives kept in a refrigerator, the acid value remained fairly constant between 1 and 1·5, whilst in the case of the olives kept under ordinary conditions, the oil prepared on Nov. 18, 1911, had the acid value, 1·02; that prepared on Dec. 15, 1911, 9·2; on Jan. 15, 1912, 21·32; and on Feb. 10, 1912, 32·05. Olives dried rapidly after collecting and kept in a dry place for three months, furnished oil of good quality, having an acid value of 1·32.—A. S.

Castor oil as lubricant. Times Eng. Suppl., 1912, April 3 1912, 21.

The use of castor oil as a lubricant is coming into favour again. The revival of the oil is due to the difficulties of lubrication in internal combustion engines, in which cylinder distortion has made the use of a peculiar "Bramah-leather" type of brass piston ring essential. The lubrication of this could be made adequate only by the most viscous of oils. There are other reasons, connected with the non-miscibility of castor oil and petrol for that particular engine, but castor oil is of value in all bearings and in small quantities in the engine. The chief adulterant is sugar, detected by the castor oil turning brown when heated. The chief requirements to be complied with by a good castor oil are:—(*a*) that it shall be free from sugar and water white; (*b*) have a specific gravity at 60° F. of 0·964—0·968; (c) an acidity value of not more than 0·3 per cent. of potassium hydroxide; (*d*) a sample of the oil, placed in a flat dish to a depth of $\frac{1}{8}$—$\frac{1}{4}$ in., and heated for one hour at a constant temperatore of 215° C. (420° F.) must not darken in colour appreciably.

Oils; Deodourisation and removal of acidity from ——. A. Diedrichs. Z. Untersuch. Nahr. Genussm., 1912, **23**, 208—212.

Samples of sesamé oil, some of which were previously nearly neutralised, were subjected to the action of superheated steam, which was subsequently condensed by means of a vacuum pump. The results obtained with 6 samples of the nearly neutral oil and 45 samples of oil not previously treated are tabulated. The previously partially neutralised oils were all completely deodourised at the end of the steaming, but the untreated oils, although deodourised, still retained a strong bitter after-taste, which was not present in the neutralised samples. In neutralised oils only about 0·1 per cent. of free acid (as oleic acid) was expelled by the steam, as compared with 0·5 to 1·0 per cent. in the case of the other oils. In the latter the ratio of fatty acid to neutral fat in the fraction blown off was about 90 : 10, whilst in the neutralised samples the proportion was reversed. The degree of removal of acidity was found to depend upon:—(1) the concentration of the free fatty acids and their components; (2) the temperature; (3) the properties and amount of superheated steam; and (4), under certain circumstances, upon the amount of the vacuum. During the first 3 or 4 hours the acidity is only slowly reduced, but subsequently the reduction is accelerated in an almost uniform manner.—C. A. M.

Glycerides; Solubility of —— *in alcohol and acetic acid.* [*Detection of cocoanut oil in lard.*] Hoton. Bull. Soc. Chim. Belg., 1912, **26**, 70—71.

On treating one part by volume of a glyceride with two parts of acetic acid, two phases are formed, *viz.*, a glyceride-acid and an acid-glyceride phase. If the glyceride is coloured, the colouring matter will pass into the acid-glyceride phase. When mixtures of cocoanut oil and lard are extracted twice with acetic acid, the glyceride-acid phase of the first extraction increases with the rise in the proportion of lard, but diminishes in the second extraction. The successive extracts also differ in character and may be classified into two groups, *viz.*: (1) butter and cocoanut oil, in the case of which the refractive indices of the first extracts are lower than those of the original fat, whereas those of the second extracts are higher; and (2) fats the refractive indices of the extracts of which are lower in the case of the second extract than of the first. In this way it is possible to detect the presence of 5 per cent. of cocoanut oil in lard, since the mixture gives a first extract in which the refractive index is lower (instead of higher) than in the case of pure lard. It has also been found possible to detect 1 per cent. of cocoanut oil in lard by means of successive extractions of the fat with 95 per cent. alcohol.—C. A. M.

Fatty acids; Separation of ——. S. Fachini and W. Dorta. Chem. Rev. Fett-Ind., 1912, **19**, 77—79.

In extension of their earlier work (this J., 1910, 1065) the authors suggest the use of 90 per cent. acetone as a means of separating liquid from solid fatty acids, since the potassium salts of the latter are insoluble in this medium at the ordinary temperature, the corresponding salts of the liquid acids being completely soluble. The results obtained are similar to those given by the lead-salt ether method. It is also possible to effect a separation of solid acids of high molecular weight from those of lower molecular weight by fractional crystallisation from this medium, but the results are only of a qualitative nature. —J. A.

Oils; Colour reactions of —— *bleached by "Lucidol."* Utz. Chem. Rev. Fett-Ind., 1912, **19**, 70—72.

Oils which have been bleached by "Lucidol" (benzoyl peroxide) do not respond readily to many of the colour reactions which are used for the detection of particular oils or else the colour is diminished or considerably altered. Amongst the tests affected are the Baudouin test for sesamé oil and the Becchi and Halphen tests for cottonseed oil.—J. A.

Beeswax: Analysis of ——. [*Abyssinian beeswax*]. A. Lejeune. Bull. Soc. Chim. Belg., 1912, **26**, 77—85.

After giving an outline of the general methods of analysis the author describes the composition of six samples of pure beeswax exported from Abyssinia. These gave the following average results:—Sp. gr. at 15° C., 0·964; sp. gr. at 100° C., 0·820; m. pt., 64° C.; foreign bodies, 0·15 per cent.; acid value, 21·70; saponification value, 94·20; ester value, 72·50; and ratio, 3·34. These values differ considerably from those published by Berg, who found the ratio to vary from 3·83 to 4·03.—C. A. M.

National Insurance Act, 1911: Liability of oil seed crushers and oil refiners. Board of Trade J., April 18, 1912. [T.R.]

In pursuance of Regulations made by the Board of Trade and dated 26th day of March, 1912, notice is hereby given that the Umpire (Unemployment Insurance) has received applications for decisions as to whether contributions are payable or not in respect of the following classes of workmen:—

Fitters, Joiners, Smiths, Bricklayers and their Labourers employed solely in the work necessary to the erecting, driving and upkeep of plant and machinery, used in the mills, and in the upkeep of the premises of a firm whose business is that of *Seed Crushers, Oil Cake Manufacturers, and Oil Refiners.*

Any representations with reference to the above may be made in writing to the Umpire, by, or on behalf of any workman or employer appearing to him to be interested, or on behalf of the Board of Trade, and forwarded to the Registrar, Office of the Umpire, 47, Victoria Street, London, S.W., on or before the 11th day of May, 1912. Notice is further given that the Umpire proposes to give his decision on the above applications on or after the 13th day of May next.

Extract from Regulations.

3. If before the date specified in the notice any representations with reference to the application are made in writing to the Umpire by or on behalf of any workman or employer appearing to him to be interested, or the

Board of Trade, the Umpire shall take those representations into his consideration, and the Umpire may at any time before the said date require any persons to supply to him such information in writing as he thinks necessary for the purpose of enabling him to give a decision.

All such representations and information shall be open to inspection by any employer or workman appearing to the Umpire to be interested or any persons authorised in that behalf by any such employer or workman or the Board of Trade.

4. Any persons claiming to be interested may apply to the Umpire to be heard by him orally in reference to any application under these Regulations, and the Umpire may, in any case in which he thinks it desirable, require the attendance of any person before him to give oral information on the subject of any application.

Oils and fats; Imports of —— into the United Kingdom. Times Finan. Suppl., April 10, 1912. [T.R.]

The following table shows the quantity (in tons) and value of the imports of oil seeds, oils, and fats into the United Kingdom in recent years:—

Hydrogenisation of unsaturated fatty acids, their glycerides and other esters; Process for the ——. F. Bedford and C. E. Williams, Sleaford. Eng. Pat. 29,612, Dec. 20, 1910.

Unsaturated fatty acids or their glycerides or other esters, or suitably purified oils containing them, are converted into the saturated compounds by treatment with hydrogen, water-gas, or other gas containing hydrogen, in presence of heated finely divided metallic oxide, the gas being applied under a low pressure. Nickel oxide has been found to be the most effective for the purpose, an addition of 0·5 to 1 per cent. to the oil being generally sufficient. The gas containing hydrogen is freed from injurious substances (compare Eng. Pat. 3752 of 1910; this J., 1910, 1396). *Example.*—A stream of electrolytic hydrogen is passed through purified oleic acid, heated to about 255° C., to which has been added one per cent. of finely divided nickel oxide; the product consists of stearic acid together with amounts of hydroxy-stearic acids depending on the amount of oxygen present in the hydrogen.—T. F. B.

—	Quantities (tons).			Values.		
	Three years 1906-08.	Three years 1909-11.	1911.	Three years 1906-08.	Three years 1909-11.	1911.
Oil seeds, etc.—				£	£	£
Cotton seed	1,999,840	1,888,567	596,959	12,747,679	13,346,625	4,328,675
Linseed	1,000,445	799,673	213,927	11,979,249	12,986,445	4,728,536
Rape seed	92,329	108,964	40,634	1,099,321	1,136,200	431,376
Soya beans	228,156	982,531	222,657	2,645,928	7,236,859	1,652,383
Castor beans		197,862	64,957		2,176,482	775,532
Other seeds		—	52,586		—	564,252
Total seeds	3,320,770	3,977,540	1,221,714	28,472,177	36,882,611	12,480,754
Nuts and kernels	184,976	266,128	101,000	2,976,253	5,202,175	2,100,000
Total, oil materials	3,505,746	4,213,668	1,322,714	31,448,430	42,084,786	14,580,754
Oils—						
Palm, crude	202,490	269,387	81,536	4,950,640	7,726,554	2,474,320
Cocoanut, crude	62,434	79,402	27,298	1,876,286	2,767,107	1,001,227
Linseed, pure	27,102	86,025	28,847	792,747	2,913,603	1,170,165
Do., not pure	3,600	3,287	381	71,348	69,173	13,301
Rape seed	29,507	33,429	8,408	833,756	901,274	246,193
Cotton seed, crude	5,100	5,278	3,557	106,192	140,862	98,129
Olive, crude	22,090	15,385	4,223	850,629	742,546	200,619
Cocoa butter	1,176	810	370	150,235	83,368	35,890
Other oils	16,789	32,076	12,526	515,305	1,060,349	440,334
Total, vegetable oils	370,288	525,079	167,146	10,147,138	16,404,836	5,680,178
Whale, seal, and fish oils	82,931	133,840	56,282	1,607,185	2,817,115	1,252,663
Tallow	254,536	343,149	110,183	9,312,407	11,225,692	3,671,248
Totals, industrial oils and fats	707,755	1,002,068	333,611	21,066,730	30,447,643	10,040,089
Refined oils and other food fats—						
Palm oil	5,803	11,448	5,577	158,874	421,445	223,677
Cocoanut oil	26,223	63,307	29,442	866,156	2,711,509	1,259,083
Cottonseed oil	40,361	55,419	21,419	1,017,579	1,758,766	713,925
Olive oil	15,016	14,159	4,136	768,949	1,159,756	296,824
Lard, genuine	300,099	251,791	81,138	13,260,348	13,629,858	4,257,758
Do., imitation	32,364	34,038	9,173	1,073,384	1,403,261	366,908
Oleo oil	58,211	72,483	25,000	2,630,931	3,650,937	1,256,[illegible]00
Margarine	140,023	146,675	47,220	7,038,685	7,640,306	2,461,325
Butter	637,911	634,565	215,147	69,959,044	71,520,523	24,602,111
Totals, food fats and oils	1,256,016	1,283,885	438,252	96,763,950	103,896,361	35,425,611
Oil cake	1,022,417	983,284	337,425	6,616,732	6,198,307	1,958,309
Grand total, oil materials, oils, food fats, and oil cake	6,591,934	7,512,905	2,432,002	155,895,842	182,627,097	62,004,763

Patents.

Fats; Process for decolourising ——. A. M. D. Ricard. Fr. Pat. 435,934, Oct. 31, 1911.

The fats are bleached, without previous neutralisation, by heating them with, *e.g.*, infusorial earth, alumina, silica, animal or vegetable charcoal, and a "destructive agent," *e.g.* calcium chloride, zinc chloride, sulphuric acid, phosphoric acid or phosphoric anhydride, at a suitable temperature.—G. W. McD.

Fatty acids of the series, $C_nH_{2n-4}O_2$, from oils containing glycerides of the corresponding fatty acids of the oleic series; Process for preparing unsaturated ——. F. Hoffmann-La Roche und Co. Ger. Pat. 243,582, July 20, 1909.

The oils mentioned are saturated with bromine at low temperatures, the bromine is removed by heating under pressure with alcoholic potash or soda, and the crude acids of the stearolic group are freed from oily impurities by conversion into their alkali salts, and finally recrystallised from alcohol or other suitable solvent. The crude stearolic acids may also be purified by adding magnesium salts to their alcoholic-ammoniacal solutions, to separate the solid impurities, and the oily impurities are then removed by mechanical pressing alone.—T. F. B.

Detergent composition intended more particularly for use in washing with sea water. C. Reisdorff and L. Soulier, Oran, Algeria. Eng. Pat. 6161, March 11, 1911. Under Int. Conv., March 11, 1910.

See Fr. Pat. 414,964 of 1910; this J., 1910, 1117. In the first formula, "Si" should be read as silica, whilst the organic compounds added are methylene blue, cineol, and dextrin.—T. F. B.

Emulsions from aqueous solutions of soaps; Process for preparing ——. F. Kripke G. m. b. H. Ger. Pat. 242,301, March 2, 1911. Addition to Ger. Pat. 236,254, July 1, 1909.

In the process described in the principal patent (this J., 1911, 1072) the soap solutions may be replaced by solutions of soluble salts of pure fatty acids or mixtures of these salts.—T. F. B.

Fats or fatty substances; Method of separating the solid constituents from the liquid constituents of ——. F. Winterstein and S. Nitsch, Pressburg, Austria-Hungary. U.S. Pat. 1,020,673, March 19, 1912.

See Ger. Pat. 226,137 of 1909; this J., 1911, 36.—T. F. B.

Soap; Process for the manufacture of ——. F. J. Lothammer, London. Eng. Pat. 5786, March 8, 1911.

See Fr. Pat. 432,025 of 1911; this J., 1912, 33.—T. F. B.

Preparation of elastic products and substitutes for resins. Fr. Pat. 435,650. *See* XIII.

Disinfectant substances [*soaps*]. U.S. Pat. 1,020,624. *See* XIXb.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Patents.

Elastic products and substitutes for resins; Process for the preparation of ——. L. Turcat and G. Nuth. Fr. Pat. 435,650, Dec. 30, 1910.

Bodies of varying elasticity are produced by the action of ammonia or amines (or substances which easily evolve these compounds) on the products of reaction of halogenated derivatives of sulphur and fatty oils. The reactions are carried out by heating in an autoclave. —G. W. McD.

Condensation products of phenols and formaldehyde. Knoll und Co., Ludwigshafen on Rhine, Germany. Eng. Pat. 6430, March 14, 1911. Under Int. Conv., March 14, 1910.

See Addition of March 14, 1911, to Fr. Pat. 397,051 of 1908; this J., 1911, 1125.—T. F. B.

Phenolic condensation product and method of preparing same. J. W. Aylsworth, East Orange, Assignor to F. L. Dyer, Montclair, N.J. U.S. Pats. 1,020,593 and 1,020,594, March 12, 1912.

See Eng. Pat. 3496 of 1911; this J., 1912, 347.—T. F. B.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Caoutchouc; Determination of —— *as tetrabromide.* Utz. Gummi-Zeit., 1912, 26, 968—970.

Present methods of determining the percentage of bromine in caoutchouc tetrabromide tend to give too high or too low results. The author has applied the method of Baubigny and Chavanne for estimating halogens in organic compounds (see this J., 1903, 761, 1018; 1904, 136). The tetrabromide from 0·1 grm. of rubber is placed in a flask into which a glass connection is ground as in a Drechsel wash-bottle. One tube passes to the bottom of the flask and serves to blow air through the apparatus. The other tube is sealed to an absorption apparatus similar to a potash bulb. The glass joint is moistened with sulphuric acid. The bromide is oxidised by carefully and slowly warming to 135—140° C. in an oil-bath with an oxidation mixture consisting of 40 c.c. of sulphuric acid (sp. gr. 1·84) which has been warmed with 1—1·5 grms. of silver nitrate and again with 4—8 grms. of powdered potassium bichromate till all has dissolved, and then cooled. The absorption bulbs have been filled with 30 c.c. of a mixture of equal parts of cold saturated sodium sulphite solution and 15 per cent. solution of caustic soda. Potassium iodide was not found to be successful as an absorbent. After the reaction is over, air is bubbled through the apparatus till all the bromine has been expelled from the flask. The absorption apparatus is then emptied into an Erlenmeyer flask and washed three or four times with distilled water. The alkaline liquid is strongly acidified with nitric acid and heated till no more sulphur dioxide is evolved, when 20 c.c. of *N*/5 silver nitrate are added. The excess of silver is titrated with *N*/5 ammonium thiocyanate using ferric alum as indicator. Four experiments, which agreed excellently, gave a mean of 70·17 per cent. of bromine in a sample of tetrabromide prepared from purified rubber, the calculated value being 70·14 per cent. Higher values were obtained after longer than 6 hours bromination of the rubber. Using this method of bromine estimation, almost theoretical values were obtained working with a bromide obtained by aqueous bromination of rubber, washing the precipitate with alcohol and ether and purifying by solution in chloroform and precipitation by petroleum spirit. This suggests that further work on Hübener's method (this J., 1909, 909) may be desirable using this method of bromine estimation, since the later critics of the method have used a fusion method of bromine estimation which may give too high results.—H. E. P.

Patents.

Waste rubber; Recovering or/and utilising ——. W. E. W. Richards, London. Eng. Pat. 28,489, Dec. 7, 1910.

A mixture of subdivided waste rubber and asbestos is heated and agitated in a mixing and heating machine before moulding and before adding sulphur; the mass is heated to a temperature (usually 300° C.) sufficient to melt the rubber. Sulphur may be mixed with the fused mass which may then be moulded and vulcanised. In this case the mixture may be raised to vulcanising temperature while in the machine under agitation; the mass when vulcanised may be removed and pressed in hot moulds. The rubber may be dissolved and separated from the fused mass of waste rubber with asbestos (or with mineral wool or ammonium chloride or like heat-resisting material).—H. E. P.

Rubber regeneration. R. G. East, Wimbledon. Eng. Pat. 5349, Mar. 3, 1911.

A process and apparatus are claimed in which disintegrated rubber is uniformly heated throughout its whole mass and then compressed prior to moulding. The disintegrated rubber may be passed through a heated feed chamber, such as a steam-jacketed hopper in which it is subjected to agitation. The moulding may be effected after the above operations at a higher temperature. Under 100° C. is mentioned as a suitable heating temperature and 285°—270° C. as a suitable compressing temperature.—H. E. P.

Rubber; Regeneration of waste ——. Moore Architectural and Engineering Co. Fr. Pat. 434,841, Sept. 30, 1911.

A regenerating apparatus comprises a vessel containing waste rubber and a regenerating solution, means for passing an electric current through the solution first in one direction and then in the other, an envelope open at the end disposed within the vessel and a conveyor within the envelope to feed in material and to remove it.—H. E. P.

Rubber ; Process for transforming old —— into a regenerated substance of industrial value. H. Carroll. Fr. Pat. 435,809, Jan. 7, 1911.

The rubber is treated at about 125° C. with crude vaseline, whereby the free sulphur is eliminated as hydrogen sulphide, and a small amount of vaseline becomes incorporated with the rubber. The excess of vaseline is removed by washing with light petroleum.—G. W. McD.

Artificial rubber and the like ; Production of ——. J. S. Campbell, Isleworth. Eng. Pat. 5395, Mar. 3, 1911.

Seaweed (with or without other vegetable matter) is boiled in ammonia, and is then heated and agitated with oil and a glutinous or resilient binding material and a vulcanising substance. A preservative may be added such as wood or bark extract, with or without tannic acid and potassium bichromate and with or without certain powdered fillers. Pontianac gum or jelutong is mentioned as a glutinous or resilient body, and naphtha, rosin oil or terpene oil as an oil. A filler may also be made by boiling seaweed in ammonia and oil.—H. E. P.

Rubber, rubber substitute, celluloid, etc. ; Filler for ——. T. D. Kelly, Southend-on-Sea. Eng. Pat. 5712, Mar. 7, 1911.

Bleached and washed clay, and flint stones (or sand) are each burnt and ground, and the two powders are mixed to produce a substitute for zinc oxide, etc., as a filler. —H. E. P.

Rubber waste ; Apparatus for reclaiming ——. F. W. Golby, London. From The Moore Architectural and Engineering Co., Akron, Ohio, U.S.A. Eng. Pat. 21,566, Sept. 30, 1911.

See Fr. Pat. 434,841 of 1911 ; preceding.—T. F. B.

Isoprene and other hydrocarbons suitable for conversion into caoutchouc substances ; Production of ——. K. Gottlob, Prague-Vysocan, Austria. Eng. Pat. 18,431, Aug. 15, 1911. Under Int. Conv., Aug. 30, 1910.

See Fr. Pat 433,322 of 1911 ; this J., 1912, 151.—T. F. B.

Process for producing isoprene. Fr. Pat. 435,312. *See* XX

XV.—LEATHER ; BONE ; HORN ; GLUE.

Tanning extracts ; Process for decolourising and clarifying —— ; also for clarifying extracts for dyeing. Lepetit, Dollfus and Gansser. Sealed Note No. 1213, dated Oct. 26, 1910, and Report thereon by R. Geigy. Bull. Soc. Ind. Mulhouse, 1912, **82**, 69—70.

The natural impurities in the decoctions and extracts are precipitated by addition of resin soap solution together with finely divided barium (or lead) sulphate to accelerate the precipitation. This process, due to E. Tagliani, has been used by the authors on the large scale since 1900. Twenty litres of soap solution (15 kilos. of colophony and 15 kilos. of sodium hydroxide solution, 20° Bé., to 250 litres of water) and 1700 grms. of barium sulphate paste (80 per cent.) are added, with stirring, to 1000 litres of chestnut wood decoction (2½°—3½° Bé.) previously cooled to 25°—30° C., and the mixture allowed to settle. Precipitation is complete in an hour, the clear liquid is drawn off for concentration, and the deposit pressed in a filter press. The extract thus obtained is of a paler colour than those purified with blood, etc. Logwood, quebracho and oak decoctions are similarly treated. Better results still can be obtained by first adding a little lead nitrate solution and then ¾ of the above proportions of soap solution and barium sulphate. The process can be applied to ordinary chestnut extract and the following quantities are given for 1000 kilos. of extract (28° Bé.) :—66 kilos. of barium sulphate paste, 14 kilos. of resin and 14 kilos. of sodium hydroxide (20° Bé.) with 170 litres of water ; followed by 2 kilos. of sulphuric acid (66° Bé.) mixed with 2 litres of water, to restore the original acidity. Precipitation is complete in 24 hours ; the clear extract obtained (density, 25° Bé.) is soluble in cold water and nearly equal to that obtained by treating the decoction. R. Geigy in reporting on the method, states that it is useful for coloured tannins such as chestnut, quebracho, etc., though larger quantities of reagents than those given are required for a good clarification. The process is not suitable for extracts containing tannins yielding gallic acid.—A. Sbld.

Patents.

Unhairing hides and skins ; Process of ——. L. Stern, Newark, N.J. U.S. Pat. 1,019,854, March 12, 1912.

The hair or other surface covering of hides or skins is made brittle by submitting it to the action of intense cold by the application of liquid air or other liquefied gases. In this condition the hair may be broken away from the skin by slight agitation.—D. J. L.

Artificial leather, jointing or packing material or the like ; Production of ——. J. S. Campbell, Isleworth. Eng. Pat. 5396, March 3, 1911.

Seaweed, with or without addition of other vegetable matter, is boiled with ammonia, then mixed with fibrous material, powdered filling material, and a glutinous or resinous binder, and the whole agitated in a heated condition with or without subsequent pressure and complete or partial vulcanisation. Mineral or vegetable oil may also be added and wood or bark extract. *Example :* 5 cwt. of seaweed are boiled to form a jelly with 1 gallon of ammonia (sp. gr. 0·880), and is then introduced into an agitating machine where it is agitated under the action of heat. A small quantity of chromates may then be added, and afterwards, in succession, 1 gallon of mineral or vegetable oil, such as naphtha, rosin or terpene oil, 1 cwt. of hair or other fibrous material, and a mixture of powdered materials of the following composition : magnesia 25 per cent., prepared chalk 6·5, lime 2·5, antimony sulphide 3·5, zinc oxide 3·5, whitening 5, and sulphur 3·5 per cent. on the weight of the seaweed. After mixing, 0·85 per cent. of wood or bark extract with or without a small quantity of tannin and an equal weight of potassium bichromate are added, and the whole is then mixed with 25 per cent. of a resinous gum such as pontianac gum, jelutong, gutta percha or reclaimed rubber waste and after heating till nearly all the moisture is removed, the material is calendered and rolled to the required thickness. The material is finally heated under pressure to vulcanise it partially or wholly.—D. J. L.

Casein ; Process for the treatment of —— to obtain material for the manufacture of sheets, etc., of great tenacity. F. Lebreil and R. Desgeorge. Fr. Pat. 435,239, Dec. 19, 1910.

The casein is brought into a plastic state and is then treated with an acid or acid salt (*e.g.*, 0·2 per cent. of nitric acid), or other substance capable of inducing the formation of a ferment in the casein. The fermented casein is made into blocks, or other required forms, and rendered insoluble by formalin or any other agent.—G. W. McD.

Tanning process. Chemisch-Technologische Studienges. m. b. H., Hersfeld, Germany. Eng. Pat. 7091, March 21, 1911. Under Int. Conv., March 21, 1910.

See Fr. Pat. 427,614 of 1911 ; this J., 1911, 1129.—T. F. B.

Chrome salts from leather, leather scrap or offal ; Processes for the removal and recovery of ——. H. A. Voedisch and P. Kreismann, Brantford, Ont., Canada. Eng. Pat. 9462, April 18, 1911.

See Fr. Pat. 428,711 of 1911 ; this J., 1911, 1174.—T. F. B

Glove-leather and process of preparing it. E. Simon, Dresden, Assignor to L. Grässer, Zwickau, Germany. U.S. Pat. 1,021,380, March 26, 1912.

See Fr. Pat. 405,167 of 1909 ; this J., 1910, 227.—T. F. B.

Glue and the like; The finishing or drying of ——. H. Schimmel, Gross Lichterfelde, Germany. Eng. Pat. 12,887, May 29, 1911. Under Int. Conv., May 31, 1910.

See Ger. Pat. 232,715 of 1910; this J., 1911, 638.—T. F. B.

Tanning and rendering impermeable vegetable or animal fibres. Fr. Pat. 435,577. *See* VI.

XVI.—SOILS; FERTILISERS.

Humic acids. B. Tacke and H. Süchting. Landw. Jahrbb., 1911, **41**, 717—754. Chem. Zentr., 1912, **1**, 939—941.

A large amount of experimental evidence is brought forward in favour of the view that humic acids have a definite acid character independent of their colloidal properties. In presence of a given quantity of water, the amount of phosphoric acid liberated or rendered soluble from tricalcium phosphate by peat moss is greater the greater the quantity of the phosphate in relation to that of the peat. An alteration of the surface of the colloidal peat substance has no influence on the conversion of the tertiary phosphate into soluble compounds, and no evidence can be obtained of any effect due to the colloidal nature of the peat on the reaction between peat and tricalcium phosphate. A neutral colloid, such as starch, is unable to produce soluble phosphoric acid from tricalcium phosphate. Peat liberates considerable quantities of acetic acid from acetates, whereas starch and cellulose do not. Peat is also capable of liberating small quantities of oxalic acid from calcium oxalate, and of decomposing ferric chloride solutions; the extent of the decomposition increases with decreasing concentration of the solution, nearly the whole of the iron being precipitated from $N/1000$ solution. In all these cases the colloidal nature of the peat appears to play no part. On the other hand the adsorption of iron from colloidal ferric hydroxide solution by peat appears to be connected with the colloidal character of the latter, for it is diminished by rise of temperature and by reduction of the surface of the peat. Gelatin (a neutral colloid) adsorbs considerably less iron than peat does from ferric hydroxide sol: from a $N/2$ sol it adsorbs water but no iron. The very low electrical conductivity of peat moss is not a proof of the absence of acids, for other organic acids, sparingly soluble in water, also show low electrical conductivity. The formation of a blue colouration with a mixture of potassium iodide and iodate and starch paste is not a property of neutral colloids but only of substances of an acid character. This reaction is given by *Sphagnum acutifolium*, *Hylocomium Schreberi*, *Cladonia rangiferina var. alpestris*, stalks of *Trifolium hybridum*, stearic acid, humic acid, and peat moss. Colloid substances appear to play no part in this reaction, for the "acidity" of the plants and soils examined was not increased by washing them with water so as to remove some of the bases present as adsorption compounds. Peat moss is capable of inverting sucrose and of developing hydrogen on treatment with iron; this latter reaction is prevented almost completely by saturating the peat acids with calcium carbonate.—A. S.

Nitrogen compounds; Transformations of —— in different soils. H. Fischer. Landw. Jahrbb., 1911, **41**, 755—822. Chem. Zentr., 1912, **1**, 941—942.

Nitrification of ammonium sulphate.—Different soils show not only different nitrifying powers, but the progress of the nitrification is different. In a somewhat heavy soil nitrification proceeds more rapidly than in a quite light sandy soil. In a light sandy soil nitrification is increased by addition of lime, a much larger addition than that requisite theoretically for the nitrification of the ammonia present giving the best results; but even with a relatively large addition of lime the nitrification is much less than in soils of good nitrifying power. In good soils fixation of nitrogen takes place *pari passu* with the better nitrification, but in light sandy soils, there is considerable loss of nitrogen, especially after addition of lime.

Decomposition of an organic nitrogenous fertiliser (blood meal).—Experiments indicated that no sharp biological distinction can be drawn between production of ammonia from an organic nitrogenous substance and nitrification. The two processes take place simultaneously, at least in normal soils, where the conditions are different from those prevailing in water cultures, and where especially the nitro-bacteria are most resistant to external influences (soluble carbohydrates, large additions of ammonium compounds, products of putrefaction, etc.). The production of ammonia from blood meal was more intense in light sandy soils than in heavier soils, and this seemed to exert a favourable influence on nitrification, especially in soils in which nitrification of ammonium sulphate occurred only to a small extent or not at all. With regard to the production of ammonia from organic nitrogenous substances, a soil which had been manured for three years with sodium nitrate was superior to the same soil after treatment with ammonium sulphate for the same period, and also to the untreated soil.

Denitrification.—No denitrification was observed in soils to which the normal quantity of nitrogen was supplied in the form of sodium nitrate. Denitrification, however, set in, especially in light sandy soil, and to a lesser extent in better soils, when blood meal was used as a nitrogenous fertiliser. Of three specimens of the same soil, one which had been manured for three years with sodium nitrate was most active with respect to denitrification, whilst one which had been manured with ammonium sulphate for the same period was more active than the untreated soil. The losses of nitrogen by denitrification after addition of organic nitrogenous fertilisers are not so large as the losses of ammonia-nitrogen after treatment with lime. The organic matter of the soil tends to prevent loss of ammonia by volatilisation.—A. S.

Determination of phosphoric acid in presence of colloidal silicic acid. Mélikoff and Becaia. *See* XXIII.

Nicotine as an insecticide. Times, April 1, 1912. [T.R.]

In a series of tobacco growing experiments carried out at Wye College, the yield of nicotine per acre during 1911 in several instances exceeded 150 lb. per acre; it is estimated that a yield of 100 to 120 lb. per acre will be necessary to supply farmers with nicotine at prices which they can afford, viz., not more than one-third of the present prices. The Treasury has agreed to sanction the manufacture and sale of nicotine solutions, providing a suitable denaturant is found, and has also agreed, subject to the same conditions, to admit tobacco extract free of duty provided it is denatured at the point of entry or in bond. A mixture of sulphur and copper sulphate is suggested as a suitable denaturant.

Patents.

Fertiliser; Process of making ——. S. B. Newberry and H. N. Barrett, Baybridge, Ohio. U.S. Pat. 1,020,153, March 12, 1912.

Natural calcium phosphate is dissolved in hydrochloric acid, the solution filtered, and to the liquid is added the amount of sulphuric acid necessary to precipitate, as calcium sulphate, the lime present as carbonate and approximately one-third of the lime present as phosphate in the raw material. The calcium sulphate is filtered off, and the solution evaporated to dryness, the residue of dicalcium phosphate being gently heated and the hydrochloric acid recovered by condensation.—B. N.

Parasiticide for plants. G. Grether, Koblenz, Germany. U.S. Pat. 1,021,095, March 26, 1912.

See Ger. Pat. 240,285 of 1910; this J., 1912, 142.—T. F. B.

XVII.—SUGARS; STARCHES; GUMS.

Raffinose in raw [beet] sugars; Determination of ——. F. Strohmer and O. Fallada. Oesterr.-Ungar. Zeits. Zuckerind. u. Landw., 1911, 40, 867—888.

On determining the raffinose in certain raw sugars, and then in the molasses adhering to them, it was found that the raffinose content of the molasses, calculated from the results found for the raw sugar, did not agree with the value actually obtained, although exactly the same process was employed in both cases. Experiments were therefore made with (*a*) affination syrups, and (*b*) mixtures of sucrose and affination syrups in definite proportions. In the case of the affination syrups, it was found that variable results for the raffinose content are obtainable according to the procedure followed, the ordinary Herzfeld method giving the highest and the Andrlik-Stanek modification, in which the direct reading is taken in an acid medium, the lowest, the differences being 0·22—0·58 per cent. With the mixtures of affination syrups and sucrose in known proportions, it was observed that in order to obtain correct results, account must be taken of two sources of error: (1) the use of an insufficient amount of acid for the hydrolysis of the impure product, and (2) the application of an incorrect concentration constant, the same one having been used as for the raw sugar, although less sucrose was present. On adopting the constant 132·03 for the concentration of 6·512 grms. per 100 c.c., and adding 6·5 c.c. of hydrochloric acid, as recommended by Koydl for impure products, a satisfactory agreement was obtained between the found and calculated results in the case of the sucrose as well as in that of the raffinose values. The authors also studied the influence of non-sugar substances on the determination of raffinose in raw sugars by the Herzfeld inversion method by using mixtures of sucrose with different amounts of non-sugar substances obtained by fermenting molasses and affination syrups and eliminating the alcohol and yeast. From the experiments it is shown that the influence of the non-sugars in the small amount occurring in raw sugars upon the determination of the raffinose is inappreciable and within the limit of experimental error.—J. P. O.

Sugar solutions; Determination of the percentage content of ——, from the values found by the table of the Kaiserliche Normal-Eichungs-Kommission. O. Schrefeld. Z. Ver. deut. Zuckerind., 1912, 312—318.

Although the table for the determination of the true density and Brix value of sucrose solutions drawn up by the Kaiserliche Normal-Eichungs-Kommission in 1900 has been officially accepted by the International Congress of Applied Chemistry, the International Commission for Uniform Methods of Sugar Analysis, and the German sugar trade chemists generally, it has not been adopted by the majority of the chemists engaged in sugar manufacture in Germany, who still adhere to the Brix tables constructed by Balling in 1839. The reason of this is that it is always necessary to convert the apparent density figure, as found by the spindle, the pycnometer, or the Westphal balance, into the true density, for which alone the tables give correct values. Either the formulæ given by Kohlrausch, or the correction tables of Landolt and Börnstein, may be used for this purpose, or again the true density may be found from the apparent by means of the following equation, deduced by the author from those already in use: D^{20}_{4} = Apparent density × 0·997035+0·0012. Attention is now, however, called to a set of new tables constructed by Domke in which the true density and the corresponding Brix value can be directly found from the apparent density as given by the spindle, pycnometer, or Westphal balance, without any calculation.—J. P. O.

Aldoses from ketoses; Distinguishing ——. M. Betti. Gaz. chim. ital., 1912, 42, I., 288—294.

β-Naphtholbenzylamine, $(C_{10}H_6{\cdot}OH)(C_6H_5)CH{\cdot}NH_2$, combines with aldoses to form well-defined crystalline compounds of the aldehyde-amine type, but has no action on ketoses. The compounds with *d*-mannose, $C_{17}H_{13}ON:C_6H_{12}O_5$ (white needles, m. pt. 207°—208° C. with decomposition), *d*-galactose (small prisms, m. pt. 206° C. with decomposition), *d*-glucose (white silky needles, m. pt. 192° C. with decomposition), and rhamnose, $C_{17}H_{13}ON:C_6H_{12}O_4$ (m. pt. 192° C. with decomposition) are described. The reagent may be used for the separation of dextrose and lævulose. An aqueous alcoholic solution containing 0·9 grm. of each of the sugars was added to a warm alcoholic solution of 2·5 grms. of β-naphtholbenzylamine, and after 24 hours the solution was allowed to evaporate in a dish. The crystals which separated were triturated with water, thrown on a filter, and further washed on the filter. The aqueous solution contained the lævulose. From the crystals after drying and washing with petroleum spirit, the dextrose can be recovered by treatment with dilute hydrochloric acid.—A. S.

Honey; Quantity of formic acid in ——. H. Fincke. Z. Unters. Nahr. Genussm., 1912, 23, 255—267.

Honey does not always contain formic acid, many of the samples examined by the author being free from this constituent. At the same time, the greater part of the samples contained a volatile acid which reduced mercuric chloride, the quantity of the acid present varying from 0·003 to 0·02 per cent. (calculated as formic acid). This acid occurred partly in the free state and partly in the form of salts; esters of formic acid could not be detected. It is also shown that small quantities of formic acid are obtained when invert sugar is distilled in a current of steam, the quantity formed depending on the acidity of the solution. When sucrose is inverted by means of enzymes, the resulting invert sugar does not yield formic acid on distillation. The samples of honey considered to be free from formic acid did not yield larger quantities of volatile acid than were obtained from corresponding amounts of invert sugar.—W. P. S.

Starch; Saccharification of —— by dilute acids. A. Fernbach and M. Schön. Bull. Soc. Chim., 1912, 11, 303—308.

The authors have confirmed the statement of several earlier investigators that maltose is formed during the saccharification of starch by acids. The maltose was isolated, as osazone, from the products formed on heating starch at 120° C. for an hour with dilute solutions of hydrochloric, sulphuric, oxalic and tartaric acids. There is no reason to consider that the acid saccharification of starch proceeds differently from the diastatic saccharification, at least, during its earlier stages.—J. H. L.

Use of maize starch in writing papers. Wrede. *See* V.

Patents.

(1) *Sugar-dryer.* (2) *Sugar-drying machine.* W. H. Hannam and W. E. Murray, Assignors to Western Sugar Refining Co., San Francisco, Cal. U.S. Pats. 1,019,958 and 1,019,959, Mar. 12, 1912.

(1) The apparatus consists of an upper drying chamber provided with a discharge outlet, and a lower, hot air chamber. The dividing floor between them is pierced by a number of transverse, slanting slots through which hot air, pumped into the lower chamber, escapes into the higher one. The sugar on entering the upper chamber is delivered on to this floor, and dried by the jets of hot air issuing through it. (2) The lower, hot air chamber has a screen-covering, on to which the sugar is fed, and through which the hot air escapes into the upper chamber. The sugar is made to travel along the screen cover towards the discharge end of the machine by a continuous moving band carrying cross-pieces or drags.—J. H. L.

Sugar; Process of refining ——. H. Wiese, Wallaceburg, Ontario. U.S. Pat. 1,021,173, Mar. 26, 1912.

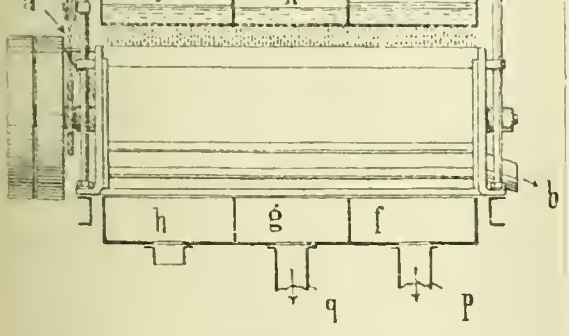
Successive "drafts" of sugar juice or syrup are concentrated and grained at 72°—80° C. in a vacuum pan to a degree of less than 94 per cent. of dry substance. The concentration of the whole mass is then continued under increased vacuum and at a lower temperature, until the limit of natural circulation is reached. The concentration is then further continued by mechanically agitating the mass, and the latter is further cooled and agitated until a dry substance-content of 94 - 96·5 per cent. is attained, all these operations being performed in the vacuum pan.—L.E.

Sugar cane ; Process and apparatus for treating ——, *the new product obtained thereby, and its uses.* E. Disdier. Fr. Pat. 436,131, Nov. 9, 1911.

The cane is cut into thin slices at an inclination of, say, less than 25° to its axis. The apparatus used includes a vertical circular plate mounted on a rotatable shaft, and provided with radial slits which begin at a certain distance from the centre and extend to the circumference ; one side of the plate carries radial knives. A hopper consisting of two vertical, lateral walls and a third wall inclined at an acute angle to the plate, is so fixed in relation to the plate that there is a narrow opening between the lower edge of the inclined wall and the surface of the plate. The cane is placed in the hopper and is cut by the rotating knives, the slices pass to the other side of the plate through the slits in the latter, whilst a thin strip of uncut rind passing through the narrow opening mentioned above, tends to draw the cane down and thus insures contact between it and the plate. The slices may be sent to the diffusion battery at once, but the process is chiefly advantageous in that the slices, unlike ordinary cane chips, can be dried rapidly at a relatively low temperature without decomposition of the sugar. The dried slices keep very well and may be sent to a beet sugar factory, the beetroot diffusion juice from one battery being used to extract the sugar from the cane slices in a second battery. The bagasse is very suitable for paper-making, or, mixed with molasses, it serves as fodder. Again, the dried slices may be used for the manufacture of spirit, etc., or they may be ground and pressed into cakes to be used as fodder. —L. E.

Amylaceous material ; Process and apparatus for washing ground ——. Jahn-Kommanditges. Maschinenbau-Anstalt, Eisengiesserei und Kesselschmiede. Fr. Pat. 435,567, Oct. 23, 1911.

The apparatus includes two washing vessels with perforated bottoms. The fresh supply of ground material enters the lower vessel through the pipe, *a*, and, having been partly freed from starch, leaves this vessel by the outlet, *b*. The material is then further ground, and introduced into the upper vessel through the pipe, *c*, being completely freed from starch by the time that it reaches the outlet, *d*. Under the lower vessel is a trough divided into three compartments, *f*, *g*, *h* ; under the upper vessel is a trough divided into three compartments, *i*, *k*, *l*, and provided with a perforated bottom ; at the top of the upper compartment is a perforated plate, *e*, and a trough divided into two compartments, *n*, *o*, provided with a perforated bottom. Fresh water is introduced through *e*, descends through the zone, *e*, *i*, *f*, taking up starch from the material ; the starch suspension is pumped from *f* to *n*, from whence it descends through the zone, *n*, *k*, *g*, and is pumped from *g* to *o*, whence it descends through the zone *o*, *l*, *h*. The suspension of high starch-content that collects in *h*, is withdrawn for further treatment.—L. E.



Sugar ; Process of purifying ——. J. Ost, Buenos Aires. U.S. Pat. 1,020,219, March 12, 1912.

See Eng. Pat. 25,860 of 1906 ; this J., 1908, 32.—T. F. B.

XVIII.—FERMENTATION INDUSTRIES.

Hops ; Determination of hard and total soft resins in ——. H. V. Tartar and C. E. Bradley. J. Ind. Eng. Chem., 1912, 4, 209—212.

The authors have carried out a comparative study of the following methods in use for determining the hard and soft resins of hops :—Briant and Meacham's (this J., 1897, 702), Siller's (this J., 1909, 1056), Lintner's volumetric method (this J., 1899, 178) and a modification of the last differing from it only in that the hops are ground before extraction. A gravimetric method is also described, the details of which are as follows :—10 grms. of hops are extracted with ether for 8—10 hours in a Soxhlet apparatus, and the filtered extract is made up to 200 c.c., of which 100 c.c. are used for the determination of total resins and the remainder for that of soft resins. In the former case the 100 c.c. are distilled until most of the ether has been removed. The residue is dried completely in a vacuum desiccator at ordinary temperatures and then extracted with alcohol. The extract is filtered from wax and made up to 100 c.c., of which 20 c.c. are evaporated and dried to constant weight in a tared beaker in a vacuum oven at 50° C. The residue represents the total resins in 1 grm. of hops. In determining the soft resins 100 c.c. of ethereal extract are taken to dryness exactly as before. The residue is well worked up in about 100 c.c. of petroleum ether (boiling at 40°—45° C.) with a glass rod, and allowed to stand for a short time to ensure complete solution of the soft resins. After filtering from the hard resins the petroleum spirit extract is distilled and taken to dryness in a similar manner to the ethereal extract. The residue is taken up with alcohol and an aliquot part of the filtered alcoholic extract is evaporated in a tared beaker exactly as in determining the total resins. Great care should be taken to secure petroleum ether of the right quality ; the authors started with a commercial product boiling at 40°—60° C. and distilled twice, collecting the portion passing over below 45° C. each time. The following results were obtained in analysing a sample of Oregon hops by the methods named ; they are fairly typical of a number of similar comparative tests :—

Method.	Total resin.	Soft resin.	Hard resin.
	Per cent.	Per cent.	Per cent.
Briant aad Meacham's	19·96	8·59	11·37
Siller's	22·89	20·96	1·93
The Authors'	19·08	17·29	1·79
Lintner's original	—	6·80	—
,, modified	—	18·00	—

In Siller's method the hops are ground before extraction and the high results obtained are due to the extraction of material from the ground hop-seeds. Although unground hop-seeds give no appreciable amount of extract with petroleum ether or ordinary ether, the ground seeds yield about 25 per cent. of their substance to these solvents. Siller's method was no doubt worked out with seedless continental hops and consequently this point did not arise. The proportion of total resins in the individual cones of a sample of hops may vary by more than 6 per cent. of the weight of the cones; and between duplicate 10 grm. samples differences of 0·5—0·75 in the percentage of total resins commonly occur. The determination of total and soft resins should always be made on the same sample. Lintner's modified volumetric method appears to be the best for the rapid determination of soft resins for commercial purposes. Gravimetric and volumetric determinations made on aliquot portions of the same solution of soft resins show that the volumetric method often gives somewhat higher results than the gravimetric, perhaps owing to the choice of molecular weights for making the calculation in the former case.—J. H. L.

Yeast fermentation; Contribution to the knowledge of ——. II. H. Euler and H. Bäckström. Z. physiol. Chem. 1912, **77**, 394—401. (See also this J., 1911, 824, 1274).

THE authors found that although sodium hexosephosphate alone is not fermented by living yeast, it accelerates the fermentation of dextrose by the latter. For example, 20 c.c. of 20 per cent. dextrose solution, containing 0·5 grm. of the hexosephosphate, were treated with 0·25 grm. of pressed yeast; the volume of carbon dioxide evolved in 8 hours was about twice that in a blank experiment without the hexosephosphate. No considerable hydrolysis of the hexosephosphate into phosphates precipitable by magnesium mixture occurred during fermentation. The authors also confirmed an observation made by Harden and Young, that dried yeast, after thorough washing with water, does not ferment dextrose even on addition of hexosephosphate, whereas it does on addition of the wash-liquors. The hexosephosphate is therefore not a co-enzyme in the sense of Harden and Young.—J. H. L.

Volatile acids; Formation of —— by yeast after fermentation with access of air. A. Osterwalder. Zentr. Bakter. u. Parasitenk., II. Abt., 1912. **32**, 481—498. Chem. Zentr., 1912, **1**, 1128.

AFTER fermentation with a pure culture of yeast, with access of air, there begins on and in the lees, fresh growth of the yeast, a flocculent or smooth film of new yeast being formed. Under similar conditions with fruit and grape wines in small vessels, in the course of 4—5 months at the ordinary temperature, up to about 0·18 per cent. of volatile acids (reckoned as acetic acid) is formed; the greater portion of the volatile acids is formed after fermentation has ceased. This formation of volatile acids varies according to the race of yeast used; it does not appear to be due to simple oxidation of the alcohol, but seems to be connected with the renewed growth of the yeast after the fermentation has ceased.—A. S.

Alcohol; Method for detecting small quantities of —— in fermenting liquids, and some results obtained therewith. A. Klöcker. Comptes rend. Trav. Lab. Carlsberg, 1911, **10**, 99—113.

BY the following modification of a test employed by Hansen and by Pasteur, it is possible to detect as little as 0·002 or sometimes 0·001 per cent. of alcohol in nutrient liquids such as yeast-water or wort. Five c.c. of the liquid are introduced into a test-tube, 18 cm. by 2·4 cm. fitted with a cork through which passes a glass tube of length 80 cm. and external diameter 3 mm. The lower end of the tube extends only to the bottom of the cork. The test-tube is fixed vertically over a piece of wire gauze and is heated by a small flame. To promote regular ebullition a small spiral of thin copper wire may be placed in the test-tube, and frothing may be diminished by addition of three drops of strong nitric acid. The presence of alcohol in the liquid is shown by the formation of drops of a highly characteristic, oily, appearance (tears) in the tube. The higher these drops appear in the tube the smaller is the quantity of alcohol present. This reaction is not shown by any substance, except alcohol, likely to be present in fermenting liquids. By applying it the author has found that wort or yeast-water, when exposed to air which is also in contact with alcoholic liquids, absorbs traces of alcohol. Yeast-water appears to develop minute traces of alcohol spontaneously on storage for several weeks. A number of organisms, including *Oidium lactis* and Hansen's *Saccharomyces membranæfaciens*, which have been regarded as incapable of alcoholic fermentation, were found by the author to produce small quantities of alcohol.—J. H. L.

Saccharification of starch by dilute acids. Fernbach and Schön. *See* XVII.

PATENTS.

Malt-extract containing lecithin; Process for manufacturing ——. U. Patz, M. and G. Patermann and P. Bergell, Berlin. Eng. Pat. 23 613, Oct. 25, 1911.

FRESHLY prepared lecithin, mixed with an equal quantity of glycerin, is added to a larger quantity (*e.g.*, from 5 to 10 parts) of malt extract of such water-content that the resulting mixture has a gravity not less than 38° Bé. The glycerin protects the lecithin against decomposition by the water present.—J. H. L.

Filtering or straining presses [for hops]. A. G. Hupfel, New York. Eng. Pat. 23,829, Oct. 27, 1911.

THE claim is for the addition of an annular sleeve, forming a feeding device, to a rotary cylindrical press. In order to decrease friction and wear, the sleeve bears against the lateral face, only, of a flange, on the rotary press. A deflector plate is mounted on the rotary drum or press to prevent the accumulation of material within the sleeve. —W. H. C.

Yeast; Process for manufacturing dried ——. P. D. H. Ohlhaver, Sande, Germany. U.S. Pat. 1,020,306, Mar. 12, 1912.

FRESH yeast is submitted to a process of maturation by treating it for a sufficient time with aerated water which may contain also starch or other carbohydrates, and is then dried.—J. H. L.

Microbes and ferments; Apparatus for preparing pure cultures of ——. F. d'Herelle. Fr. Pat. 435,373, Oct. 17, 1911. Under Int. Conv., Oct. 20, 1910.

THE apparatus includes an upper sterilising vessel and a lower culture vessel. Near the bottom of the sterilising vessel is a perforated tube connected by valved pipes with an external air-filter, and with a steam-pipe. An outlet pipe from the upper part of the sterilising vessel communicates with the upper of two chambers constituting a water-seal, and, by a valved branch pipe, with a small air-filter; the latter is provided with an annular space into which steam can be injected in order to sterilise the cotton-wool. The chambers constituting the water-seal communicate by a pipe leading from the bottom of the upper chamber through the top, and nearly to the bottom of the lower one; the lower end of this pipe is immersed in water or in an antiseptic solution. The lower chamber is fitted at the top with an air-outlet, and at the bottom with a cock for discharging the water or antiseptic solution. Air or vapour leaving the sterilising vessel must pass through the water-seal, whilst air entering the sterilising vessel must be introduced through the small air-filter and valved branch pipe. The culture vessel is provided with appliances similar to those with which the sterilising vessel is fitted. Communication between the two vessels is made by a pipe fitted with two cocks; the portion of the pipe between the cocks communicates with a steam-pipe fitted with a cock, and may thus be sterilised when necessary, a device being also provided for the automatic removal of water that collects in this portion of the pipe during sterilisation. The pipe through which the contents of the culture vessel are discharged is similarly fitted, and in this case, the portion of the pipe between the two cocks also serves as a sampling vessel: this discharge pipe, the upper end of which projects above the bottom of the vessel, may be moved up or down, so that the quantity of liquid left in the culture vessel may be varied.—L. E.

Brewing; Process for coating the interior surface of iron fermentation vats, storage vessels, and cooling backs, employed in ——. H. Friedmann. Fr. Pat. 435,717, Oct. 13, 1911.

The vessel is coated internally with a metallic powder (*e.g.*, silver-, aluminium-, or magnesium powder) suspended in a solution of inert material such as resins. The coating is distinguished by its hardness, firmness, and elasticity.—L. E.

Alcohol; Processes and apparatus for preparing and extracting —— from any suitable material. H. Cornette and L. Faucheux. Fr. Pat. 435,911, Jan. 9, 1911.

Any suitable saccharine material, *e.g.*, beetroot cossettes, is treated in a special vessel with water acidified with sulphuric acid to a degree corresponding to 1—2 per cent. of the sugar. The mixture is pitched with yeast, stirred, and left to ferment; the liquid is then withdrawn and used for pitching a fresh charge of cossettes in a second vessel and so on. The cells of the residual cossettes contain alcohol in place of the sugar originally present. To extract this alcohol, steam is injected into a number of the vessels successively; the first vessel of the series contains nearly exhausted cossettes whilst the last contains the cossettes of maximum alcohol-content. The special vessel in which the process is executed may be barrel-shaped and mounted so as to be rotatable about a fixed horizontal shaft.—L. E.

Yeast; Manufacture of pressed ——. J. Effront, Brussels, and A. Boidin, Seclin, France. Eng. Pat. 19,379, Aug. 30, 1911. Under Int. Conv., Feb. 15, 1912.

See Fr. Pat. 433,119 of 1911; this J., 1912, 146.—T. F. B.

Distilling apparatus [for worts]. H. A. Kuester. Fr. Pat. 434,585, Sept. 26, 1911.

See Ger. Pats. 242,734 and 242,735 of 1910; this J., 1912. 354.—T. F. B.

Evaporation, concentration, desulphitation, and distillation in vacuo of liquids. Addition to Fr. Pat. 424,990. *See* I.

XIXA.—FOODS.

Wheaten flour; Studies on ——. *I. Influence of the concentration of hydrogen ions on the baking properties of flour.* H. Jessen-Hansen. Comptes rend. Trav. Lab. Carlsberg, 1911. 10. 170—206.

A large number of parallel baking tests were carried out, the effect of addition of different quantities of acid to the dough being studied in particular. The concentration of hydrogen ions was found not by titration but by determinations of electric conductivity and also colourimetrically (see Sörensen, this J., 1909, 950). The following conclusions are drawn: For dough prepared from wheaten flour there is a certain optimum concentration of hydrogen ions, in presence of which the best results are obtained on baking, and this concentration is rather higher than that of dough prepared from freshly ground flour and distilled water or fresh milk. It corresponds approximately to $p_{\overset{+}{H}}=5$ (*i.e.*, to a concentration of hydrogen ions $10^{-5}N$, see Sörensen, *loc. cit.*) but differs somewhat according to the quality of the flour, being higher for superior qualities and lower for commoner kinds. The flour from the central portion of the wheat-grain possesses a greater acidity (measured colourimetrically or electrometrically) than that from the outer layers. The various means for improving flour which have been recommended in recent years have scarcely any other effect than to increase the concentration of hydrogen ions in the dough. The separation of gluten from flour by washing is valueless as an analytical method for determining the baking value of the flour.—J. H. L.

Molasses fodder; Analysis of ——. L. Ledoux. Bull. Soc. Chim. Belg., 1912, 26, 70.

In determining the proteins in molasses fodder by Kjeldahl's method, the amino-compounds in the molasses are included as proteins. It is therefore necessary to precipitate the proteins with copper hydroxide by Stutzer's method, and only to determine the nitrogen in the precipitate as protein nitrogen. Determinations by the two methods show considerable differences. There are serious errors possible in the official (Belgian) method of determining carbohydrates, the extraction being incomplete and the polarimetric determination by Clerget's method being inaccurate. The carbohydrates may be quantitatively extracted by drying 50 grms. of the sample completely at 100° C. and then powdering and sifting it. A given weight (1 grm.) is boiled for 15 minutes with 20 c.c. of water, and the extract subsequently decanted. This treatment is repeated five or six times, and the united extracts are inverted with hydrochloric acid, defecated with lead acetate, and the dextrose determined gravimetrically with Fehling's solution. Other methods of extraction do not effect complete removal of the carbohydrates. —C. A. M.

Solubility of glycerides in alcohol and acetic acid. [Detection of cocoanut oil in lard.] Hoton. *See* XII.

Patents.

Milk and other liquids; Process and apparatus for sterilising ——. C. de Bock, Zele, Belgium. Eng. Pat. 5456, March 4, 1911.

The liquid is introduced into containers arranged in an autoclave and is subjected to pressure during the whole of the heating and subsequent cooling processes. The filling of the containers is effected through a series of tubes connected with a liquid reservoir, the tubes being fitted to a device attached to the neck of each container. This device consists of a closing arrangement comprising a piston and means for lowering the same while the containers are being filled and heated; a spring placed below the piston causes the latter to rise and hermetically close the container at the end of the sterilising process.—W. P. S.

Milk and cream; Treatment of —— [to prevent separation of cream] F. G. Lecomte, Bidirt, France. Eng. Pat. 7233, March 23, 1911.

To render milk homogeneous and to prevent the cream from rising, it is heated to 70° C. and a solution of powdered agar-agar in water or milk is added, about 3 grms. of agar-agar being used for every litre of milk. The powdered agar-agar may also be added directly to the milk. Cream may be treated similarly.—W. P. S.

Milk; Process and apparatus for testing the freshness of ——. Vereinigte Lausitzer Glaswerke Akt.-Ges. Fr. Pat. 436,019, Nov. 6, 1911.

Fifty c.c. of the milk are mixed in a bottle with 1 c.c. of a reagent prepared by diluting 0·1 c.c. of a saturated alcoholic solution of methylene blue with 70 c.c. of water and then adding 30 c.c. of alcohol. The mixture is maintained at a temperature of about 37° C. and exposed to the light. Should the milk not be fresh, the colour of the mixture is discharged within 30 minutes. The bottle may be provided with a small side tube in which is placed a quantity of the original milk for the purpose of comparison. (See also Eng. Pat. 26,264 of 1910; this J., 1912, 42.)—W. P. S.

Nutritive material for both animal and vegetable life; Manufacture of ——. M. S. Greenbaum, Chicago. U.S. Pat. 1,020,091, March 12, 1912.

Any nutritive material, including cereals and their by-products, is mixed with liquid distillery slop which has been concentrated to a syrupy consistence; the more solid portion of the distillery slop is then added, the mixture is boiled, mixed thoroughly, and deprived of its excess of moisture.—W. P. S.

Yeast ; Process of increasing the raising power of dried [bakers'] ——. P. D. H. Ohlhaver, Sande, Germany. U.S. Pat. 1,021,700, Mar. 26, 1912.

Thin layers of the yeast are exposed to the action of air artificially saturated with moisture, for sufficient time to cause re-hydration of the cells.—L. E.

Alimentary pastes ; Process for drying ——. F. Chateau. Fr. Pat. 435,427, Dec. 23, 1910.

Food materials in the form of pastes may be dried by placing them upon corrugated paper arranged in layers in compartments of a chamber through which a current of air is circulated. The layers of paper may be supported on boards, and, in the case of materials like macaroni, the paste may be hung from rods between vertical sheets of the paper.—W. P. S.

Desiccating process [milk, etc.]. P. Bévenot, Paris, and E. de Neveu, Asnières, France. U.S. Pat. 1,020,632, March 19, 1912.

See Fr. Pat. 372,581 of 1906 ; this J., 1907, 631.—T. F. B.

Wheat ; Treatment of germ of ——. J. Wallis, Assignor to J. and T. H. Wallis, Ltd., Beddington. U.S. Pat. 1,021,119, March 26, 1912.

See Eng. Pat. 12,432 of 1910 ; this J., 1911, 236.—T.F.B.

XIXb.—WATER PURIFICATION ; SANITATION.

Nitrates and nitrites in water and in rain-water ; Determination of —— by Schlösing's method. A. Huizinga. Z. anal. Chem., 1912, **51**, 273—292.

The usual way of carrying out this method (evaporating the water with the addition of magnesium oxide, boiling the residue with ferrous chloride and hydrochloric acid, and treating the evolved gases with sodium hydroxide) does not always yield correct results; the presence of nitrites invariably causes the figures obtained to be incorrect. The water should be rendered alkaline with potassium hydroxide before evaporation, carbonates must be decomposed by treatment with acetic acid, and nitrites and organic substances oxidised with permanganate, before the residue is heated with ferrous chloride. The details of the procedure recommended are as follows:—Five litres of rain water, or 1 litre of ordinary water, are rendered alkaline with potassium hydroxide and evaporated to a volume of 100 c.c.; 4 c.c. of *N*/10 potassium permanganate solution are now added, the mixture is heated to boiling, filtered, a further quantity of 4 c.c. (or more, if necessary) of permanganate solution and 2 c.c. of dilute sulphuric acid are added to the filtrate, the mixture is boiled, then rendered alkaline, again boiled, and filtered. The filtrate is evaporated to 20 c.c., 2 c.c. of acetic acid are added, and the evaporation continued to dryness. The residue is then rinsed into the Schlösing apparatus with hydrochloric acid and the method proceeded with as usual, except that the gases do not require to be treated with sodium hydroxide solution. Working with known amounts of nitrate, the method yields results which do not differ by much more than 0·1 mgrm. of nitrogen from the quantity of the latter actually present.—W. P. S.

"Luminator" apparatus for treating hard water ; Action of the ——. S. Sugden. Chem. News, 1912, **105**, 161. (See this J., 1911, 933 ; 1912, 57.)

The author finds that the crystals obtained from a saturated solution of calcium sulphate which has been in contact with a piece of polished aluminium foil for 1 hour, are not gypsum, but a hydrate of the formula, $3CaSO_4.2H_2O$. The action of the aluminium appears to be catalytic: the metal had lost less than 1 mgrm. in weight after converting 3—4 grms. of calcium sulphate.
—A. S.

Patents.

Mud, slime, or the like contained in or floating upon waste water or the like ; Method of de-hydrating ——. B. Heine, Charlottenberg, Germany. Eng. Pat. 9705, April 21, 1911.

The mud is subjected to the action of ozone or ozonised air before being dried in centrifugal machines, filter presses, or like apparatus.—W. P. S.

Zeolites [after use in water softening] ; Process of regenerating ——. R. Haddan, London. From Latzel und Kutscha, Vienna. Eng. Pat. 732, Jan. 9, 1912.

A solution of sodium chloride is caused to percolate through a layer of the spent zeolites, the solution being agitated during the percolation process. The agitation of the solution may be effected by placing the vessel of the filter in communication with a vessel containing a piston which is operated continuously, or at intervals, so as to produce a rise and fall of the solution in the filter.
—W. P. S.

Sterilisation and concentration of liquids ; Method of simultaneous ——. A. A. Poulverel and F. E. Grimaud. Fr. Pat. 435,656, Dec. 31, 1910.

The liquid to be sterilised, is sprayed in the state of a very fine mist into a chamber in which there are arranged a number of electric lamps emitting ultra-violet rays. A column still is arranged above the chamber, and is also connected with a vacuum pump, so that the liquid is simultaneously sterilised by the ultra-violet rays and concentrated under vacuo.—W. H. C.

Disinfectant substances [soaps] ; Process for the manufacture of —— and products produced thereby. K. Rulke, Berlin. U.S. Pat. 1,020,624, Mar. 19, 1912.

A disinfectant fat-solvent soap containing 10 per cent., or more, of fenchone, is obtained by "treating fenchone with the component materials of liquid soaps."—W. P. S.

Sewage ; Treatment of ——. J. S. Waddington, Bradford. U.S. Pat. 1,019,933, March 12, 1912.

See Eng. Pat. 22,251 of 1910 ; this J., 1911, 645.—T. F. B.

XX.—ORGANIC PRODUCTS ; MEDICINAL SUBSTANCES ; ESSENTIAL OILS.

Strychnine ; The sulphates of ——. D. B. Dott. Pharm. J., 1912, **88**, 425.

The preferable formula for the neutral sulphate of strychnine is $(C_{21}H_{22}N_2O_2)_2H_2SO_4, 5\frac{1}{2}H_2O$. The amount of water in the acid sulphate is represented by the formula, $B,H_2SO_4.2H_2O$.—F. Shdn.

Atropine sulphate. D. B. Dott. Pharm. J., 1912, **88**, 425.

The commercial sulphate of atropine contains an appreciable amount of water, amounting to $\frac{1}{4}H_2O$, and readily takes up water corresponding to $\frac{1}{2}H_2O$. A percentage loss of 1 to 1·3 on drying should be permitted as it is admittedly difficult to prepare a salt without a moderate proportion of hyoscyamine sulphate, a compound containing 2 mols. of water of crystallisation.
—F. Shdn.

Apomorphine hydrochloride solution ; Preservation of —— by means of hypophosphorous acid. U. Corbelli. Boll. Chim. Farm., 1911, **50**, 871—873. Chem. Zentr., 1912, **1**, 1242—1243.

For the preservation of sterilised 1 per cent. solutions of apomorphine hydrochloride for subcutaneous injection, the author recommends acidification with about 1 per cent. hypophosphorous acid. The solution gradually changes colour, but maintains its physiological activity unaltered even after 1 year.—A. S.

Narcotics and local anæsthetics. III. Stability of local anæsthetic bases in solutions. IV. Action of different salts of novocaine. O. Gros. Arch. exp. Pathol. u. Pharmak., 1912, **67**, 126—136. Chem. Zentr., 1912, **1**, 1240—1241.

A REPLY to Symes and Veley (Roy. Soc. Proc., **83B**, 413; this J., 1911, 740), who have controverted the statement of the author (see this J., 1910, 1176) that in the group of local anæsthetics, the bases are more powerful than their chlorides. The differences between the experimental results of Symes and Veley and of the author are ascribed to differences in the stability of cocaine and of its chloride. In order to prepare a *N*/300 solution of cocaine (0·1 grm. in 100 c.c. of a 0·7 per cent. solution of sodium chloride), prolonged shaking at the ordinary temperature is necessary, during which the cocaine undergoes decomposition. If a quickly prepared solution (filtered from the undissolved substance) be employed, it exhibits a stronger action than a corresponding solution of the chloride, notwithstanding its smaller concentration owing to incomplete solution of the cocaine. That this instability of cocaine is the cause of the conflicting results of Symes and Veley is confirmed by the fact that in the case of the stable compounds, novocaine and alypin, the more powerful action of the base compared with that of its chloride, is evident even in solutions which have been kept for a long time, and also after warming the solutions. Further evidence is also adduced in favour of the view that the activity of salts of local anæsthetic bases is dependent upon the degree of hydrolytic dissociation. In the case of the borate, bicarbonate, secondary phosphate, acetate, and chloride of novocaine, the decreasing hydrolytic dissociation in the order given is accompanied by decreasing anæsthetic activity. In a solution of a salt of a local anæsthetic base, the concentration of the free base and hence the activity of the solution can be increased by addition of a sodium salt of the corresponding acid. In accordance with this view the following prescriptions are given for the preparation of a 2 per cent. novocaine solution of maximum activity: (1), sodium bicarbonate, 1·2; novocaine, 2; and water, 100 parts; (2), sodium phosphate, 3·5; novocaine, 2; water, 100 parts.—A. S.

Sandal-woods from Madras; Oil value of some ——. P. Singh. Forest Bull. No. 6, Forest Research Inst., Dehra Dun, India. Chem. and Drug., April 13, 1912, 48—49.

AN examination of fifteen specimens of sandalwood (*Santalum album*), grown in different localities and on different kinds of soil, confirmed the belief that wood from plants grown on dry rocky mountain soils yields more oil than that from trees grown on the fertile soils of the plains. The low yield of oil obtained by Madras distillers (an average of 2·5 per cent., as against 3—6 per cent. by European distillers) appears to be due to the use of the wood in the form of chips, for at Kanauj in the United Provinces, where the wood is reduced to fine powder and soaked for 48 hours before being placed in the stills, a yield of 5—6 per cent. of oil is obtained. The following method for the determination of the essential oil in sandalwood is stated to be both rapid and accurate. About 10—15 grms. of sandalwood filings are extracted with three successive small quantities of alcohol by boiling under a reflux condenser. The alcohol is then distilled off and the extract and the residual powder are distilled with steam. The distillates are extracted with chloroform, the chloroform distilled off, and the residual oil, after treatment with a gentle current of air, is weighed. The results of the examination of the fifteen samples of sandalwood mentioned above gave results more in accord with the figures of Parry (1·5 to 6 per cent.) than with those of Gildemeister and Hoffmann (3 to 5 per cent.) with regard to the variation of oil content.—A. S.

Essential oils; Constituents of ——. Cedrenol, a new primary alcohol of the sesquiterpene series. F. W. Semmler and E. W. Mayer. Ber., 1912, 45, 786—791.

IN addition to the solid cedrol, cedar wood oil contains a primary alcohol, $C_{15}H_{24}O$, styled *cedrenol.* It amounts to about 3 per cent. of the oil. Its constitution is analogous to that of cedrene, and the molecule is tricyclic and possesses one double linkage. It boils at 161—167° C. at 10 mm., has the sp. gr. 1·0098 at 20° C., α_D +1 at 20° C., n_D 1·5230 at 20° C. Cedrene is produced by reducing the chloride with sodium amalgam.—F. SHDN.

Sesquiterpenes. V. [Detection of β-caryophyllene]. E. Deussen. Annalen, 1912, **388**, 136—165. (See this J., 1910, 898.)

BY means of a diagram the relationship of α- and β-caryophyllene to their respective derivatives is shown. In order to detect β-caryophyllene in essential oils, the following reaction can be used. 2—3 grms. of the oil are dissolved in 10 times the weight of ether. Nitric oxide is passed in till no more precipitation takes place, light being excluded during the operation. In this way β-caryophyllene nitrosite, m.pt. 159° C., is obtained. This sesquiterpene together with cadinene is found in the Para, Maracaibo and African varieties of copaiba oil and also in West Indian sandalwood oil. The oil of hop flowers contains about 4 per cent. of β-caryophyllene. The caryophyllene regenerated by Semmler (this J., 1911, 48) is closely related to isocaryophyllene. β-Caryophyllene contains an ethylene linkage, which can be saturated with hydrogen chloride. Baeyer's theory to account for the blue colouration of β-caryophyllene nitrosite is confirmed. The high optical rotation of the latter compound is then discussed. When β-caryophyllene is oxidised by means of permanganate at 0° C., a glycol, $C_{15}H_{22}O_4$, is formed. This does not possess the composition, $C_{14}H_{22}O_4$, ascribed to it by Haarmann. When β-caryophyllene nitrosite is treated with potassium ethoxide, a crystalline compound, $C_{17}H_{29}NO_2$, is obtained, which melts at 163° C., and contains an ethoxyl group. The same compound is contained in crude α-caryophyllene nitrosochloride and is produced by the action of potassium ethoxide upon the nitrosochlorides of either β-caryophyllene or isocaryophyllene.—F. SHDN.

Alcohols of the terpene group; Catalytic action of copper at 300° C. on some ——. G. B. Neave. Chem. Soc. Trans., 1912, **101**, 513—515.

SABATIER and Senderens (Bull. Soc. Chim., 1905, **33**, 263; see also Neave, this J., 1909, 912) showed that when passed in the form of vapour over finely divided copper at 300° C., primary alcohols yield hydrogen and aldehydes, secondary alcohols yield hydrogen and ketones, and tertiary alcohols yield water and unsaturated hydrocarbons. Similar experiments have now been made with some cyclic alcohols. Borneol, fenchyl alcohol, and menthol, which may be regarded as secondary alcohols, yielded the corresponding ketones, camphor, fenchone, and menthone respectively. Terpineol and terpin, which are tertiary alcohols, yielded dipentene. Isoborneol yielded a small quantity of camphene, and hence is probably a tertiary alcohol. In the case of sobrerol, which contains both a secondary and a tertiary alcoholic group, the expected unsaturated ketone, carvone, was not obtained, but instead ring formation took place, with loss of water and formation of pinol.—A. S.

Diaminodihydroxyarsenobenzene hydrochloride [salvarsan] and its closely allied derivatives. P. Ehrlich and A. Bertheim. Ber., 1912, **45**, 756—766.

THE starting point in the preparation of salvarsan is 3-nitro-4-hydroxyphenyl-1-arsinic acid. Under the influence of strong reducing agents this passes directly into 3·3′-diamino-4·4′-dihydroxy-1·1′-arsenobenzene, the base corresponding to salvarsan. Gentle reduction leads to the production of intermediate compounds. If sodium amalgam is used to reduce the nitro-compound, 3-amino-4-hydroxyphenyl-1-arsinic acid, $C_6H_3(OH)(NH_2)AsO_3H_2$, is produced. This can be crystallised from hot water in which it is only moderately soluble. It dissolves in alkalis, but is precipitated therefrom by the addition of an equivalent amount of a mineral acid. The substance dissolves in excess of the acid. Upon heating it darkens above 170° C. and decomposes without any definite melting point. It possesses some reducing properties. When reduced with sulphur dioxide the corresponding arsenoxide, $C_6H_3(OH)(NH_2)AsO$, is formed, which is best isolated as the hydrochloride. The salt is readily soluble in water and alcohol. It gives with sodium β-naphthoquinone sulphonate, a dark red precipitate, which is soluble in alkalis, and gives condensation products with aldehydes. Sodium hydrosulphite immediately reduces it to diaminodihydroxyarsenobenzene. Reduction with tin and concentrated hydrochloric acid produces a yellow precipitate of salvarsan. The latter substance can be prepared directly from the nitro-compound by reducing with sodium hydrosulphite. Salvarsan is readily soluble in water, methyl alcohol, ethyleneglycol, and glycerin, moderately soluble in ethyl alcohol, very slightly soluble in glacial acetic acid, acetone, ether and concentrated hydrochloric acid. No precipitate is produced at first by the addition of sodium hydroxide solution. The base is precipitated by the addition of two molecular proportions of alkali, but is soluble in excess of the latter. The base can be precipitated from its alkaline solution by means of carbon dioxide. Salvarsan in solution gives an orange colouration and then an orange-coloured precipitate with *p*-dimethylaminobenzaldehyde dissolved in dilute hydrochloric acid. The reaction becomes more delicate if mercuric chloride be added to the aldehyde solution. When exposed to the air, even in a stoppered bottle, oxidation takes place with the formation of the arsenoxide compound. The latter can be estimated by dissolving the salvarsan in methyl alcohol and water and adding calcium carbonate. The arsenobase is precipitated whilst the aminohydroxyphenylarsenoxide remains in solution and can be titrated with iodine solution. Iodine and hydrogen peroxide convert salvarsan into the corresponding arsinic acid. The alkaline, alcoholic and aqueous solutions of salvarsan are very readily oxidised by the air, causing a marked increase in the toxicity.—F. Shdn.

Uric acid; Decomposition of —— by radium-emanation. P. Mesernitsky. Comptes rend., 1912, **154**, 770—772.

Radium emanation decomposes monosodium urate, as is evidenced by the increased amount of nitrogen in the solution. In 12 days, 29 mgrms. of the salt were completely decomposed by 50 milli-curies. The final result of the decomposition is ammonia; the intermediate products have not yet been identified. The decomposition is produced by the α-rays; the more penetrating rays have no effect: nor does oxygen play an appreciable part. Possibly this action may afford an explanation of the therapeutic effects of the emanation on gouty persons. —J. T. D.

Radium emanation; Action of —— on monosodium urate. E. von Knaffl-Lenz and W. Wiechowski. Z. physiol. Chem., 1912, **77**, 303—326.

The beneficial action of radium emanation in the treatment of gout has been explained by Gudzent on the basis of experiments which appeared to show that the emanation, or its transformation-product (radium D), converts monosodium urate into soluble compounds and finally into carbon dioxide and ammonia. According to the authors' experiments the salt undergoes no change whatever under the influence of even relatively large amounts of radium emanation, its transformation-products or the ozone produced by it from atmospheric oxygen.—J. H. L.

Chloral; Detection of small quantities of —— in presence of chloroform. T. Jona. Giorn. Farm. Chim., 1912, **61**, 57—59. Chem. Zentr., 1912, **1**, 1148.

The usual method for the determination of chloral by conversion into formic acid and reduction of the latter is inapplicable in presence of chloroform, and substances such as bromoform, iodoform, and trichloroacetic acid may also interfere. The following method is recommended in such cases. The substance is dissolved in water rendered faintly acid with sulphuric acid and treated with zinc, the containing vessel being closed with cotton-wool. After allowing to stand at the ordinary temperature until the evolution of hydrogen has ceased, the mixture is warmed and the evolved vapour allowed to act upon a piece of filter paper impregnated with a freshly prepared solution of sodium nitroprusside and a 5 per cent. solution of piperidine. A blue colouration of the paper indicates the presence of aldehyde formed by reduction of the chloral. It is stated that chloral hydrate at a dilution of 1 : 20,000 can be detected in this way. —A. S.

Formic acid; Determination of —— alone or mixed with its homologues by means of permanganate in alkaline solution. A. Fouchet. Bull. Soc. Chim., 1912, **11**, 325—328.

In order to determine the amount of formic acid alone or in the presence of its homologues, the following method can be used. The solutions required are:—(1), 5 grms. of potassium permanganate per litre; (2), 50 grms. of sodium carbonate crystals per litre; (3), 20 grms. of ferrous ammonium sulphate and 30 grms. of sulphuric acid in a litre; (4), 50 per cent. sulphuric acid. 40 c.c. of the carbonate solution and 20 c.c. of the permanganate solution are placed in an Erlenmeyer flask. 0·05 grm. of the substance is dissolved in a little water and added to the contents of the flask. A blank is also made up using the same volume of water as that used to dissolve the substance. Where only small quantities of formic acid are present, 1 per cent. permanganate solution may be employed, care being taken not to exceed the former total volume of the mixed liquids. The flasks are placed for three minutes in boiling water so as to raise their temperature to about 80° C. They are then cooled, acidified with 20 c.c. of the sulphuric acid, and 50 c.c. of the ferrous solution added. The excess of the latter is determined by titration with the permanganate solution, 1 c.c. of the latter corresponding to 3·51 mgrms. of formic acid.—F. Shdn.

Formaldehyde; Determination of ——. E. Rimini and T. Jona. Giorn. Farm. Chim., 1912, **61**, 49—56. Chem. Zentr., 1912, **1**, 1147—1148.

Unless precautions be taken, the method of Riegler (this J., 1901, 510) may give low results, for on prolonged contact the compound of formaldehyde and hydrazine is decomposed to an appreciable extent by iodic acid. For example on prolonging the time of contact of the reagents from 2 mins. to 39 mins., the percentage of formaldehyde found by Riegler's method fell in one experiment from 39·0 to 28·4. The authors propose a simple modification of Rimini's method (this J., 1906, 1233) of determining the excess of hydrazine, mercuric chloride being used instead of potassium iodate in alkaline solution. 5 c.c. of the formaldehyde solution (about 1·1 per cent. concentration) are mixed with 20 c.c. of a 1·1 per cent. solution of hydrazine sulphate and with mercuric chloride, and the volume of nitrogen evolved is measured. The volume of nitrogen produced from 20 c.c. of the hydrazine sulphate solution, without the formaldehyde, by the action of mercuric chloride is also measured. The reaction is represented by the equation: $N_2H_4.H_2SO_4+6KOH+2HgCl_2=K_2SO_4+4KCl+2Hg+N_2+6H_2O$.—A. S.

Volatile oil obtained in the sulphite digestion of spruce wood. Bergström. *See* V.

Volumetric determination of hydrazine. Jamieson. *See* XXIII.

Volumetric determination of mercury. Jamieson. *See* XXIII.

Patents.

Ketones; Process for the preparation of ——. T. H. Easterfield and C. M. Taylor, Wellington, New Zealand. Eng. Pat. 7619, March 27, 1911. Under Int. Conv., April 21, 1910.

The production of ketones from the higher fatty acids, such as palmitic, stearic, oleic, brassidic, cerotic, montanic, and melissic acids, may be effected by heating the acid in presence of finely divided iron, the temperature not being allowed to rise much above that of incipient decomposition of the acid. The heating is continued until he evolution of carbon dioxide has nearly ceased, and he product is purified by crystallisation, distillation, etc. or example, hard pressed stearin is heated with about ne-tenth of its weight of finely divided iron to about 00° C., and the temperature is allowed to rise slowly to 60° C., at which the heating is continued for 3 to 4 hours; he product is dissolved in hot petroleum spirit and allowed o cool. The yield of stearone is stated to be about 80 per ent. of the weight of stearin used.—T. F. B.

Radio-active aromatic compounds of bromine and iodine; Production of —— [*for therapeutic use.*] A. de Szendeffy, Budapest, Hungary. Eng. Pat. 14,471, June 19, 1911.

A substance suitable for therapeutic purposes can be produced by combining iodine or bromine or their compounds with terpenes or allied bodies and a fat or glycerin. A substance containing radium is then added. The terpene or allied bodies may be dissolved in fat and the mixture covered with iodine dissolved in potassium iodide solution containing radium bromide.—F. Sodn.

Arseno-compounds and intermediate products, Manufacture of ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 15,438, July 3, 1911.

When the diazo compounds of 3-nitro-4-aminoarylarsinic acids are treated with agents capable of combining with mineral acids, they are converted into the corresponding 4-diazo-3-hydroxyarylarsinic acid. By combining these with easily acting azo components, such as β-naphthol, an aminonaphtholsulphonic acid or resorcinol, azo dyestuffs are produced from which the 4-amino-3-hydroxyarylarsinic acids are obtained by reduction. If the azo dyestuffs are reduced by more powerful reducing agents, or if the 4-amino-3-hydroxyarylarsinic acids are treated with strong reducing agents such as hydrosulphites, they are converted into the corresponding symmetrical 4·4-diamino-3·3-dihydroxyarsenobenzene derivative. The reductions are best effected without access of air.—T. F. B.

Nitro-aminoarylarsinic acids, Process for preparing diazo derivatives of ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 243,648, Aug. 14, 1910.

Nitroaminoarylarsinic acids which contain the nitro-group in the *o*-position to the amino-group, are diazotised, and the resulting diazo compounds are treated with substances which will combine with mineral acids. By replacing the nitro group by a hydroxyl group, 4-diazo-3-hydroxybenzene-1-arsinic acid is produced, which is of value in the preparation of therapeutic compounds. —T. F. B.

Antitoxins. A. Viquerat, Lausanne, Switzerland. Eng. Pat. 26,140, Nov. 22, 1911.

An antitoxin capable of conferring immunity against microbial infection can be made from chemically prepared creatinine. The latter substance may be associated with guanidine and allantoin. A suitable solution for internal use contains 0·2 per cent. of creatinine, 0·01 per cent. of guanidine, and 0·10 per cent. of allantoin, with or without the addition of 0·8 per cent. of phenol.—F. Sodn.

Erythrene; Process for the production of ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 448, Jan. 5, 1912. Under Int. Conv., April 15, 1911.

Erythrene may be readily obtained from cyclohexane, its homologues or derivatives, with the exclusion of cyclohexanol (compare Fr. Pat. 425,967; this J., 1911, 968), by subjecting them to the action of hot contact bodies or hot surfaces, and isolating the erythrene from the resulting gases. *Example.*—The vapours of cyclohexane are passed over a spiral of aluminium silicate which is heated electrically to a dull red heat: the unchanged hydrocarbon is returned to the boiler, whilst the gases are freed by cooling from liquid hydrocarbons, and the erythrene extracted from them by physical or chemical means.—T. F. B.

Isoprene; Process for producing ——. Badische Anilin und Soda Fabrik. Fr. Pat. 435,312, Oct. 14, 1911. Under Int. Conv., May 27, 1911.

This patent relates to the preparation of isoprene from the isopentane obtainable from petroleum or oil gas. Isopentane is first converted into a mixture of monohalogen derivatives, for example by submitting a mixture of chlorine and an excess of isopentane to the influence of the mercury vapour lamp. The chloro-isopentanes are then treated with an agent (*e.g.*, lime) which will remove the elements of the hydrohalogen acid, with formation of trimethylethylene; this is converted by addition of one mol. of halogen into its dihalogenide, from which the elements of the hydrohalogen acid are removed, for example by passing it, under reduced pressure, over a catalytic agent such as alumina or barium chloride, heated to about 350° C. It is stated that the product consists of practically pure isoprene, whereas, if agents which do not act catalytically are employed to eliminate the hydrohalogen acid, mixtures of isoprene and dimethylallene are produced.—T. F. B.

Tuberculo-toxoidin. T. Ishigami, Osaka, Japan. U.S. Pat. 1,020,761, Mar. 19, 1912.

After the removal of soluble matter from a mass of tubercle bacilli by treatment with water, the residue is washed, dried and dissolved in sulphuric acid. The solution is then precipitated, the precipitate being washed and subsequently dissolved in dilute aqueous alkali; an antiseptic is added to the resulting liquid after neutralisation.—W. E. F. P.

Calcium salt of acetylsalicylic acid and process of making same. R. Berendes, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,020,121, 1,020,181, and 1,020,182, March 12, 1912.

(1) The calcium salt of acetylsalicylic acid is prepared by treating with a calcium compound a compound containing the radical of acetylsalicylic acid: *e.g.*, a solution of acetylsalicylic acid in methyl alcohol is added to an aqueous solution of calcium acetate, and the calcium salt is filtered off. (2) Alkali salts of acetylsalicylic acid are treated with calcium salts of acids which yield with alkalis salts which are soluble in alcohol. (3) Acetylsalicylic acid is treated with a calcium alcoholate.—T. F. B.

Hydrogen peroxide and urea; Process for producing a compound of ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 436,095 Nov. 8, 1911. Under Int. Conv., Dec. 27, 1910, and June 19, 1911.

A compound of hydrogen peroxide with urea, containing 36·2 per cent. (= 1 mol.) of hydrogen peroxide, is obtained by treating urea at low temperatures with hydrogen peroxide or its solutions or with substances which form hydrogen peroxide. *Example:* 600 parts of urea are dissolved in 1500 parts of 30 per cent. hydrogen peroxide solution, and the compound is separated by cooling; further quantities are obtained by carefully concentrating the mother liquor *in vacuo*. The new compound forms colourless prisms, which evolve oxygen when heated to 85° C. Its acidified aqueous solution liberates iodine from potassium iodide.—T. F. B.

Nuclein-iron compounds; Process for preparing ——. W. Wolff und Co. Ger. Pat. 243,583, July 23, 1909.

Compounds of iron and nuclein are obtained (1) by the action of iron-albumin compounds on nucleinic acid of animal or vegetable origin; (2) by treating iron nucleinate with animal or vegetable albumin or an albuminous substance; (3) by treating with a soluble iron salt a mixture or a compound of an albuminous substance and nucleinic acid. The resulting compounds are stated to contain higher proportions of iron and phosphorus and to be purer than analogous products obtained from yeast. —T. F. B.

Ointment basis containing large quantities of water; Process for preparing an ——. A. Schleimer. Ger. Pat. 243,661, March 16, 1910.

A solid hydrocarbon of m. pt. about 64° C. is melted together with a liquid hydrocarbon and an unsaturated higher aliphatic monocarboxylic acid, and the product is intimately mixed with water, of which it can combine with considerable quantities. This basis may serve for the preparation of ointments containing Peru balsam, salicylic acid, menthol, etc.—T. F. B.

Phenyl-, alkoxyphenyl-, and dialkoxyphenyl-ethanolamines and their alkyl ethers ; Process for preparing ——. K. W. Rosenmund. Ger. Pat. 244,321, Sept. 22, 1910.

Derivatives of phenylethanolamines of the general formula $R.CH(OR_1).CH_2.NH_2$, where R represents phenyl, alkoxyphenyl, or dialkoxyphenyl and R_1 hydrogen or alkyl, are obtained by condensing benzaldehyde or its alkoxy- or dialkoxy-derivatives with nitromethane in presence of alkali, and treating with dilute acids the salts of nitro-ethanols thus produced to convert them into nitro-alcohols, which are subsequently reduced to the amino-alcohols. The nitro-ethanols may also be obtained by the addition of water to nitrostyrols by aid of alkali. The following compounds are described :—Phenylethanolamine, α-methoxyphenylethanolamine, *p*-methoxyphenylethanolamine and its α-methyl ether, trimethyl ether of 3.4-dihydroxyphenylethanolamine.—T. F. B.

Carbamates of tertiary alcohols ; Manufacture of ——. G. W. Johnson, London. From Verein. Chininfabrik. Zimmer und Co., Frankfort on Maine, Germany. Eng. Pat. 14,699, June 21, 1911.

See U.S. Pat. 1,016,977 of 1912 ; this J., 1912, 301.—T. F. B.

Quinine esters of aromatic amino acids ; Manufacture of ——. G. W. Johnson, London. From Verein. Chininfabriken Zimmer und Co., Frankfort on Maine, Germany. Eng. Pat. 14,907, June 26, 1911.

See U.S. Pat. 1,019,285 of 1912 ; this J., 1912, 358. —T. F. B.

Chlorinated hydrocarbons ; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 17,291, July 28, 1911.

See Fr. Pat. 433,309 of 1911 ; this J., 1912, 151.—T. F. B.

Diamides of the adipic and beta-alkyladipic acids ; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 17,414, July 31, 1911.

See Ger. Pat. 241,897 of 1911 ; this J., 1912, 257.—T. F. B.

Lecithin ; Process of producing ——. H. C. Buer, Bonn, Germany. U.S. Pat. 1,019,945, March 12, 1912.

See Eng. Pat. 18,540 of 1909 ; this J., 1910, 900.—T. F. B

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Silver chloride ; Gelatin and other colloids as retarders of the reduction of ——. W. Reinders and C. J. van Nieuwenburg. Z. Chem. Ind. Kolloide, 1912, 10, 36—40.

It has been shown (this J., 1911, 446, 924, 1231) that silver chloride crystals containing gelatin, albumin, etc., obtained by crystallisation from ammoniacal solutions, are more readily darkened by the direct action of light than silver chloride alone. On the other hand, it is now found that silver chloride crystals containing gelatin, albumin, etc., are reduced by ferrous citrate solution just as readily as are silver chloride crystals alone, whilst the addition of the colloids to the developer causes a retardation of the reduction process. A series of experiments is described, showing the influence of gelatin, albumin, agar-agar, gum arabic, and also of Acid Violet 6B. (Bayer) and Ponceau 3R. It was found that no reduction of silver chloride by ferrous citrate had occurred after two minutes in solutions containing 0·012 per cent. of gelatin, 0·015 per cent. of albumin, 0·125 per cent. of gum arabic, or 0·025 per cent. of Acid Violet ; in solutions containing 0·24 per cent. of agar-agar less than two per cent. of the silver chloride was reduced, whilst with 0·5 per cent. solutions of Ponceau 9 per cent. was reduced (68 per cent. after five minutes).—T. F. B.

Solubility of silver chloride and bromide in sodium sulphite solution. Luther and Leubner. *See* VII.

Patent.

Paper, fabric, etc., permeable temporarily to light rays ; Process for rendering ——. E. Rousseau. Fr. Pat. 436,100, Jan. 13, 1911.

Paper, fabric, or other material on which there is a design which it is desired to reproduce by transmitted light, is rendered temporarily permeable to light by immersing it in a non-inflammable organic chloro compound of high density or boiling point, such as pentachloroethane or tetrachloroethane.—T. F. B.

XXII.—EXPLOSIVES ; MATCHES.

Phenanthrene as an ingredient of smokeless powders. G. Spica. Z. ges. Schiess- und Sprengstoffw., 1912, 7, 129—130.

Phenanthrene is suggested as an ingredient of smokeless powders in order to diminish erosion of the gun. The presence of this substance causes the formation of less carbon dioxide on explosion. Experiments with ballistite (nitroglycerin 48·75, nitrocellulose 48·75, and phenanthrene 2·5 per cent.) gave the following results :—The charge was increased by 10·25 per cent. in order to give the same ballistics as were obtained with ballistite containing no phenanthrene, and the heat evolved was 62·2 large calories, compared with 69·9 with ordinary ballistite. Heating nitrocellulose with fused phenanthrene apparently gave small amounts of mononitrophenanthrene. The author considers that this points to the value of phenanthrene as a stabilising agent for smokeless powders as it would probably absorb the nitrogen peroxide produced by slow decomposition during storage.—G. W. McD.

Fuse ; The rate of burning of —— *as influenced by temperature and pressure.* W. O. Snelling and W. C. Cope. U.S. Bureau of Mines. Technical paper No. 6, 1912, 1—28.

The weight of powder in the safety fuses investigated varied from 22 to 24 grains per foot. The composition of the powder was approximately as follows :—Potassium nitrate (75 parts), charcoal (13), and sulphur (12 parts). The American fuse varied in rate of burning from 19 to 27 secs. per foot, and the European fuse from 30 to 40 secs. per foot. Experiments were made in which the fuse was burnt under pressure, whilst enclosed in a steel tube provided with a pressure gauge, or encased in plaster of Paris or clay. Under these conditions the rate of burning was, at times, increased from 28·2 secs. to 6·4 secs. per foot. On exposure to temperatures of 60° C., and 90° C., for one hour, the rate of burning fell to 30 secs. and 98 secs. respectively, and on exposure for 4 hours at 60° C., the rate of burning fell to 227 secs. This retardation was owing to the melting of the waterproofing of the fuse covering, which became mixed with the powder. Exposure at —4° C. for 3 hours did not very appreciably affect the rate of burning. The ordinary bending and coiling of the fuse does not affect the rate of burning, but actual hammering or pounding, or the blows of fallen rock increase the rate of burning under some circumstances up to 3 secs. per foot.—G. W. McD.

Testing for fire-damp and black-damp by means of a safety lamp. Briggs. *See* IIa.

Patents.

Fulminate composition for rim-fire cartridges or caps. W. Meyer. First Addition, dated Oct. 17, 1911, to Fr. Pat. 435,049, Sept. 23, 1911.

The composition consists of potassium picrate, barium nitrate, lead peroxide, mercury fulminate, "antimony," sulphur and powdered glass.—G. W. McD.

Explosive. E Louis, Houilles, France. Eng. Pat. 12,246, May 20, 1911. Under Int. Conv., May 20, 1910.

See Fr. Pat. 418,675 of 1910; this J., 1911 110.—T. F. B.

Priming compounds for ammunition; Manufacture of ——. W. Meyer Berlin-Wilmersdorf, Germany. Eng. Pat. 23,193, Oct. 24, 1911. Addition to Eng. Pat. 21,337, Sept. 27, 1911.

See Addition of Oct. 17, 1911, to Fr Pat 435,049 of 1911; preceding.—T. F. B.

XXIII.—ANALYTICAL PROCESSES.

Phosphoric acid; Determination of ——, in presence of colloidal silicic acid. P. Mélikoff and M. Becaia. Comptes rend., 1912, **154**, 775—776.

The authors' method (this J., 1912, 70) for separating phosphomolybdates and silicomolybdates is accurately applicable to the determination of phosphoric acid in presence of colloidal silicic acid.—J. T. D.

Mercury cathode; Utility of the —— especially for the analytical separation of metals. P. Baumann. Z. anorg. Chem. 1912, **74**, 315—350.

The author discusses in detail the principles which determine the possibility of satisfactory estimations and separations of the metals at a mercury cathode in electroanalysis. He also describes simple methods for the purification of mercury and of ether for electroanalytical purposes. The mercury, which is liable to be contaminated with all kinds of metallic impurities through its use in the various analyses, is twice shaken with dilute chromic acid solution for two hours in each case. It is then twice treated in the same way with a solution of mercurous nitrate in dilute nitric acid. After washing with water and alcohol and drying, it is distilled in a current of carbon dioxide from a cast iron retort of half a litre capacity The retort is connected with a condenser tube which is cooled by a coil of lead pipe with running water. Ether is liable to contain impurities which act on mercury and destroy its value for washing the cathode. The active impurity is probably vinyl alcohol which can be removed by standing for some time over solid potassium hydroxide, and subsequently distilling from this in small quantities as required. The decomposition potentials of the various electrolytes are obtained from E.M.F.-current curves, and are found to differ appreciably from those determined with a platinum cathode. The particular E.M.F. which is most suitable for the deposition of a particular metal may also be determined by a direct electrolytic experiment, noting the E.M.F. at which the metal is first deposited at an appreciable rate. For the separation of different cations, the author has devised a special cell, using a minimum quantity of mercury and a small volume of electrolyte, and has applied a compact form of electrical heater which can be immersed in the electrolyte so as to keep the temperature constant at any required value. By means of graded potential it is possible in this apparatus to effect various separations. Mercury (univalent or divalent) may be separated from bismuth in nitric acid solution, with an E.M.F. of 1·2 to 1·4 volt, the mercury being completely deposited and the bismuth left in solution. In the case of mercuric salts it is necessary that the speed of rotation of the platinum gauze anode, and the concentration of the electrolyte shall both be kept as small as possible. Mercury may also be separated from copper, and silver from bismuth with the same E.M.F. All the above analyses are carried out at room temperature. At 70° C. copper may be separated from antimony or cadmium and bismuth from cadmium. For the copper-antimony separation the electrolyte is obtained by dissolving in nitric and tartaric acids, and adding ammonia more than sufficient to redissolve the precipitate which first forms. With an E.M.F. of 1·76 volt the copper is completely deposited free from antimony. For the separation of copper or bismuth from cadmium in nitric acid solution, the maximum E.M.F. is 1·8 volt. The separation of bismuth from antimony is rendered impossible by the difficulty of preparing an electrolyte. If a solution of bismuth in nitric acid is mixed with a solution of antimony in nitric and tartaric acids, a white precipitate is produced which cannot be easily redissolved in acid. In the presence of excess of ammonia the bismuth is in such complex combination that it only deposits with extreme slowness at 1·7 to 1·8 volt. It is also not possible to separate cadmium from zinc in this apparatus, the cadmium being deposited only very slowly. The author's cell can also be conveniently used with a silver anode for the determination of halogens. —W. H. P.

Lead, nickel, and zinc; Determination of —— by precipitation as oxalates and titration with potassium permanganate. H L. Ward. Amer. J. Science, 1912, **33**, 334—338.

Lead may be determined as oxalate, by adding ammonium oxalate or oxalic acid, in the presence of a large excess (half the total volume) of acetic acid, and titrating the precipitate with permanganate. Nickel and zinc are precipitated by oxalic acid in aqueous solution, and acetic acid is added subsequently, to precipitate the metal remaining in solution, the precipitate being titrated with permanganate as before. With nickel, errors are liable to occur from the inclusion of the precipitant and from indefiniteness of the end point, owing to the colour of the solution.—F. Sodn.

Mercury; Volumetric method for the determination of ——. G. S. Jamieson. Amer. J. Science, 1912, **33**, 349—351.

The mercury, in the form of mercurous chloride, may be titrated with potassium iodate, in the presence of 15—20 per cent. of free hydrochloric acid, using chloroform as indicator, according to the general method of L. W. Andrews (J. Amer. Chem. Soc., 1903, **25**, 756). The titration is carried out in a stoppered bottle, in the presence of 20 c.c. of water, 30 c.c. of concentrated hydrochloric acid, and 6 c.c. of chloroform, the standard iodate solution being added, with shaking until the colour produced in the chloroform layer is just discharged: the reaction is expressed by the equation, $4HgCl+KIO_3+6HCl=4HgCl_2+KCl+ICl+3H_2O$. The presence of organic matter, as in pharmaceutical preparations, does not, as a rule, interfere with the titration.—F. Sodn.

Hydrazine; Volumetric method for the determination of ——. G. S. Jamieson. Amer. J. Science, 1912, **33**, 352—353.

The method is based on the interaction of hydrazine with potassium iodate, in the presence of hydrochloric acid, which takes place in accordance with the equation. $N_2H_4+KIO_3+2HCl=N_2+ICl+3H_2O+KCl$. It is carried out exactly as described for mercurous chloride (see preceding abstract).—F. Sodn.

Oxalic acid in leaves of conifers; Determination of ——. J. Otto. Z. anal. Chem., 1912, **51**, 296—300.

Leaves (needles) from young shoots of pine trees were found to contain from 0·4 to 0·9 per cent. of oxalic acid (calculated on the dry substance), whilst leaves from shoots over 1 year old contained up to 2·3 per cent. of the acid. Young larch leaves contained about 0·1 per cent. of oxalic acid. The latter was determined by extracting the dried leaves with warm 1 per cent. hydrochloric acid, boiling the extract to precipitate colloidal substances, and then precipitating the oxalic acid by the addition of calcium acetate, acetic acid being also added. After the precipitated calcium oxalate had been freed from traces of iron, manganese, etc., it was titrated with permanganate solution.—W. P. S.

Testing for fire-damp and black-damp by means of a safety lamp. Briggs. *See* IIa.

Determination of sulphur in petroleum. Sanders. *See* IIa.

Two analytical aids for controlling the manipulation of wool. Becke. *See* V.

Reducing power of stannous chloride in the fused condition. Sandonnini and Aureggi. *See* VII.

Oxidation of chromic salts by silver suboxide. [*Detection and determination of chromium.*] Meneghini. *See* VII.

Rapid determination of tungsten in ferrotungsten. Ficker. *See* X.

Wet assay of tin-bearing silver bullion. Salas. *See* X.

Determination of sulphur in metallurgical products. Giolitti and Marantonio. *See* X.

Analysis of copra. Hoepfner and Burmeister. *See* XII.

Solubility of glycerides in alcohol and acetic acid. [*Detection of cocoanut oil in lard.*] Hoton. *See* XII.

Separation of fatty acids. Fachini and Dorta. *See* XII.

Colour reactions of oils bleached by "Lucidol." Utz. *See* XII.

Determination of caoutchouc as tetrabromide. Utz. *See* XIV.

Determination of raffinose in raw [*beet*] *sugars.* Strohmer and Fallada. *See* XVII.

Determination of the percentage content of sugar solutions from the values found by the table of the Kaiserliche Normal-Eichungs-Kommission. Schrefeld. *See* XVII.

Distinguishing aldoses from ketoses. Betti. *See* XVII.

Determination of hard and total soft resins in hops. Tartar and Bradley. *See* XVIII.

Method for detecting small quantities of alcohol in fermenting liquors. Klöcker. *See* XVIII.

Analysis of molasses fodder. Ledoux. *See* XIXA.

Oil-value of some sandal-woods from Madras. Singh. *See* XX.

Sesquiterpenes. V. [*Detection of β-caryophyllene*]. Deussen. *See* XX.

Detection of small quantities of chloral in presence of chloroform. Jona. *See* XX.

Determination of formic acid alone or mixed with its homologues by means of permanganate in alkaline solution. Fouchet. *See* XX

Determination of formaldehyde. Rimini and Jona. *See* XX.

PATENTS.

Combustible gas in a gaseous mixture; Apparatus for estimating the percentage of a ——. L. A. Levy, London. Eng. Pat. 20,692, Sept. 19, 1911.

THE gaseous mixture is measured and passed through absorbing vessels to absorb any gaseous constituents that would interfere with the subsequent operations and is then passed through an oxidation vessel where the combustible constituent it is desired to estimate is acted on by an appropriate reagent. The gas is then passed through a vessel containing a known quantity of absorbent for the oxidised products formed in the oxidation vessel, coloured with a suitable indicator. When the absorbent is saturated, the colour of the indicator changes, and the flow of gas is stopped. As the quantity of oxidised product capable of being absorbed by the reagent is known, and the quantity of gas passed, up to the time of saturation, is also known, it is easy to calculate the amount of combustible gas present. (See also this J., 1911, 1437.) (Reference is directed to Eng. Pat. 12,225 of 1906: this J., 1906, 954.)—W. H. C.

Sulphurous anhydride; Apparatus intended for the volumetric determination of liquefied gases, especially ——. Comp. Ind. des Proc. R. Pictet. Fr. Pat. 435,763, Oct. 27, 1911.

A METAL reservoir, to contain the liquefied gas, is connected by a double valve or valves, of special construction, with a graduated glass measuring vessel (suitably protected by wire or the like), in such a manner that, on opening the valves, an equalisation of gas pressure is at once established, and liquid flows into the measuring vessel, from which it may be withdrawn in any desired quantity, by means of another valve.—F. SODN.

Viscosity of liquids; Apparatus for measuring the ——. A. Baldus, Frankfort on Maine, Germany. U.S. Pat. 1,021,229, March 26, 1912.

SEE Eng. Pat. 22,961 of 1910; this J., 1911, 110.—T. F. B.

Process and apparatus for testing the freshness of milk. Fr. Pat. 436,019. *See* XIXA.

Books Received.

WATER ANALYSIS FOR SANITARY AND TECHNICAL PURPOSES. By HERBERT B. STOCKS. Chas. Griffin and Co., Ltd., Exeter Street, Strand, London. 1912. Price 4s. 6d. net.

8vo volume, containing 102 pages of subject matter, 29 pages of appendices, and an alphabetical index of subjects. There are eight illustrations. The text is subdivided as follows:—I. Physical examination. II. Chemical examination. (i.) Quantitative analysis for sanitary purposes. (ii.) Quantitative analysis of the mineral constituents. (iii.) Deleterious metals. (iv.) Gases contained in solution. Appendix I. Standards of purity recommended by the Rivers Pollution Commissioners. II. Standards for effluents. III. Average composition of unpolluted water. IV. Warington's method of estimating nitrates, etc., etc.

STUDIEN ÜBER PFLANZENKOLLOÏDE. I. DIE LÖSUNGSQUELLUNG DER STÄRKE BEI GEGENWART VON KRYSTALLOÏDEN. Von Prof. Dr. MAX SAMEC. Wien. Sonderausgabe aus Kolloïdchemische Beihefte. Monographien zur reinen und angewandten Kolloïdchemie. Herausgegeben von Dr. Wo. Ostwald. Bd. III. Theodor Steinkopff's Verlag. Dresden. 1912. Price M. 1.50.

8vo volume in pamphlet form. Contains 42 pages with six illustrations, treating of the swelling of starch in presence of crystalloids.

L'ACIDE FORMIQUE OU MÉTHANOÏQUE. Par ANDRÉ DUBOSC. H. Dunod et E. Pinat, Editeurs. 47 et 49, Quai des Grands-Augustins, Paris. 1912. Price 15 fr. Bound 16.50 fr.

LARGE 8vo volume, containing 354 pages of subject matter and a table of contents. The arrangement of the subject matter follows the order now shown: I. Formic acid. II. Natural occurrence. III. Historical. IV. Constitution and structure. V. Methods of formation and preparation. VI. Preparation by synthesis. VII. Preparation by electrolysis. VIII. Various methods. IX. The concentration of formic acid. X. Formic anhydride. XI. Mixed formic anhydrides. XII. Chemical properties of formic acid. XIII. Thermochemical properties. XIV. Physical properties. XV. Analysis. XVI. Addition products. XVII. Substitution products. XVIII. Various compound formic acids (Silicoformic, etc.).

THE MEASUREMENT OF HIGH TEMPERATURES. By G. K. BURGESS and H. LE CHATELIER. Third edition. Rewritten and enlarged. John Wiley and Sons. New York, U.S.A. 1912. Price $4 net, or 17s. Chapman and Hall, Limited. London.

LARGE 8vo volume, containing 497 pages of subject matter, with a frontispiece (Wedgwood's pyroscope) and 178 illustrations, a bibliography filling 24 pages, 8 pages of tables, and an alphabetical index. The subject-matter is grouped under: I. Introduction. II. Standard scale of temperatures. III. Gas pyrometer. IV. Calorimetric pyrometry. V. Thermoelectric pyrometer. VI. Electric resistance pyrometer. VII. Laws of radiation. VIII. Radiation pyrometer. IX. Optical pyrometer. X. Various pyrometric methods. XI. Recording pyrometers. XII. Standardisation of pyrometers.

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Liverpool Section.

Meeting held at Liverpool University on Wednesday, February 14th, 1912.

MR. ARTHUR CAREY IN THE CHAIR.

COAL DUST EXPLOSIONS AND THEIR PREVENTION.

BY DR. J. HARGER.

A simple method has been worked out in the laboratory of Liverpool University for preventing the colliery explosions such as occurred at Courrières in 1906 and in our own country at Whitehaven and Hulton pits in 1910. I include Whitehaven because the process not only prevents explosions but provides a means of dealing with a fire in a mine, without risk of explosion.

A candle flame burns in air in a closed space, giving off carbon dioxide and water, until the amount of oxygen left is 17—17½ per cent. when it goes out. Petroleum oil, benzol, ligroïn, and petroleum ether, when burnt in a lamp with wick, have each a definite and different composition of atmosphere at which they go out, and this is while there is still, one would think, plenty of oxygen for them to continue. If means are taken to remove the carbon dioxide, as formed, it makes a little difference but not a great deal. The percentage of oxygen left in most cases is a little less. With coal gas, acetylene, and hydrogen the percentage of oxygen left, when the flames go out, is not very great, as shewn in the following table.

Percentage of oxygen in air at which flames go out

	Per cent.
Soft candle	16·9—17
Petroleum	16·9
Ligroïn, 90—120	16·9
Petroleum ether, 19—33	15·5
Benzene	16·4
Hydrogen	7¼
Acetylene	9·4
Coal gas	11¼

At 11¼ per cent. of oxygen the acetylene flame diminishes in luminosity and, leaving the jet, as a perfect hollow double cone of flame, it wanders about, apparently seeking more congenial surroundings.

When we breathe ordinary air and examine the exhaled air we find that only a very small amount of the oxygen has been used, the contents of the dry gas being 3½—4 per cent. carbon dioxide, 17—16½ per cent. oxygen, 79½ per cent. nitrogen. Since we use so little of the total oxygen, it may well be asked if it be necessary to have so much more than we use? The answer is No, it is not. Normal people would not know they were breathing anything different or unusual if a supply of 17½ per cent. oxygen, 82½ per cent. nitrogen replaced the ordinary air. If we were in a mine 3000 ft. deep 15 per cent. oxygen, 85 per cent. nitrogen would be equivalent to it. Contrary to what we had in the case of combustion the percentage of oxygen for respiration is not what matters. It is the tension—the actual weight in a given volume—that counts. A flame will burn in 21 per cent. oxygen at 380 mm., but will not in 10½ per cent. oxygen at 760 mm. For respiration they act exactly alike.

As long as there is the minimum amount of oxygen necessary to reform the normal quantity of oxy-haemoglobin from the venous blood with ease, it is all that we need. Any more acts as an indifferent gas or almost so.

The depth and frequency of breathing are unconsciously so regulated as to keep the carbon dioxide in the air within the lungs constant at about 5½ per cent. With more than the normal amount of carbon dioxide in the air breathing becomes deeper; with 1 per cent. the effect is not noticeable, and no bad effects follow with this percentage in ordinary air or air containing only 17½ per cent. of oxygen.

The last factor in respiration—the water vapour—is of much more importance than we were led to suppose years ago. It is not noticed much below 70° F. wet bulb; above that it is uncomfortable—stuffy. Above a wet bulb temperature of 80° F. the amount of continuous work which a man is capable of doing without serious rise of bodily temperature rapidly decreases and becomes practically nil at 90° F. wet bulb, even though, as in hot mines, very little clothing is worn. [See also Leonard Hill and Martin Flack, J. Roy. Soc. Arts, 1912, 344—354, (this J., 1912, 251)]

The views of prominent physiologists on these points will be of interest.

Professor Haldane writes that a reduction of oxygen to 17½—18 per cent. is immaterial, and he adds that the oxygen tension in the lungs in a mine, even when a flame goes out is greater than in ordinary air at sea level.

Dr. Leonard Hill writes:—"A reduction of oxygen to 17½—18 per cent. of an atmosphere would have no influence on the work done. Mining operations are conducted, railways, etc., are built, and big towns exist at altitudes where the partial pressure of oxygen is much less than this. An increased percentage of carbon dioxide, say up to 1 per cent., will slightly increase the breathing, otherwise it will have no effect. Men in breweries work long shifts in atmospheres of 0·5—1 per cent. carbon dioxide. The whole question of ventilation is one of heat and humidity, so long as poisonous gases are excluded.

"I have animals now doing well and putting on weight living continuously in 2—3 per cent. carbon dioxide, in air which has been breathed by other animals."

Prof. Benjamin Moore states that a reduction to 17½ per cent. will make no difference and a small quantity of carbon dioxide, about 1 per cent., certainly not injurious. He informs me he has had animals in an atmosphere containing 14 per cent. carbon dioxide for 48 hours with no ill effects.

The effect of coal dust in extending an explosion was first recorded by John Buddle after the Wallsend explosion in 1803.

Attention was again called to it by Faraday and Lyell in a report to the Home Office in 1844 on the explosion at Haswell Colliery. It was not, however, until Galloway, in 1876, read his paper before the Royal Society that the great dust controversy started. It has gone on practically to the present time, being revived in the last few years by the explosion at Courrières in 1906, the biggest mining disaster on record, in which over 1100 lives were lost.

Up to 1894, Galloway, Hall, Abel, The Chesterfield Institute, and more especially the Austrian Firedamp Commission tried experiments on the large scale, Hall in disused shafts, and the Austrian Committee in a large gallery. The results were roughly—Galloway, Hall, and Abel could make some dusts ignite with a blown-out shot (or an imitation of one) some not—sometimes they went off, sometimes not.

The final report of the Austrian Committee gives this conclusion among others:—

"A blown-out shot with coal dust tamping or a charge of dynamite lying free will ignite every kind of coal dust." In a former report this same Commission classified the various coal dusts examined into (1) Explosive; (2) Slightly explosive; (3) Inflammable; (4) Safe. One of the dusts they described as safe came from Camphausen Colliery, and shortly afterwards a violent explosion occurred there with no fire-damp present, in which 200 lives were lost.

The report of our Royal Commission, published in 1891–4 clearly shows the position at that time. The witnesses were about equally divided. Half were certain that some dusts mixed with air alone could ignite and explode. The other half were equally certain that coal dust and air without fire-damp could *not* ignite and explode. The latter class were often men who had spent years in mines. and it must be confessed that they had apparently good grounds for thinking as they did. As an example, one witness with 57 years' experience said :—

> "My experience dates back to 1834 when the mines were much dustier than they are now. The roads were full of dust and we had many explosions but they were always in the workings, where it was not so dusty. . . . It was a regular thing to have an explosion but they were never heavy. . . . They were not particular about ventilation in those days. There was not so much air in the mines as we have now. I never knew an explosion take place in dust. I have fired hundreds of shots in very dusty places. . . . I have seen a great many blown-out shots in dusty places and never the slightest sign of setting the dust on fire."

On the other hand there were many explosions in positions where gas was impossible and cases of explosions extending for miles with very little dust and certainly no gas.

The explosion at Altoft's Colliery in 1886 is a typical example of a dust explosion with no gas present. It originated in one of the main haulage roads which was also an intake way for fresh air and was caused by the third of three shots which were fired to remove some rock. The first two shots went all right and did their work, the third was a blown-out one. It was apparently overcharged and blew out the stemming. An ignition of the dust followed, and after a certain distance it turned into an explosion, which traversed the whole of the intake ways which had any dust but did not do any damage at the working faces or in the return airways.

At the place where the ignition started and for about 70 yards, there were no signs of violence. The men killed there were burnt and suffocated. After 70 yards there were signs of a big increase in speed—a wave of progressive combustion is shown by props being blown out, huge falls of roof. and the men found dead here had broken legs, arms, backs, etc. Further on still the wave attained enormous velocity and power. The men found killed being literally blown to pieces, tubs broken to matchwood, and heavy machinery moved which it was estimated would require a velocity of 50—100 miles per minute. It is events like this that have convinced many mine officials of the danger of coal dust.

These three shots were the only ones fired in the main haulage roads for 23 years ; 2000 shots a year were fired at the working faces in this mine and never a single accident. Shot-firing has been abolished here altogether since. The colliery was well ventilated. 147,000 cu. ft. of fresh air per minute were passed through the mine, and of this 50,000 cu. ft. were travelling along the road in which the ignition took place.

All big dust explosions are similar. An ignition for 50—120 yards. then it is developed into the explosive wave or something approaching it in velocity, and it races through the dust and air at about 50 miles per minute. Almost without exception they are confined to the intake ways that are dusty and seldom, if ever, traverse the working faces or the return airways, many of which are also dusty. A stretch of damp road. 100 yards long or so, will stop an explosion, probably because there is not sufficient dust in the air to propagate it. Also a stretch of stone dust, 100 ft. or so, will stop it provided the dust is fine and pure.

They all occur in well-ventilated mines and in the best ventilated parts of such mines. The explosion always takes place against the current of air ; sometimes it goes in the other direction as well, but seldom reaches the working faces. Mostly this branch is an ignition which fails to develop explosive violence.

Obstacles in the path of the ignition invariably increase the speed and violence. The explosive violence is developed sooner with obstacles present.

These very opposite and apparently contradictory facts can only be reconciled by taking into consideration the oxygen contents of the air mixed with the dust. Two substances take part in a dust explosion—the dust and the oxygen of the air. The part which oxygen plays in ordinary combustions has not been appreciated by chemists and others working on dust explosions. They have also assumed that coal dust acts like a gas, such as hydrogen without any grounds whatever.

The following occurs in the report of The British Coal Dust Experiments, published in 1910 :—"The impossibility of preventing an explosion taking place by depriving it of the oxygen necessary to propagate combustion is so manifest that it need not be enlarged upon."

Is it so manifest as the author thinks ? In studying the evidence of witnesses and reports of various colliery explosions, it was forced on me over and over again that it was always in well-ventilated mines that dust explosions occur, and not only that but in the best ventilated parts of such mines ; generally the faces and return ways are untouched.

It is found that, as the air passes through the mine, the oxygen percentage is gradually reduced and a little carbon dioxide is added. Coal dust absorbs oxygen. fresh coal on the tubs also does. but the chief factor is that black-damp is constantly given off by the waste. At the workings the fresh coal absorbs oxygen also. and gives off black-damp, so that the oxygen percentage is always less here than in normal air. Often it is reduced to below 20 per cent., sometimes below 19. and is found as low as 17 per cent.

Whalley's Report : Average mines in Scotland.

	Returns.	Faces.
Less than 20 per cent. oxygen	19 out of 52	7 out of 18
More than ½ per cent. CO_2	20 out of 52	7 out of 18

Even when the air in the main return shows a good percentage of oxygen. it does not follow that the air at the workings is equally high, because near the workings there is a great deal of leakage from the intake ways to the return ways ; the air gets short-circuited and again the workings are of course the most difficult parts to ventilate, as they are constantly moving forward.

It occurred to me that as flames of oils and waxes go out with still so much oxygen present, coal dust would too, and that perhaps this reduction in the oxygen contents of the air at the working faces would explain why dust ignitions never take place there, although they are often dry and dusty.

Most of the shots fired in mines are fired at the workings. There are over 50 million fired in this country every year, and they are mostly of gunpowder and a fair proportion are blown-outs. The number of blown-out shots is, unfortunately, not available.

To test this idea I fitted up an apparatus, in which was passed air through coal dust, means being provided by which a spark from an induction coil could be passed through the mixture, or in a modification a continuous current circuit could be broken. This means of ignition on a laboratory scale is a very difficult point to settle. It is clearly just as bad to get a source of ignition which is too severe as it is to get the reverse. The chief objection to the induction spark is that it forms ozone and even combusts part of the nitrogen. A continuous current circuit broken in the mixture is open to the same objections.

I hope to be able to devise a better method of ignition, but the present one is quite good for the comparison of different air mixtures.

The only pure coal dust I have failed to ignite when mixed with normal air is a sample of a South Wales anthracite.

It is significant that they were unable to ignite anthracite dust against the air current in the Altofts tube, in which the means of ignition used must be regarded as severe—too much so to make the results of any practical importance, except that they have achieved the object intended, which was to convince mining engineers that the danger of coal dust is very real indeed.

Using my apparatus and coal dust made by grinding coal in a mortar, and using ordinary air, I obtained an ignition every time. I then tried :—

16 per cent. oxygen, 84 per cent. nitrogen—No ignition.
17 per cent. oxygen, 83 per cent. nitrogen—No ignition.
18 per cent. oxygen, 82 per cent. nitrogen—No ignition.
18½ per cent. oxygen. 81½ per cent. nitrogen—Partial ignition.
19 per cent. oxygen, 81 per cent. nitrogen—Just full ignition.

All three experiments were done under same conditions as regards barometric height, temperature, etc. Since then I have tested dozens of coal dusts: some will not ignite with ordinary air but with those that will on reducing the oxygen a point is soon reached at which no ignition takes place.

I obtained samples of dusts from a mine working the Barnsley seam, in which several extensive explosions have occurred. Samples from the screens, roadways, and from the beams and in the intake ways. I could not get any of these to ignite in my apparatus, even after drying and grinding. On grinding a piece of the coal from this seam and using this dust I got ignitions every time with normal air. This appeared strange, especially so in the case of the screen dust, which looked quite black—pure coal dust. An analysis of the dusts pointed to the explanation:—

	Per cent.
Ash in screen dust	10·4
Ash in dust from timbers (1)	33·9
Ash in dust from timbers (2)	19·5
Ash in dust made from coal in laboratory..........	1·3 only

It is interesting to notice that although the screen dust would not ignite with ordinary air, it did so when the oxygen percentage was increased to 23 per cent.

A quantity of the screen dust was separated by blowing air through it and settling the fine dust. This very fine fraction on testing in the apparatus with ordinary air gave an ignition. This suggests a probable explanation of the behaviour of some of the dusts tested by the Austrian Commission and by Hall. They were not pure dusts, and they were mixed with pure air. In the mines, however, they would be mixed with air which had quite a material quantity of dust floating in it, and this dust is probably purer and certainly more inflammable than that settled out.

It is the dust in the air which is the important factor (aided by the other dust) in an explosion.

The dust made from this Barnsley coal ignited with ordinary air every time and it was found that the oxygen had to be reduced to 18¾ per cent. to just prevent ignition or to 17½, using a very powerful flaming spark.

Carbon dioxide has a marked influence on the ignitions, a mixture of 19¼ per cent. oxygen, 80 per cent. nitrogen and ¾ per cent. carbon dioxide acting in the same way as 17½ per cent. oxygen and 82½ per cent. nitrogen.

Coal dust explosions have generally been started by a blown-out shot or a fire-damp explosion. The blown-out shots have been usually but not invariably of gunpowder, and the charges have sometimes been very big (2 lb. or so); the average is rather less than 1 lb.

The gas from mining powder is inflammable and there is a large quantity—1 lb. of powder giving 150 litres. The solid part is also combustible. (See table 23A.)

It is not difficult to understand why a blown-out shot will ignite a mixture of dust and air.

Products from explosion of mining powder.

Gas.	Per cent.	Solids.	Per cent.
Carbon dioxide.......	32·2	Potassium carbonate ..	41·4
Carbon monoxide	33·8	Potassium sulphate ...	0·6
Nitrogen	19·0	Potassium sulphide ...	37·1
Hydrogen sulphide ...	7·1	Sulphur as polysulphides	14·1
Methane	5·2	Potassium thiocyanate.	2·9
Hydrogen	2·7	Potassium nitrate	0·1
		Ammonium carbonate	1·7
		Charcoal	2·1

There are many distinct phases in every big coal dust explosion. The first is the *ignition*, the last the *detonating explosion*. After carefully studying all the evidence there appears to be little doubt that the conditions for an ignition and for a detonating explosion are quite different.

For the ignition there must be a large excess of dust—much more than can be burnt to carbon dioxide and water. Why this is so is not clear, unless it is that the particles of dust must be within a certain distance of one another. The ignition is not a violent reaction because of this excess of dust; a large quantity of carbon monoxide must be formed and remain, and this reaction does not give out a very great amount of heat. In actual time explosions, the first part appears to be quiet slow combustion, which gradually gets up speed to a certain point; then the pace quickens and rapidly gets up to a maximum; *then* if the conditions in the mine are favourable the detonating explosion takes place; if unfavourable the ignition dies away. There have been many cases on record where the dust ignition has travelled 20–50 and more yards and died away without showing any violence.

For the detonating explosion or the propagation of the explosive wave, the conditions are quite different.

It is when the very fine dust, not in great excess, is suspended in the air in about the right proportion for complete combustion, that the explosion is propagated through the mixture at enormous velocity showing great explosive violence, and continuing, to be pulled up finally at the top of the shaft or by a long stretch of wet dust-free road, or by a stretch of road at the faces where the oxygen contents is too low for propagation.

According to this view it is only after the explosive wave has passed that the dense clouds of dust are thrown into the air and partially burnt to carbon monoxide and coked dust.

The invariable presence of carbon monoxide and coked dust after a dust explosion has misled many investigators and has made others consider very dense clouds of dust necessary to propagate an explosion.

There is no doubt, however, that once an explosion has been started and great velocity attained, a very small quantity of dust in the air is all that is required to propagate it.

One of the most extensive dust explosions on record (Elemore, 1886) extended over more than five miles of roads and the evidence was all to the effect that there was very little dust and no gas. Some recent experiments in France have shown that it is possible to get an explosion with 2 oz. of dust spread over 10¾ sq. ft.

One phenomenon which is always noticed after a dust explosion is that coked dust is found plastered on the sides and top timbers and floor. It is not often plastered on the side facing the origin of the explosion (except near the starting point), but on the reverse. It is easy to understand why, when the explosion wave passed, there was no coked dust—this was formed by the slower process after and it was plastered on the timbers by the return wave due to cooling of the hot gases *or* by a return wave often observed in gas explosions.

A great many workings are damp, but many are dry and dusty, especially in the deep mines which are hot, but no ignitions of dust take place there. All the explosions which have originated in the workings have proved on inquiry to be due to gas or gas and dust.

Taking all the facts and experiments into consideration, it appears that not only will an atmosphere with slightly less oxygen prevent dust ignitions, but the propagation of an explosion will not take place through dust mixed with air containing a little less than the normal amount of oxygen.

The very rarity of coal dust explosions points to the fact that normal air, with its 21 per cent. oxygen, is near the lower limit for ignitions, even with pure coal dusts (in fact it is below for some South Wales anthracite coal I tested), and that a very slight reduction, say to 20 per cent. or 19½, will be sufficient to make the intake ways of a mine as safe as the working faces now are.

Large dust explosions unaided by gas are comparatively modern and may be said to date from the Act of 1872; since then the tendency has been to increase the ventilation—removing the many small fire-damp explosions and giving the few big dust explosions.

The recent Mines Act, which comes into force in a few month's time, is again a speeder up of ventilation. When its provisions are carried out the danger zone will be carried further in, perhaps to the very working faces, as indeed it is now with some excessively ventilated mines. If it is the whole of the intakes, workings, and returns in every dry mine, will be liable to be traversed by a monster dust explosion started by any trivial ignition. At present the reduction of oxygen percentage at the faces, which is almost universal, makes them the safety zone: a dust ignition cannot originate there or an explosion be propagated from the intakes through the faces to the returns.

It is impossible at a reasonable cost to keep the air of a mine free from that small quantity of dust which is all that is required for the propagation of an explosion. When it is remembered that the roads of even a small mine will be 10—15 miles long, the impossibility of keeping them free from dust is apparent.

The only way to absolutely prevent dust explosions is to reduce the oxygen percentage below the lower limit, which varies with the different coal dusts. A reduction of 2 per cent. in practice will do this for all mines, but to get a guarantee of absolute immunity 17½ per cent. oxygen is the figure. A 17½ per cent. oxygen atmosphere is ideal for a coal mine, if it were not too expensive to obtain, which should not be the case

The advantages of such an atmosphere in a mine are:—

(1) Dust ignitions are rendered impossible and explosions of any kind quite out of the question.

(2) The chances are enormously against even an ignition of fire-damp, however much, or however little is present.

(3) A fire of timber or coal starting in the ways is impossible. It is also almost certain that a gob fire could not originate, but granted it did originate, it is impossible for it to spread or become a source of real danger.

[A gob fire is fire in the goaf or waste fed by the coal left there and started by spontaneous combustion by some means at present unknown.]

(4) From the point of view of respiration 17½ per cent. oxygen is as good as 21 per cent., and for a mine it is better, provided there is not more than about 1 per cent. of carbon dioxide present.

The problem of lighting a mine with this 17½ per cent. oxygen atmosphere is solved by the use of electric lamps or better, acetylene lamps. Acetylene continues to give a fair light even with 12 per cent. oxygen and it does not go out until 9 per cent. is reached. A great advantage of an acetylene flame is that for combustion, it requires about the same percentage oxygen as a man does for respiration at normal pressure. It is possible to tell the percentage of oxygen in air by taking advantage of the fact that different combustibles go out at different oxygen percentages. When the oxygen is above 17½ per cent. it is possible to tell the percentage of oxygen to about 1 per cent. or less by the light or length of a candle flame.

An atmosphere of 19—19½ per cent. oxygen with ¾—1 per cent. of carbon dioxide, may be obtained in any well-known way. Probably the only feasible way is to use flue gas—purified free from sulphur compounds and smoke, and finally passed through cuprous chloride and copper or some other suitable absorbent for carbon monoxide. One part of purified flue gas is mixed with 15 parts of pure fresh air before or in the intake shaft.

For purifying the flue gas some simple plant will be necessary, but the capital outlay will be small and the working cost very little. The same plant will be of enormous value in case of a fire breaking out in the pit. The oxygen contents can be quickly reduced to any desired extent. The percentage of oxygen can then be increased to 14—15 and men sent in to examine. A man can breathe this quite well even with the carbon dioxide in it and with a simple pocket carbon dioxide absorber such as a Towers respirator, he can do so in comfort.

This method is, in my opinion, the only one which can be thoroughly applied to mines or machines making inflammable dust.

The other methods of preventing dust ignitions are watering and stone dusting.

Watering is used very extensively in Germany, where all dusty mines must be provided with water mains for the whole length of all the dusty roads, the pipes being provided with spraying nozzles at intervals. In the Westphalia Coal Mines there are over 1000 miles of these water mains. Apart from the cost it is impossible for many of the mines in this country to adopt any thorough system of watering like this, because the strata in our dry dusty mines will not stand watering. A considerable amount of watering is done in South Wales, but practically nowhere else in this country.

In a hot mine, watering, even in zones, increases the wet bulb temperature to such a degree that continuous hard work is impossible. Partial watering is of no use except round the spot where a shot is to be fired, and it is very doubtful if this custom does not produce a false sense of security. There have been a number of accidents from shots where the prescribed watering has been done. Further, there is every reason to suppose that moisture in the air makes an ignition or explosion much more violent, and may make an ignition possible when with dry air it would not occur.

Dixon long ago showed that carbon monoxide and oxygen will not burn or explode if dry; in fact to get a violent explosion a considerable quantity of moisture is required and the violence increases up to 7 per cent. moisture.

Gob fires appear to originate chiefly during foggy weather, which is certainly a reason why watering should *not* be done in mines liable to such fires.

There is no doubt that where it has been done thoroughly, as in Germany and in some mines in South Wales, watering is a good thing.

Stone dusting. The process of stone dusting is effective according to the amount of care, labour and dust spent on it. At first the idea was to have dust zones, but this has been given up and preference is now given to dusting the main ways from beginning to end.

Experiments have shown that unless 50 per cent. stone dust, very fine, is mixed with the coal dust of a fiery seam, it is not safe from ignition. The dust has to be fine and go wheresoever the coal dust goes to be effective also, in my opinion it must be such that a current of air passed through the dusts will not bring about a separation of the coal dust to any great extent.

It must be remembered always that it is the dust in the air which is the danger, and after that the dust on the beams and tubs, etc., which can be thrown into the air by the stoppage of the ventilating current. The heavier dust counts for nothing in the explosion, but no doubt takes part in the after effects and gives the poisonous gas. There has been no report published up to now to show that coal dust containing stone dust can pull up an explosion when it has attained a big velocity.

Manchester Section.

Meeting held at the Grand Hotel on Friday, April 12th, 1912.

DR. GILBERT J. FOWLER IN THE CHAIR.

HISTORY OF THE COMMERCIAL DEVELOPMENT OF INDIARUBBER.

BY S. FRANKENBURG.

The first notice of indiarubber or caoutchouc we can trace is to be found in a work written by Antonio de Herrara y Tordesillas (published at Madrid from 1601 to 1615), describing the voyages of the Castilians from 1492 to 1554. In this mention is made of the natives of Hayti playing a game with balls made from the gum of a tree, doubtless indiarubber.

Again, in dealing with the conquest of Mexico, the Castilians found trees in which the natives made incisions from which there flowed a milky substance that converted itself into "a white gum with a pleasant smell." Juan de Torquemada, in his book "The Indian Monarchy," published in Madrid in 1615, was the first to give an accurate description of the leading characteristics of the tree ("Ulequahuitl," or *Castilloa elastica*) which yielded this gum, and of the method employed by the Indian natives to collect it. Torquemada states that the Indians used the rubber for medicinal purposes, and that the Spaniards in Mexico were the first users of waterproof cloaks.

In 1736 Lacondamine sent to the Paris Academy of Science from Brazil a dark, resinous lump of caoutchouc, from which the natives made torches. He later found the

Hevea tree growing along the banks of the Amazon. The Indians of this district gave the name of "Cahucha" to the resin, the waterproofing properties of which were well known to them.

In 1762, Fusset Aublet, a French botanist, discovered the rubber tree in French Guiana, and named it *Hevea Guyanensis*; whilst about the year 1765 another Frenchman, M. Coffigny, found rubber trees in the Island of Madagascar.

During this time the new resin was the object of study by a number of chemists with a view to making use of it for manufacturing purposes. Their great difficulty was to find a good solvent.

In 1761 Hérissant and Macquer found a satisfactory solvent for caoutchouc. By dissolving it in oil of turpentine rectified over lime they obtained a pasty mass which allowed the rubber to regain its former elastic state. They pointed out also that ether might also be used as a solvent.

In 1770 Dr. Priestley found that rubber could be used for erasing pencil marks, and Magellan introduced this use of rubber into France in 1772. The price at that time was about 20s. an oz.

In 1798 rubber had been found in Penang, by Mr. J. Howison, who discovered the tree known as *Urceola elastica*, and shortly afterwards in Assam by Dr. Roxburgh. The tree he found there was the *ficus elastica*.

In 1791, Samuel Peal took out the first patent in connection with rubber, "For application of dissolved indiarubber to waterproofing, the solution in spirits of turpentine to be spread over the fabric with a brush." Peal does not seem to have done anything with this patent, and it was 29 years before the next patent was taken out, this being granted to Thomas Hancock on April 29th, 1820, and was "For an improvement in the application of a certain material to various articles of dress and other articles that the same may be rendered more elastic."

In 1823 Charles Macintosh brought out a patent for waterproofing fabrics by a solution of indiarubber in coal oil or naphtha, and established a factory for the manufacture of waterproof articles at Glasgow. This factory he later on moved to Manchester. He formed a partnership with the Messrs. Birley, the firm being called Charles Macintosh and Co. This is still one of the largest factories in this country, and although there is now no Macintosh in the firm, the third and may be the fourth generation of the Birley's are still actively connected with it. It was in Manchester then that Charles Macintosh began to make those waterproof coats which still bear his name.

Up to this time the rubber had been coming into the country in the form of bottles and of figures, and a difficulty was found to get the material of uniform thickness. Hancock in London had in 1826 had made for him a machine worked by man power to masticate the rubber. This machine would take a charge of one pound. Next year he moved to a larger place in Goswell Road, where he had a horse mill put up and fixed here larger masticators, and also iron rollers through which he passed the raw rubber when hot, which process he found formed it into a rough corrugated sheet, thus bringing it into a good state of preparation for the masticator and also greatly facilitated drying. The charges he was now putting into his machine were of 14 to 15 lb. in weight. The same machines are still used to this day with very few alterations, with the exception that they are much larger.

Hancock was now manufacturing all kinds of elastic articles such as garters, braces, knee-caps, surgical bands, etc. In 1823 he commenced making billiard table cushions, and in 1826 he was making rubber driving belts for machinery and card fillets for carding machines. He had in 1825 taken out a license from Macintosh for the use of his patent. This he now began to apply to air-beds, air-cushions, etc. He also made life preservers of rubber. About this time his brother, John Hancock, started making rubber hose which was taken up in the first place by breweries. Thomas Hancock next took in hand the manufacture of diving suits and tubes for supplying air to the diver. In 1828 he started a factory in Paris principally for the manufacture of elastic webbings.

In 1830, Hancock joined Charles Macintosh and Co., still, however, keeping up his place in London. During the next few years other people started experimenting with the manufacture of rubber articles.

The one disadvantage of the waterproof articles manufactured by Hancock and Macintosh was, that they would not stand the extremes of heat and cold. In 1832 a German chemist, Ludersdorf, discovered that sulphur mixed with rubber dissolved in turpentine took away the viscosity but he does not seem to have gone further in the matter.

It was an American, Nelson Goodyear, who first solved the great secret of how to produce rubber articles which would keep their nature in the extremes of heat and cold. Goodyear's partner, Nathaniel Hayward, accidentally dropped on a heated stove some rubber mixed with sulphur, and afterwards noticed how the sulphur was taken up by the rubber, which itself became elastic and kept its nature when afterwards exposed to the sun's rays. This was in 1839. Goodyear saw the possibilities of this discovery and further developed it. He had already been experimenting with rubber dissolved in alcohol, and in 1836 had secured a contract from the U.S. Government for waterproof mail bags, which, however, had been found useless at high temperatures. Goodyear finally took out an American patent in 1844 for his vulcanising process.

In the meantime, however, Hancock had in 1843 taken out a British patent for practically the same process, so that when in 1847 the Hayward Rubber Company of America started importing rubber overshoes into this country, they were challenged by Charles Macintosh, who stated they were infringing Hancock's patent. The matter was, however, arranged amicably by Macintosh granting the American firm an exclusive right to sell in this country overshoes of their own manufacture.

In 1846 Alexander Parkes took out a patent for the cold cure or vulcanisation process, which consists in immersing rubber in a solution of sulphur, chloride, and carbon bisulphide. This process showed that heat was not necessary for the vulcanisation of rubber.

Rubber at this time was replacing leather for many purposes. In addition to the uses already mentioned it was now being used for steam valves, for door springs, for railway buffers and also for rollers for printing. It now came into use for carriage tyres, and in 1850 Lt. Halkett, of the Royal Navy, brought out his rubber collapsible boat, which is still used by many a yachtsman. The use of rubber for manufacturing purposes was now becoming very wide spread, and during the next 30 years new factories were springing up.

In 1886 a patent was granted for printing patterns on the rubber face of faced cloth, and about the same time a process was brought out to get rid of the smell from waterproof cloth, which had prevented the macintosh from being very largely used. These two processes brought the waterproof garment into much wider uses, more especially for ladies, who up to this time had not been specially catered for.

About this time also the bicycle was becoming popular, and the manufacture of bicycle tyres gave a further impetus to the rubber trade. This further strengthened by the introduction of the pneumatic tyre by Michelin and Dunlop.

The great development in electricity for lighting and power purposes also created great demands for rubber for insulating purposes.

Next came the great development in the use of motor cars, which made a further demand on the rubber industry; in fact with the lowering in price of motor cars, which brought them into popular use all over the world, and the resultant demands for tyres, the demands for raw rubber had become great, and was increasing so rapidly, that in the beginning of 1910, there was a temporary shortage of supply, which with the help of speculation sent up the price of Para rubber in less than 18 months from 2s. 9d. to 12s. 6d. per lb.

The following figures will serve to show the great increase in the demand for rubber. In 1830 the total export of rubber from America was 25 tons. In 1850 this had grown to 750 tons. In 1870, 1500 tons. For the season 1900-1901 the receipts of rubber of Para alone was 27,600 tons, whilst in 1910-1911 the receipts of Para was 37,500 tons. Besides this increasing quantities were being exported from Africa and from the Eastern plantations.

Plantation rubber.—It was in June, 1876, that the first supply of *Hevea* seeds was introduced into England, Mr. Wickham having collected them in the Amazon Valley on behalf of the Indian Government. A few weeks later, 7000 seedling *Hevea* plants, grown from these seeds at Kew, were sent to the Eastern tropic Botanic Gardens mostly to Ceylon. To show what bearing the plantations will have on the rubber market in the near future, the amounts of rubber exported from there during the last few years have been as follows:—1908, 2500 tons; 1909, 4600 tons; 1910, 7050 tons; 1911, 12,000 tons.

DISCUSSION.

The CHAIRMAN asked whether the smoking process, with its consequent production of acetic acid and some other substances was only to accelerate the clotting of the latex, or whether it was essentially an enzymic change, which would take place in any event on exposure to the air if time were allowed.

Mr. WM. THOMSON inquired what difference there was between plantation rubber and ordinary Para. The question of drying over the palm nuts was an exceedingly interesting one. He had distilled some of the palm nuts used in drying the rubber, and got an oily matter, which was not creosote, and on putting it on a fine tissue india-rubber, and leaving it exposed to the air, it seemed to preserve the rubber. In masticating the rubber there was a number of airholes produced round the walls of each of which there was oxidation constantly going on. The oily matter produced in the Para curing process from the smoke from the smouldering nuts appeared to have the effect of preserving the rubber from oxidation.

Mr. H. L. TERRY said that the difference between plantation rubber and the fine Para rubber was purely a matter of moisture. There was 15 per cent. of moisture in fine hard Para rubber, whilst in the process by which rubber was prepared in the East moisture was eliminated. Allowing for the moisture, Brazil rubber cost the manufacturer more than the plantation rubber. He would like to learn whether almedia was coming into its own again. It was very much neglected when Mr. Christy brought it over to England 25 years ago, and its value gradually got down to 6d. per lb. It was being brought forward again under the auspices of one of the new companies. The 10 per cent. of rubber might be extracted on the lines that were being adopted with regard to the Jelutong, or Pontianac, which it very much resembled, though it came from a different tree. That process was being carried on at the present time on a commercial basis though there were no dividends so far. He believed that when they got the 10 per cent. of rubber away from the 40 per cent. of resin, that it had a pronounced tendency to be tacky, although some samples looked exceedingly good. It was said there was a certain demand for the resin, and of course a great deal would depend upon whether both the products could be made of commercial value. It was reported that the whole of the large output from Jelutong could be utilised. The latest patent in connection with the matter was in respect to its use for varnishing stonework in lieu of linseed oil.

Mr. HÜBNER asked whether the lecturer would give his opinion with regard to the attempts of the Bayer Company, of Elberfeld, to produce synthetic rubber.

Mr. J. ALLAN said that Pontianac gum or Jelutong was collected largely by Malays and Chinese; the coagulation was brought about by mixing the latex with "whitestone" (powdered gypsum) and ordinary burning petroleum. After coagulation the curd was poured into closely woven bamboo baskets where it drained but was always left very wet as otherwise the rubber oxidised rapidly and the original 14 or 15 per cent. of rubber in the substance would be greatly reduced. It was not uncommon to find Jelutong containing only 7 per cent. of actual rubber. He had seen Hevea latex coagulated without acetic acid, or the addition of any acid. It was quite common in some districts to use the old latex liquid from previous coagulations as the coagulating material instead of acetic acid. It was said that a better result was obtained if ordinary fermented vinegar was used, instead of a pyroligneous or distilled acid. He thought in the majority of cases the natural coagulation of the Hevea latex was similar to the natural coagulation of the Castilloa latex. The rapid coagulation was a property of the emulsion itself as acids were formed by fermentation. Since the globules in the Castilloa latex were about five times as large as those in Hevea latex, the former might be expected to coagulate more rapidly than the latter.

Mr. W. F. ERMEN asked whether any work had been actually done in distilling the palm nuts, and using the condensed distillate for coagulating the latex.

Mr. S. B. JATAR asked whether any use had been found for the different oils distilled from the resin.

Mr. A. JOHNSON asked how frequently they were able to tap the trees and at what age they commenced.

Mr. E. ARDERN asked what was the average yield of rubber per tree per annum.

Mr. FRANKENBURG, in reply, said that for some purposes of manufacture there was no doubt that the plantation rubber was just as good as if not better than the Para rubber. So far as tensile strength and general usefulness went, and from all the tests one could make, the old Para rubber was immeasurably superior to the plantation rubber. Plantation rubber was vulcanised in the same manner as ordinary rubber. After a certain length of time the plantation rubber would decompose, but the Para rubber would keep for a considerably greater length of time without showing signs of decomposition. Synthetic rubber had been produced, but only in small quantities up to the present, and was therefore of no commercial importance. The foundation was isoprene. The almedia being a material which gave 10 per cent. of rubber, and that not of the best quality from a rubber manufacturer's point of view, would not pay for very much research work. If the 40 per cent. of resin could be brought into good commercial use, and could be extracted by some very cheap method, it might be useful. Almedia and the Jelutong might pay at present with rubber at about 5s. per lb., but in the near future when the plantations were further developed they would not be a financial success. The recognised age for the first tapping of a Para rubber tree was five years. During the rubber boom many trees were tapped at three or four years with the result that those trees were not now giving a good yield. During the last two years some of the plantations had decreased their output. In the first year's tapping two ounces were obtained from an incision, and a fully grown tree would give a yield of 4 to 5 lb. on the average. One tree had given in two years 160 lb. of rubber; that was, however, very exceptional, and it was a tree over 30 years old. By correct tapping the trees could be tapped to a very great age. In the Amazons many trees had been spoiled through the natives not tapping them in a proper manner, with the result that trees at 10 or 12 years of age had not yielded any more rubber. Scientifically treated there was no reason why a tree should not yield when it was 30 years old. Acetic acid caused coagulation and accelerated it, but rubber latex would coagulate without any chemical or without any smoking whatever.

New York Section.

Meeting held at Rumford Hall, Chemists' Building, on Monday, March 22nd, 1912.

PROF. M. C. WHITAKER IN THE CHAIR.

RECENT DEVELOPMENTS IN WOOD DISTILLATION.

BY THOS. W. PRITCHARD.

Credit for the first commercial work in the distillation of pine wood is to be given to James Stanley, who built a small commercial plant in Wilmington, N.C., in 1872

This plant was not a success in his hands, and was shortly after taken over by Mr. L. Hanson, now President of the Spiritine Chemical Company of Wilmington, N.C., and another gentleman of Danish birth, who had had some experience of similar work elsewhere. By a rather striking coincidence the test plant, which is by the author's process, has been built in Wilmington within a few feet of the former location of Stanley's first plant.

The process started by Stanley and carried out by Mr. Hanson, was the old crude method of destructive distillation in a series of retorts with condensers attached set in brickwork with furnaces beneath. The wood was placed in the retorts and the doors closed, fires were started in the furnaces and kept up until distillation ceased; the retorts were then allowed to cool and the charge was withdrawn. No attempt was made to control the temperature during distillation; the heat in different parts of the retort varied, the top being much hotter than the bottom or sides. It was not until years later that the possibilities of varying the products, according to the temperature employed, was thought of. The loss of heat was very great, as it was necessary to heat up the brick work before distillation started. There was no attempt at first to refine or separate the products, which were pumped into storage tanks and used in adjacent plant for the creosoting of timber.

No one, at that time, even appears to have thought than there might be turpentine in the products of distillation; the credit for the conception of the extraction of turpentine must be given to the exploiters of the steam process, which, though it offered many possibilities, has ultimately proved commercially successful only in a few cases.

The solvent process has within the last few years been applied to the extraction of the products from pine wood, and great things are claimed for it. By this process the wood to be treated is first shredded, or hogged, as it is called, and then extracted with naphtha or some other volatile solvent. The extract thus produced is drawn off and subjected to fractional distillation. The solvent is recovered and the products are then refined. Though the solvent process is claimed by many to be the most profitable, and large sums are being spent for the erection of plants for its exploitation, it seems economically wrong to extract but a proportionately small part of the valuable contents of the raw material and to throw the remainder away. This applies both to the solvent and to the steam process. The one great essential to be sought for in wood distillation is temperature control throughout the distillation, and it is now reasonably certain that a method by which this is secured has at last been successfully worked out in the plant just completed for the National Wood Distilling Company.

The good points of the old destructive distillation process are good utilisation of the raw material and high yield of products. The average production from a cord of good wood by it is approximately twenty gallons of turpentine, ten gallons of light oil, and seventy gallons of heavy oil, with a residue of twenty-five bushels of charcoal. Neither alcohol nor acetic acid are included because their value is slight and variable, and with very few plants are they utilised. The first cost of this style of plant is relatively low, and the expense and difficulty of hogging wood are not incurred. Nearly every plant that has proved a financial success has been of this type.

The weak points, which are serious, in this process are:—(1) The lack of temperature control in the retort, whereby all sorts of compounds are formed which distil with the turpentine and contaminate it, while a large percentage of the heavy products is burned in the retort. A deposit of carbonised matter has to be cut out of the retorts after a short usage; (2) the very high temperatures of working which entail comparatively quick wear-out and very heavy up-keep, as well as an enormous waste of fuel; and (3) the risk of fire, so that no insurance company will accept this style of plant as a risk. Finally it takes very much longer to handle a given quantity of wood by this process than by others.

In considering the steam process, credit must be given for the good quality of the turpentine produced, for the temperature control, which is of paramount importance in wood distillation, and for the freedom from risk of fire. The weak points in the process are the very small proportionate yield of products, and that the raw material is not utilised to the fullest extent. This process yields from six to fifteen gallons of turpentine, and from two to four gallons of pine oil from a cord of fat wood, the variations being due to differences in quality and treatment. The expense of operating the steam process is high, and the waste of raw material is enormous and unreasonable.

The solvent process appears to possess considerable advantages over the steam process in quantity of products while the quality of the turpentine is as good, and a good yield of rosin is obtained. There is, however, a very high fire risk; the cost of operation is comparatively high and the raw material is not completely utilised.

The ideal process for the distillation of wood should possess the following essential features: First, definite control of the temperature during the entire process of distillation; second, a maximum yield of products; third, products of good quality; fourth, cost of operation comparatively low; and fifth, the fire risk minimised.

The author realised when he first began work on wood distillation that the temperature control was of the greatest importance. After many experiments it was discovered that the oil bath could be utilised to give very definite temperature control at comparatively high temperatures. There was great difficulty for a long time in getting an oil which would stand repeated heating without cracking, but finally a petroleum cylinder stock of very high fire test was found, which could be heated to six or seven hundred degrees F., without trouble, provided air was excluded. With this fact as a base the process which is embodied in the plant recently built in Wilmington, N.C., was developed.

A miniature plant on these lines, built last year, in which continuously ninety-six charges were run, was constructed of two pieces of pipe. One was eight inches in diameter by twenty-four inches in length, and the other inclosed the first, with an intermediary space of one-half inch. The ends of this space, of course, were tightly closed. An outlet pipe passed from the inner shell through the jacket to an ordinary worm condenser. A half-inch inlet pipe and a take-off pipe were connected to the bottom of the outer shell of the jacket, at opposite ends of it.

A small rotary pump drew oil from a small closed steel storage tank and forced it through the circulating system of a gas-heated bath-water heater, and thence to the inlet of the jacket. After traversing the latter, the oil returned to the storage tank, whence it was circulated afresh through the heater and plant. A by-pass pipe and suitable valves were provided so that the oil circulation through the jacket of the retort could be completely cut off. A reserve tank filled with cold oil allowed the latter to be introduced into the circulation at any time. By increasing or decreasing the speed of the pump, opening or closing the by-pass valves or introducing cold oil into the circulation, it was found entirely practicable to control the temperature absolutely.

The charge in this small retort was 20 lb. of wood, and estimating the weight of a cord of good rich wood at 4000 lbs., the average yields (for fifty charges) were 36 gallons of water-white turpentine, 10 gallons of light oil, and 125 gallons of heavy oil per cord of wood.

There was no trouble whatsoever in getting complete and uniform carbonisation. The heat distribution by this method was so good that a solid stick of timber exactly filling the retort was charred through and through. It was discovered in operating this model that by varying the temperatures varying products could be obtained, and also that by drawing off the liquid contents of the retort after the turpentine had been distilled large quantities of an excellent grade of rosin could be produced. In fact, one of the main features of this process is its extreme flexibility.

The commercial plant, which has just been completed and is now in daily operation, exactly follows the model, except that the jacket space is proportionately about three times as great. The inner shell of the retort is three and a half feet in diameter, and 28 feet in length, and the outer shell is 18 inches wider. The oil heater consists of a continuous coil of electrically welded pipe, 350 feet long, set in a specially constructed furnace so that while not in direct contact with the fire, it yet gets a maximum amount of the heat. The results with this large retort have checked absolutely with the model, and there seems no reason why they should not continue to do so indefinitely. The same oil was used for heating in the model for 96 successive charges, and it appears to be in exactly the same condition to-day as when first put into service. The low cost of this oil and its long service make it an ideal medium for conveying the heat.

In operating the plant, the wood is run on cars into the retort; the doors are closed, and a steam jet is turned into the interior to force out the cold air and so hasten the heating. The oil is then circulated by means of a low pressure pump from the storage tank through the heating coil to the retort where it fills completely the space between the inner and outer shells. It there forms a jacket of hot oil with a uniform temperature, and passing out at the bottom of the retort returns to the storage tank. The heat is controlled so that the inside temperature does not exceed 450° F., until all the turpentine and pine oil have been distilled off; the temperature is then allowed to rise slowly until the light oil has passed off, at which point destructive distillation begins and fractional distillation ceases. At approximately 480° F., the distillates with the distinctive empyreumatic odours begin to occur and the temperature is kept below 525° F. until all the light oil is over, when it is increased as fast as possible. A maximum temperature of 610° F., in the inner shell gives complete distillation of all the products, leaving dry charcoal of excellent quality. The bath oil is then at 650° F., and it is not generally carried higher, though 750° F. has been reached, without trouble.

The results prove, in the author's opinion, that this process is the most accurate, and the apparatus the most scientific ever evolved for this work. The process is under perfect control at all stages and the temperature can be raised or lowered at will. Tests have shown that the temperature of the oil bath can be kept at any given degree as long as may be desired. The time consumed in running a charge by this process is comparatively shorter than by any other; for though longer than with a steam process plant, the difference in the production turns the scale in favour of the new process. Distillation begins as soon as the wood is in the retort, as the oil is raised to about 350° F. beforehand. After the charge is worked off, instead of waiting many hours for the retort to cool, cold oil is pumped through the jacket to assist the cooling.

The fire risk by this process is also slight. An examiner for one of the leading Insurance Companies in America has classed the plant as a comparatively safe risk, and is willing to write it at a very fair rate. In regard to the quantity and quality of the products obtained, both the turpentine and oils are of a very high grade, and the production is far greater than by any other process with which the author is familiar. The record sheets of the charges show not only the yield, but the temperature both of the oil jacket and of the interior of the retort at which each product was distilled and the time. In regard to the quality of the products made by this process, they are distinctly different from the products of the old destructive distillation process. The turpentine would be indistinguishable from the very best gum turpentine but for the pine oil contents, which is the one means of distinguishing wood turpentine from gum turpentine. The presence of pine oil, even in very small quantities, raises the average of the boiling points in fractionation. A method of refining is now being tried which seems to promise an easy and economical method of extracting even the slightest quantity of pine oil from refined turpentine, and it is believed that it will not be possible to distinguish good wood turpentine after such extraction from that distilled from the crude gum turps. Samples of the oils both in crude form and refined show that the heavy and light oils are very much brighter in colour, and have a much milder odour than the ordinary destructive distillation products. This is due in part to the fact that they are not burned, and are taken from the retort at their normal distilling temperatures. Some of the oils made by the old destructive process were so black in colour and so high in odour that they have been hardly worth marketing, and they have unquestionably been spoiled by exposure to excessive temperatures.

Four oils produced by the Company's special processes of refining compare favourably with the better grades of rosin oil, though they do not resemble it in composition, and can be produced at much less cost. One of them ("XL") is practically odourless; it seems to have rather remarkable drying properties, and worked into paint shows excellent wear. Paint samples which have been in service for seven months or more have given very favourable results as compared with pure linseed, but only the darker shades could be produced as the oil darkens any light pigments.

In regard to the refining of the oils produced from the distillation of pinewood, much remains to be done. The author has made, perhaps, as many as seventy-five distillates, but this branch of work alone offers a wonderful field for the research chemist. As to the possibilities of the distillation of pine wood, there are to-day millions of cords of wood lying on the ground rotting, in each cord of which there is a money value of approximately twenty-five dollars. Thousands of cords of rich pinewood having an equal money value are burned every day at saw mills.

The distillation of pinewood is not an industry which requires large capital. Plants may be built for comparatively small amounts that will pay good dividends. There is an unlimited demand for all the products, at prices which will pay handsomely. Every failure in the past can be safely attributed to either lack of knowledge of the industry, lack of capital, or a poor process. Many men have gone into the business thinking that they could get fancy prices for the products and have been disappointed. A steady sale at a reasonable profit is all that can be expected. There is, however, a steady demand for all of the distillates now, and this demand is growing daily. The heavy wood oil is even more valuable than dead oil from coal tar for the preservation of timber, and there have been offers from users of timber preservatives for very large quantities of it, if it could be furnished in sufficient quantity and at a low price. So far, this has been out of the question, as one large railroad system could take all the oil made in this country. One feature of the industry which has done more to militate against it than anything else, is the lack of co-operation among the men engaged in the work. An association which would allow of an exchange of ideas and promote a spirit of helpfulness would do more for it than anything else. Trade secrets need not be divulged, but matters of moment for the good of all could be promoted by such an organisation, and only by such.

The following is an abstract of one out of many specimens of the record sheets of the working off of a charge by the new process.

Charge No. 90. August 12, 1911.
20 lb. Western wood.

	Temperature inside retort.	Temperature of oil jacket.	
	°F.	°F.	
8.25 a.m. Fire started .			
10.08 a.m. Turps. started	397	473	32½ oz. crude
11.00 a.m.	414	477	turps.
12.00 noon	439	495	27 oz. water.
1.00 p.m.	459	511	10 oz. crude
2.00 p.m.	486	562	light oil.
3.00 p.m.	551	622	5½ oz. water.
4.00 p.m.	606	702	90 oz. crude
5.00 p.m.	637	682	heavy oil.
5.30 p.m.	631	686	32 oz. acid.

Charcoal, 4¾ lb. Residue, 11 oz.

Refined products obtained.	Per cord. (4000 lb.)
W.w. turpentine	40 gals.
Seconds turpentine	1·5 ,,
Light oil	10·5 ,,
Light product (from heavy oil)	3·1 ,,
Light product (from extra heavy oil)	2·7 ,,
Heavy oil	87·5 ,,
Extra heavy oil	40·6 ,,
Charcoal	950 lb.
Residue	138 ,,

Discussion.

Mr. H. O. Chute called attention to the fact that wood distillation as applied to hard wood was well developed in the United States, there being over one hundred plants using about a million cords of wood per year, and a satisfactory type of machinery for performing the operations had been developed. There was considerable similarity in the operations and the products of distillation of wood, whether of hard wood such as beech or maple or birch and the resinous woods such as the southern pine. The gas generated from the pine had greater illuminating and calorific power than hard wood gas. The pyroligneous acid of each contained both acetic acid and methyl alcohol in about equal proportions, but the yield per cord of those products was twice as great from hard wood as from pine. The problem of heat distribution in the retort had been solved by the hard wood distillers by lowering the fire to a sufficient distance from the retort, so that the flame in no case impinged on any part, and only heated air or products of combustion struck the retort. The distribution of heat in the retort, the speaker thought, could be accounted for only on the supposition that the heated gas and vapour in it carried the heat from the shell to the interior in the same way as, but less perfectly, than the water did in the ordinary steam boiler. It was reasonable to suppose that if all the heat in ordinary working of retorts were supplied at the bottom and observation showed that the greatest heat development was at the top, there must be some heat distribution through the retort.

Some experimental work had been done a few years ago on working up light wood in a five foot diam. retort, 9 ft. long, which held a cord of wood. The distillation was carried on over a period of about 36 hours and yielded 110 gallons of oil and tar, 150 gallons of pyroligneous acid, and 500 lb. of charcoal. From this was produced 16 gallons of wood turpentine which boiled within the standard limits of gum turpentine. The tar yielded also other oils boiling at temperatures above turpentine. The pyroligneous acid contained enough acetic acid to produce 100 lb of grey acetate of lime per cord Four gallons of alcohol was also produced. The wood turpentine put on the market must be fractionally distilled till its boiling point corresponded with that of standard gum turpentine. On experimenting with light wood in a retort holding several cords, using steam distillation only, the yield was found to be only ten gallons of oil, and of this only six gallons boiled within the limits of gum turpentine. On trying the ordinary mill waste such as sawdust, etc., by the same method, only two gallons per cord were produced; this was due to the fact that all mill waste consisted mostly of the comminuted sap wood which did not contain much resin. In ordinary mill practice the outer layers of wood were converted into boards and planks and the heart was used for heavy timbers. Thus very little of the resinous matter was found in saw mill waste. In conclusion, he thought that there was a bright outlook for wood turpentine, as the demand for turpentine was increasing and the supply of trees which had not already been worked for the gum turpentine was now almost exhausted

Journal and Patent Literature.

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I.—GENERAL PLANT; MACHINERY.

Patents.

Concentration of syrupy liquids and apparatus therefor. J. MacGregor, Glasgow, and Ernest Scott and Co., Ltd., London. Eng. Pat. 6866, March 18, 1911.

The concentration is carried out in a multiple effect evaporator the final effect of which (the third) is of larger capacity and has a relatively smaller heating surface than the earlier effects and forms a finishing vessel for the accumulation and final evaporation to the desired density of the syrup; the heating of this vessel may be augmented by the use of direct steam. During the evaporation the finishing vessel forms the last effect; when this is to be discharged, the condenser is cut off and caused to operate on the preceding effect and, should the storage capacity of this effect be inadequate for the liquid evaporated in the time occupied by the discharging, the evaporated liquid from it is pumped away to a storage tank in readiness to pass to the finishing vessel when it is again connected up in series. A tank is provided below the finishing vessel into which the finished product may be rapidly discharged.
—B. G. McL.

Concentrating liquids; Process for ——. P. Kestner, Lille, France, Assignor to Kestner Evaporator Co., Philadelphia, Pa. U.S. Pat. 1,022,321, April 2, 1912.

The liquid to be evaporated is heated and the pressure allowed to rise; it is then conveyed to an expansion chamber where it is partly vapourised. The vapour and the hot liquid are separately conducted into the feed chamber of an evaporator having vertical, externally heated tubes. The vapour is caused to enter the lower end of each tube as a jet and so act as an injector, and draw the hot liquid into the tube, up which it rises as an annular film, and is evaporated.—W. H. C.

Furnaces [for burning megass, etc.]. George Fletcher and Co., Ltd., and F. P. Rudder, Derby. Eng. Pat. 15,521, July 4, 1911.

The furnace, which is intended for burning green megass or other light and fine refuse material is constructed as a vertical brick-work chamber of rectangular cross-section. The grate, which is near the bottom of this chamber consists of two sets of grate-bars sloping downwards from the shorter sides to form a V-shaped trough. The fuel is charged on to the grate through two apertures in the roof of the furnace so placed that the fuel falls on to the highest parts of the grate, the angles of which approximate to the natural angle of repose of the material to be burnt. Below the apex of the grate a horizontal shaft provided with cams and an external handle is fixed, so that the grates may be rocked to aid removal of the ash or clinker. Natural or forced draught may be employed, the products of combustion passing away by a lateral opening near the top of the furnace.—B. G. McL.

Drying kilns. H. Vinel, Bourg, France. Eng. Pat. 16,590, July 19, 1911. Under Int. Conv., July 23, 1910.

The kiln or drying shed is of the type in which air circulates continuously through the drying chambers and heating chamber. The kiln is rectangular in plan, and the inner walls are of glazed bricks with a backing of sand or other heat-retaining material. The interior of the kiln is divided by vertical walls so as to form two drying chambers separated by the furnace and heat-distributing means. The gases from the furnace pass through a nest of inclined iron pipes to a stack pipe, and the air is heated in circulating over these pipes. The hot air passes into mixing chambers and thence, together with vapours circulating from the drying chambers, it passes through orifices in the inner vertical walls into the drying chambers. Large horizontal pipes on the floors of the drying chambers lead the vapours back into the mixing chambers, or to the furnace as desired, the working being controlled by dampers. The kiln may be used for drying wood. —A. T. L.

Distributing or storing inflammable liquids; Apparatus for ——. Maschinenbau-Ges. Martini und Huneke m. b. H., Berlin. Eng. Pat. 1941, Jan. 24, 1912. Under Int. Conv., Feb. 10, 1911. Addition to Eng. Pat. 19,691 of 1909, dated Nov. 23, 1908.

In the apparatus described in the chief patent, the suction of the pump is connected with the interior of the casing which surrounds the delivery pipe for the inflammable liquid. The suction also dips into a tank containing the neutral liquid, and the delivery communicates with the interior of the closed tank containing the inflammable liquid. The delivery pipe for the inflammable liquid, but not the casing, communicates with the closed tank.—W. H. C.

Distillation apparatus with automatic device for the separate collection of different fractions. C. Kohn. Ger. Pat. 244,534, March 15, 1911.

Inside the still is a cylinder containing some glycerin or mercury and fitted with a piston. On heating the still the expansion of the glycerin or mercury causes the piston to move outwards. The end of the piston rod has the form of a rack, which engages with a pinion, and the latter by means of other gearing causes the pipe through which the vapour passes away from the still to turn. This vapour-outlet pipe has a projecting branch pipe enclosed in a casing. As the vapour-outlet pipe turns in accord with the movement of the piston, the end of the branch pipe registers successively with different openings in the surrounding casing, each communicating with a separate receiver.—A. S.

Transparent and translucent bodies; Manufacture of ——. K. W. Spalteholz, Leipzig, Germany. U.S. Pat. 1,021,952, April 2, 1912.

See Fr. Pat. 401,961 of 1909; this J., 1909, 1186.—T. F. B.

Compressed or liquefied gas. Container or cylinder for ——. R. H. Campbell, Assignor to Aerators, Ltd., Edmonton. U.S. Pat. 1,022,301. April 2, 1912.

See Eng. Pat. 10,609 of 1910; this J., 1911, 271.—T. F. B.

Furnace-gases; Process for the filtration of ——. F. Müller and P. Pape, Brebach on Saar, and O. Johannsen, Neufechingen, Assignors to Rod. Böcking und Co. Erben Stumm-Halberg und Rud. Böcking G. m. b. H., Halbergerhütte, Germany. U.S. Pat. 1,022,496, April 9, 1912.

See Eng. Pat. 29,933 of 1910; this J., 1911, 1299.—T. F. B.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Moisture in coals; Determination of ——. E. H. Archibald and J. N. Lawrence. J. Ind. Eng. Chem., 1912, **4**, 258—262.

Experiments on the drying of bituminous coals and anthracite under different conditions are described, the results of which show that the official (U.S.A.) method (heating for 1 hour at 104°—107° C.) gives figures for moisture content much below the true values, the error, in the case of some bituminous coals, amounting to 40 per cent. of the true moisture content. The errors, which are probably mainly due to oxidation of iron or sulphur, or both, and to incomplete expulsion of the moisture, are much greater with bituminous coals than with anthracite. For the determination of moisture in bituminous coals, it is recommended that the coal be heated in a current of dry air at a temperature of at least 110° C., the moisture expelled being absorbed by anhydrous calcium chloride. —A. S.

Coke-oven gas; Use of —— for town purposes. Development in Germany. G. S. Cooper. J. Gas Lighting, 1912, **118**, 107—108.

In Germany the towns of Waldenburg, Altwasser, and Salzbrunn in Silesia, Essen, Dortmund and Mülheim have been supplied for some time with gas derived from the neighbouring coke-oven plants. The entire supply of gas for the town of Mülheim-on-the-Ruhr and also for Barmen, some forty miles distant, is obtained from two coke-oven plants. The installation consists of 50 Koppers' horizontal regenerator ovens each capable of taking a charge of 8 to 10 tons of coal; the time of carbonisation is 24 hours and only the richer portion of the gas—that evolved from the second to the twelfth hour, and which represents about 50 per cent. of the yield—is used for distribution. During this period one oven will produce 70,600 cb. ft. of gas of a calorific value well over 600 B.Th.U. per cb. ft. and having the following average composition:—Carbon dioxide, 1·2; carbon monoxide, 6·8; hydrogen, 49·5; methane, 38·3; and nitrogen, 4·2 per cent. The Koppers' direct process which is employed for the removal of ammonia has been found to exert no impoverishing effect on the gas. In the process a yield of 65 to 69 per cent. of large coke; 5 to 6 per cent. of tar; and 1·3 to 1·5 per cent. of ammonium sulphate is obtained. The gas costs 2½ pf. per cub. m. (8⅓d. per 1000 cb. ft.) and after purification from hydrogen sulphide—an operation undertaken by the town authorities—it is sold to the consumers at 10 pf. per cb. m. (2/9⅓ per 1000 cb. ft.). (See also this J., 1912, 113.)—B. G. McL.

Water-gas; Removal of tar from ——. A. P. Beardsley. J. Gas Lighting, April 16, 1912, 165—166.

The experiments were carried out on a plant in which the gas was cooled and the tar removed in five distinct stages in the following order:—I. A board scrubber. II. A condensing system comprising an exposed steel main, 30 in. diam. and 310 ft. long, followed by a condenser in which the gas travels horizontally and impinges on vertical pipes in which the cooling water flows; an exhauster forces the gas through. III. A Pelouze and Audouin extractor of rated capacity 5¾ million cb. ft. daily. IV. Two shavings scrubbers in parallel having a combined capacity of 2 million cb. ft. daily, and through which, neglecting the space occupied by the shavings, the gas passes at the rate of 12·24 feet per minute. V. Four purifiers, each with three layers of oxide, in parallel, and in which at 2 million cb. ft. daily the rate of flow is 0·77 ft. per minute, giving a contact time of 13 minutes. The following results were obtained at each stage:—I. The gas leaving the superheater at a temperature of about 1400° F. and containing 5·79 lb. of tar per 1000 cb. ft., has figures reduced to 160° F. and 4·56 lb. respectively; the tar removed represents 21 per cent. and the reduction in temperature is attended by a raising of the water content of the gas from 8·03 to 10·93 lb. per 1000 cb. ft. It is suggested that the inefficiency of the removal of tar at this stage is partly due to the rapidity of cooling of the gas, leading to the production of a fine tar fog, easily carried forward in suspension in the gas. Were the cooling slower, the tendency would be for the formation of larger and more easily separable drops. II. The temperature of the gas here fell to 101° F., 80 per cent. of the tar entering or 63 per cent. of the total tar being removed. III. A drop in temperature of 3° or 4° F. was effected, and the percentage of tar removed varied with the differential pressure employed; at 2 inches differential pressure 67 per cent.; at 4 inches 75 per cent.;

nd at 8 inches, 81 per cent. IV. With the gas passing hrough the scrubbers at the rated capacity the tar emoval was 88 per cent., falling to 53 per cent. at 60 per cent. verload; a certain time of contact with the shavings was ecessary for the removal of the fine tar fog. V. The fficiency of tar removal here amounted to 98 per cent., the uantity of tar finally left in the gas being from 0·01 to ·06 oz. per 1000 cb. ft. Thus while it is important, in rder to prolong the life of the purifiers to send to them a gas containing as little tar as possible, the figures show ow effective the filtering out of tar fog may be made. See also this J., 1907, 674; 1906, 917.)—R. G. McL.

Petroleum, Asphaltum theory of the formation of ——. K. W. Charitschkoff. J. Russ. Phys.-Chem. Soc., 1912, **44**, 354–359.

The petroleum synthesised by the method of Sabatier and Senderens (this J., 1907, 42) consists of unsaturated liquid hydrocarbons which have a high iodine value and readily oxidise and become tarry. But if the catalytic substance is insufficiently heated, instead of a liquid product, a black, polymerised tarry substance resembling natural asphaltum is obtained. The qualitative and quantitative resemblance between some of the fractions obtained on distilling petroleum and natural asphaltum has already been pointed out by the author, and a similar resemblance is now found with the distillation products of this artificial asphaltum. The conclusion is drawn that the formation of petroleum is a more complex process than is assumed by the theories of Mendeléeff, Berthelot and Cloëz, which only deal with the initial stage of the process, namely, the formation of unsaturated hydrocarbons from carbides. These hydrocarbons, by a process of polymerisation, give solid natural bitumen (asphaltum) which, on decomposition by heat or very protracted spontaneous decomposition, yields liquid petroleum. This process is probably reversible, since petroleum, by oxidation or other processes, may be converted into more complex products similar to asphaltum and undoubtedly possessing a cyclic structure. Destructive distillation of the tarry matter formed by the condensation of petroleum, gives a petroleum rich in paraffins. The author regards the asphaltum theory of the formation of petroleum as definitely established.—T. H. P.

Fixation of ammonia, alone or with hydrogen sulphide, by means of sulphurous acid, with simultaneous formation of ammonium sulphate and free sulphur. Feld. *See* VII.

Mineral oil industry of the Caucasus. Board of Trade J., April 25, 1912. [T.R.]

The quantity of oil produced by the wells of the Baku district has much decreased. The deficiency in 1911, as compared with the production of 1910, is estimated at 53,200,000 poods (239,400,000 gallons), a decrease of 11 per cent. Only a small proportion, *viz.*, 38,657,775 poods, or 179,830,559 gallons, of the petroleum products manufactured at Baku found their way to Batoum for oversea trade. The quantity of Russian kerosene shipped to India in 1911 was 6,518,968 gallons against *nil* in 1910.

Grozni oilfields.—The output of the wells at Grozni, which also commenced to yield a smaller quantity of crude oil than in 1910, averaged about 6,000,000 poods (27,000,000 gallons) a month, which was almost exclusively consumed in Russia.

Maikop oilfields.—The Maikop oil industry made little progress in the direction of sound development; the production of oil by the wells that were sunk in the district was calculated to be only 6,000,000 poods per annum.

Tcheleken oilfields.—The island of Tcheleken, situated on the Caspian Sea, at the entrance to the Bay of Krasnovodsk, in 1911 produced about 15,000,000 poods 67,500,000 gallons), and promises to be a prolific field before long.

Prices of oil.—Prices of mineral oil in the Caucasus, which were principally determined by the necessity of deeper drilling than heretofore and by the increased demand for crude oil in Russia, were well maintained throughout 1911. In fact, prices during the year were so high that in the districts along the Volga where crude oil has been for years used for fuel, owners of factories, in many cases, have reverted to coal for fuel purposes.

Pipe lines.—The petroleum pipe line between Baku and Batoum was in use without interruption during the year, but, owing to the small quantities of kerosene that had to be conveyed to Batoum, it was not worked to its full capacity. Only 29,500,000 poods (132,750,000 gallons) of kerosene were pumped through the line in 1911.

Patents.

Fuel briquettes: Process for making ——. G. F. Forwood, Limpsfield, Surrey, and A. A. A. Zimmer, London. Eng. Pat. 5288, March 2, 1911.

Non-bituminous fuels are made into briquettes by means of two binders, the first being an oxychloride binder which gives a hard and waterproof briquette, which would, however, disintegrate at high temperatures, and the second a bitumen, starch, or like binder which prevents such disintegration. This second binder may consist of bitumen, pitch, starch, dextrin, glue, white of egg, casein or like substances. Suitable proportions for 100 parts of anthracite are:—First binder: magnesium oxide, 2·5; calcium or magnesium chloride, 1·07; water 3·57 parts; second binder: bitumen, 1, or bitumen 0·5, and starch 0·5 part.—A. T. L.

Explosion of coal dust; Composition for coating the walls of coal mines, etc. for preventing or lessening the possibility of ——. H. Belger, Cullercoats, and R. H. Whitehead, Whitley Bay, Northumberland. Eng. Pat. 6773, March 17, 1911.

The dust of coal mines is conglomerated by means of a solution of sodium or potassium silicate and the mass is maintained in a moist or pasty condition by the use of chromic acid or a salt of chromium or a chromate. Other materials such as sea salt, alkali acetates, magnesium chloride or a mucilaginous material may be added to delay drying, and the pasty mass may be converted into a heavy soil suitable for removal by the addition of mineral dust and tar, or of clay or slaked lime and salt.—H. H.

Coke oven with vertical chambers and regenerators adjacent thereto. Stettiner Chamotte-Fabrik Akt.-Ges. vorm. Didier. Fr. Pat. 436,611, Nov. 21, 1911.

The oven has vertical coking chambers separated by walls provided with two vertical rows of horizontal heating flues. Adjacent to the narrow ends of each coking chamber are vertical regenerators, each divided by a vertical partition, the two compartments communicating at the top. The compartments of the regenerators adjacent to the coking chamber communicate at the bottom with vertical collecting conduits connected by means of branches with the heating flues, whilst the other compartments of the regenerators communicate by means of conduits provided with dampers, with mains which by means of a reversing valve are put into communication alternately with the air supply and with the chimney stack.—A. S.

Gaseous fuel for metallurgical and other purposes; Production of ——. A. Reynolds, London. Eng. Pat. 29,367, Dec. 17, 1910.

Clean combustible gas free from tarry products and of substantially definite composition and calorific intensity is produced by effecting the complete combustion of producer or similar gas and forcing the combustion products through a deep bed of incandescent coke. A twin gas producer such as described in Eng. Pats. 971 of 1891 and 3429 of 1900 (this J., 1891, 533; 1901, 697) with a combustion chamber between, or combustion chambers beneath the producers, may be employed for this purpose so as to give a continuous flow of gas.—H. H.

Furnaces; Gas firing of ——. A. L. Forster, Birmingham. Eng. Pat. 8316, April 3, 1911.

In furnaces fired with producer gas, air is supplied to the furnace and to the producer by separate positive blowers, the output of which may be varied independently for controlling the proportions of primary and secondary air, and conjointly for controlling the total amount of air supplied. The blowers are conveniently driven by electric motors provided with a suitable controller. Steam is mixed with the primary air by means of a steam jet injector, of which the air passages are normally closed. If the electric current fails, air valves are thereby released so that the steam-jet injects primary air, and the secondary air is drawn in by the natural draught.—A. T. L.

Carburetting air. C. E. Dawson, Teddington. Eng. Pat. 18,533, Mar. 17, 1911.

A stream of liquid fuel issuing from a jet is atomised by admixture with a stream of air at a temperature of not less than 350° F. issuing from an annular jet surrounding the fuel jet, and the stream of the mixture thus formed is caused to mingle first with air delivered in a direction at right angles to the stream and then with air delivered in a direction opposed to the direction of flow of the stream. The richness of the mixture can be varied by regulating both the fuel and air supplies.—H. H.

Coal; Manufacture of gas from ——. A. Rollason, Long Eaton, Derby. Eng. Pat. 18,744, Aug. 21, 1911.

Lime or limestone is added to coal for gas making in proportion sufficient, in conjunction with basic substances already in the coal, to transform the silica of the ash into a neutral silicate of the formula, SiO_2,CaO. By this means it is stated that the temperature of the retort can be reduced, the period of carbonisation shortened, and an improved quality of coke produced.—H. H.

Gas producer. W. B. Hughes, Assignor to The Wellman-Seaver-Morgan Co., Cleveland, Ohio. U.S. Pat. 1,022,678, April 9, 1912.

The producer comprises a rotating body portion, and a rotating ash-table beneath the body enclosed within a stationary base or ash-pit. The ashes are discharged from this ash-pit through a hopper formed eccentrically in it, into a truck which can be brought beneath. A scraper carried beneath the rotating ash-table throws the ashes into the discharge hopper.—A. T. L.

Producer and other gases; Treatment of ——. [*Recovery of ammonia*]. Vickers, Ltd. and J. Imrie, Sheffield. Eng. Pat. 11,940, May 17, 1911.

In working gas producer plant for the recovery of ammonia, the crude gas is first washed with hot water in order to retain ammonium salts (chloride and sulphate) without retaining the free ammonia. The solution thus obtained after separation of tar and dust, is treated before or after concentration with calcium chloride or other chloride to precipitate the sulphate and leave all the ammonia as chloride, which after separation of the sulphate is crystallised out.—A. T. L.

Gas-purifier. W. C. Butterworth, Platteville, Wis. U.S. Pat. 1,021,503, Mar. 26, 1912.

The purifier is of the stationary washer type and consists of a cylindrical casing divided into a number of superimposed chambers, the gas passing from one chamber to the next above it through a number of internal pipes which project into both chambers rather more than halfway. The lower ends of these pipes are provided with a number of lateral openings. The washing liquid fills each chamber to a depth which may cover the lower end and any desired proportion of the lateral openings of the tubes, this depth being determined by the position of an open-ended overflow sliding tube in a balancing tube external to the washer and communicating with several of the sections.—B. G. McL.

Petroleum oil and other hydrocarbons; Apparatus for the distillation of ——. A. F. G. C. P. J. von Groeling, Vienna, and H. S. Smith-Rewse, Darlington. Eng. Pat. 29,705, Dec. 21, 1910.

The apparatus consists of a retort resembling a boiler with horizontal flues and directly fired, and a heater in which the oil flowing to the evaporator is heated by the products of distillation, naphtha being wholly or partially separated from the oil before it reaches the retort. The heater is provided with inclined pipe coils through which the vapours from the evaporator flow upwards, whilst the condensed products flow in the reverse direction so that the arrangement serves as a dephlegmator. Any vapours produced in the heater are passed through a vertical dephlegmator, which may also be arranged between the evaporator and the heater, and the vapours may pass through this on their way to the heater. To ensure the free escape of the residues when working continuously, the draw-off pipe from the evaporator is provided with an inverted siphon bend which can be turned about a horizontal axis so as to adjust the height according to the pressure in the evaporator. The heater may be fitted with upper and lower pipe coils connected to separate evaporators which yield distillates of different temperatures. The condensed vapours from the heaters are passed through coiled tubes and are cooled by the counterflow of crude oil on its way to the heater. These coolers are provided with dephlegmators for the vapours distilled from the crude oil. In an arrangement for the vacuum distillation of benzine, the vapours from the vacuum evaporator pass through a series of heaters in which there is no vacuum.—A. T. L.

Distilling bituminous materials; Process of and apparatus for ——. W. C. Holmes and Co., Ltd., and H. Howell, Huddersfield. Eng. Pats. 12,599 and 22,746, May 25 and Oct. 16, 1911.

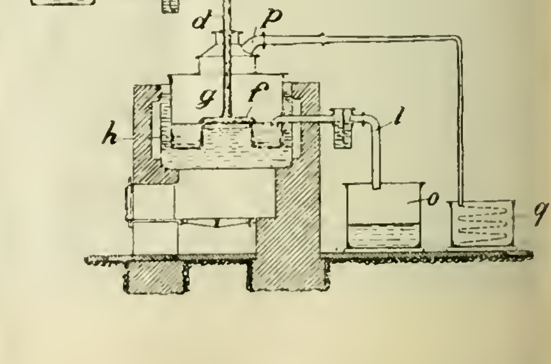
The material is placed in a cage or basket which is suspended within a moderately heated vertical retort, so that the bitumen melts and drops into the lower part of the retort which is more highly heated. The bottom door of the retort is hollow and the incandescent gases from the producer or combustion chamber are led through it and thence around the walls of the retort. For treating Italian bituminous limestone, or other substances, for the removal of bitumen, when the gas and coke are not the main products sought, the bottom is not made hollow, and the cage is made in hinged semi-cylindrical halves to facilitate removal of the limestone or other material after treatment.—A. T. L.

Paraffin; Deodourising and improving ——. Soc. anon. L'Ozokerite. Fr. Pat. 436,283, Nov. 8, 1911.

The paraffin is heated to its melting point, mixed with from 1—1½ up to 10 per cent. of a per-salt or a peroxide, and the mixture heated gradually to 110° C. with continuous agitation.—A. S.

Mineral oils; Apparatus for removing water and salts from crude ——. Dampfkessel- und Gasometerfabr. A.-G., vorm. A. Wilke und Co. Ger. Pat. 244,064, Jan. 20, 1911.

In the apparatus shown in the diagram, the crude oil is run from the container, *a*, on to a circular plate, *f*, which is heated to the requisite temperature by a lead-bath or an



l bath; thence the oil flows into the trough-shaped essel, *h*, where it deposits the remainder of the salts, and run off through the overflow pipe, *l*, into a suitable ceiver, *o*. The steam and other vapours pass through into the condenser, *q*. To prevent the gases from owing back to the apparatus, the pipes, *d* and *p*, are rovided with suitable traps. The deposited salts must e removed at intervals from the plate, *f*, and the vessel, *h*.
—T. F. B.

Montan wax; Process for preparing an ester from ——. Ernst Schliemanns Export-Ceresinfabrik. Ger. Pat. 244,786, Oct. 5. 1911.

When glycerol is heated with montan wax, a glycerol limontanic ester is produced in the form of a hard, white, ax-like substance, of m. pt. 80°—81° C. It is soluble n the usual fat-solvents, and resembles carnauba wax in ppearance and in its power to raise the melting point of fats and waxes of low melting point.—T. F. B.

Retorts; Vertical —— for carbonising coal and other purposes. Comp. Générale de Construction de Fours. Fr. Pat. 436,891, Nov. 27, 1911. Under Int. Conv., Dec. 6, 1910.

See Eng. Pat. 28,388 of 1910; this J., 1911, 481.—T. F. B.

Gas producers. W. Climie, Bo'ness. Linlithgowshire. Eng. Pat. 25,736, Aug. 1, 1911.

See Fr. Pat. 434,027 of 1911; this J., 1912, 220.—T. F. B.

Ammonium sulphate from coke oven or retort gas; Process for the direct recovery of ——. R. Fabry. Fr. Pat. 417,257, Dec. 7, 1911. Under Int. Conv., March 7, 1911.

See Eng. Pat. 5667 of 1911; this J., 1911, 955.—T. F. B.

Detecting inflammable gases in mines. Eng. Pat. 7978. *See* XXIII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

Carbonizing peat; Apparatus for ——. K. E. Edgeworth, Chatham. Eng. Pat. 18,393. Aug. 15, 1911.

The process relates to the "wet carbonizing" treatment of peat as described in Eng. Pat. 20 420 of 1903 (this J., 1904, 14; 1903, 1120). The peat is subjected to a graduated increase in temperature in one of a series of carbonizing vessels through the medium of water circulated through vessels of the series containing carbonized peat at higher temperatures until the temperature of the peat is raised to about 80° C. Further graduated heating is then effected by steam from other carbonizing vessels, to a temperature of 140° C., after which steam is admitted from a boiler to raise the temperature to 160° C., the carbonized peat being finally cooled by a reverse series of operations.
—H. H.

Electric incandescence lamps; Manufacture of metallic filaments for ——. The Westinghouse Metal Filament Lamp Co., Ltd. Fr. Pat. 437,185, Dec. 4, 1911. Under Int. Conv., Dec. 5, 1910.

Filaments of tungsten, titanium, etc., preferably obtained by the process described in Fr. Pat. 414.257 of 1910 (this J., 1910, 1195) are heated electrically to a high temperature and then compressed by drawing through one or more dies, or by other suitable means. This treatment is claimed to render the filaments stronger and more durable.—A. S.

Electric incandescence lamps, Manufacture of filaments for ——. J. Pintsch Akt.-Ges. Fr. Pat. 437,198, Dec. 5, 1911. Under Int. Conv., Nov. 17, 1911.

Filaments of refractory metals, prepared by one of the usual methods, are subjected to drawing, hammering, rolling, or other mechanical working in order to obtain filaments possessing great elasticity, which may be bent and rolled into desired forms.—A. S.

Use of metallic tungsten and uranium for the production of electrodes for arc lamps. [Sterilisation of water, etc.] Addition to Fr. Pat. 418.280. *See* XIXb.

Obtaining ductile blocks from chemically pure metals of high melting point [tungsten, etc.]. Fr. Pat. 437,114. *See* X.

Reduction of the oxides of chromium. Fr. Pat. 437,197. *See* X.

III.—TAR AND TAR PRODUCTS.

Creosote; Modification of the sulphonation test for ——. E. Bateman. U.S. Dept. Agricul., Forest Service, Circular 191, Dec. 9, 1911.

The following modification of the sulphonation test is claimed to give more accurate results in a shorter time than the old method: Ten c.c. of the fraction of creosote under examination are treated with four successive portions of 10 c.c. each of 37/*N*-sulphuric acid, in a Babcock's milk bottle, which is shaken for 2 minutes after each addition. It is then kept for an hour at 98° to 100° C., being meanwhile thoroughly shaken every ten minutes, and is subsequently cooled, filled to the mark with ordinary sulphuric acid, and whirled for five minutes in a Babcock's separator, after which the amount of unsulphonated residue is read upon the graduated scale. The reading multiplied by 2 gives directly the percentage of unsulphonated oil by volume. The size of the steam bath used to maintain a constant high temperature during the sulphonation is immaterial, provided it be large enough to contain completely the bottle beneath its cover.
—C. A. M.

Nitrobenzene; Electrolytic reduction of —— without a diaphragm. E. F. Farnau. J. of Phys. Chem., 1912, **16**, 249—252.

By the electrolysis of nitrobenzene suspended in sodium sulphate solution, between iron electrodes, good yields of aniline can be obtained, and no other reduction product is formed in appreciable quantity. Both the cathodic hydrogen and the ferrous hydroxide formed from the anode take part in the reduction, the latter being oxidised to ferric hydroxide. In the author's experiments a piece of $2\frac{1}{4}$ in. iron pipe, $8\frac{1}{2}$ in. long, and capped at one end served as container and cathode, and a spindle of $\frac{1}{4}$ in. tool steel with blades of twisted iron wire served as stirrer and anode. The electrolyte consisted of 250 c.c. of a 10 per cent. solution of sodium sulphate holding in suspension 12 grms. of nitrobenzene. The temperature was about 25° C. at the beginning and 35° C. at the end of the run. Current was taken from a 110 volt direct current line, a lamp bank resistance being placed in series with the cell. In three experiments, the results of which are given, the voltage was 10·5—8·0, 6·0—4·9, and 3·5—1·5; the current, 3·5, 3·0, and 3·0 ampères, the speed of the stirrer, 1200, 1500, and 1200 revs. per minute; and the amount of nitrobenzene reduced, 6·16 grms. in 81 mins., 7·03 grms. in 170 mins., and 6·41 grms. in 135 mins. respectively.—A. S.

Disappearance of higher-boiling phenols in creosoted wood. Cabot. *See* IX.

Antiseptic properties of creosote. Charitschkoff. *See* XIXb.

Patents.

Solid or resilient bodies [from naphthalene residues]; Process for making ——. K. Scherrer, Frankfort, Germany. Eng. Pat. 636, Jan. 9, 1912. Under Int. Conv., Jan. 9, 1911.

Ground naphthalene residues, obtained in the distillation of crude naphthalene with sulphuric acid, are mixed with filling materials suited to the desired product, and are then heated and pressed and if necessary also vulcanised. If the finished product is to form a mass resembling stone, mineral substances are used as filling material; if a woody product is to be made, ground wood or leather or cork is employed; and if it be desired to make a substance like vulcanite, ground vulcanite clippings or graphite or balata are added.—H. H. S.

Di- and polyhydroxybenzenes; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 437,281, Dec. 7, 1911. Under Int. Conv., Dec. 27, 1910.

Di- or polyhydroxybenzenes and their derivatives are produced by heating halogenated phenols or their substitution products with alkaline-earth oxides or hydroxides. For example, when a mixture of 130 parts of *p*-chlorophenol, 630 parts of crystallised barium hydroxide, and 600 parts of water is heated to 170°—195° C. for 13 hours, quinol is produced. Similarly, catechol is obtained from *o*-chlorophenol, homocatechol from 3-chloro-4-cresol, toluquinol from *p*-bromo-*o*-cresol, gallic acid from 3·5-dibromo-4-hydroxybenzoic acid, and a new bromohomocatechol ($CH_3 : OH : OH : Br = 1 : 3 : 4 : 5$), of m.pt. 80° C., from dibromo-*p*-cresol. The alkaline-earths may be replaced in part by alkali hydroxides, and accelerating agents may be added, such as copper sulphate.—T. F. B.

Amino[hydr]oxynaphthalenesulphonic acid and process of making same. H. Bucherer, Assignor to Kalle und Co. Akt.-Ges., Biebrich, Germany. U.S. Pat. 1,022,019, April 2, 1912.

See Eng. Pat. 9743 of 1910; this J., 1910, 872.—T. F. B.

IV.—COLOURING MATTERS AND DYES.

Indigotindisulphonic acid, atmospheric oxygen and hydroxyl ions. M. Chilikin and V. Milanovsky. J. Russ. Phys.-Chem. Soc., 1912, **44**, 359—373.

According to Friedländer's investigations on the action of alkali on indigo (Ber., 1877, **10**, 1971), the principal products of the reaction are indoxyl-2-aldehyde and anthranilic acid, the chrysanilic acid formed being due to a secondary condensation of these two products: these results were confirmed by similar experiments on thioindigo. The authors have investigated the action of caustic alkali on indigotindisulphonic acid in which the blue colour of the latter is destroyed. They find that the action of the alkali is mainly a catalytic effect of the hydroxyl ions and that the reaction depends also on the presence of atmospheric oxygen and is of an order varying with the number of molecules of oxygen available. When the concentration of the atmospheric oxygen dissolved in the solution is kept constant, the reaction is unimolecular. These results are not in agreement with the scheme given by Friedländer.—T. H. P.

Pyridine dyestuffs from secondary aromatic amines; Relation between the colour and constitution of ——. W. König and G. A. Becker. J. prakt. Chem., 1912, **85**, 353—385.

The authors have prepared a large number of pyridine dyestuffs, the general method being to condense a solution of two molecules of a secondary amine, such as methylaniline, in alcohol with a freshly prepared mixture of one molecule of pyridine and one molecule of cyanogen bromide in ethereal solution. On evaporation of the ether the dyestuff remains usually in the crystalline form. In some cases the amine was warmed with an alcoholic solution of 2 : 4-dinitrophenylpyridinium chloride. The dyestuffs produced give yellow to violet shades on tannin-mordanted cotton. Their absorption spectra have been measured and the authors discuss the influence of the various groups in the amines used on the colour and dyeing capacity of the dyestuffs.—J. C. C.

Patents.

Anthraquinone derivatives; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 9111, April 12, 1911.

See Ger. Pats. 238,981 and 238,982 of 1910; this J., 1911, 1306 and 1372. Anthraquinone-oxazoles and thiazoles of analogous constitution are similarly obtained from o-aminohydroxyanthraquinones and o-aminoanthraquinone-mercaptans, respectively.—T. F. B.

Sulphide dyestuffs and process for making them. Act.-Ges. f. Anilinfabr. Fr. Pat. 436,373, Nov. 14, 1911. Under Int. Conv., June 27 and Oct. 23, 1911.

p-Hydroxydiphenylamine or its derivatives in which the other *p*-position to the imino group is not occupied by an amino or substituted amino group, are converted into dyestuffs by heating with sulphur, or with an alkali polysulphide, or with sulphur in presence of a condensing agent such as aluminium chloride, iodine, a hydro-halogen acid, or a reagent capable of generating a hydro-halogen acid. The reaction may be carried out in presence of a solvent or diluent. *Example.*—A mixture of 40 parts of *p*-hydroxydiphenylamine and 40 parts of sulphur is fused, and 10 parts of aluminium chloride are slowly added: the mixture is heated to 150° C., and after the evolution of hydrogen sulphide has ceased, the temperature is raised to 190° C. during about five hours. The product dyes unmordanted cotton from sodium sulphide baths reddish-brown shades, extremely fast to washing, soaping, and chlorine. The dyestuff similarly produced from 4-hydroxyphenyl-1-naphthylamine dyes cotton fast violet to violet-black shades.—T. F. B.

Algarrobo; Method of utilising the natural exudations and the bark of white and black —— *as colouring matters.* J. A. Dominguez. Fr. Pat. 437,020, Oct. 10, 1911.

The catechin of algarrobo (*Prosopis alba* and *P. nigrum*) is capable of producing a variety of colours when it is treated with different reagents. For example, when the exudation or the bark is treated with a solution of ferric chloride and sodium carbonate, a wine-red colour is produced; with copper sulphate, deep brown; with basic lead acetate, a slatey gray; with potassium bisulphate, reddish-brown. These properties may be utilised in the dyeing of cotton, silk, and wool.—T. F. B.

Colouring matter of the anthracene series; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine Germany. Eng. Pat. 8295, April 3, 1911.

See Ger. Pat. 242,621 of 1911; this J., 1912, 278.—T.F.B.

Azo colouring matters. A. Zart, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,022,287 and 1,022,288, April 2, 1912.

See Eng. Pat. 19,545 of 1910; this J., 1911, 1108.—T.F.B.

Disazo dyestuff; Process for producing a ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 436,314, Nov. 11, 1911. Under Int. Conv., Nov. 25, 1910.

See Eng. Pat. 27,627 of 1910; this J., 1911, 1109.—T.F.B.

Azo dyestuff; Process for producing an ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 436,576, Nov. 20, 1911. Under Int. Conv., Dec. 10, 1910.

See Eng. Pat. 316 of 1911; this J., 1912, 119.—T. F. B.

at [anthracene] dye. H. Friedmann, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,022,781, April 9, 1912.

ee Ger. Pat. 238,982 of 1910; this J., 1911, 1372. T.F.B.

hrome dyestuffs of the triphenylmethane series; Process for producing ——. Farbenfabr vorm. F. Bayer und Co. Fr. Pat. 436,288, Nov. 9, 1911. Under Int. Conv., Dec. 9, 1910.

ee Eng. Pat. 11,083 of 1911; this J., 1912, 182.—T. F. B.

at [indigo] dyestuffs; Process for producing halogenated ——. Soc. pour l'Industrie Chimique à Bâle. Fr. Pat. 437,181, Feb. 11, 1911.

ee U.S. Pat. 997,766 of 1911; this J., 1911, 1006.—T.F.B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Diastase as a starch liquefying agent. M. Battegay. Färber-Zeit., 1912, 23, 133—134.

The author summarises the literature on the application of diastase, in preference to mineral acids, for stripping starch from fabrics, whether it has been applied as a dressing, finishing, or thickening agent. Comparison of the commercial preparations "diastafor" and "diastafor extra" with 4 times the weight of finely ground malt showed the former to be about equal to malt, whilst the latter is distinctly superior. 0·1 to 0·15 per cent. (of the weight of the fabric) of "diastafor extra" (£2 4s. to £2 15s. per cwt.) suffices for a complete stripping; the goods are passed through the solution at 50°—60° C., in a vat with squeezing rollers and then allowed to lie for 6 hours before washing. Large scale trials show also that the cost of stripping does not exceed that of the older and less satisfactory methods. (See also this J., 1911, 533; 1912, 124.)—A. Sbld.

ellulose in woods and textile fibres; Determination of ——. J. König and F. Hühn. Zeits. Farben Ind., 1911, **11**, 297—300, 326—330, 344—348, 366—370; 1912, **12**, 4—9, 17—29, 37—46, 57—64, 77—81 and 102—109 (Compare also Renker, this J., 1909, 1269.)

The authors have carried out a comparative series of determinations of the cellulose in a number of typical raw materials by the principal methods which have been proposed and adopted by various authors. The raw materials were first extracted with cold and hot water, then with benzene and alcohol; they were dried and allowed to absorb moisture from the air. The materials tested comprised beech, oak and fir woods, the barks of these woods, sulphite wood pulp, cotton, flax, hemp and jute. The methods employed were those of Weende-Henneberg ("crude fibre"), Tollens-Dmochowski (this J., 1910, 1003), König (this J., 1908, 176; 1905, 1069), also the direct treatment with ammoniacal hydrogen peroxide, and the methods of Cross and Bevan (chlorination), Schulze (potassium chlorate and nitric acid) and Müller bromine water and ammonia). Of these methods the Weende-Henneberg and the method of direct treatment with ammoniacal hydrogen peroxide yield products which can hardly be described as cellulose at all, being still rich in lignin, whilst certain of the others yield celluloses more or less profoundly modified by oxidation and still containing appreciable residues of the non-cellulose constituents of the raw materials. In this connection the authors have made a very full investigation of the nature of the cellulose products obtained, not only by qualitative tests, which are of little value, but also by quantitative determinations of elementary composition, calorific value, methyl value, and pentosan-content (furfural value). Comparison of these results with those found for the raw materials afforded a measure of the extent to which the various non-cellulose groups had been removed. Consideration of this side of the problem raises the question of a definition of "cellulose." According to the authors' views, the original materials contain: "true cellulose," lignin, hemihexosans and pentosans, together with cutin in the case of bark tissues. They contend that only by a regulated hydrolysis followed by oxidation can the true cellulose be freed from the other constituents. Although the methods depending on oxidation without hydrolysis (*e.g.* Cross and Bevan's chlorination method) may under favourable conditions eliminate the greater part of the lignin, such methods fail to remove most of the hemihexosans and pentosans, and the higher yields thus obtained depend on the presence of these impurities; moreover the cellulose obtained possesses the properties of a pronounced oxycellulose. For instance, Cross and Bevan's method yielded 100 per cent. of cellulose from cotton, whilst König's method yielded only 88·27 per cent., in the form of a friable powder. Hence it is contended that cotton is not substantially composed of true cellulose but contains very considerable proportions of hemihexosans. In addition to the quantitative tests mentioned above the authors also propose the following new method for testing the purity of the cellulose preparations. The cellulose is dissolved in a solution of zinc chloride in concentrated hydrochloric acid and the liquid is examined polarimetrically at intervals over a considerable period, the specific rotatory power being calculated. This, starting from about zero, gradually rises as hydrolysis proceeds, reaching a maximum after 2 or 3 days, then falling slowly owing to condensation, until the liquid becomes opaque. Those preparations which reach the highest maximum specific rotation represent the purest forms of true cellulose, since pentosans and other impurities tend to lower the results. Thus cotton cellulose prepared by König's method showed a maximum $[\alpha]_D$ 82·5° after 72 hours, whilst cotton purified by Cross and Bevan's method showed a maximum of only 56·7° after 55 hours. Hydrocellulose and oxycellulose reach only low maximum rotations and the rotatory power changes rapidly. This supports the authors' contention that digestion with glycerin containing 2 grms. of sulphuric acid per 100 c.c. at a temperature of 137° C., whilst eliminating the hexosans and pentosans, has practically no effect on the true cellulose, and that König's method, in spite of the low yields of cellulose obtained is the best one for the quantitative determination of that constituent. Next to König's, the method of Tollens-Dmochowski is preferred, according to which hydrolysis by the Weende process is followed by oxidation with nitric acid; the hydrolysis of the hexosans and pentosans however is not quite complete. The following incidental observations may be noted:—(1) Fir wood was the only fibrous material which was found to contain any notable quantity of methylpentosans, showing 4·48 per cent. out of 13·72 per cent. of total pentosans. (2) The following percentages of cutin were found in the bark tissues by dissolving the cellulose in acid zinc chloride: beech bark, 1·42; oak bark, 7·33; fir bark, 3·33.—J. F. B.

Sulphite wood pulp; Economy of heat in digesting —— with indirect steam. A. W. Bergöö. Papierfabrikant, 1912, **10**, 419—422.

In working with a battery of four digesters heated indirectly with steam coils, an economy of heat may be effected in the following manner:—The first digester is heated with high-pressure steam and for the first six hours the exhaust from the coils is discharged in the ordinary manner. At the end of this time, the temperature in the first digester has risen to such a point that the exhaust steam from its coils may with advantage be discharged through the coils of the second digester and used, together with a little fresh steam, for heating up its contents during the first six hours, after which the coils of the third digester receive the exhaust steam from those of the first and second, and so on until the first digester is ready to be emptied. An analogous method of economising steam is to connect the exhaust from the coils of a digester with a kind of feed-water heater. In another direction economy of heat may be effected by charging a digester with only 90 per cent. of the usual quantity of fresh liquor and making up the remaining 10 per cent. with boiling liquor from a digester which is about to be discharged. A further improvement is the so-called "after-steaming," according to which, the chips in the digester having been steamed, the digester is opened and the space which has become available by the softening action of the steam on the first charge is filled up with fresh chips. Thus the digester is enabled to hold 10—12 per cent. more than its normal charge, whilst the volume of liquor to be heated remains the same. Insulation of the digesters also serves to economise the consumption of steam. A digester of 150 cub. m. capacity, with the "after-steaming" process, will hold 36,000 kilos. of wood having 25 per cent. of moisture, *i.e.*, 27,000 kilos. of dry wood and 9000 kilos. of water; this quantity requires 100 cub. m. of cold fresh liquor and 10 cub. m. of hot liquor, and the charge has to be digested at 130° C. for 18 hours, using steam containing a total heat of 700 cals. per kilo., of which 590 cals. are available for digestion. This charge will yield 13·3 tons of air-dry cellulose, whence it is calculated that the steam consumption will amount to 2·13 kilos. per kilo. of air-dry pulp.—J. F. B.

Viscose and artificial silk; Simplified manufacture of ——. A. K. Semenov. J. Russ. Phys.-Chem. Soc., 1912. **44**, 339—344.

Sheets of paper pulp are immersed in hot (40°—50° C.) 22—24 per cent. aqueous sodium hydroxide solution, to which albumin, water-glass, zinc oxide, alumina, etc., may be added if desired. The pulp rapidly swells up and is then pressed until its weight is 1·75—2 times that of the original dry material. When the sheets have assumed the temperature of the air (16°—20° C.), they are transferred to shallow, rectangular, earthenware, glass or wooden vessels, which fit closely round the sheets and are provided with air-tight covers. The sheets are here treated with a mixture of 20 vols. of benzine (or naphtha, benzene, oil of turpentine, etc., either alone or mixed with resin, caoutchouc, colouring matter, etc.) and 1 vol. of carbon bisulphide in such amount that 0·5 kilo. of the latter is present per kilo. of air-dry pulp. The vessels are kept hermetically sealed for 3—8 hours; when the reaction is at an end, the viscous mass is cinnamon-coloured, pulls out between the fingers, and when shaken with excess of water does not break up into fibres like the original pulp. The liquid is then run off through a tap in the bottom of the vessel, after which water at the ordinary temperature, or not above 40° C., is gradually introduced and slowly penetrates the pores of the cellulose sodium xanthate, giving a transparent solution of viscose, free from air-bubbles; the best results are obtained with 6—7 litres of water per kilo. of original pulp, a 16—14 per cent. solution being thus obtained. The action of the water occupies 5—6 hours. The viscose solution is introduced into a vessel, provided at the bottom with a number of glass tubes drawn out very fine (0·1 mm.) and immersed in a mixture of alcohol and sulphuric acid (a 6—10 per cent. solution of the acid is sufficient). This vessel is capable of a rotatory movement so that the bundle of fibres may be twisted into a single thread. The thin filaments which are delivered under pressure (6—9 atmos.) are wound on a bobbin turning in hot water or hot dilute alcohol. The artificial silk, which may be obtained of any desired thickness, is subsequently wound into balls or skeins. The cost of materials for 1 pood (16·38 kilos.) of artificial silk does not exceed 18 roubles (38s.) and a similar sum covers labour, power, heating and lighting.—T. H. P.

Bleaching and dyeing of artificial silk. Frank. *See* VI.

Further tests on vat colours [and a test for oxycellulose and hydrocellulose]. Ermen. *See* VI.

Hardening of German river waters by effluents from potassium chloride works. Ditges. *See* XIXb.

Patents.

Floss and waste silk; Process for the destruction of hairs and other extraneous matter in ——. C. Seignol. Fourth Addition, dated Jan. 28, 1911, to Fr. Pat. 416,063, July 28, 1909 (see this J., 1910, 1371; 1911, 79 888, 1207).

Solutions of alkali sulphides (to which any fatty or waxy substance may be added whether of vegetable, animal or mineral origin), are circulated through the material at a constant temperature.—P. F. C.

[Artificial silk] Process and apparatus for filtering cellulose solutions, for coagulating solutions of cellulose xanthate, and for producing lustrous threads. A. Boisson. Fr. Pats. 436,555 and 436,556, Jan. 24, 1911, and 436,590, Jan. 19, 1911.

(1) The solution of cellulose is filtered by forcing it through a chamber provided with a filtering device which is supported by wire netting. (2) The spinning nozzle consists of a plain perforated disc. (3) Solutions of cellulose xanthate are coagulated by a solution of sodium bisulphate (which must be free from sulphuric acid), at a temperature of 60° C. If desired, the coagulated filaments may afterwards be passed through a cold bath containing either sodium bisulphate or a free acid in solution.—P. F. C.

Cellulose products; Manufacture of ——. W. E. Lake, London. From Comp. Franç. des Applications de la Cellulose, Fresnoy-le-grand, France. Eng. Pat. 11,714, May 15, 1911.

It has been found that alkali arsenites possess a slight power of coagulating cupro-ammoniacal solutions of cellulose, and that they produce cellulose products containing the whole of the copper from the solution. By adding about 10 grms. of an alkali arsenite or arsenious acid to each litre of a 30 per cent. caustic alkali solution, suitable coagulating baths are obtained, which remain clear indefinitely, and do not require "regenerating," as do solutions of caustic alkalis alone. It is stated that at the end of a month's treatment at a temperature of 60°—65° C., the bath is quite free from copper. The threads or other coagulated products, which are an intense blue colour, may be freed from copper by treatment with dilute sulphuric acid, without precipitation of a copper-arsenic compound.—T. F. B.

Films and sheets; Process for making non-inflammable ——. D. A. Young and J. Minuto. Fr. Pat. 436,900, Feb. 3, 1911.

Cellulose acetate is macerated with an aqueous solution (*e.g.*, of 0·3 per cent. strength) of borax, dried, and dissolved in tetrachloroethane containing a small quantity of alcohol and petroleum. For 1 kilo. of cellulose acetate, the following mixture is suitable:—Tetrachloroethane, 3500 grms.; alcohol (90°), 350 grms.; pure petroleum, 18 grms. Non-inflammable sheets or films may be produced from this solution.—T. F. B.

Celluloid and glass; Process for preparing a mass of ——. S. de Medveczky. Fr. Pat. 436,245, Oct. 26, 1911. Under Int. Conv., Oct. 27, 1910.

See Ger. Pat. 239,773 of 1910; this J., 1911, 1461. The masses may be treated with an alcoholic solution of camphor, and also with an aqueous solution of an alkali hydroxide and then with an acid, preferably hydrofluosilicic acid.—T. F. B

Pulp for paper making and other purposes; Manufacture of ——. J. A. M. Bonar, Raynes Park, Surrey. Eng. Pat. 8214, April 1, 1911.

A pulp is prepared by beating a suitable blend of papyrus, bordia, samar and scirpus littoralis and then boiling it with a dilute solution of caustic soda.—P. F. C.

Retting of textile plants in general; Process for the chemical ——, *and conversion of vegetable matter into paper pulp.* L. Peufaillit. First Addition, dated Jan. 31, 1911, to Fr. Pat. 413,097, Feb. 28, 1910.

See Eng. Pat. 22,869 of 1910; this J., 1911, 1307.—T. F. B.

Washing and degreasing [wool]; Machines for ——. W. R. Kay. Fr. Pat. 437,159, Dec. 4, 1911. Under Int. Conv., Dec. 5, 1910.

See Eng. Pat. 28,192 of 1910; this J., 1911, 1307.—T. F. B.

Artificial silk; Process and apparatus for the manufacture of —— or for coating or glossing textile fibres. B. Loewe, Paris. Eng. Pat. 19,450, Aug. 31, 1911. Under Int. Conv., Aug. 31, 1910.

SEE Addition of Aug. 31, 1910, to Fr. Pat. 403,242 of 1908; this J., 1911, 415.—T. F. B.

Artificial threads; Process of manufacturing fine ——. C. R. Linkmeyer, Bremen, Germany. U.S. Pat. 1,022,097, April 2, 1912.

SEE Fr. Pat. 409,789 of 1909; this J., 1910, 750.—T. F. B.

Viscose; Process for coagulating ——. J. E. Brandenberger. Fr. Pat. 436,188, Jan. 16, 1911.

SEE Eng. Pat. 24,015 of 1911; this J., 1912, 184.—T. F. B.

Cellulose; Process for acetylating ——. Soc. Chimique des Usines du Rhone. Fr. Pat. 437,240, Dec. 6, 1911. Under Int. Conv., Dec. 14, 1910.

SEE Eng. Pat. 25,893 of 1911; this J., 1912, 279.—T. F. B.

Purification of caustic alkali solutions [containing soluble cellulose products]. Eng. Pat. 1573. *See* VII.

Production of leather-board stock. U.S. Pat. 1,021,660. *See* XV.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Bleaching agents; Action of —— on the colouring matter of linen. R. L. Taylor. J. Soc. Dyers and Col., 1912, **28** 151—153.

THE colouring matter of unbleached linen is practically unaffected by a solution of pure hypochlorous acid and by free chlorine. But if a small quantity of any alkali be added to the solutions, they both bleach the linen. The addition of common salt to a solution of chlorine in dilute caustic soda (with a view to reversing the reaction, $2NaOH + Cl_2 \rightarrow NaCl + NaOCl + H_2O$), has generally much less effect on the bleaching of linen than on the bleaching of other colouring matters with which the author has experimented.—P. F. C.

Artificial silk; Bleaching and dyeing of ——. W. Frank. Z. Farben-Ind., 1912, **12**, 1—3.

THE bleaching of artificial silk may be carried out with calcium or sodium hypochlorite or electrolytic bleach liquor, but alkaline liquors containing Turkey-red oil or soap such as are sometimes used in cotton-dyeing, are unsuitable. The threads are very tender when wet and bleaching must be performed rapidly and with dilute liquors to avoid mechanical and chemical damage. After bleaching and souring, an antichlor should be used. Many difficulties might be overcome by using hydrogen peroxide or sodium peroxide in place of the hypochlorite bleach. In dyeing artificial silk extreme care is necessary to avoid damaging and tangling the threads. Copper dyeing vessels are preferable to wood and the heat should be applied indirectly, as live steam tends to entangle the threads; the skeins should be turned no more frequently than is absolutely necessary. It is best to add the dyestuffs in small portions at a time. Sometimes some skeins dye more or less rapidly than the bulk, owing to the parcel containing portions of batches of different manufacture. Inequalities in dyeing may sometimes be prevented by giving the silk a preliminary treatment, *e.g.* with magnesium hydrosulphide in the case of collodion silks, or with acid in the case of cuprammonium silk, to remove possible residues of copper which would act as a mordant. Except for dark shades, basic dyestuffs may generally be applied without a mordant; when one is required, tannic acid and tartar emetic are used and the silk is dyed without drying, after mordanting. A little glue may be added to the last dye-bath to improve the firmness of handle. Acid dyestuffs are only suitable for pale shades, as they have little affinity for the cellulose; sulphide dyestuffs also should not be used for deep shades because the sodium sulphide injures the lustre. Substantive dyestuffs are most generally applicable, preferably in conjunction with "monopol soap." Vat dyestuffs also give excellent results. Oil or soap finishes soften the silk but do not impart the desired "scroop"; this is got by treatment with acetic acid, or better with tartaric or citric acid.
—J. F. B.

Dyeing; Theory of ——. Dyeing with basic dyestuffs with subsequent re-solution [stripping]. W. P. Dreaper and A. Wilson. J. Soc. Dyers and Col., 1912, **28**, 137—142.

A LARGE number of experimental results are given showing the influence of various factors on the dyeing of silk with Methylene Blue in the presence of substances of either an acid, neutral or alkaline nature. A series of experiments was also carried out to determine the amount of stripping which occurred on treating the dyed fibre with soap solution or alcohol. The main result of the investigation is to confirm the conclusion deduced from a similar research on Acid Anthracene Red (this J., 1910, 1432), namely, that the dyeing process is too complicated to be a simple absorption or adsorption of the dyestuff by the fibre. The authors suggest that in addition to the "electrical" or "surface concentration" factor, the actual size of the dyestuff aggregates, especially when combined with the time factor, is of importance.
—P. F. C.

Ice colours on unprepared cloth. E. A. Fourneaux. J. Soc. Dyers and Col., 1912, **28**, 131—137.

THE solution of the problem of abolishing the necessity for preparing cotton cloth with naphthol (which is the weakest feature of the present process for producing ice colours) calls for the co-existence of the diazo and phenol components in one fluid medium. The mixture must be reasonably stable and capable of being applied without damaging the fibre. The author suggests that the problem may be solved by applying either or both of the components in an inert form. β-Naphthol, for example becomes inert whenever the 1- position adjoining the hydroxyl group is occupied and provided that the substituting group is loosely bound, any compound of this class may be suitable. The only inert diazo compounds that have found practical application are the nitrosamines and most of those nitrosamines derived from diazo compounds used for producing ice colours are too unstable for commercial application. Diazo-sulphonates however are fairly stable and several of them can be converted into active diazo-compounds, presumably sulphates, by oxidation. The author also reviews the known methods of using paranitrophenylnitrosamine for producing ice colours on unprepared cloth. (Compare also this J., 1912, 382.)—P. F. C.

Vat colours; Further tests on —— [and a test for oxycellulose and hydrocellulose.] W. F. A. Ermen. J. Soc. Dyers and Col., 1912, **28**, 132—134. (See also this J., 1910, 418.)

(*a*) A NUMBER of cotton dyeings with recent vat dyestuffs were tested for fastness to washing, scouring, mercerising, cross-dyeing, bleaching and light and the results, which in general are surprisingly unsatisfactory, are given. (*b*) The author following up a suggestion of Knecht has worked out the following improvement of Scholl's test for altered celluloses (this J., 1911, 739). A few drops of a suspension of Indanthrene Yellow (prepared by dissolving some of the dried paste in strong sulphuric acid, then precipitating by pouring into cold water and neutralising the liquor) are added to a 10 per cent. solution of caustic soda and the cloth to be tested is passed through the mixture and lightly squeezed. The material is then held over a beaker in which water is briskly boiling. Within a minute a deep blue stain appears wherever oxycellulose or hydrocellulose has been formed, whilst the rest of the cloth, if it has been carefully bleached, shows no trace of blue for at least 5 minutes. If the cotton is next washed, soured and rubbed with soap, the unaffected dyestuff is readily removed, but where the reduction has taken place, the colour is firmly fixed.—P. F. C.

Vat dyestuffs in [calico] printing. A. Peters. Färber-Zeit., 1912, **23**, 134—136.

Printing with vat dyestuffs is discussed and stress is laid on the important part played by the thickening agent, in the selection of which, regard must be paid, not merely to its behaviour with alkali hydroxide, but also to its properties from a colloid-chemical standpoint (see this J., 1910, 811). In the case of British gum it is pointed out that the thickening is not liquefied, on steaming, by the relatively large proportion of sodium hydroxide in the colour paste, but that it is converted into its homogeneous modification and remains in that condition. This gives, like all homogeneous colloidal thickenings, a good penetration into the fibre, without, however, properly binding the leuco-derivative of the dyestuff; re-oxidation takes place so rapidly that a portion of the colour remains unfixed. Starch thickening, a micella sol, is also converted into the homogeneous modification in the steaming of the colour paste, but on cooling it reverts to the original micella sol condition, which ensures a good fixation of the leuco-compound and its slower re-oxidation, resulting in a well fixed colour. For those dyestuffs, derived from anthraquinone, which yield difficultly soluble leuco-compounds, a mixture of British gum and wheat starch should be used, the proportion of starch being increased or diminished as the leuco-compound is more or less soluble.—A. Sbld.

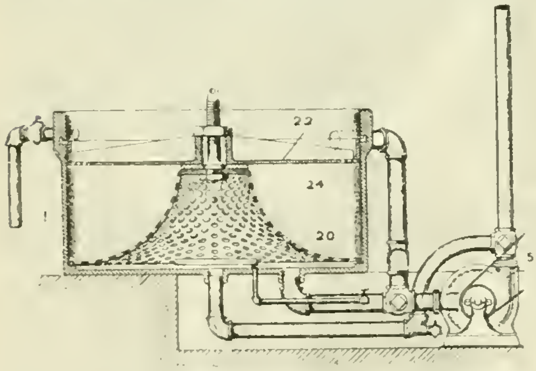
Patents.

Textile piece goods, warp yarns and the like; Machine for treating —— with liquids. J. S. Ainley, Huddersfield. Eng. Pat. 8260, Apr. 3, 1911. Addition to Eng. Pat. 19,135, Aug. 20, 1909 (this J., 1910, 1102).

The material after passing between the squeezing rollers travels under a partially submerged tension roller and over a large skeleton cylinder (also partially immersed) before it descends into the treating liquor.—P. F. C.

Dyeing machine. The Psarski Dyeing Machine Co. Fr. Pat. 436,936, Nov. 28, 1911.

This machine is of the type in which the stationary material packed in the receiver, 1, is dyed by a circulating dyebath forced through it by a centrifugal pump, 5. The novelty of the invention resides in the bell-shaped form of the distributor, 20, and in the disposition of the outflow perforations, 24, round the periphery of the cover, 22. By this arrangement all the perforations in the distributor 20, are equidistant from the openings, 24, and it is claimed that by such means the production of uniform dyeings is facilitated.—P. F. C.



Fabric-printing machine. R. Baird, Montclair, N.J., U.S.A. Eng. Pat. 17,795, Aug. 4, 1911.

This is a selvage printing machine of the type in which an endless narrow stencil can be transversely adjusted so as to compensate for variations in the path of the travelling selvage. Means are provided for causing the stencil and the fabric to travel at exactly the same speed during the printing operation in order to avoid blurred outlines. The machine also has a rotary brushing device in contact with the stencil for applying the ink to the fabric.—P. F. C.

Cotton fabrics in open width; Apparatus for dyeing, steaming, scouring, bleaching, and impregnating —— in a continuous cycle. S. M. Krosnowski. Fr. Pat. 436,697, Nov. 24, 1911.

See U.S. Pat. 1,020,294 of 1912; this J., 1912, 382.—T.F.B.

Brown reserves on printed cotton fabrics and similar goods; Process for forming ——. C. Pilz. Fr. Pat. 436,504, Nov. 17, 1911.

See Ger. Pat. 242,611 of 1911; this J., 1912, 280.—T.F.B.

Composition of matter for the treatment of leather, fabrics and the like. U.S. Pats. 1,020,926 and 1,020,927. *See* XV.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Acetic acid and phosphorus pentachloride; Dissociation of gaseous ——. C. Holland. Z. Elektrochem., 1912, **18**, 234—236.

The author has observed the deviations from Boyle's law of gaseous acetic acid and of phosphorus pentachloride, and from the deviations he has calculated the degrees of dissociation at various temperatures and pressures. The values for acetic acid agree closely with the equation $\log\frac{p_1}{p_2^2}=\frac{16480}{4{\cdot}571\,T}-11{\cdot}05$, where, p_1 is the partial pressure of double molecules, p_2 that of single molecules and T the absolute temperature. The heat of reaction at constant pressure is therefore 16480 cals. For phosphorus pentachloride the heat of reaction at constant pressure is 21800 cals. and the thermodynamic equation is:—

$$\log\frac{p_{PCl_5}}{p_{PCl_3}p_{Cl_2}}=\frac{21798}{4{\cdot}571T}-11{\cdot}50.$$

—W. H. P.

Ammonia, alone or with hydrogen sulphide; Fixation of —— by means of sulphurous acid with simultaneous formation of ammonium sulphate and free sulphur. W. Feld. Z. angew. Chem., 1912, **25**, 705—711.

The author criticises proposals which have been made for the recovery of ammonia as sulphite, with subsequent oxidation to sulphate, and explains and discusses his own methods of fixing ammonia as sulphate (and utilising hydrogen sulphide), through the agency of metallic thiosulphates (this J., 1910, 352) and of polythionates, without introducing metallic salts (this J., 1911, 1381). In the polythionate method, the net result of the reactions, $2(NH_4)_2S_2O_3+3SO_2+S=2(NH_4)_2S_4O_6$ and $(NH_4)_2S_4O_6+2NH_3+H_2O=(NH_4)_2SO_4+(NH_4)_2S_2O_3+S$, is given by the equation, $4NH_3+2H_2O+3SO_2=2(NH_4)_2SO_4+S$; the oxygen necessary for the formation of sulphate is thus derived from a part of the sulphur dioxide, that is, from the air used in burning the sulphur. When hydrogen sulphide is present in the gas, it provides the necessary sulphur, according to the reaction, $(NH_4)_2S_4O_6+3H_2S=(NH_4)_2S_2O_3+5S+3H_2O$. This method is claimed to furnish a simple and satisfactory solution of the problem of recovering ammonia directly as sulphate, without the use of sulphuric acid.—F. Sodn.

Colloidal solutions [of ferric hydroxide and Prussian blue]; Formation of ——. Prelim. communication. N. Pappadà. Z. Chem. Ind. Kolloide, 1912, **10**, 181—182.

The author has previously expressed the view that the substances which determine the suspension of colloidal particles are not chemically indifferent, but react with the latter to form unstable compounds. Such compounds remain undecomposed in presence of an excess of the first-named substances, but are decomposed in presence of much water. It is now pointed out that ferric chloride solution is capable of dissolving not only ferric hydroxide, but also chromium and aluminium hydroxides and hydroxides of divalent metals; bismuth hydroxide dissolves only in very concentrated solutions of the chloride and is precipitated as a yellow powder on addition of water. The solutions all have a reddish brown colour and have similar properties, but on dialysis, only ferric hydroxide remains in colloidal solution; with the other hydroxides, the metals pass through the membrane in the form of cations and can be detected in the outer liquid. With regard to the formation of Prussian blue sol, the author finds that besides oxalic acid, soluble organic compounds containing several alcoholic hydroxyl groups, carboxylic acids, hydroxy-acids, and soluble sugars all have the property of causing Prussian blue to pass into the colloidal condition in aqueous solution. The property appears to be connected with the presence of the hydroxyl group, for if the latter be esterified, the property is lost: acetic acid, for example, is an energetic solvent of Prussian blue, whereas ethyl acetate is quite inactive in this respect. —A. S.

Carbon; Melting of ——. W. Borchers. Metallurgie. 1911, **9**, 230—231.

In reply to La Rosa (Ann. der Phys., 1911, 95), and to Watts and Mendenhall (Phys. Rev., 1911, **33**, 65) the author has repeated his experiments on the fusibility of carbon, using very pure carbon rods supported between the poles of an electric furnace. It is maintained that carbon shows no tendency to melt at the highest temperatures obtainable. The effects produced are the result of the expansion and loosening of the mechanical structure present in even the purest rods, causing them to become less coherent and break.—A. H. C.

Utilisation of lead furnace fume. Hughes. *See* XIII.

Hardening of German river waters by effluents from potassium chloride works. Ditges. *See* XIXB.

Perchloric acid in electrochemical analysis. Hendrixson. *See* XXIII.

Nitrogen thermometer scale from 300° *to* 630° *C., with a direct determination of the boiling point of sulphur.* Day and Sosman. *See* XXIII.

Potash deposit in California. Board of Trade J., April 18, 1912. [T.R.]

According to the United States Geological Survey, an apparently important deposit of potash has been discovered at Borax or Searles Lake, in the north-western corner of San Bernardino County, California. This deposit is in the bed of what was formerly a great lake, now almost dried up, whose central depression contains a large body of crystalline salts, saturated with brine. Samples of this brine, taken from six wells distributed over the salt flat, showed an average of 6·78 per cent. of potassium oxide in solution, and an average salinity of 43·82 grams. of solids per 100 c.c. The potassium salts occur in soluble form in a natural saturated brine, under conditions especially favourable to its separation and recovery by solar evaporation. The bed is estimated as at least 60 feet thick and covering 11 square miles. Other minerals found in the Borax Lake deposits include borax, gypsum, glauberite, carbonate and sulphate of soda, salt, thenardite, and hanskite

Patents.

Copper liquors; Treatment of ——. J. H. Thwaites, Peterborough. Eng. Pat. 9174, April 13, 1911.

Copper liquors, such as those obtained in wet copper processes, are treated with a mixture of barium sulphate and zinc sulphide, so as to produce a precipitate of copper sulphide, mixed with barium sulphate. The copper sulphide spread over a basis of barium sulphate oxidises rapidly and completely. The copper is then separated as sulphate from the mixture, and the residual barium sulphate converted into sulphide; this is added to the liquor (which must contain a dissolved sulphate), from which the copper has been precipitated, thus giving the mixture of barium sulphate and zinc sulphide required for the first stage of the process. Any excess of zinc is worked up directly from the liquor, from which the mixture of barium sulphate and zinc sulphide has been removed.—F. Sodn.

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Nitrogen compounds of molybdenum [molybdenum nitride], Manufacture of —— *and of metallic molybdenum.* J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 12,662. May 25, 1911.

A compound of molybdenum containing oxygen, is heated with nitrogen and (or after treatment with) a reducing gas, at a temperature below 800° C., preferably under pressure. For example, molybdic acid is heated at 500°—600° C., in a mixture of nitrogen and hydrogen (equal volumes), under a pressure of 60 atmos., or is successively treated with hydrogen at 500°—600° C., either at ordinary or increased pressure, and with nitrogen or a mixture of nitrogen and hydrogen, under 50 atmos. pressure, at 500° C. Metallic molybdenum may be prepared from the nitride by heating it to a higher temperature (but below the melting point of the metal), preferably *in vacuo.*—F. Sodn.

Potassium salts and phosphates [from seaweed, etc.]; Production of ——. W. S. Firman, Los Angeles, Cal., U.S.A. Eng. Pat. 15,593, July 4, 1911.

See U.S. Pat. 1,010,403 of 1911; this J., 1912, 28. To obtain superphosphates or other phosphates, a material containing phosphoric acid (*e.g.*, phosphate rock) is added to the seaweed before treatment.—T. F. B.

Asbestos; Purification of ——. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, New York. Eng. Pat. 16,960, July 24, 1911.

Commercial asbestos, containing a relatively insoluble impurity (especially magnetite), is subjected to the action of a suitable reducing agent (*e.g.*, by heating in a current of hydrogen, at about 400° C., for 20—24 hours) and is then treated with a dilute acid or other solvent capable of dissolving the reduced impurity, after which it is washed and dried. The process increases the electrical resistance of the material, without affecting its mechanical strength. —F. Sodn.

Caustic alkali solutions [containing soluble cellulose products]; Purification of ——. La Soie Artificielle Soc. Anon. Française, Paris. Eng. Pat. 1573, Jan. 19, 1912. Under Int. Conv., Dec. 23, 1911.

Caustic alkaline lye containing impurities, especially soluble cellulose products, is treated with a compound of copper or other heavy metal, and the gelatinous precipitate formed is separated from the purified lye.—F. Sodn.

Calcium cyanamide; Process of producing ——. A. Bonnington and H. G. Akers, Toronto, Canada. U.S. Pat. 1,021,445, March 26, 1912.

Calcium carbonate or other calcium compound, is intimately mixed with carbon, so as to form a porous mass, and this is heated to a suitable temperature in the presence of nitrogen, by passing it, for example, through a heated zone in a furnace and introducing nitrogen into the heated mass, which is allowed to cool in an atmosphere of the same gas. A catalytic agent, such as calcium fluoride, may be added to the mixture, if desired.—F. Sodn.

Hydrocyanic acid; Process and [*electric*] *furnace for obtaining reactions with gases, specially applicable to the synthetic production of* ——. Chem. Fabr. Griesheim-Elektron, O. Dieffenbach, and W. Moldenhauer. Fr. Pat. 436,201, Aug. 2, 1911.

SPECIAL features of the furnace are (*a*) a carbon crucible, into which depends a central tubular electrode, (*b*) radial channels, furnished with cooling arrangements, which pierce the wall of the crucible, above the lower end of the electrode, and (*c*) a vertical tube, opening into the bottom of the crucible, and containing a piston, by means of which the lower electrode, which is made up of fragments of carbon or coke, to which a binding agent may be added, is pushed up into the reaction zone, as consumed. For the production of hydrocyanic acid, a mixture of nitrogen and hydrogen or hydrocarbons is introduced through the tubular electrode, and, after having been submitted to the action of the arc, the gases immediately escape by the side channels. The reacting gaseous mixture contains preferably 25—35 per cent. of hydrogen and 65—75 per cent. of nitrogen.—F. SODN.

Ammonia from its elements; Process for the catalytic production of —— *with the help of pure iron as catalytic agent.* Badische Anilin und Soda Fabrik. Fr. Pat. 436,472, Nov. 16, 1911. Under Int. Conv., Nov. 29, 1910, and Oct. 19 and Nov. 8, 1911.

A MIXTURE of nitrogen and hydrogen is submitted to the catalytic action of pure iron at a relatively low temperature (*e.g.*, 550°—600° C.), the contact substance being prepared, either by reduction of an iron compound at a temperature preferably not above 600° C. or by heating pure iron, in presence of oxygen, or pure oxides of iron, in presence or absence of oxygen, to a high temperature (preferably to fusion), with subsequent reduction at temperatures below or above 600° C. (the reduction in the latter case being preferably effected as rapidly as possible), or, again, by treating pure iron compounds with ammonia, at temperatures which may exceed 600° C., provided that the quantity of undecomposed ammonia present exceeds that corresponding to the equilibrium for the reduction temperature adopted. In carrying out the process, the contact chamber may be charged with pure ferric oxide, etc., and a mixture of nitrogen and hydrogen introduced at a temperature preferably not exceeding 600° C.
—F. SODN.

Ammonia; Synthetic process of manufacture of ——. G. Coutagne. Fr. Pat. 436,710, Jan. 30, 1911.

OXIDE of aluminium, or of other metal capable, in the nascent state or as carbide, of fixing nitrogen at a high temperature, is strongly heated (in a closed electric resistance furnace, for instance) in the presence of nitrogen and a reducing agent (such as hydrogen), and the product is treated with steam at a lower temperature, so as to give ammonia and the metallic oxide again. The oxide is suitably distributed on carborundum or coke (in the latter case, no further reducing agent being required), and catalytic agents may be added, if desired. A systematic circulation of the gases through several furnaces, or several compartments of the same furnace, in which successive phases of the process are in operation, is preferably adopted.—F. SODN.

Nitrides; Electric furnace for the manufacture of ——. G. Coutagne. Fr. Pat. 436,789, Feb. 1, 1911.

A MIXTURE of carbon and an oxide (or mixture of oxides) of silicon, calcium, barium, magnesium, aluminium, boron, titanium, or analogous element is heated, in the presence of nitrogen (or mixture containing nitrogen), in an electric furnace, which is so constructed that the material passes slowly downwards over a series of sloping bars or plates (of carbon or a suitable mixture), arranged, one above another, and fitting at either end into large carbon electrodes. Several elements, each consisting of two large electrodes, connected by one or more bars or plates, may be superposed and so separated by insulating material that the current passes through each element in succession, thus heating the bars or plates, which act as resistances, to incandescence. The nitrogen passes upwards through the furnace, and regenerative chambers are provided, in which the waste heat is utilised in heating the entering material (both solid and gaseous).—F. SODN.

Nitrides [*of boron and aluminium*] *and ammonia; Process of obtaining* —— *from mixtures of boric acid and alumina or their compounds.* Soc. Générale des Nitrures. Fr. Pat. 437,168, Feb. 10, 1911.

AN intimate mixture of boric acid and alumina (or their compounds) with carbon (*e.g.*, 70 parts of boric anhydride, 102 of alumina, and 72 of carbon) is heated to at least 1400° C. in a current of nitrogen (or gas containing such), and the nitrides thus formed are utilised in known manner for the preparation of ammonia, the oxides being regenerated.—F. SODN.

Ammonium nitrate; Process for the production of pure ——. Gewerkschaft des Steinkohlenbergwerks Lothringen. Fr. Pat. 436,768, Oct. 28, 1911. Under Int. Conv., Dec. 20, 1910.

THE process described in Fr. Pat. 417,505 of 1910 (this J., 1911, 85) is modified by (1) the employment of uncooled gases, without previous dehydration, the temperature of the absorbing liquid being maintained at about 100° C., (2) the use of concentrated ammoniacal gases, such as are obtained from ammoniacal liquors, and (3) the treatment of the liquor obtained, by slightly acidifying and heating until a reaction commences (with a slight evolution of gas), so as to give a product which is chemically pure.—F. SODN.

Refractory materials [*bauxite*]; *Treatment of* ——. J. Pettigrew and E. Gerbel-Strover. Fr. Pat. 436,916, Nov. 28, 1911. Under Int. Conv., August 1, 1911.

VERY refractory materials are fused and then introduced into a vessel surrounded by a jacket, in which a partial or complete vacuum may be maintained, so that the time of cooling may be controlled or prolonged indefinitely. The material may be reheated, if necessary, before cooling, after its introduction into the cooling vessel, and, in certain cases (*e.g.*, with carbon), a partial or complete vacuum may be established in the heating and cooling vessels themselves. The process is specially applicable to the production of pure crystalline alumina from bauxite.—F. SODN.

Sulphur employed in agriculture and industry; Process for enabling —— *to be readily moistened.* J. H. Fabre. Fr. Pat. 437,015, Feb. 6, 1911.

A SMALL proportion of animal gall (preferably mixed with alcohol) is incorporated with the sulphur or is added to the water used.—F. SODN.

Aluminium salts; Process for obtaining ——. Richter und Richter. Ger. Pat. 244,538, Nov. 10, 1910.

ALUMINOUS minerals such as clay, etc., are ignited, with exclusion of air, and then treated with acids. The minerals after ignition in absence of air can be ground much finer than after ignition in presence of air, and are more readily attacked by acids than are the raw minerals.
—A. S.

Metallic salts; Deposition of —— *from solutions containing them.* H. J. Rees, Llansamlet, Glam., and The Metals Extraction Corporation, Ltd., London. Eng. Pat. 7222, March 22, 1911.

SEE Fr. Pat. 433,477 of 1911; this J., 1912, 230.—T. F. B.

Concentrators for ammonia or the like. W. H. Wright, St. Paul, Minn., U.S.A. Eng. Pat. 10,053, April 25, 1911. Under Int. Conv., May 2, 1910.

SEE U.S. Pat. 1,005,761 of 1911; this J., 1911, 1312.—T.F.B.

Ammonia; Process for the production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 436,680, Nov. 23, 1911. Under Int. Conv., Nov. 29. 1910.

SEE Eng. Pat. 26,749 of 1910; this J., 1912, 385.—T. F. B.

yanides and cyanamides; Process of producing ——. C. Bosch and A. Mittasch, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,022,351, April 2, 1912.

See Ger. Pat. 235,662 of 1909; this J., 1911, 1058.—T.F.B.

Hydrocyanic acid; Process for recovering —— *from gases.* G. P. Guignard and H. L. A. M. Watrigant. Fr. Pat. 436,185, Jan. 16, 1911.

See Eng. Pat. 14,588 of 1911; this J., 1911, 1381.—T.F.B.

Air, Process for liquefying and rectifying ——. L'Air Liquide Soc. Anon. Fr. Pat. 437,013, Feb. 6, 1911.

See Eng. Pat. 3326 of 1911; this J., 1912, 335.—T. F. B.

Treatment of producer and other gases. [*Recovery of ammonia*]. Eng. Pat. 11,940. *See* IIa.

Process and apparatus for electrically decomposing fluids. Eng. Pat. 27,902. *See* XI

VIII.—GLASS; CERAMICS.

Glass; Selenium ——. F. Kraze. Sprechsaal, 1912, 45, 214—216, 227—228.

A mixture of selenium and cadmium sulphide was used 21 years ago to impart pink, red, or orange colours to glass, and selenium with about a quarter of its weight of uranium oxide is recommended for a transparent yellowish red lead glass, which only shows a greenish tinge in reflected light and not by transmitted light as in the case of other uranium glasses. Selenites and selenates have also been used to give red glasses, and are less volatile in the glass furnace than selenium itself. New shades have also been produced by combining selenium or its compounds with gold, silver, and opacifying metal oxides and minerals, such as cryolite, fluorspar, etc. If, however, these oxidise the selenium to the dioxide, the author's experiments show that the red colour is impaired or destroyed. Reducing conditions necessary in the glass fusion to develop the red colour are generally secured by using arsenious acid, which causes the red elementary selenium to separate. The addition of saltpetre is often recommended in making glasses, especially lead glasses, which are to be coloured by selenium, but it only serves to oxidise the selenium to the colourless dioxide, and not to oxidise any lead that may have been reduced. As the red colour is due to the separation of red selenium in the elementary condition, treatment of the glass with strong hydrofluoric acid causes the generation of hydrogen, until all the selenium is converted into fluoride; the acid at first acquires a faint yellowish red colour due to the preliminary setting free of the selenium. On treating a red selenium glass with zinc and hydrofluoric acid the gas evolved was found to be hydrogen selenide, which points to the presence of a selenide, probably potassium selenide, in the glass. Selenium in the form of sodium selenate is also used as a decolourising agent in glass making, the selenium red acting as a complementary colour to the green of ferrous oxide and giving white. A number of experimental glasses of different compositions were made in order to study the effect of the composition of the glass upon the colour developed from selenium. In a potash-lime glass, the red colour was only developed when a completely reduced condition had been secured, *e.g.*, by the addition of a sufficient amount of arsenic. A soda-lime glass was not suitable for the selenium colouration, and the formation of a colouring sodium selenide did not occur. This was confirmed by a soda-lime glass in which the lime was increased at the expense of the soda. A potash-lime glass, richer in potash than the former, cooled to a bright yellowish brown, with a marked red tinge, and was probably contaminated by the iron stirrer. A similar result was obtained with a potash-barium glass; the iron was reduced to the ferrous condition, giving a green colour, and probably some barium selenide was formed. The first addition of arsenic to a molten soda-barium glass produced an orange brown colour, but a second addition changed it to a colourless glass, due to the production of complementary colours. With a potash zinc glass, selenium gave a deep brown yellow colour, possibly due to zinc selenide, and no trace of red was found with a soda-zinc glass. With more acid (SiO_2), potash glass the red colour is more strongly developed, so that the amount of selenium may be reduced. It was also found that an increased amount of selenium did not deepen the red colour. An acid barium-glass acquired a red colour with a brown tinge. The acid zinc glass was colourless, and the acid lead glass brownish yellow. Replacement of part of the silicic by boric acid in the acid potash glasses decreased the red colour, and phosphoric acid and stannic oxide acted similarly and to a greater extent. Replacement of the lime by fluorspar gave only a colourless glass, possibly because the selenium is volatilised as fluoride during the fusion.—W. C. H.

Soda lime glasses; Relation of the refractive index of —— *to their chemical composition.* E. W. Tillotson, jun. J. Ind. Eng. Chem., 1912, 4, 246—249.

In order if possible to obtain data whereby the refractive indices of soda lime glasses might be calculated from their composition, a series of glasses ranging in composition from $Na_2O,3SiO_2$ to CaO,SiO_2, was prepared from sodium carbonate, calcium carbonate, and glass sand containing 98·5 per cent. of silica. The refractive indices for white light of selected pieces of the different glasses were determined with an Abbé refractometer, and from these the specific refractive powers were calculated by the formulæ of Gladstone and Dale and of Lorenz and Lorentz respectively, using in each case the specific gravities calculated as described previously (this J., 1912, 28). When the values for the specific refractive powers were plotted, in each case two straight lines were obtained intersecting at a point corresponding with a glass of the composition, $2Na_2O,3CaO,9SiO_2$, indicating the formation of a compound of the type $2Na_2O,3CaO,xSiO_2$. The specific refractive powers of the glasses, computed with the aid of the calculated densities, are additive from pure sodium silicate up to the composition in which the molecular proportions of soda and lime are 2:3. The specific refractive power, K (for use in ascertaining the refractive index by means of the formula of Lorenz and Lorentz) of the glasses can be calculated by means of the equation:

$K = \frac{P_1K_1}{100} + \frac{P_2K_2}{100} + \frac{P_3K_3}{100}$, in which P_1, P_2, and P_3 are the percentages of silica, lime, and sodium oxide respectively and K_1, K_2, and K_3 are the empirically determined specific refractive powers of these oxides, viz., $K_1(SiO_2)$, 0·1220; $K_2(CaO)$, 0·1210; $K_3(Na_2O)$, 0·1302.—A. S.

Silica glass; Devitrification of ——. Sir W. Crookes. Proc. Roy. Soc., 1912, **86**, A, 406—408.

A silica-glass tube was exhausted and heated for 11 hours at 1300° C. It suffered devitrification so that 8 per cent. of its capacity was filled with air which had permeated through. The devitrified tube was then again exhausted in company with a facsimile made of glass, and in a few days air equivalent to 46·6 per cent. of its capacity had leaked in, while the glass tube contained only a microscopic bubble of air. A micro-photograph showed the surface cracked all over into cells, many of which were hexagonal. The appearance was very similar to that produced by evaporating radium bromide in a silica dish. In the cold radium salts will keep for years in both glass and silica. The author concludes that devitrification of silica is caused by exposure to very high temperatures and to contact with radium salts at the temperature of boiling water.—H. H. S.

Porcelain and silica crucibles, etc.; Marking ——. P. A. Yoder. U.S. Dept. Agric., Bureau of Chemistry, Circular No. 93, Feb. 23, 1912.

Two methods are described for putting permanent distinguishing marks on pottery to withstand ignition and mild treatment with acids or alkalis. In the first or platinum process, the crucibles are cleaned by heating for half an hour with nitric acid (1 : 1). The region to be marked is then dipped in a hot 5 per cent. solution of gelatin. When dry, the desired number is stamped on by a linen pad saturated with platinic chloride solution containing 12—15 per cent. of platinum. After drying, the crucibles are gently heated, preferably in a muffle, till the platinum is reduced and the gelatin burnt off. The marks are then raised to the temperature of the flame of a blast lamp for half a minute. By this process marks are obtained which adhere well and are resistant to single acids, but not to alkalis. They may be rendered more prominent by burnishing. Gold may be mixed with the platinum, but there is danger of volatilising gold chloride, thereby causing a spreading of the deposit. The second process recommended consists of the application of ordinary ceramic stains by rubber stamps in a medium of "fat oil" (partially oxidised linseed oil), and of subsequent firing. Resistance to acid or alkali depends of course on the stain selected.—H. H. S.

Porcelain colours; New hard fired ——. W. Pukall. Sprechsaal, 1912, 45, 211—212.

New colours are obtained by allowing suitable refractory, porous, colourless bodies, such as aluminium hydroxide, silicic acid, Zettlitz kaolin, zinc oxide or a mixture of that with aluminium hydroxide in the ratio of 0·5 ZnO. $1Al_2O_3$, meta-stannic acid, calcium phosphate, etc., to absorb easily soluble salts of metals yielding colouring oxides, and then calcining at Seger cone 7, whereby the salts are decomposed. Cobalt oxide with alumina (or its mixture with zinc oxide), or silicic acid as the basis gave tones, ranging from the most delicate ultramarine to the deepest dark blue, suitable for porcelain and earthenware. Chromium oxide in very small amounts, with an alumina basis, gives reddish-grey tones, especially under a glaze rich in magnesia. With the alumina-zinc oxide basis, 0·2 molecule of Cr_2O_3 to 0·5 ZnO,Al_2O_3 gives bright pink colours, which beyond that amount turn to reddish grey. By saturating aluminium hydroxide with manganese nitrate so as to produce on ignition a body of the composition, Al_2O_3,0·15—0·2 MnO, a violet-red is obtained, which is converted into brown by larger amounts of manganese oxide. Colours with 0·1—0·3 mol. of ferric oxide (derived from ferrous sulphate) to 1 mol. of alumina stand fairly well under stoneware glazes, though somewhat brownish red in appearance. Serviceable, red under-glaze stoneware colours are given by mixtures of 0·2—0·8 mol. of ferric oxide to 1 mol. of calcium phosphate as the basis. Copper red under-glaze colours can be produced from copper nitrate with alumina or silicic acid as the basis, though the latter gives a brighter and more reliable effect. With alumina, cuprous oxide reds begin to develop with 0·5 mol. of cupric oxide to 1 mol. of alumina, the finest red being produced on a porcelain biscuit. With 1 mol. of silica a bright red is produced with only 0·4 mol. of cupric oxide. Bright to dark brown colours are produced on porcelain from uranium nitrate, with 0·2 to 1·0 mol. of uranium trioxide to 1 mol. of alumina, silicic acid or Zettlitz kaolin. Under an alkali glaze upon stoneware very bright orange yellows are obtained, but those colours with kaolin as the basis are most fixed. —W. C. H.

Leadless glazes: Studies on ——. V. Tafner. Sprechsaal, 1912, 45, 239—240.

A preliminary report of experiments made to obtain leadless glazes at low temperatures (cone 010 and under). The subject was studied in three aspects. First, natural compounds and minerals were tried as substitutes for lead, but with no success. Then fluorides and other fluorine-containing compounds were introduced into glazes of the general formula, $RO,3$—$3·5SiO_2$. This method and the last of the three, which was to obtain fusible eutectics and compounds by mixing metallic oxides, were more satisfactory, and glazes were obtained at cone 018. The subject is to be developed in further papers. —H. H. S.

Patents.

Potters' ovens. J. Broadhurst, Stoke-on-Trent. Eng. Pat. 6718. March 17, 1911.

In place of constructing the fireplaces around the base of the oven outside the general line of the main wall enclosing the firing chamber proper, they are built under and within the main wall so that more heat is utilised. (Reference is directed to Eng. Pat. 185 of 1868).—H. H. S.

Kilns for burning or firing bricks, tiles, or other earthenware fireclay, or like goods; Continuous ——. G. Andina, Trofarello, Italy, and J. W. Bottomley, Leeds. Eng. Pat. 11,870. May 17. 1911.

Heat radiated from the walls, arches and floor of a continuous kiln is utilised to heat the supply air by having the main air flue or flues parallel with the central smoke chamber, air conduits beneath each compartment communicating with the main air flue, and series of air pipes built longitudinally, crosswise, vertically, transversely and archwise, with means for controlling admission of air. —H. H. S.

Quartz bodies; Production of hollow ——. F. W. Burckhardt, Biebrich-on-Rhine, Germany. Eng. Pat. 15,949, July 10, 1911.

In the manufacture of hollow bodies of fused silica, the carbon rod or tube constituting the resistance of the electric furnace is closely surrounded with a layer of combustible material, containing as little ash as possible, *e.g.*, cellulose paper, in order to generate gases which will produce an interspace between the carbon rod and the mass of fused silica; these gases are allowed to escape only slowly from the furnace.—W. C. H.

IX.—BUILDING MATERIALS.

Creosoted wood; Phenomenon of the disappearance of the higher-boiling phenols in —— and its explanation. S. Cabot. J. Ind. Eng. Chem., 1912, 4, 266—267.

The higher-boiling coal-tar phenols on prolonged exposure to air become converted into tarry substances insoluble in benzene but soluble in acetone. Of this tarry matter a portion is insoluble in 10 per cent. sodium hydroxide solution, but soluble as an alkali salt in water; a portion forms with alkali a salt that undergoes hydrolysis on dilution; and a third portion has a very slight affinity for alkali. The author concludes that the higher-boiling phenols remain in creosoted wood in the form of complex oxidation products. (See also this J., 1912, 337).—A. S.

Wood; Preservation of —— with fluorides. R. Nowotny. Oesterr. Chem.-Zeit., 1912, 15, 100—102. (See also this J., 1910, 566; 1911, 686.)

For the purpose of increasing the preservative effect of sodium fluoride on wood, it is now being mixed with nitro-phenols. One of these mixtures ("Bellit") consists of 90 parts of 90—95 per cent. sodium fluoride and 10 parts of dinitrophenolaniline, this compound being used because, whilst active as an antiseptic, it does not, like free dinitrophenol, act upon the iron vessels in which the timber is impregnated. The selective phenomena observed when treating timber with mixtures of zinc fluoride and hydrochloric acid are reproduced in the "Bellit" treatment. Impregnation by steeping results in the solution being absorbed as a whole, but in the hydrostatic and pneumatic pressure methods the nitro-compound is absorbed more rapidly than the fluoride. Examination of telegraph poles which had been treated in 1905 and 1906 with copper sulphate and zinc fluoride respectively has shown that, in general, the latter is much the better preservative.—J. A.

Peat in the brick industry; Utilisation of ——. V. Pinkl. Tonind.-Zeit., 1912, 36, 637—638.

Earthy peat can be used for making porous bricks. For that purpose, sods about 50 × 20 × 20 cm. are cut and left *in situ* to freeze in winter and dry out in spring. The material is then disintegrated and worked up with clay. —O. R.

Hydraulic cements; Theories of the hardening of ——, tested by the most recent observations. F. M. Meyer. Z. angew. Chem., 1912, **25**, 711—718.

Experiments on the burning of cement materials, containing 20—70 per cent. of calcium carbonate, at temperatures varying between 700° and 1000° C. (compare Meyer, this J., 1909, 243), have shown that good hydraulic cements may be obtained with mixtures containing as little as 40 and even 25 per cent. of calcium carbonate; no connection was, however, established between the strength of the product on testing and the proportion of lime present. The author concludes from the results of his investigation, that hardening depends on the presence of a slightly soluble crystallisable body, such as lime, and a semi-permeable substance which protects the crystals formed from the further action of water, rather than on the chemical composition of the cement mixture or the formation of definite compounds during burning. The strength attained during hardening is thought to depend on the relative quantities of these constituents and on the physical properties of the protecting substance, which would depend on the temperature of burning. It is suggested that the brick-dust used by the Romans in the mixing of mortar was made from lightly burnt bricks and acted in this latter capacity.—F. Sodn.

Plaster; Water of hydration and analysis of ——. A. Moye. Tonind.-Zeit., 1912, **36**, 630.

Owing to the ease with which plaster loses its water of hydration at comparatively low temperatures, the author recommends that free moisture should be estimated by heating the raw material to 80° C. for not more than 1 hour. For very exact determinations the temperature should not exceed 35°—70° C. The author's experiments did not confirm the views of G. Surr, that a large quantity of combined water was lost in the preliminary operation of pulverising the sample to be examined; he found that if the sample was carefully and quickly ground, no appreciable amount of water of hydration was lost.—O. R.

Modification of the sulphonation test for creosote. Bateman. *See* III.

Antiseptic properties of creosote. Charitschkoff. *See* XIXb.

Patents.

Vulcanized wood. C. Howard, New York, Assignor to National Lumber Vulcanising Corporation. U.S. Pat. 1,021,676, March 26, 1912.

Claim is made for wood freed from pyroligneous acid and all volatile aqueous matters, and having its undecomposed gums and resins deposited uniformly throughout the entire mass. Such "vulcanised wood" is said to remain practically unchanged through long and severe use. —H. H. S.

Wood; Process of preserving ——. C. H. Curtis, Argos, Ind. U.S. Pat. 1,022,064, April 2, 1912.

Two parts of sodium carbonate and one of finely ground silica are fused together, the frit is cooled, pulverised and dissolved in water, and the solution treated with chlorine gas. The wood to be preserved is dried by heat, immersed in the solution, and then removed from the bath and dried, these operations being repeated until the wood is impregnated to the desired degree. The wood is afterwards immersed in a bath of dilute sulphuric acid under pressure, to render the silica insoluble, and then dried by heat.—W. C. H.

Wood; Process for the impregnation and preservation of ——. H. Lindemans. Fr. Pat. 436,589, Nov. 21, 1911. Under Int. Conv., Aug. 26, 1911.

Air is first driven out of the wood to be treated which is then saturated under pressure with an aqueous solution of sulphides or polysulphides of an alkali or alkaline earth.—W. C. H.

Wood; Process for preserving ——. Höntsch und Co. Ger. Pat. 213,227, Sept. 28, 1910.

Wood may be preserved by impregnating it with acetone oil or analogous liquid which has been saturated with acetylene at the ordinary pressure; a resin may be added to the solution. The process may be economically carried out by impregnating the wood with the acetylene solution maintained under pressure, and then reducing the pressure, whereupon a portion of the acetylene and also of the liquid will be released and recovered. The above process is said to produce a much greater preservative effect than when coal gas or tar oil vapours are employed.—T. F. B.

Cement; The application of zinc chloride to cover surfaces constructed of ——. J. A. Cornuché. Fr. Pat. 436,260, Oct. 30, 1911.

Cement surfaces, façades, etc., are treated with a solution of zinc chloride in order to preserve any paint applied to the cement surface, and to give it a greater solidity. —W. C. H.

Agglomerates; Process of manufacture of ——. P. H. A. Hoho and J. G. H. Segors. Fr. Pat. 436,973, Nov. 29, 1911.

The agglomerants used, *e.g.*, for the manufacture of building materials from wood, cork, peat, sand, slag, etc., are lime and starch, the latter preferably in a boiled condition. Any substances containing large or small quantities of lime may be used, such as the refuse from sugar works, and similarly by-products containing starch from other manufactures can be utilised to supply the starch, such as refuse from maize factories.—W. C. H.

Gypsum; Processes of treating —— and industrial applications of the products obtained. A. L. Francois. Fr. Pat. 436,748, Jan. 31, 1911.

(1) Gypsum is completely dehydrated in a retort or muffle, either at about 250° C., when the product reacts readily with water and is capable of desiccating alcohol, or at a temperature approaching the limit, beyond which the product will not set with water, so as to obtain a very slow-setting plaster. (2) Gypsum is heated in closed vessels at 250° C., giving a slow-setting plaster. (3) Gypsum is burnt at a high temperature (*e.g.*, about 1000° C.), so as to give an inert plaster, which may be kept indefinitely without undergoing change, but has the property of setting, when gauged with water containing appropriate salts, such as sodium sulphate, zinc sulphate, alum, etc., giving a plastic material, very suitable for the manufacture of artificial marble and stone. (4) Gypsum is burnt at about 1400° C., so as to cause partial dissociation, giving a product which contains free lime and is analogous to Portland cement; its setting time is about 600 hours, but may be made to vary from 20 minutes to 4 weeks by the addition of a "positive catalytic dialyser" to the gauging water.—F. Sodn.

Wood; Process for treating ——. A. W. Mathys, London. From National Lumber Vulcanizing Corporation, Dover, Del., U.S.A. Eng. Pat. 21,818, Oct. 3, 1911.

See U.S. Pat. 1,004,168 of 1911; this J., 1911, 1255. —T. F. B.

Oil colours, particularly for cement surfaces. Fr. Pat. 437,080. *See* XIII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Special steels; Magnetic properties of —— at low temperatures. J. G. Gray and A. D. Ross. Faraday Soc., April 23, 1912. [Advance proof.]

Specimens of cast iron, Swedish soft iron, and Sankey transformer iron, and of iron-, carbon-, chrome-, silicon-, phosphor- and tungsten-steels were tested at the ordinary temperature and at —190° C. in the conditions brought about by: (1) normalising by heating nearly to redness and cooling slowly; (2) annealing at 900° C.; (3) quenching at 450° C.; (4) quenching at 900° C. The effect of cooling to the temperature of liquid air is in general to diminish the permeability for low values of the magnetising force, and to augment it for high values. A magnetisation curve corresponding to —190° C. lies initially below and finally above that corresponding to the ordinary temperature. In the carbon steels the value of the field strength, for which the curves cross, increases with the carbon content. In these steels the coercive force is greater at —190° C. than at 15° C. In high-carbon steel in the quenched condition the coercive force is 32 at the ordinary temperature; at —190° C. it is 50. The crossing points of the curves are very low in the case of chrome steels. In annealed steel of this variety containing 10 per cent. of chromium, the crossing point is at $H=8$, and is only slightly higher in the condition brought about by quenching at 450° C. In this steel cooling to —190° C. brings about an increase in the coercive force. In the annealed steel containing 4 per cent. of chromium, crossing of the curves takes place for $H=150$. In the condition brought about by quenching at 450° C., crossing takes place at $H=16$. After quenching at 900° C. a very great magnetising force is necessary to bring about crossing. In annealed silicon steel containing 3·5 per cent. of silicon, crossing of the curves occurs for $H=150$ c.g.s. units. After quenching at 900° C. the magnetisation curve corresponding to —190° C. lies everywhere above that corresponding to the ordinary temperature. An annealed steel specimen containing 6 per cent. of silicon behaved in a somewhat similar manner. In the annealed condition of the material crossing of the curves took place for $H=180$. After quenching at 900° C. crossing took place for $H=15$. In the silicon steels the effect of the liquid air temperature is to increase the coercive force. Specimens of tungsten- and phosphor-steels behaved quite normally. Tungsten steel is magnetically much harder at —190° C. than at the ordinary temperature. In all cases where a series of special steels has been examined, the general rule is found to hold, that the crossing-point of the I-H curves corresponding to 15° C. and —190° C. respectively, is higher, the greater the amount of the added element: carbon, silicon, chromium, etc. This rule holds for the steels in any of the above-mentioned conditions. The paper opens with a summary of previous work done, and the different conditions in which the steels were examined are discussed in the light of the iron-carbon equilibrium diagram. The magnetometer employed was designed by the authors, the method used being that of testing the specimen in the A and B positions of Gauss, and deducing the distance between the poles. The demagnetising factors were determined by testing a bar 100 cm. long, then cutting this into five bars each of 20 cm. length, testing these, and comparing the curves.—R. W. N.

Vanadium [in iron and steel]; New method for the determination of ——. D. J. Demorest. J. Ind. Eng. Chem., 1912, 4, 249—250.

THE method depends upon the selective oxidation of ferrous sulphate in presence of vanadyl sulphate by manganese dioxide. The manganese dioxide should be sufficiently fine to pass through a 200-mesh sieve, but "should settle in a beaker of water in 30 seconds" (see following abstract). Two grms. of the iron or steel are dissolved in a mixture of 30 c.c. of water and 12 c.c. of concentrated sulphuric acid. One c.c. of nitric acid of sp. gr. 1·42 is added to oxidise the iron, and the solution is boiled to expel nitrous fumes, diluted with 30 c.c. of water and boiled with excess of a strong solution of permanganate to oxidise completely all carbon, etc. Excess of ferrous sulphate is next added, the solution is boiled, diluted to about 250 c.c., a $N/10$ solution of permanganate is run in until the solution is just pink, and the containing vessel is cooled under the tap. After a further addition of ferrous sulphate solution until all reducible compounds, including chromic and vanadic acids are reduced, about 1 grm. of C.P. manganese dioxide is added, with vigorous shaking, and after two minutes and subsequently at intervals of one minute, a drop of the solution is tested with ferricyanide. (The presence of ferrous iron is indicated by an immediate blue colouration; a blue colour after a few seconds is due to the reaction of ferric iron with ferrocyanide produced by reduction of the ferricyanide by vanadyl sulphate.) When the iron is completely oxidised (4—6 mins.), the solution is shaken for $\frac{1}{2}$ min. longer, then the manganese dioxide is filtered off, standard permanganate is added to the solution, now containing ferric sulphate and vanadyl sulphate, until a pink colour is obtained and then 1 c.c. more, and the excess of permanganate is titrated with sodium arsenite solution. The percentage of vanadium is calculated from the amount of permanganate consumed. A blank test should be made with a steel free from vanadium. The results of determinations of vanadium in the Bureau of Standards (U.S.A.) standard vanadium steel both alone and in presence of chromium are cited, showing the accuracy of the method.—A. S.

Vanadium [in iron and steel]; New method for the determination of ——. J. R. Cain and D. J. Demorest. J. Ind. Eng. Chem., 1912, 4, 256.

THE apparent discrepancy between the results of the two authors in the use of manganese dioxide as an oxidising agent (see Cain, this J., 1911, 958, and Demorest, preceding abstract) is shown to be due to differences in the state of division of the manganese dioxide. Very finely divided manganese dioxide readily oxidises the lower oxides of both iron and vanadium, but, with somewhat coarser material, the oxidation of the vanadium is inappreciable in the brief period needed for the complete oxidation of the iron.—A. S.

Vanadium in steels, ores, etc.; Rapid method for the determination of ——*, based on its quantitative inclusion by the phosphomolybdate precipitate.* J. R. Cain and J. C. Hostetter. J. Ind. Eng. Chem., 1912, 4, 250—256.

A PRECIPITATE of ammonium phosphomolybdate produced in a solution containing ten times as much phosphorus as vanadium carries down the whole of the vanadium, and the latter can then be determined by a method based on reduction with hydrogen peroxide in concentrated sulphuric acid solution (see this J., 1912, 333). For steels containing vanadium, chromium, titanium, manganese, and molybdenum, singly or in combination, an amount of drillings containing from 2 to 10 mgrms. of vanadium is dissolved in nitric acid of sp. gr. 1·135, the solution is boiled to expel nitrous fumes, oxidised with permanganate, the manganese dioxide dissolved by addition of sodium sulphite, and the solution boiled till free from fumes. After nearly neutralising with ammonia, a quantity of sodium phosphate solution representing at least ten times as much phosphorus as there is vanadium present is added, the solution is heated to boiling and the requisite quantity of the molybdate reagent added. The supernatant liquid is decanted through an asbestos filter, and the precipitate is washed thrice with a hot acid solution of ammonium sulphate (15 c.c. of ammonia solution of sp. gr. 0·9 and 25 c.c. of sulphuric acid of sp. gr. 1·84 to 1 litre of water), and then dissolved in hot concentrated sulphuric acid, which has been used previously for dissolving the small quantity of precipitate on the filter. The acid solution should contain 5—8 c.c. of concentrated sulphuric acid for every 10 mgrms. of phosphorus present. It is heated with a few drops of nitric acid (1 : 25) and when fumes are being strongly evolved, the vanadium is reduced by successive small additions of hydrogen peroxide (3 per cent.) until the solution acquires a deep brown colour changing on heating to the clear green or blue colour of vanadyl vanadium. The flask is then heated for four or five minutes, covered, cooled, and the contents diluted to an acid concentration of 1 : 5 by vol., and titrated at 70°—80° C. with $N/100$ permanganate. The determination only occupies about $\frac{1}{2}$ hour, and gives very accurate results. In the case of solutions containing hydrochloric acid and in general when the volume of the solution is very large, it is advantageous to add 10 grms. of ammonium nitrate per 100 c.c. of solution, before precipitating with the molybdate reagent. It is pointed out that in the determination of phosphorus in steels containing vanadium, the use of dilute solutions of potassium nitrate or nitric acid for washing the phosphomolybdate precipitate may cause considerable errors, owing to the solubility of the precipitate; acid ammonium sulphate and ammonium nitrate solutions are the best washing agents.—A. S.

Cyanide experiments. L. Cohen. Met. and Chem. Eng., 1912, **10**, 203—205.

The author describes various tests carried out with potassium cyanide, on miscellaneous ores, which have given unusual results. The amount of insoluble gold remaining in a slime cake (38 per cent. of moisture) obtained after the usual agitation and filtration, was reduced from $1·22 to $0·76 per ton in the case of an oxidised ore, and from $0·44 to nil in the case of a sulphide, by drawing air through the cake for one minute, and then treating it again with cyanide solution. On 40-mesh pyritic material assaying $18 in gold, when leached with a cyanide solution containing 10 lb. of cyanide per ton, the following figures were obtained: continuous leaching for 72 hours gave an extraction of 37·8 per cent., with a cyanide consumption of 13·5 lb. per ton of ore. When leached intermittently for 18 hours, air being passed through the ore after each passage of the cyanide solution, an extraction of 53·3 per cent. was obtained, and the cyanide consumption was 7 lb. per ton of ore. Other experiments, on oxidised material, gave similar results. The addition of 0·5 to 0·8 lb. of picric acid per ton of ore when cyaniding would appear to increase the extraction and diminish the cyanide consumption, except where no protective alkali is present, when the effect is not seen. With a sulphide ore, better extraction is obtained on adding lead acetate to the solution. When a copper-bearing sulphide ore (1·38 per cent. of copper, and $5·20 in gold) was cyanided without roasting, no gold was extracted, and the cyanide consumption was 7·6 lb. per ton, with a lime consumption of 5·4 lb. per ton. After roasting at a high temperature, an extraction of 79·4 per cent. was obtained, with a cyanide consumption of 5·2 lb. and a lime consumption of 3·4 lb. per ton of ore. When roasted at a low temperature, the extraction rose to 91·7 per cent., the cyanide consumption falling to 3·2 lb. per ton of ore, and the lime consumption rising to 11·4 lb. per ton of ore. When testing an ore which gave an extraction of 40·9 per cent., with a cyanide consumption of 6 lb., and a lime consumption of 19·3 lb. per ton, it was found that if treated with a cyanide solution containing no protective alkalinity, an extraction of 75 per cent. was obtained, the cyanide consumption being only 3·4 lb. per ton.—R. W. N.

Cyanide solutions; Clarifying ——. C. Steinem. Eng. and Min. J., 1912, **93**, 739—740.

The main difficulties encountered in connection with zinc-boxes are: deposition of fine rock-particles on the zinc, diminishing the activity of the latter, and deposition of zinc slime from complex zinc compounds in solution. It is suggested that a process similar to that in use for clarifying town water supplies might be of service. A test showed that alum, while clarifying a muddy cyanide solution, did not entail the loss of an appreciable amount of precious metal in the precipitate of aluminium hydroxide formed.—R. W. N.

Zinc-dust tests. W. J. Sharwood. J. Chem., Met., and Min. Soc., S. Africa, 1912, **12**, 332—338.

In the valuation of zinc-dust for gold precipitation, it is generally accepted that about 95 per cent. should pass a 200-mesh screen, and that none should remain on a sixty-mesh. The presence of 2 to 3 per cent. of lead is an advantage. Analyses are given of typical dusts, showing variations in the content of metallic zinc from 30 to 92 per cent., and of zinc oxide, from traces to over 50 per cent. The determination of the lead in zinc-dust is best effected, using 10 grms., by the molybdate titration method. For the determination of the oxide, the method based on the solubility of zinc oxide in ammonium chloride and ammonia gives satisfactory results. A solution is prepared containing 250 c.c. of water, 70 grms. of ammonium chloride, and 150 c.c. of ammonia of sp. gr. 0·900. One grm. of dust is shaken for exactly five minutes with 25 c.c. of the prepared solution, filtered, and rapidly washed. The filtrate and washings are acidified with hydrochloric acid, and the zinc is titrated with ferrocyanide in the usual way. Total zinc is determined by dissolving 1 grm. of dust in hydrochloric acid, and titrating with ferrocyanide. "Metallic zinc" is best taken as the difference between "total zinc" and "zinc present as oxide," though it can be determined directly by allowing the zinc-dust to reduce chromic acid, or a solution of iodine in potassium iodide, and determining the amount of reduction effected, by means of a subsequent titration. The precipitating efficiency can be well determined by using 0·5 grm. of zinc-dust, and stirring it with an excess of a silver cyanide solution, then filtering, and cupelling the residue. The efficiency is calculated in percentage, taking complete replacement of zinc by silver as 100. This method of testing has been used during the last seven years and found satisfactory. Much information can often be gained regarding a specimen of zinc-dust by an elutriation test in an ascending current of water carefully regulated. The efficiency of zinc-dust as a precipitant is chiefly due to its finely divided condition, or in other words to its great surface. Grains which barely pass 200-mesh (diam. 0·003 in.) expose 55 sq. ft. per lb., while material in grains 0·0001 in. diam., such as compose a considerable part of a good zinc-dust, expose 1650 sq. ft. per lb. For comparison, zinc shavings $\frac{1}{32}$ in. broad and 0·001 in. thick expose 56·8 sq. ft. per lb. The average amount of surface exposed per lb. of zinc-dust would appear to be about 300 sq. ft.—R. W. N.

Bullion, Cadmium and nickel in cyanide ——. F. P. Dewey. Eng. and Min. J., 1912, **93**, 733—734.

In consequence of serious differences in the assay values obtained by the United States Mint Service on consignments of bullion produced by cyanide mills in Utah, analyses have been made of this material, and also of that from similar mills in Montana. In each case cadmium was present in amounts which were large when compared with the amount of zinc present, though it is considered certain that the cadmium had been introduced during precipitation by the zinc. All samples examined showed copper, and varying amounts of lead and silver. A notable amount of nickel was found in each case, while cobalt in no case was in sufficient quantity to give a clear reaction. The nickel was undoubtedly derived from the ores, and it is probable that the cyanide operations in some way effected a separation of nickel from cobalt. To investigate further the influence of these constituents on the results of assays made on bullion containing them, systematic work is now being done on cadmium alloys.
—R. W. N.

Platinum in ores and bullion; Direct determination of small amounts of ——. F. P. Dewey. J. Ind. Eng. Chem., 1912, **4**, 257—258.

Small quantities of platinum pass into the nitric acid solution obtained in the regular course of assaying on parting gold from silver. To this solution a limited quantity of a very dilute solution of hydrogen sulphide (1 part of the strong solution diluted with from 10 to 20 parts of water), sufficient to precipitate the platinum and three to five times as much silver, is added, and after standing for 3—4 hours, or preferably over-night, the precipitate is collected, dried, the paper burnt off, and the residue wrapped in a small piece of thin lead foil and cupelled. The resulting bead is parted in strong sulphuric acid, leaving the platinum usually in the form of sponge, which is washed, annealed, and weighed. The same method of concentrating in a precipitate of silver sulphide may be used for the determination of minute quantities of gold in high-grade silver.—A. S.

Platinum metals; Assay of ores containing ——. A. C. Dart. Met. and Chem. Eng., 1912, **10**, 219—220.

Eight portions of the ore, one assay-ton each, are fused with suitable fluxes. If much copper be present, the resulting buttons are scorified until soft, and then cupelled. The weight of the beads obtained, gives the total quantity of precious metals in the ore. The beads are combined to two lots of 4 assay-tons each, and recupelled with ten times their weight of silver. The resulting beads are parted with 12 per cent. nitric acid, and finally with concentrated nitric acid. Silver, palladium, and platinum are dissolved; gold remains, and is weighed. The bulk of the nitric acid solution should be kept as small as possible. The silver is precipitated as chloride, by the addition of hydrochloric acid, and removed by filtration. The filtrate is evaporated to dryness, and a few drops of hydrochloric acid and ten c.c. of water are added. If silver chloride separates out, it is filtered off and added to the main portion. The filtrate is rendered ammoniacal, acidified with formic acid, and boiled for 30 minutes. Platinum and palladium are reduced, and can be filtered off, washed ignited, and weighed. The precipitate is dissolved in *aqua regia*, evaporated to dryness, taken up again with hydrochoric acid and 50 c.c. of hot water, saturated with ammonium chloride crystals, and after addition of 10 c.c. of alcohol, is allowed to stand 24 hours. The ammonium platinic choride is filtered off, washed with ammonium chloride solution, and ignited slowly.

—R. W. N.

Copper; The solution of —— in water. J. Pionchon. Comptes rend., 1912, **154**, 865—867.

A cell formed from two plates of copper with water as electrolyte, shows a momentary current when one of the plates is lightly tapped, the tapped electrode becoming negative. If the water be left in contact with the copper plates for some time, this effect disappears, but it may be renewed by changing the water. This behaviour is supposed by the author to be due to the solution of minute traces of copper by the water. The amount dissolved is too small to be detected chemically, but the inactive water becomes active again after shaking with iron. By application of this method the author claims to be able to state whether water has been in contact with copper, when no trace can be detected by ordinary means.—W. H. P.

Nickel plating baths; Determination of boric acid in ——. A. Wogrinz and J. Kittel. Chem.-Zeit., 1912, **36**, 433—434.

Gravimetric methods for determining the boric acid in a nickel bath, which also contains ammonium salts and citric acid, fail owing to loss of boric acid in the process of removing ammonium salts, after evaporating with sodium carbonate or magnesium chloride. The volumetric method involving the use of glycerin or mannitol is unreliable in the presence of ammonium sulphate, and if glycerin is used it is found that it causes high results owing to its own acidity, when used in the quantities necessary for a sharp end point. The presence of sodium sulphate, though not without effect, is not very inconvenient, and it is therefore possible to obtain fairly reliable results as follows. The sample is electrolysed, to remove the nickel and destroy citric acid, and the ammonium salts are decomposed by evaporation with solid sodium hydroxide. After making neutral to methyl orange, a sufficient excess of mannitol is added, and the titration completed with phenolphthalein as indicator. For a quantity of liquid, in which the boric acid is equivalent to 30—50 c.c. of $N/5$ alkali, about 100 c.c. of a 10 per cent. mannitol solution are used.—W. H. P.

Aluminium, Action of salts of mercury and mercury upon ——. Application to the analysis of aluminium. P. Nicolardot. Bull. Soc. Chim., 1912, **11**, 410—413. (See this J., 1910, 571.)

The purity of aluminium has an important influence on its behaviour in solutions of salts of mercury. Sheets of metal containing 99·2 per cent. of aluminium were dipped into solutions of mercuric chloride and then put into water. With mercuric solutions of 1 : 1000 and 1 : 10,000, the evolution of hydrogen in water was immediate. The action was slow but distinct with a solution as weak as 1 : 100,000. Using metal of 98 per cent. purity, there was no action after dipping in mercury solutions of any concentration. Metals which can amalgamate with mercury, particularly copper, prevent the reaction. Iron has no inhibiting action. When a drop of a solution of mercuric chloride (1 : 1000) is placed on a clean aluminium surface, white filaments of the hydroxide appear at once if the metal is pure. Metals of the alkalis and alkaline-earths can be separated from aluminium alloys by oxidising them after treatment with mercuric chloride, and filtering off the alumina which separates.—F. Sodn.

Tungsten and molybdenum; Solubility of wrought ——. W. E. Ruder. J. Amer. Chem. Soc., 1912, **34**, 387—389. (See also this J., 1910, 825.)

Tungsten.—Discs of sheet tungsten, 18 mm. diam. and about 2·5 mm. thick, such as are now being used for X-ray targets (see this J., 1912, 134) were employed. The discs have an average surface area of 650 sq. mm. and weigh from 9 to 12 grms. Hydrochloric acid of any concentration did not attack the metal at the ordinary temperature. With the concentrated acid (sp. gr. 1·15) at 110° C., no action could be observed after 45 hours, but after 175 hours the metal had lost 0·5 per cent. in weight and had a black coating of oxide. With dilute hydrochloric acid at 110° C. there was a loss of weight of 0·05 per cent. after 22 hours, but no further loss after 50 hours. After 175 hours there was a gain of weight of 1 per cent. and the metal had an adherent coating of tungstic oxide which prevented further loss. Dilute sulphuric acid had no action on wrought tungsten even at 110° C. Concentrated sulphuric acid had no action at the ordinary temperature, but at 110° C. there was a loss of weight of 0·1 per cent. after 18 hours, 0·16 per cent. after 40 hours, and 0·63 per cent. after 175 hours; at 200° C., 0·62 per cent. was lost in 4 hours and 1·18 per cent. in 8 hours. In fuming sulphuric acid the metal lost 1·2 per cent. in 8 hours. Concentrated nitric acid had practically no effect on the metal even after 48 hours at 110° C. Dilute nitric acid produced a yellow coating of oxide: there was a slight gain in weight after 15 hours and then no further change after 175 hours. With *aqua regia* at the ordinary temperature, a coating of tungstic oxide was produced: the loss of weight was 0·31 per cent. after 215 hours. With *aqua regia* at 110° C. the chlorine was all expelled in 4 hours and the metal had lost 0·1 per cent. and had a tough greenish yellow coating which protected it against further action. Hydrofluoric acid, either hot or cold, had no action on the metal. Potassium hydroxide had no action in aqueous solution, but with the fused alkali, the metal lost 31 per cent. in weight after 15 hours, and the disc was completely dissolved after about 40 hours. In fused alkali carbonates, the metal lost about 2·5 per cent. in 4 hours, whilst after addition of potassium nitrate, the loss was 32 per cent. in 6 hours. In a saturated solution of sodium hypochlorite, the metal lost 4·27 per cent. in 20 hours. A mixture of hydrofluoric and nitric acids dissolved the metal very rapidly with evolution of nitric oxide and production of tungstic oxide, but a mixture of sulphuric acid and chromic anhydride had no action.

Molybdenum.—Small strips of the metal were used, 30×9×0·4 mm., having a surface of 540 sq. mm. Dilute hydrochloric acid at 110° C. slowly dissolved the metal to a brown solution, with the formation of a black oxide, probably Mo_2O_3; the loss of weight was 20·3 per cent. after 18 hours. With concentrated hydrochloric acid (sp. gr. 1·15) at 110° C., the loss of weight was only 0·34 per cent. after 18 hours. Dilute sulphuric acid (sp. gr. 1·30) had no action even at 110° C. With concentrated sulphuric acid (sp. gr. 1·82) there was a loss of weight of only 0·29 per cent. after 18 hours, but at 200°—250° C., the metal dissolved rapidly to a green solution with evolution of sulphur dioxide. The metal was dissolved slowly by concentrated nitric acid (sp. gr. 1·4) and rapidly by the dilute acid (sp. gr. 1·15), and by *aqua regia*. The metal was dissolved by fused alkalis, but was not attacked by potassium hydroxide solution nor by hydrofluoric acid, hot or cold.—A. S.

Alkali metals; Vapour pressures of — between 250 and 400° C. L. Hackspill. Comptes rend., 1912, 154, 877—880.

The vapour pressures were measured by sealing the metal in a U-tube, one limb of which was kept at the required temperature, and the other just above the melting point of the metal. From the observed changes in level of the metal in the two arms of the tube, together with the density (at the melting point) and coefficient of expansion of the liquid metal, the vapour pressure can be calculated. Figures and curves are given for cæsium, rubidium, potassium and sodium. The highest vapour pressures measured were: cæsium, 15·88 mm. at 397° C.; rubidium, 6·14 mm. at 367° C.; potassium, 1·61 mm. at 400° C.; and sodium, 0·26 mm. at 397° C.—W. H. P.

Gels in relation to ore deposition. E. Hatschek and A. L. Simon. Inst. Mining and Met., April 18, 1912. [Advance proof.]

The results obtained by Hatschek (this J., 1912, 281) in a study of the formation of precipitates in silicic acid gel, indicated that many of the features characterising occurrences of gold in quartz could be explained on the assumption that such occurrences were due to the reduction of gold salts in a medium of gelatinous silicic acid. In general if the reducing agent be hypotonic in relation to the gold salts in the gel, the gold diffuses out and is precipitated in aggregates, frequently of crystalline form, at the point or points of contact of the reducing agent with the gel. If the reducing agent be hypertonic in relation to the salts in the gel, the gold is precipitated within the gel, and frequently in distinct layers parallel to the surface of the gel in contact with the reducing agent, the distance from one layer to the next increasing with the distance from this surface. When illuminating gas is used as reducing agent, a black substance, probably carbon, is precipitated as well as the gold. The authors discuss the application of their results to the question of the genesis of certain types of gold deposits, including the occurrence of nuggets and rich outcrops, and quartz veins with banded structure, sometimes with bands of graphite occurring with the gold. A. S.

Utilisation of lead furnace fume. Hughes. *See* XIII.

Patents.

Steel; Manufacture of ——. F. W. Paul, Glasgow. Eng. Pat. 6808, Mar. 18, 1911.

In the manufacture of acid or open-hearth steel from pig iron, a portion of the latter is first melted, the remainder being subsequently added, together with the necessary iron oxide, in small quantities at a time, so that the metallic bath is maintained in a substantially liquid condition throughout the whole operation. The predetermined quantity of steel scrap is then added in a similar manner, the process being subsequently conducted as in ordinary practice. (Reference is directed to Eng. Pats. 2137 of 1865, 2166 of 1867, and 3631 of 1868).

—W. E. F. P.

Manganese steel; Method of treating ——. F. Kohlhaas, Dusseldorf, Germany. Eng. Pat. 13,478, June 6, 1911.

The metal is heated to a temperature varying (according to the proportion of manganese present) from 950° to 1350° C., and is then slowly cooled in the heating chamber or under hot ashes, air being excluded throughout the treatment. It is claimed that, by this means, steel of high manganese content is rendered easily machinable, the original properties being restored by quenching the metal in water or oil from a bright yellow heat.—W. E. F. P.

Steels; Process and apparatus for eliminating the dissolved gases from metals and alloys, especially cast ——. L. Baradue-Muller. First Addition, dated Jan. 13, 1911, to Fr. Pat. 434,865, Dec. 8, 1910 (see Eng. Pat. 30,198 of 1910; this J., 1912, 135).

A vertical cylinder enclosing a number of water-cooled tubes is adapted to form an air-tight joint with the rim of the casting ladle by means of a water-cooled rubber joint suitably isolated from the radiant heat of the molten charge. The ladle is raised into position by hydraulic means, the gases drawn from the metal passing upwards through the cylinder and thence downwards through a similar cylinder (cooled by means of brine, or otherwise) before entering the vacuum pumps. Access of air through the tapping hole in the bottom of the ladle is prevented by means of an external metal cap which, upon the withdrawal of the rod from the orifice, is immediately pierced by contact with the molten metal. Economy in the power required may be effected by duplicating the apparatus and working each part alternately, and also by utilising the heat abstracted from the gases.

—W. E. F. P.

Iron articles; Process for manufacture of — resistant to acids and heat. Grohmann und Co., Ges. m. b. H. Fr. Pat. 437,141, Dec. 4, 1911.

Claim is made for alloys composed of commercial iron with from 20 to 70 per cent. of chromium alone or with a maximum of 18 per cent. of silicon in addition. It is stated that, although capable of being worked like steel, the alloys are unattacked by acids at high or low temperatures.—W. E. F. P.

Alloys; Metallic ——. J. F. Duke, Manchester. Eng. Pat. 7863, Mar. 29, 1911.

Claim is made for an alloy composed of about 30 parts by volume of iron, 30 of copper, and 20 of nickel, with or without 2 parts by volume of tin. One to 2½ per cent. by weight of aluminium (or a suitable quantity of other deoxidising agent) is added at the time of casting, the finished product containing more than 35 per cent. of copper and less than 27 of nickel by weight. The alloy, which is stated to be unaffected by exposure to moist air, is intended as a substitute for the iron and steel used in exterior fittings such as door handles, knockers, etc.

—W. E. F. P.

Alloy; Metallic ——. J. F. Duke, Manchester. Eng. Pat. 15,740, July 6, 1911.

The alloy is primarily intended as a substitute for German silver and consists of 12 parts by volume of iron, 8 of nickel and 4 of copper, together with the residue of 1 part by volume of aluminium which is added for deoxidation purposes. During manufacture, quantities of charcoal and sodium carbonate not exceeding 0·2 and 0·4 per cent. by weight of the alloy, respectively, may be stirred into the molten charge of iron, nickel and copper before the addition of the aluminium. The hardness of the alloy may be increased by the addition of from 1 to 2 per cent. by weight of tin.—W. E. F. P.

Metals and alloys; Annealing or heat treatment of ——, *and apparatus therefor.* T. V. Hughes, Birmingham. Eng. Pat. 8362, Apr. 4, 1911.

The apparatus is constructed of refractory slabs or blocks so shaped as to form a series of muffles surrounded by tubular heating flues. Each of the muffles is connected at one end with a chamber (or with a chamber at each end) for the preliminary heating and after cooling of the metal. The treatment of the latter is conducted in an inert gas which, if not of lower density than the heating gases, is maintained under slight pressure to prevent leakage of the latter into the chambers: before being passed into the chambers the gas is conducted through preheating tubes containing scraps of the metal under treatment.

—W. E. F. P.

Furnace; Continuously operating annealing — for metals. C. Kugel, Werdohl, Germany. Eng. Pat. 22,786, Oct. 16, 1911.

In an apparatus adapted to effect, in succession, the preliminary heating, maximum heating, graduated cooling and discharge of the material under treatment, the latter, placed upon trucks, is passed through a series of communicating chambers the closing of which is effected

automatically by means of flexible members adapted to come into contact with the trucks. By means of sliding or hinged doors, the end chambers of the series are separated from those intervening, access of air to the latter being thus prevented. External means are provided by which the loaded trucks may be intermittently moved from one chamber to another without opening the furnace.
—W. E. F. P.

Crucible furnaces. J. E. Bayley, London. Eng. Pat. 8671, April 7, 1911.

A vertical charging-tube, attached to the crucible in an air-tight manner, extends through the cover of the furnace, and is provided with a suitable lid. To permit of the escape of the gases from the charge, the projecting part of the charging-tube is provided with a side tube communicating with the chimney of the furnace.—W. E. F. P.

Furnaces; Mechanical ——, for roasting ores and the like. J. Harris. Fr. Pat. 436,298, Nov. 11, 1911.

In a mechanical furnace of the kind in which the material is passed from the top to the bottom of a series of superimposed chambers wherein it is propelled by means of rotating rabble arms, contamination with ore dust of the acid gases evolved, is prevented, it is claimed, by a system of intermittent charging in which each fresh portion of the material is allowed to attain about the same temperature as the portion preceding it before being permitted to mix with the latter. An enclosed discharge is provided, the gas and ore passages of the apparatus being so disposed that the material falling from one compartment to another is not directly exposed to the gaseous current passing through the furnace.—W. E. F. P.

Blast-furnace for the fusion of ores and metals. L. Robert. Fr. Pat. 436,437, Nov. 16, 1911.

In a water-jacketed furnace constructed of sheet iron and fired with petroleum, the crucible is composed of masonry, the lower part of the inner casing being lined with refractory material. The air blast and the petroleum are introduced through alternate tuyères situated at the upper part of the crucible, the air being preheated by passing through an annular pipe at the base of the water-jacket, and the petroleum gasified by passing through pipes coiled round the tuyères through which it is injected into the furnace.
—W. E. F. P.

Moulding sand; Substitute for ——. D. M. McPherson, Glasgow. Eng. Pat. 9771, April 22, 1911.

Pulverised furnace-ash is mixed with sufficient clay to form a plastic mass on the addition of water.—W. E. F. P.

Ores: Reduction of metal ——. S. E. Sieurin, Höganäs, Sweden. Eng. Pat. 14,612, June 20, 1911.

In the reduction of ores without fusion, the material being heated in admixture with carbonaceous matter in closed vessels, in order to facilitate the removal of the charge after the operation, the walls and bottom of the receptacle are lined (before, during or after the introduction of the charge) with non-coherent, refractory material such as carbon, ashes, sand or clay.—W. E. F. P.

Tin from ores and other tin-bearing materials; Process for the recovery of ——. by conversion into volatile tin compounds. A. Richards, London. Eng. Pat. 26,644. Nov. 28, 1911.

The tin-bearing material (ore, tailings, slag or metal scrap) is heated with a suitable quantity of common salt in the presence of a solid or gaseous reducing agent, the operation being conducted at a temperature somewhat above a cherry red heat. It is claimed that practically the whole of the tin is thus volatilised, the fume being collected and subsequently reduced in any known manner. Ores, etc., containing more than 4 per cent. of sulphur are roasted before treatment.—W. E. F. P.

Tin; Electrolytic separation of —— and its recovery from tin-plate scrap. J. Matuschek. Ger. Pat. 244,567, April 22, 1911.

The electrolyte consists of a concentrated solution of ammonium oxalate saturated with "pink salt" ($SnCl_4.2NH_4Cl$), to which quercitannic acid has been added. Further additions may be made to the bath of sodium dihydrogen phosphate, sodium silicofluoride, an inorganic acid other than nitric acid, preferably hydrofluosilicic acid, or a mixture of borax and hydrofluosilicic acid. It is stated that much higher current densities can be used, at the ordinary temperature, with a neutral or acid bath of the composition given than with the usual hot alkaline baths employed for the deposition of tin.
—A. S.

Ore; Apparatus for the treatment of ——. J. Gross and L. Cohen, Denver, Colo. U.S. Pat. 1,021,248, March 26, 1912.

A shallow, annular receptacle, the bottom of which is inclined downwards from the outer edge and provided with a filter-bed, is arranged about a vertical, rotatory shaft to the upper part of which a hemispherical vessel or cap is centrally attached. The mixture of ore and solvent supplied to the latter vessel is conveyed to the filter-bed through a feed pipe to the lower end of which a rabbling device (for spreading the material upon the bed) is attached. A suction chamber is disposed beneath the filter-bed, and the receptacle is suitably enclosed to prevent the escape of the gas employed during the treatment. The discharge of waste or tailings is effected through closable openings provided in the inner wall of the receptacle.—W. E. F. P.

Copper ores; Process of treating ——. R. Gahl, Morenci, Ariz. U.S. Pat. 1,021,768, April 2, 1912.

The unroasted ore is concentrated under conditions yielding finely-divided tailings from which latter (without roasting) the copper is extracted by means of a solution containing ferric iron and sulphuric acid.—W. E. F. P.

Ores; Process of treating ——. R. Gahl, Morenci, Ariz. U.S. Pat. 1,021,769, April 2, 1912.

In a decantation process for the extraction of metals from ores by means of solvents, the thickened ore pulp and a supernatant liquid are caused to traverse a series of decanting vessels "in resultantly opposite directions." The solvent is introduced at an intermediate point in the series and the dissolved metal is precipitated from the out-flowing liquid, the latter being afterwards returned to the opposite end of the series.—W. E. F. P.

[Ores] Mineral substances; Art of concentration of ——. J. M. Hyde, Basin, Mont. U.S. Pat. 1,022,085, April 2, 1912.

In a continuous process of concentration by agitation and froth-flotation, the ore pulp is allowed to remain for some time in contact with an acid precipitant before being agitated with the frothing agent. The froth produced is separated by overflowing with water and subsequently "cleaned" by further agitation and flotation.—W. E. F. P.

Lead and zinc; Process for the treatment of mixed ores of ——. J. de Coppet. First Addition, dated Feb. 1, 1911, to Fr. Pat. 430,821, Aug. 23, 1910 (this J., 1911, 1393).

After treatment of the sulphuric acid solution with zinc blende, the zinc is precipitated from the liquid as a mixture of sulphide and hydroxide by means of hydrogen sulphide. The lime, magnesia, iron and alumina remain in the solution, which is utilised, with or without the addition of fresh acid, for the treatment of a further quantity of ore.
—W. E. F. P.

[Tungsten, etc.]. Metals of high melting point; Process for obtaining ductile blocks from chemically pure ——. C. H. Fischer. Fr. Pat. 437,114, Dec. 2, 1911.

The metal (or oxide) is agglutinated by heating with a flux of low melting point, such as an alkali or alkaline earth, the flux being subsequently eliminated by heating the mass to a high temperature in a vacuum or inert atmosphere by electrical or other means. It is claimed that refractory metals may thus be obtained in a form suitable for the direct production of filaments by cold rolling or drawing.—W. E. F. P.

Tungsten ; Process for reduction of the oxides of ——. J. Pintsch Akt. Ges. Fr. Pat. 437,197, Dec. 5, 1911. Under Int. Conv., Nov. 7, 1911.

The reduction is effected at a high temperature by means of a mixture of hydrogen and nitrogen, the presence of the latter, it is claimed, rendering the reduced metal specially suitable for the production of filaments for incandescent lamps. Ammonia (which is dissociated at the high temperature employed) may be used instead of the mixed gases.—W. E. F. P.

Ore-briquettes ; Preparation of —— *by sintering in tunnel kilns.* Köln-Müsener Bergwerks-Akt.-Ver. Ger. Pat. 244,613, Aug. 18, 1910.

The sintering of the briquettes is effected in a tunnel kiln by means of a flame directed downwards. In order to obtain a short, very hot flame, a burner for the supply of a mixture of combustible gas and air is provided below the gas-inlet. This burner is composed of parallel, longitudinal, narrow channels, some of which are open at the back in order to receive air which has been preheated by passage over the finished briquettes, whilst alternate ones communicate with closed channels through which the combustible gas is supplied.—A. S.

Roasted materials ; Process for cooling —— *by means of inert gases.* B. Bruhn. Ger. Pat. 244,622, Nov. 5, 1910.

The patent relates to rotary roasting furnaces, the claim being for the use of the waste gases of the installation as inert gases for cooling the roasted material. In addition to introducing the waste gases into the cooling chamber, they may also be introduced into the roasting chamber in order to restrict oxidation, the current of waste gases being kept, as far as possible, separate from the stream of combustible gas and air used for heating.—A. S

Converters for the manufacture of steel. Soc. Anon. des Forges et Fonderies de Montataire, Paris. Eng. Pat. 10,666, May 2, 1911. Under Int. Conv., July 19, 1910.

See Fr. Pat. 418,449 of 1910 ; this J., 1911, 92.—T. F. B.

Reduction or smelting of [*iron*] *ore by means of the electric current ; Process and furnace for the* ——. Aktiebolaget Elektrometall. Fr. Pat. 436,528, Nov. 18, 1911. Under Int. Conv., Nov. 25, 1910.

See Eng. Pat. 25,862 of 1911 ; this J., 1912, 393.—T. F. B.

Iron and manganese ores and other minerals ; Process for treating ——. C. A. Brackelsberg. Fr. Pat. 437,250, Dec. 6, 1911. Under Int. Conv., Dec. 9, 1910.

See Ger. Pat. 241,321 of 1910 ; this J., 1912, 136.—T. F. B.

Alloys ; Manufacture of ——. L. Weiss, Charlottenburg, Germany. Eng. Pat. 29,904, Dec. 23, 1910. Under Int. Conv., Dec. 23, 1909.

See Fr. Pat. 424,056 of 1910 ; this J., 1911, 752.—T. F. B.

Alloys ; Process and device for the production of —— *by the employment of metal fusible at high temperatures only.* Titan Ges. m.b.H., and G. Meissner, Dresden, Germany. Eng. Pat. 7663, March 27, 1911.

See Fr. Pat. 425,604 of 1911 ; this J., 1911, 904.—T. F. B.

Radium ores ; Process for treating complex ——. S. Radcliff, Bairnsdale, Vic., Australia. Eng. Pat. 8936, April 10, 1911. Under Int. Conv., Feb. 7, 1911.

See Fr. Pat. 429,368 of 1911 ; this J., 1911, 1220.—T. F. B.

Metal blocks free from gas and blow holes ; Manufacture of —— *and apparatus therefor.* Rheinische Metallwaaren- und Maschinenfabrik, Dusseldorf-Derendorf, Germany. Eng. Pat. 21,249, Sept. 26, 1911. Under Int. Conv., Jan. 16, 1911.

See Fr. Pat. 431,655 of 1911 ; this J., 1912, 313.—T. F. B.

[*Ore*] *roasting furnace.* T. D. Merton, Watford, Assignor to H. M. Ridge, London. U.S. Pat. 1,022,961, April 9, 1912.

See Eng. Pat. 13,625 of 1909 ; this J., 1910, 1113.—T. F. B.

Metallisation of silicious articles ; Process for the superficial ——. P. Marino. Fr. Pat. 436,304, Nov. 11, 1911. Under Int. Conv., June 13, 1911.

See Eng. Pat. 14,033 of 1911 ; this J., 1911, 1153.—T. F. B.

Zinc and other metals ; Production of ——. A. B. Pescatore Fr. Pat. 436,650, Nov. 22, 1911. Under Int. Conv., Dec. 22, 1910.

See Eng. Pat. 29,839 of 1910 ; this J., 1911, 1456.—T. F. B.

Production of gaseous fuel for metallurgical or other purposes. Eng. Pat. 29,367. *See* IIa.

Treatment of copper liquors. Eng. Pat. 9171. *See* VII.

Manufacture of nitrogen compounds of molybdenum and of metallic molybdenum. Eng. Pat. 12,662. *See* VII.

XI.—ELECTRO-CHEMISTRY.

Electrolytic reduction of nitrobenzene without a diaphragm. Farnan. *See* III.

Perchloric acid in electrochemical analysis. Hendrixson. *See* XXIII.

Patents.

Electrically decomposing fluids ; Process and apparatus for ——. L. A. Fixen, Chicago, U.S.A. Eng. Pat. 27,902, Dec. 12, 1911.

The process consists in electrolysing a liquid which is caused to flow in the same direction as the electric current, the decomposition products being withdrawn at different points along the stream. In an example, the anode of an electrolytic chamber for decomposing sodium chloride solution is arranged in the centre of the chamber, with cathodes at each end. Fresh sodium chloride solution is caused to flow into the middle of the chamber and chlorine water is drawn off from points near the ends which are separated from the cathodes by partitions having perforations near the bottom, the liquid being drawn off through pipes extending nearly to the top. The alkaline liquid produced round the cathodes is similarly removed through pipes extending nearly to the surface.—H. H.

Electrode ; Storage-battery —— *and process of making it.* W. Morrison, Des Moines, Iowa. U.S. Pat. 1,021,989, April 2, 1912.

The negative-pole electrode comprises a support and conductor with active material thereon, and a porous envelope of vegetable parchment, resistant to alkali, enclosing the active material. A strip of wire gauze is wound helically on the envelope, so that it is insulated from the active material, the adjacent edges of the strip being intermeshed.—B. N.

Active material [*for positive lead electrodes*] *; Binder for peroxide* —— *and process of making it.* W. Morrison, Des Moines, Iowa. U.S. Pats. 1,021,990, 1,021,991, and 1,021,992, April 2, 1912.

The permanent binder, for the active material of positive-pole lead electrodes, consists of an oxy-sulphur compound of lead, which has also in its acidic radical a metal, such as (1) tungsten, (2) tantalum, or (3) niobium, incapable of directly replacing hydrogen in a sulphuric acid solution. The metals mentioned are not rendered soluble by anodic oxidation, incapable of cathodic reduction to metal, or of electrolytic separation as metal in a sulphuric acid solution, but capable of forming complex anions with electronegative elements.—B. N.

Active material of positive pole lead electrodes: Process of binding the ——. W. Morrison, Des Moines, Iowa. U.S. Pats. 1,021,993, 1,021,994, 1,021,995, and 1,021,996, April 2, 1912.

(1) The process consists in dissolving, in a solution of a "reducing" agent, such as hydrogen peroxide, a compound having in its acidic radical a metal, such as tungsten, possessing the properties detailed in the preceding abstract, and which can constitute the acidic radical of compounds having lead as the base. Sulphuric acid is added, and the active material is saturated with the resulting solution. (2) The active material is saturated with a solution of a lead compound having a metal, such as tungsten, in its acidic radical, and the compound is then treated electro-chemically so as to precipitate in the active material a binder consisting of a lead-tungsten-oxygen compound. (3) An electric current is passed from the electrode through a solution of a tantalate, thereby impregnating the active material with a tantalum compound, afterwards acting electro-chemically on the compound with sulphuric acid. (4) A niobate is used in place of the tantalate as described in (3).—B. N.

Storage-battery conductor or support. W. Morrison, Des Moines, Iowa. U.S. Pat. 1,021,997. April 2, 1912.

The conductor consists of lead, an element, in the sulphur group of the periodic law, having an atomic weight higher than that of sulphur, and another metal or metals, such as antimony.—B. N.

Electrodes for electrolytic purposes; Process for making ——. P. Askenasy. Ger. Pat. 243,543, Nov. 25, 1909.

The electrodes are formed from the product obtained by oxidising iron in such a manner that ferrous oxide is produced principally: for example, an iron tube is burnt by means of a current of oxygen passing through it, and the resulting fused mass shaped to the desired form. The electrodes are especially suitable for use as anodes in the preparation of potassium chlorate or sodium hypochlorite or in other processes in which chlorine is generated.—T. F. B.

Primary battery. W. A. F. Bleeck, Brisbane, Queensland. U.S. Pat. 1,021,859, April 2, 1912.

See Eng. Pat. 15,194 of 1909; this J., 1909, 1144.—T. F. B.

Process and [electric] furnace for obtaining reactions with gases, specially applicable to the synthetic production of nitric acid. Fr. Pat. 436,201. *See* VII.

Electric furnace for the manufacture of nitrides. Fr. Pat. 436,789. *See* VII.

Plastic compositions and their preparation. Fr. Pat. 435,944. *See* XIV.

Stirrer for use in quantitative analysis by electrolysis. Ger. Pat. 243,761. *See* XXIII.

XII.—FATS; OILS; WAXES.

Fats; The progressive hydrolysis of —— *by means of sulphuric acid.* A. Grün and O. Corelli. Z. angew. Chem., 1912, **25**, 665—670.

By treating pure tripalmitin for several hours with sulphuric acid of 66° B., at a temperature of 70° C., using the acid in the proportion of ten mols. to one of the glyceride, a fatty acidity equal to 56·5 per cent. of free palmitic acid is obtained. As all the experiments have shown the formation of diglycerides, without any evidence whatever of the formation of monoglycerides, the above acidity indicates the formation of 70 per cent. of dipalmitin, leaving 30 per cent. of unchanged tripalmitin. A similar experiment using 20 mols. of sulphuric acid gave an acidity equal to 65 per cent. of palmitic acid, corresponding to 75 per cent. of dipalmitin and 25 per cent. of unchanged tripalmitin. Similar results were obtained when tristearin was treated in the same way. The production of diglycerides from the triglycerides by this treatment can only result from the formation, in the first case, of 1 mol. of fatty acid and 1 mol. of a diglyceride sulphuric acid ester, the latter being decomposed when the reaction mixture is treated with water to remove the excess of sulphuric acid. All attempts to isolate the intermediate product from this mixture failed, but the pure ester was prepared by acting upon $\alpha\beta$-distearin with chlorosulphonic acid (the formation of an $\alpha\alpha$-diglyceride by sulphuric acid treatment is most unlikely). The substance thus obtained was rapidly decomposed by cold water into distearin and sulphuric acid and behaved in mixtures in the same way as the product obtained by treating tristearin with sulphuric acid. Similar results were obtained on preparing the corresponding ester from $\alpha\beta$-dipalmitin. —J. A.

Olive oil; Influence of substances soluble in fats on the viscosity and surface-tension of ——. F. Bubanovic. Z. Chem. Ind. Kolloide, 1912, **10**, 178—181.

The author determined the influence of small quantities of substances (chloroform, alcohol, and camphor) soluble in fats on the viscosity and surface-tension of olive oil. In the following table the effect of such substances on the viscosity coefficient (η) at 37° C. is shown: for pure olive oil the viscosity coefficient is η=0·37525.

Concentration of fat-soluble substance.	Chloroform.	Alcohol.	Camphor.
	η	η	η
1 : 10,000	0·37436	0·37632	0·37083
1 : 5000	0·37442	0·37566	0·37019
1 : 1000	0·37298	0·37205	0·36990
1 : 500	0·37060	0·36972	0·37022
1 : 100	0·35407	0·33596	0·37162

For examining the effect on the surface-tension, the method of observing the height to which the liquid rises in a capillary tube was used. At a temperature of 37° C. and with a tube ± 0·25 mm. diam., the following values were obtained: chloroform, 3·5 mm.; olive oil, 19·0 mm., mixtures of chloroform and olive oil: 1 : 10,000, 18·9 mm.; 1 : 5000, 18·7 mm.; 1 : 1000, 18·8 mm.; 1 : 500, 18·7 mm.; 1 : 100, 18·6 mm.; 1 : 10, 17·3 mm.; 1 : 5, 14·5 mm.; 1 : 2, 11·8 mm.; and 1 : 1, 10·3 mm. The results show that very small quantities of substances soluble in fats have no appreciable effect on the viscosity and surface-tension of olive oil.—A. S.

Fish oil mixtures; Fluidity of —— *as an additive property.* G. F. White. J. Ind. Eng. Chem., 1912, 4, 267—270.

Mixtures of whale, menhaden, and dogfish (*Mustelus canis*) liver oils respectively with white cod liver oil in different proportions were made up and their viscosities at different temperatures (30°, 50°, 70° and 90° C.) measured by means of the viscosimeter described previously (see this J., 1912, 239). The viscosities and fluidities as functions of the composition of the mixtures were plotted, and it was found, contrary to the statement of Kessler and Mathiason (this J., 1911, 372), that over the range of temperature studied, the fluidities of the mixtures are strictly additive. The addition of 1 part of one of the oils to 99 parts of another is distinctly shown by the effect on the fluidity with the viscosimeter used, and in conjunction with other tests the determination of the fluidity should be of value in detecting adulteration.—A. S.

Sesamé oil: Behaviour of refined ——. S. Zimmermann. Mitt. d. K. K. Techn. Versuchsamtes, 1912, 1, 71—74.

The refining and deodourising of sesamé oil affects the sensitiveness of the colour reactions with furfural and with vanillin and other aldehydes. Thus in the case of refined bleached oil from West African seed, piperonal gave a lilac to bluish-violet colour and vanillin a bluish red colouration; whereas after deodourisation the same oil gave a reddish violet to yellowish red colour with piperonal, and a purple to yellowish red colour with vanillin. In the refining of an oil from partially fermented Chinese seed, dark coloured crystals collected in the tubes connected with the air-pump. When purified by solution and filtration in ether, and then separated again and fractionally distilled, these yielded a small quantity of an impure aldehydic body (58° to 110° C.). At 200° to 220° C. the bulk of the substance was converted into a yellow mass with an odour of naphthalene, and this when repeatedly crystallised from absolute alcohol yielded colourless rhombic crystals melting at 78° to 80° C. and identified as naphthalene. The mother-liquor contained a small quantity of a dark brown oil, which when strongly diluted had a pronounced odour of acacia. The Soltsien (stannous chloride) reaction was found to be the least affected by the ordinary process of refining sesamé oil, and such oil could still be detected by that test when added to arachis oil in the proportion of 1 per cent.—C. A. M.

Oil from a cross of Juglans nigra and J. cinerea. A. Fouchet. Bull. Sci. Pharmacol., 1912, **18**, 529—534. Chem. Zentr., 1912, **1**, 1321.

The yellow oil was obtained from the nuts by extraction with cold petroleum ether, the yield being 50 per cent. It has the sp. gr. 0·925 at 12°/4° C.; n_D = 1·4765 at 22° C.; $[a]_D$ = 0; critical temperature of solution in absolute alcohol, 78·5° C.; acid value, 0·37; iodine value, 151; saponif. value, 191; acetyl value, 11. It consists mainly of glycerides of stearic, oleic, linolic, and linolenic acids, yielding only traces of soluble and volatile acids; the chief constituent (70 per cent.) is the glyceride of linolic acid. —A. S.

Mkonga [Balanites aegyptica] oil. W. Arnold. Z. Unters. Nahr. Genussm., 1912, **23**, 391—392.

A sample of oil prepared by the natives of Morogoro (German East Africa) from the seeds of the Mkonga tree (*Balanites aegyptica*) (see this J., 1909, 249 and 531) was of a light yellow colour and had a pleasant nutty taste and smell. It had the following characteristics:—sp. gr., 0·9173 (15° C.); sapon. value, 195·6; Reichert-Meissl value, 0·55; Polenske value, 0·4; iodine value, 77·2; acid value, 8·5; unsaponifiable, 0·07 per cent.; stearic acid content, 2·4 per cent. The oil became cloudy at 8·8° C.—J. A.

Polenske value; Precautions to be taken in determining the ——. W. Arnold. Z. Unters. Nahr. Genussm., 1912, **23**, 389—391.

Unless attention is paid to the following details in determining the Polenske value of fats, erroneous results will be obtained. 1. The apparatus must, in all particulars, conform to those laid down by Polenske (this J., 1904, 587). 2. Wire-gauze must not be used to support the flasks, but these should be set in a circular opening, 6·5 cm. diam., cut in an asbestos plate. 3. The burner should be so arranged that only the bottom of the flask and none of the asbestos plate is in contact with the flame. 4. The pumice stone should be in powder form. 5. The distillate should be exactly 110 c.c. 6. Exactly 20 grms. of glycerin should be used in the saponification. 7. A control test should be made with sound lard, the Polenske value for which lies between 0·4 and 0·6. Duplicate tests should agree within 10 per cent. when the value is 2 and under, 8 per cent. when the value is between 2 and 5, 5 per cent. when between 5 and 10, and 4 per cent. when the value exceeds 10.—J. A.

Determination of butter fat and coconut oil in margarine. Arnaud and Hawley. *See* XIXa.

Soaps; Classification of —— for industrial and commercial purposes. L'Industria. Through Chem. Trade J., April 27, 1912. [T.R.]

With the object of classifying different soaps on a commercial scale, the commission appointed by the Italian Soap Makers' Union has proposed to divide them in order of their requirements. The classification of Professor Gianoli, in accordance with the views of the commission, would be as follows:—

1. *Pure soaps of the finest quality.* (*a*) Boiled soaps, hard, soft, floating, white and dyed, scented or unscented, not liable to change colour or to become rancid, completely soluble in water and alcohol, and constituted by a combination of soda and fatty acids when this is insoluble in sodium chloride solutions at 15° B.—*i.e.*, free from hydroxy-fatty acids and in which the total percentage of hydrated fatty acids, non-siccative, is not less than 60 per cent. Free from non-saponified glycerides, hydrocarbons, wax, alkaline and metallic soaps; not more than 0·3 per cent. of free alkalis (NaOH); total mineral matter not exceeding 1½ per cent. (carbonates, sulphates, chlorides, alkali and earth silicates); not more than 2 per cent. foreign organic matter (colouring matter, perfume, fatty acids of low molecular weight, etc.).

(*b*) Resin soaps, boiled with not more than 15 per cent. of rosin, and otherwise corresponding to the requirements assigned to the preceding category.

(*c*) Mottled and marbled soaps in which the proportion of hydrated fatty acids is not less than 55 per cent. and the total free alkalis, carbonates and sulphates and alkali silicates does not exceed 3½ per cent.

2. *Soaps of inferior quality.*—Whether hard or soft, plain or marbled, containing, or not, alkaline mineral detergents, organic or mineral fillings in quantities greater than 3½ per cent., when the soaps contain 33 per cent. of water—*viz.*, soaps in which there are carbonates and alkaline silicates, talc, kaolin, asbestine, kieselguhr or sugar, starch, fecula, hydrocarbons, etc. Whether manufactured cold or hot with fatty acids or glycerides of any nature, with or without resin.

3. *Dry soaps.*—Those which do not give up more than 20 per cent. of water when exposed for three hours to 105° or 110° C. after being pulverised with ten times their weight of powdered glass.

Patents.

Catalytic operations; The carrying out of —— and more particularly the conversion of unsaturated fatty acids or their glycerides into saturated compounds. M. Wilbuschewitsch, Nischninovgorod, Russia. Eng. Pat. 72 of 1912, date of appl., Dec. 24, 1910.

See Fr. Pat. 426,343 of 1910; this J., 1911, 966. Pumice, clay, or kieselguhr is specified as the inert basis of the catalyst. (Reference is directed, in pursuance of Sect. 8, Sub-sect. 2 of the Patents and Designs Acts, 1907, to Eng. Pat. 5188 of 1911; this J., 1911, 1072).—T. F. B.

Fatty acids, fats, oils, fish oils, and waxes; Process and apparatus for converting —— into like bodies of higher melting point. M. Wilbuschewitsch, Nischinovgorod, Russia. Eng. Pat. 30,014, Dec. 24, 1910.

See Fr. Pat. 426,343 of 1910; this J., 1911, 966.—T. F. B.

Oils, fats, fatty acids, fish oils, or the like; Process and apparatus for oxidising ——. M. Wilbuschewitsch, Nischninovgorod, Russia. Eng. Pat. 15,440 of 1911, date of appl., Dec. 24, 1910.

See Fr. Pat. 426,343 of 1910; this J., 1911, 966.—T. F. B.

Catalysts [used for hydrogenising fats, etc.]; Process of regenerating ——. M. Wilbuschewitsch, Nischninovgorod, Russia. U.S. Pat. 1,022,347, April 2, 1912.

See Fr. Pat. 426,343 of 1910; this J., 1911, 966.—T. F. B.

Fatty acids, their glycerides and other esters; Process for converting unsaturated —— into corresponding saturated compounds. F. Bedford and C. E. Williams. Fr. Pat. 436,295, Nov. 11, 1911. Under Int. Conv., Dec. 20, 1910.

See Eng. Pat. 29,612 of 1910; this J., 1912, 398.—T. F. B.

Preparing an ester from montan wax. Ger. Pat. 244,786. *See* IIa.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Pigments; Behaviour of —— during drying. C. Zerr. Farbenzeit., 1911, 17, 132—133, 179—180, 292—294, 334—335. Chem. Zentr., 1912, 1, 1344—1345.

Not only in the case of the sensitive colour-lakes, but also in that of the mineral pigments, special care has to be exercised in drying. In all cases drying in the open air is superior to an artificial drying system. Of the lead pigments, the chrome yellows (normal lead chromate) are extremely sensitive to temperatures only slightly above that prevailing during their precipitation, and for this reason it is seldom possible to obtain, after drying, pigments of exactly the same shade, even from precipitates produced under similar conditions. The effects are due to the tendency of normal lead chromate to change, under the influence of heat and moisture, into basic compounds, which, owing to their coarser crystalline structure, appear of a darker colour. Partial "after-reddening" is caused by condensation of moisture on the surface of the nearly dry pigment or by insufficient washing of the precipitate. Chrome greens (mixtures of lead chromate and Prussian blue) are even more sensitive than chrome yellows. The effect of any acids present in the Prussian blue becomes evident only towards the end of the drying. Prussian blue, unless it has been insufficiently washed, seldom undergoes any deleterious change on drying. Many kinds of ochre become dull and reddish or brown during drying. Of copper pigments, Bremen blue at a certain stage of the drying process is even more sensitive to excessive heat than chrome yellow is, especially if too high a proportion of caustic soda has been used. The production of a greenish tinge during drying is due either to the presence of iron in the copper sulphate or water used or to inadequate arrangements for removing moisture from the drying chamber. Zinc yellow, a compound of zinc chromate and potassium chromate, is more sensitive against accumulated moisture in the drying chamber than against variations of temperature. In the case of lakes from coal tar colours, changes during drying are frequently due to reaction between the colour and the substratum. Many green lime washes and similar colours with a basis of white or grey clay become duller on warming; the most sensitive are those prepared with pure white clays, especially lean (non-plastic) clays. Colours prepared from Malachite Green or Brilliant Green with clays of the last-mentioned type sometimes change to a dirty olive green even at a temperature of 30°—40° C. Malachite Green is usually less sensitive than Brilliant Green, and the latter is less sensitive alone than when mixed with Auramine, although Auramine by itself is not affected under similar conditions. The clays in question in addition to possessing a distinctly acid character appear to be strongly hygroscopic. On drying they lose their hygroscopic moisture more or less rapidly according to their plasticity, and their acid character becomes intensified, so that similar mixed colourations to those produced by treatment with mineral acids may become apparent.—A. S.

Lead furnace fume; Utilisation of —— [for manufacture of pigments]. L. S. Hughes. J. Ind. Eng. Chem., 1912, 4, 262—264.

The fume from lead smelting plants when burned leaves a whitish cinder composed approximately of 55 per cent. of lead sulphate, 44 of lead oxide, 1 of zinc oxide, and traces of ferric oxide. Digestion with caustic soda solution in order to convert the lead compounds into lead hydroxide is successful if the wet mixture be triturated in a ball mill. The author uses a double cone ball-mill of the horizontal type, having an outlet considerably wider than the charging opening. When the reaction is complete, a jet of water is introduced into the charging opening, whilst continuing the rotation of the mill. If the mill be stopped, the whole mass sets to a solid cake, owing to crystallisation of sodium sulphate. The sludge from the mill is allowed to settle and the lead hydroxide washed by decantation. It is thus obtained in a very reactive condition and is a suitable and cheap material for the production of lead pigments (chromates, etc.) and other lead compounds. It is stated for example that the cost of production of chrome yellow, using the lead hydroxide as raw material is only 6·68 dols. (27s. 10d.) per cwt. as compared with 8·25 dols. (34s. 4½d.) when litharge is used.—A. S.

Turpentine oil; Determination of petroleum spirit and benzene hydrocarbons in ——. J. Marcusson. Chem. Zeit., 1912, 36, 413—414, 421—422.

The modification of Burton's nitric acid test for petroleum spirit previously described (this J., 1909, 1096) is defended against various criticisms, and is shown to give good results in the case both of Russian and Pennsylvanian petroleums (poor in benzene hydrocarbons) and of Indian or Galician petroleums, containing a large proportion of benzene hydrocarbons. In this respect it has the advantage over the method of Eibner and Hue (this J., 1910, 890), which is not applicable in the presence of heavy Indian petroleum spirits (*e.g.*, Sanga oil) such as are now used as substitutes for turpentine oil. For an approximate determination of benzene hydrocarbons the product of the reaction with nitric acid is treated with sulphuric acid (sp. gr. 1·6) until the oily nitro-derivatives rise into the graduated part of the flask, where their volume can be read. In experiments with mixtures containing known quantities (10 to 50 per cent.) of simple aromatic hydrocarbons, such as benzene, toluene, etc., the amounts found agreed within 4·5 per cent. of theory, whilst in the case of technical benzene preparations (solvent naphthas) the maximum difference between the figures was 3 per cent. If the presence of more than 50 per cent. of benzene derivatives is suspected (*e.g.*, from a low bromine value), the test is modified by omitting the fifteen minutes' heating of the diluted nitric acid solution, since the aromatic hydrocarbons contained in these "solvent naphthas" are attacked by hot dilute nitric acid in the absence of a sufficiently large quantity of turpentine oil. On the other hand, omission of the heating causes one part of benzene hydrocarbon to yield more than one part of nitro-derivative, so that the reading will be too high. By dividing the result by the empirical factor 1·15, approximately correct values (within 4 per cent. in the author's experiments) may be obtained.—C. A. M.

Patents.

Oil colours; Composition of —— particularly for cement surfaces. Arota Ges. m. b. H. Fr. Pat. 437,080, Dec. 1, 1911. Under Int. Conv., Jan. 25, 1911.

Silver dross—obtained in the process of refining plumbiferous silver, and consisting mainly of litharge and zinc oxide in combination as silicates—and cement are mixed with oil or varnish, with or without pigments, and employed as oil paints, particularly for painting the surface of freshly applied cement.—E. W. L.

Oily ink; Process and apparatus for the recovery of —— from cloths. M. S. Hopkins, Assignor to The Separate Recovery Co. of America, Baltimore, Md. U.S. Pats. 1,021,737 and 1,021,738, March 26, 1912.

The cloths are treated with a solvent, such as acetone, which is miscible with water, and the liquor obtained is churned with water, to precipitate and conglomerate the oily ink. The solvent is recovered from the liquor by distillation.—E. W. L.

Resin; Method of recovering —— from waste products. F. L. Huggins, Assignor to J. P. Moore, jun., Wilmington, N.C. U.S. Pat. 1,022,191, April 2, 1912.

The material is placed in a closed chamber having an outlet pipe at the bottom. Solvent is admitted, and the chamber is heated. Steam is then admitted into the upper part of the chamber, and the solvent forced back, through the outlet, to the solvent tank. Steam is passed up through the residue, which is afterwards removed and a fresh charge introduced. The previously used solvent is first admitted to extract the new charge, which is afterwards extracted a second time with fresh solvent. After returning this solvent to its tank, steam is passed up through the residue, which is then withdrawn and a third charge introduced. This charge is extracted with the first-mentioned supply of solvent, which is afterwards forced by steam pressure to a still for recovery of the solvent; then with the second supply of solvent, and so on.—E. W. L.

Condensation products from casein, phenol and formaldehyde; Process of manufacture of ——. K. Albert and L. Berend. Fr. Pat. 436,720, Aug. 18, 1911. Under Int. Conv., Jan. 20, 1911.

An intimate mixture of casein (25 grms.), phenol (25 grms.), and caustic soda solution (2 grms.) is heated until a viscous, limpid solution is obtained. 50 grms. of phenol and 10 grms. of trioxymethylene are then added, the heating is stopped at 100° C. and the reaction allowed to proceed to a finish. A further quantity of 10 grms. of trioxymethylene is then added, and heat applied until the reaction is started again. The mass obtained is allowed to cool down a little and a further 5 grms. of trioxymethylene is gradually added, after which heat is carefully applied and the mixture kept gently boiling for two hours, until a sample solidifies on cooling. This mass may be mixed with various filling matters; it may be calendered and moulded like celluloid. In moulding it is hardened by heating for about 6 hours at 100°—110° C., and afterwards for some hours at a somewhat higher temperature; or by heating for 12—20 hours at 80°—100° C. Other phenols than ordinary phenol may be employed.—E. W. L.

Lakes [from azo dyestuffs]; Manufacture of ——. E. Ulrichs, Elberfeld, Assignor to Wülfing, Dahl, und Co. A.-G., Barmen, Germany. U.S. Pat. 1,022,612, April 9, 1912.

See Eng. Pat. 18,379 of 1911; this J., 1912, 140.—T. F. B.

Minium; Process for making ——. J. Mühlbauer. Fr. Pat. 437,076, Dec. 1, 1911. Under Int. Conv., Dec. 3, 1910.

See Eng. Pat. 25,757 of 1911; this J., 1912, 347.—T.F.B.

Pitch pine oil, turpentine oil, and the like; Process for refining raw ——. J. Schindelmeiser, Dorpat, Russia. Eng. Pat. 14,315, June 16, 1911.

See Ger. Pat. 239,546 of 1910; this J., 1911, 1398.—T.F.B.

Oil suitable for use as vehicle for pigments; Process for making an —— and a pigment or colour. E. W. Enequist. Fr. Pat. 437,208, Dec. 5, 1911. Under Int. Conv., Dec. 9, 1910.

See U.S. Pat. 1,009,708 of 1911; this J., 1911, 1443. —T. F. B.

Enamel or analogous compositions. J. S. Kruse. Fr. Pat. 436,696, Nov. 24, 1911. Under Int. Conv., Dec. 17, 1910.

See Eng. Pat. 29,387 of 1910; this J., 1912, 81.—T. F. B.

Phenolic condensation product and process of manufacture. J. W. Aylsworth. Fr. Pat. 436,192, Feb. 11, 1911. Under Int. Conv., Feb. 11, 1910.

See Eng. Pat. 3496 of 1911; this J., 1912, 347.—T. F. B.

Application of zinc chloride to cover surfaces constructed of cement. Fr. Pat. 436,260. *See* IX.

Plastic compositions and their preparation. Fr. Pat. 435,941. *See* XIV.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Rubber-latex; Physical constitution of —— and its bearing upon the phenomenon of coagulation. H. C. T. Gardner. Caoutchouc et Gutta Percha, 1912, **9**, 6132—6136.

The author claims that the coagulation of rubber latex is a phenomenon of a purely physical character. Rubber latex constituting an emulsion, a physical state dependent upon surface tension, coagulation follows upon de-emulsification; de-emulsification depends mainly upon the production of a negative surface tension, such as is effected, for example, when alcohol is added to the latex in sufficient quantity. This effect of the addition of alcohol is purely physical. The author confirms the observations of Spence in regard to the pellicle of protein, assumed by Weber to surround the rubber globule. Samples of *Hevea* latex slightly diluted, were digested with papain at 50° C. for 24 to 36 hrs., and the hydrolysed protein removed by dialysis. The residual rubber was found to be still subject to coagulation. The pellicle cannot therefore consist of protein; it may be formed of solid or liquid particles, of extreme smallness. Coagulation by means of acids is not easy to explain, but it is suggested that a negative surface tension may be produced by the decomposition of resin particles, forming the pellicles round the globules. This view is supported by the fact that acid latices cream more rapidly than alkaline ones. Coagulation does not affect the microscopic appearance of the globules.—E. W. L.

Balloon fabrics; Manufacture of ——. Churrel. Gummi-Zeit., 1912, **26**, 894—895, 938—939, 972—973, 1016—1017, and 1055—1056.

Fabrics should be of the best quality, preferably Egyptian Sea Island cotton. The fabric should be freed from sizing materials by sufficient washing; it should yield practically no starch reaction with a potassium iodide solution of iodine. Mechanical tests should be made on samples which are neither quite dry nor too wet. Fine hard Para rubber should be used for coating, though it may be replaced by Peruvian Ball or smoked plantation sheet rubber up to 40 per cent. if care be taken in vulcanisation. Soft Para or Peruvian Tails or deresinified Guayule should not be used, otherwise the rubber on the fabric resinifies on keeping. Good mixings are :—(1) To secure gas-tightness: 400 parts of hard fine Para rubber, 3 of paraffin (m. p. about 66° C.), 40 of sulphur, and 17 of magnesium oxide; (2) to raise the tensile strength of the fabric: hard fine Para rubber, 400; paraffin (m. p. about 66° C.), 4; magnesium carbonate, 260; magnesium oxide, 36; and fine sulphur, 40 parts; all powders should be sifted twice; (3) to obtain gas-tightness in cold-cured fabrics: fine hard Para, 400; paraffin (m. p. about 66° C.), 5 parts. Suitable solvents are benzine and benzene which should be free from water or suspended iron oxide. The boiling point should be between 70° and 100° C.; the portion boiling over 100° C. should not be more than 8 per cent. The rubbered fabrics are prepared and combined on a smooth calender. Vulcanisation is usually effected on drums by steam or, if sensitive colours or fabrics are used, by hot air under pressure. When using steam the fabrics must be protected from direct access of steam by suitable wrapping: 50 to 90 mins. cure at not more than 133° C. (2·2 atm.) is suitable. With hot air 1—2½ hrs. at not more than 129°—130° C. is suitable (4—6 atm.). It is best to aim at a slight under-cure to allow for after-vulcanisation. Cold-cure is effected by the vapour method. Examples are given of the combination of suitable materials to yield a desired product and manufacturing details are given throughout.—H. E. P.

Patents

Rubber composition. C. Marter, London. Eng. Pat. 1843, Jan. 23, 1912.

The composition consists of ashes from coal, wood or other material, rubber, and sulphur. Proportions given by way of illustration are:—(1) ash, 52 lb.; sulphur, 15 lb.; rubber, 33 lb. (2) ash, 42½ lb.; sulphur, 15 lb.; rubber, 42½ lb.—E. W. L.

Fabric or cloth; [Rubber-coated ——]. A. H. Henderson, Assignor to The Henderson Rubber Co., Baltimore, Md. U.S. Pat. 1,020,499, March 19, 1912.

Fabrics from which oils, waxes and resins have been removed by mercerisation, are treated with solutions of rubber to fill the interiors of, and the interstices between, the fibres and to coat the surface of the material, and the rubber is subsequently vulcanised.—J. R. B.

Plastic compositions and their preparation. J. W. Aylsworth. Fr. Pat. 435,944, Nov. 4, 1911. Under Int. Conv., Nov. 4, 1910.

Claim is made for plastic compositions consisting of a powdered infusible condensation product of phenol (or its derivatives) and formaldehyde or similar compound distributed uniformly in a mass of vulcanised rubber. The condensation product may be prepared as described in Eng. Pats. 3496, 3497, and 3498 of 1911 (this J., 1912, 347). It is freed from excess of phenol and other volatile substances, then powdered and mixed with the rubber and a vulcanising agent, either in a suitable machine, or by adding the powder to a solution of rubber in a volatile solvent holding a vulcanising agent in suspension: the mixture is moulded and then heated at a vulcanising temperature. Special qualities may be imparted to the condensation product by mixing with it, before the final hardening, a substance capable of acting as a solvent for the final product (*loc. cit.*). The condensation product is preferably in the form of minute spherules of, as far as possible, uniform size. These may be obtained by atomising a mixture of a fusible condensation product and a hardening agent in a jet of steam. By dissolving the fusible condensation product in a volatile solvent before effecting the final hardening, and then expelling the solvent, the final product consists of particles permeated with pores of molecular dimensions. A product said to be specially suitable for use as an insulator in acid or alkaline batteries is obtained by heating a fusible condensation product so as to expel the excess of phenol and water, treating it with a hardening agent (hexamethylenetetramine), powdering the resulting product, heating it for some time at 205°—260° C., boiling for several hours with a 10 per cent. solution of caustic potash or soda, drying, incorporating with rubber and sulphur, vulcanising at 149°—182° C. for 2—3 hours, and treating the final product with a hot 10 per cent. solution of caustic potash or soda.—A. S.

Elastic spongy substance for filling enclosed spaces [tyre-filling]; Preparation of ——. R. H. and E. M. Pybus. Fr. Pat. 437,000, Nov. 30, 1911.

In order to moderate the speed with which gas is evolved when sulphur chloride is allowed to interact with a mixture of vegetable oil and a carbonate to form an elastic, spongy filling material, and so to prevent the formation of large air-spaces instead of small ones, the carbonate is first ground with a hydrocarbon oil, fat or wax, before being mixed with the vegetable oil. The particles of the carbonate become enveloped with neutral oil and the facility with which they can come into contact with the sulphur chloride is thus lessened.—E. W. L.

Ebonites resisting the action of chlorine; Process for the manufacture of ——. M. Wildermann, Ealing. U.S. Pat. 1,022,014, April 2, 1912.

See Fr. Pat. 395,101 of 1908; this J., 1909, 319.—T. F. B.

Composition of matter and treatment of rawhide. U.S. Pats. 1,020,497 and 1,020,498. *See* XV.

Impregnating rubbered fabrics with peroxide salts. Ger. Pat. 244,329. *See* XIXb.

XV.—LEATHER; BONE; HORN; GLUE.

Mangrove barks; Investigation of German East-African ——. J. Paessler. Collegium, 1912, 130—143.

The generic title of mangrove includes a large number of trees constituting the tidal forests, the roots of which are covered by the sea at each tide. Results are given of the analysis of 302 samples of bark from trees of this description received from Salale in German East Africa. The samples consisted chiefly of the bark of *Rhizophora mucronata. Lam.* (mkaka), *Brugiera gymnorrhiza. Lam.* (msimsi), *Ceriops candolleana Arn.* (mkandaa), *Xylocarpus* (mkomavi) and *Carapa*. All these species, on account of the high percentage of tannin contained, should be of value as tanning materials, but the tannin content varies considerably with the season of the year in which the bark is taken. The age of the tree also has a great influence on the tannin content and it varies considerably in bark taken from various positions on the tree. *Rhizophora* and *Brugiera* contain from 28—42 per cent. of tannin, with an average of 36 per cent. The tannin in *Xylocarpus* and *Carapa* varies from 27—33 per cent., with an average of 30 per cent., while in *Ceriops* it varies from 24—32 per cent., with an average of 26 per cent. The bark of *Rhizophora* and *Brugiera* gives usually a darker and redder leather than that of *Ceriops*, *Xylocarpus* and *Carapa*, and the bark of the latter does not become so dark under the influence of light as that of the former and gives a yellow brown leather, the former giving a redder colour to the leather. The age of the tree does not alter the colour given by the bark, but the season at which the bark is taken has a considerable influence, especially with *Rhizophora* and *Brugiera*. The bark of these when taken towards the end of the year gives a lighter and less red leather which is turned yellow-brown rather than red-brown by light. It is necessary therefore that mangrove bark, especially *Rhizophora* and *Brugiera*, should be harvested commercially only during the last months of the year.—D. J. L.

Hide; Swelling and solubility of —— in acids. A. T. Hough. Leather World, 1912, 4, 268—269.

In continuation of the previous article (this J., 1912, 349), the author draws practical conclusions from the figures obtained for the swelling and solubility of hide powder in the common commercial acids. A certain portion of the hide is always soluble, the soluble portion consisting of peptones and allied bodies which are less complex than the actual hide fibre. The actual fibre, unlike the peptones, etc., is not attacked by fresh lime. Since hide substance is soluble in acids, but not in presence of tannin, deliming should be short, and the goods should be placed in the tan liquors as quickly as possible. Very old weak tan liquors may contain much gallic acid and little tannin and may cause great losses of hide substance. It is concluded that water alone has a greater dissolving power than weak acids, and that therefore goods should not be left in water for long periods. Boric acid has little solvent action and is very slightly absorbed and is therefore very economical. —J. R. B.

Light leather liming control; Preliminary report on ——. J. T. Wood and D. J. Law. Collegium, 1912, 121—130.

The preliminary report of the commission appointed by the International Association of Leather Trades Chemists for the purpose of fixing standard methods of analysis of lime liquors. The efficiency of the filtering medium used has a great influence on the alkalinity of an old lime liquor as determined by titration. The only medium which gave a perfectly clear filtrate was S. and S. 605 filter paper, but very few even of the oldest limes when tested in this manner had an alkalinity greater than 1·7 c.c. of $N/10$ hydrochloric acid for 10 c.c. of the liquor. The lessening of the alkalinity is partially due to loss of ammonia during the slow filtration and the removal of some lime in combination with skin substance; but mainly to the almost sub-microscopic crystals of calcium carbonate. Centrifuging for 5 minutes removes all particles ranging in size from a little less than 1μ upwards, while filtration through S. and S. 605 removes the whole of the solid particles, but also some colloidal skin substance. Addition of kaolin is not advantageous. In addition to the spherical concretions of calcium carbonate in old lime-liquors mentioned by Procter, a considerable quantity of the same compound was observed in the form of arragonite crystals. As indicator methyl-red is recommended in place of phenolphthalein, as this shows the whole of the alkalinity and its end point is not rendered uncertain by the presence of ammonia. The hydroxyl ion content of old lime liquors as determined by the electrometric method devised by the authors (this J., 1911, 3, 872) was found to be practically the same as that of a fresh lime liquor, an old liquor showing a hydrion concentration of $P^{+}_{H} = 12·34$, while a fresh liquor showed $P^{+}_{H} = 12·5$. It therefore appears that the swelling action of the hydroxyl ions is hindered by the presence of various compounds produced by the action of lime on the skin and of bacteria on the dissolved skin substance. The presence of sodium sulphide, even in large quantities, does not affect the hydroxyl ion concentration of a lime liquor. *Ammonia* is best determined by acidifying the liquor, adding excess of magnesia to decompose ammonium salts, as recommended by Procter (Leather. Ind. Lab. Book, 63) and distilling off the ammonia into standard acid. Fairly concordant results are obtained by this method. *Sulphides* are most conveniently estimated by titration with standard zinc sulphate solution in the usual manner. *Dissolved skin substance.* The total nitrogen is determined in the usual way by Kjeldahl's method. Figures are given showing the increase of nitrogen in a lime liquor used for liming sheep skins after each lot of goods had been through and also for the difference in total nitrogen in the liquor as found after filtering clear and after centrifuging. The latter figure was slightly higher in all cases. The method of precipitation by acidifying slightly and adding excess of saturated salt solution was found to be extremely rough, as the amount of acid added has a great effect on the amount of skin substance precipitated and the volume of the latter as read on the scale diminishes very rapidly on standing. About one-half of the total nitrogen is precipitated in this way. *Differentiation of hydrolytic products.* None of the fractional precipitation methods hitherto suggested are of practical use for control purposes. The tannin precipitation method of Procter (Leather Ind. Lab. Book, 89) was tried and it was found that 67·8 per cent. of the total nitrogen in an old lime liquor was precipitated by acidifying slightly with acetic acid and adding excess of tannin. By neutralising an old lime liquor and precipitating with alcohol, 64·6 per cent. of the total nitrogen was precipitated, the precipitate containing 13·0 per cent. of nitrogen. By a comparison of the total nitrogen with the figure obtained by Stiasny's formaldehyde titration method (Collegium, 1908, 373—375, 1910, 181—187; this J., 1908, 1031; 1910, 771) a measure of the hydrolysis undergone by the dissolved skin substance may be obtained. If the formaldehyde factor found by Stiasny for gelatin $\left(\frac{\text{mgrms. of nitrogen}}{\text{c.c. of } N/5 \text{ NaOH.}} = 178\right)$ be taken as 0, indicating no hydrolysis, and the factor for ammonium salts (2·8) as 100, any intermediate hydrolysis may be expressed in percentage. *Bacteria in lime liquors.*—A 3—4 weeks' old lime liquor was estimated to contain only about 50,000 bacteria per c.c., capable of developing in ordinary nutrient gelatin made slightly alkaline with ammonia. The greater number of bacteria probably consisted of *B. prodigiosus*, and *Micrococcus flavus liquefaciens* and *aurantiacus* to which the yellow colour of old limes is possibly due.—D. J. L.

PATENTS.

Rawhide; Composition of matter, and treatment of ——. A. H. Henderson, Assignor to The Henderson Rubber Co., Baltimore, Md. U.S. Pats. 1,020,497 and 1,020,498, March 19, 1912.

Rawhide is swollen to a spongy mass by a swelling agent, such as heated oil, the swelling agent is removed and the spongy material is impregnated with a hot solution of rubber in a volatile solvent. The rubber solvent is then removed, and the rubber vulcanised.—J. R. B.

Leather, fabrics, and the like; Composition of matter for the treatment of —— *and process of making the same.* D. O'Keefe, St. Louis, Mo. U.S. Pats. 1,020,926 and 1,020,927, March 19, 1912.

(1) A mixture of cedar, mirbane, and bay (or petroleum) oils, a mixture of fish oil and Venice turpentine, and a mixture of petroleum, mustard, and azalea oils are passed in succession through the same mass of coke; the different mixtures are then combined and passed again through the mass of coke and afterwards through a mass of charcoal. (2) The composition, which is suitable for waterproofing leather, fabrics and the like, consists of about 37 per cent. of petroleum oil, 30 of fish oil, 2 of bay oil, 3 of cedar oil, 6 of mirbane oil, 3 of mustard oil, 18 of Venice turpentine, and 1 per cent. of azalea oil.—A. S.

Leather-board stock; Process for production of ——. A. L. Clapp, Braintree, Mass., Assignor to Hide-Ite Leather Co., Boston, Mass. U.S. Pat. 1,021,660, March 26, 1912.

To a beaten-up mass of cellulose a fatty or other waterproofing emulsion or compound is added, in such a way as to precipitate the waterproofing material upon the fibres, which fibres are then mixed with a mass of leather fibres.—E. W. L.

Leather; Process for preparing waterproof, non-slipping ——. F. Kornacher. Ger. Pat. 241,066, Jan. 31, 1911.

The outer layers of leather, which has been impregnated with saponifiable and unsaponifiable fatty substances, are freed from fat by successive treatments with dilute alkali solutions, water, dilute sulphuric acid, and water, and then tanned with a vegetable extract, rinsed, treated with a metallic salt which will form an insoluble soap, and finally dressed as usual.—T. F. B.

Tan waste; Apparatus for drying or expressing liquid from ——. R. Hanson, E. Edwards, and C. Jones, Warrington. Eng. Pat. 26,750, Nov. 29, 1911.

An apparatus for expressing the liquid from tan waste and spent tan to render it capable of use as fuel or for gas production. The spent tan is forced by means of a rotating screw through two tapering perforated cylinders, fitted with rollers in grooves to exert a rolling pressure on the material. The material is extruded through a nozzle in a convenient form. The process is continuous and automatic.—J. R. B.

Tanning process. Chemisch-Technologische Studienges. Hersfeld, W. Spalteholz, and K. Haring, Hersfeld, Germany. Eng. Pat. 6756 of 1912, date of Appl., March 21, 1911. Addition to Eng. Pat. 7091 of 1911.

See Fr. Pat. 427,614 of 1911; this J., 1911, 1129.—T. F. B.

Imitation horn, shell, and the like [from casein]; Manufacture of ——. F. Lebreil, Villeurbanne, and R. Desgeorge, Lyons, France. U.S. Pat. 1,023,022, April 9, 1912.

See Fr. Pat. 408,592 of 1909; this J., 1910, 580.—T. F. B.

XVI.—SOILS; FERTILISERS.

Calcium carbonate: Determination of —— in soils. H. S. Shrewsbury. Analyst, 1912, 37, 128—129.

Ten grms. of the finely powdered air-dried soil are mixed with 100 c.c. of approximately *N*/4 acetic acid, in a wide-mouthed flask, which is shaken at intervals of 30 seconds for about 10 minutes, and its contents then allowed to settle. The supernatant liquid is decanted through a filter, whilst simultaneously a similar filtrate is obtained from 10 grms. of the soil treated with distilled water. The residues left on evaporation of 25 c.c. of each filtrate in platinum basins are ignited for 30 minutes at a bright red heat, after which they are dissolved in 10 c.c. (or more) of *N*/10 acetic acid, and the excess of acid titrated with *N*/10 sodium or potassium hydroxide solution. The difference between the volumes required by the aqueous and the acid extracts, multiplied by 0·2, gives the percentage of calcium carbonate in the soil. Qualitative tests for chlorides and sulphates of calcium and magnesium in the acetic acid extract are advisable.—C. A. M.

Patents.

Superphosphate; Apparatus for removing —— from superphosphate decomposing chambers. K. J. Beskow, Helsingborg, Sweden. Eng. Pat. 11,214, May 9, 1911. Under Int. Conv., May 10, 1910.

Apparatus of the types specified in Eng. Pats. 20,466 of 1907 and 4494 of 1909 (this J., 1908, 821; 1909, 996) is modified so that the superphosphate falls, as cut, on to conveying apparatus, which moves in sympathy with the cutters, and is carried to the discharge opening without being distnrbed.—F. Sodn.

Natural phosphates; (1) Process of treating —— by hydrochloric acid with a view to obtaining fertilisers suitable for employment in agriculture. (2) Process of treating calcium phosphates by hydrochloric acid so as to obtain a superphosphate which is non-hygroscopic and contains no free phosphoric acid. J. Ciselet and P. Noblet. Fr. Pats. 436,388, Nov. 14, and 436,551, Nov. 18, 1911.

(1) Natural phosphates are intimately mixed with hydrochloric acid, and the caldium chloride formed is decomposed by means of alkali sulphates or bisulphates, which may be mixed with the phosphate before or after treatment with the acid, the apparatus employed consisting of a suitable mixer and drying chamber. The product is not hygroscopic or is less so than calcium chloride. As an example, 100 kilos. of phosphate, containing 32 per cent. of phosphoric anhydride, 100 kilos. of ammonium sulphate, and 100 litres of hydrochloric acid (20° B.) are mixed together for some minutes, and the mixture is dried by means of heated gases. Homogeneous fertilisers, containing phosphorus, nitrogen, and potassium, may be prepared in one operation by partially replacing the ammonium sulphate by potassium sulphate. (2) Calcium phosphate is converted into superphosphate by treatment with hydrochloric acid and then with sufficient sulphuric acid to react with the calcium chloride formed, or by treatment with a mixture of the two acids. The superphosphate produced is friable, non-hygroscopic, and contains no free phosphoric acid.—F. Sodn.

Process for enabling sulphur to be readily moistened. Fr. Pat. 437,015. *See* VII.

XVII.—SUGARS; STARCHES; GUMS.

Beet; Valuation of the quality of the —— from the quotient of purity of the juice obtained by the digestion method. V. Stanek. Z. Zuckerind. Böhm., 1912, 36, 375—382.

The quotient of purity obtained by Krause's digestion method should not be used for the technical valuation of the beetroot, since the results do not correspond with those actually found with the diffusion juice in the factory. This discrepancy is due to two sources of error in Krause's process, viz., (1) the presence in the dense liquid of air bubbles, which cannot be removed *in vacuo*; and (2) the presence of a greater or smaller amount of fine marc, which affects the spindle reading in the same manner as soluble substance. By applying the Le Docte hot digestion method for the sugar content, and using the refractometer for the dry substance content, the author claims to eliminate both sources of error, and advises working in the following way:—Into two of the tin digestion beakers previously recommended (this J., 1910, 1071), twice the normal sugar weight of finely divided, well-mixed pulp are placed; into one beaker are introduced 354 c.c. of the ordinary mixture of basic lead acetate and water, while into the other is run the same volume of distilled water. Both beakers are closed, well shaken, and placed for half-an-hour in a water-bath heated to 80°—85° C., being shaken once during this time. They are then cooled, after which the liquid containing basic lead acetate is filtered, and the sugar content determined by direct polarisation; while the other without filtration is examined in the Pulfrich immersion refractometer to give the dry substance, use being made of the temperature correction tables already published (this J., 1910, 775). On comparing the quotient of purity values obtained by this procedure with those actually found with diffusion juice in the factory, satisfactory results were obtained, the maximum experimental error being shown to be ±0·5 per cent.—J. P. O.

Sugar solutions and lime. P. J. H. van Ginneken. Z. Ver. deut. Zuckerind., 1912, 421—439. (See also Claassen, this J., 1911, 823).

The author has investigated the formation and decomposition of calcium trisaccharate, $C_{12}H_{22}O_{11},3CaO,3H_2O$, in sucrose solutions containing lime, and the results are discussed at length with reference to the phase rule. When solutions containing about 10 per cent. of sucrose and 2·2 per cent. of lime, prepared in the cold, are heated to 80° C., precipitation of almost pure trisaccharate occurs at first, but if the liquid is maintained for several hours at 80° C., the trisaccharate slowly undergoes decomposition. This decomposition is accelerated by the presence of excess of lime. It is a fact well known in sugar factories that bad filtration of a lime sludge may sometimes be avoided by the addition of more lime before carbonatation. This may be due to the decomposing action of the lime on small amounts of trisaccharate or other gelatinous compounds of lime, sugar and non-sugar. In the ordinary technical method of adding lime to sugar juices, practically no trisaccharate can be present in the precipitate after 20 minutes at 80° C., although if the temperature does not reach 80° C., considerable quantities may be present. —J. H. L.

Density tables for use in sugar analysis. J. Domke. Z. Ver. deutsch. Zuckerind., 1912, 302—311. (Cf. also this J., 1912, 402.)

Four sucrose density tables, based upon the one drawn up by the International Commission for Standard Methods of Sugar Analysis, have been arranged by the author especially for convenient use in the works laboratory. (1) By the first (Table I.) the percentage of sucrose (degree Brix) can be determined from the apparent specific gravity at 20° C. It has been calculated from the following expression, in which $D^{20°}_{4°}$ is the true specific gravity of the sucrose solution at 20° C., compared with water at 4° C.; $d^{20°}_{4°}$ is the corresponding specific gravity of water, taken as 0·998230; γ is the mean specific gravity of the atmosphere, equal to 0·00121: p_1 is the weight of the pycnometer filled with water at 20° C.; and p_2 that of the pycnometer filled with sugar solution also at 20° C.; $D^{20°}_{4°} - \gamma / d^{20°}_{4°} - \gamma = p_2/p_1$.

(2) From the second table (Table II.) the specific gravity of very concentrated solutions can be found, the pycnometer being weighed when almost filled with the sugar

solution and again when the volume has been completed with water, a temperature of 20° C. being used in both cases. In drawing it up the values were calculated from the following expression, in which p_1 is the weight of the pycnometer filled with water at 20° C., p_2 is the weight of the pycnometer almost filled with sugar solution at 20° C.: and p_3 the weight of the pycnometer filled with both sucrose solution and water likewise at 20° C.: $D^{20^\circ}_{4^\circ} - \gamma / d^{20^\circ}_{4^\circ} - \gamma = p_2/p_1+p_2-p_3$. In the table the ratio $q = \frac{p_2 - p_1}{p_3}$.

(3) By means of the third table (Table III.), the apparent specific gravity determined at temperatures from 5° to 80° C. can be corrected to give the density at the standard temperature of 20° C.

Table I.

Percentage of sugar by weight.	·0	·1	·2	·3	·4	·5	·6	·7	·8	·9
					Apparent specific gravity at 20° C.					
0	1·0000	1·0004	1·0008	1·0012	1·0016	1·0019	1·0023	1·0027	1·0031	1·0035
1	·0039	·0043	·0047	·0051	·0055	·0058	·0062	·0066	·0070	·0074
2	·0078	·0082	·0086	·0090	·0094	·0098	·0102	·0106	·0109	·0113
3	·0117	·0121	·0125	·0129	·0133	·0137	·0141	·0145	·0149	·0153
4	·0157	·0161	·0165	·0169	·0173	·0177	·0181	·0185	·0189	·0193
5	1·0197	1·0201	1·0205	1·0209	1·0213	1·0217	0·0221	1·0225	1·0229	1·0233
6	·0237	·0241	·0245	·0249	·0253	·0257	·0261	·0265	·0269	·0273
7	·0277	·0281	·0285	·0289	·0294	·0298	·0302	·0306	·0310	·0314
8	·0318	·0322	·0326	·0330	·0334	·0338	·0343	·0347	·0351	·0355
9	·0359	·0363	·0367	·0371	·0375	·0380	·0384	·0388	·0392	·0396
10	1·0400	1·0404	1·0409	1·0413	1·0417	1·0421	1·0425	1·0429	1·0433	1·0438
11	·0442	·0446	·0450	·0454	·0459	·0163	·0467	·0471	·0475	·0480
12	·0484	·0488	·0492	·0496	·0501	·0505	·0509	·0513	·0517	·0522
13	·0526	·0530	·0534	·0539	·0543	·0547	·0551	·0556	·0560	·0564
14	·0568	·0573	·0577	·0581	·0585	·0589	·0594	·0598	·0603	·0607
15	1·0611	1·0615	1·0620	1·0624	1·0628	1·0633	1·0637	1·0641	1·0646	1·0650
16	·0654	·0659	·0663	·0667	·0672	·0676	·0680	·0685	·0689	·0693
17	·0698	·0702	·0706	·0711	·0715	·0719	·0724	·0728	·0733	·0737
18	·0741	·0746	·0750	·0755	·0759	·0763	·0768	·0772	·0777	·0781
19	·0785	·0790	·0794	·0799	·0803	·0807	·0812	·0816	·0821	·0825
20	1·0830	1·0834	1·0839	1·0843	1·0848	1·0852	1·0856	1·0861	1·0865	1·0870
21	·0874	·0879	·0883	·0888	·0892	·0897	·0901	·0905	·0910	·0915
22	·0919	·0924	·0928	·0933	·0937	·0942	·0946	·0951	·0956	·0960
23	·0965	·0969	·0974	·0978	·0983	·0987	·0992	·0997	·1001	·1006
24	·1010	·1015	·1020	·1024	·1020	·1033	·1038	·1043	·1047	·1052
25	1·1056	1·1061	1·1066	1·1070	1·1075	1·1079	1·1084	1·1089	1·1093	1·1098
26	·1103	·1107	·1112	·1117	·1121	·1126	·1131	·1135	·1140	·1145
27	·1149	·1154	·1159	·1163	·1168	·1173	·1178	·1182	·1187	·1192
28	·1196	·1201	·1206	·1210	·1215	·1220	·1225	·1229	·1234	·1239
29	·1244	·1248	·1253	·1258	·1263	·1267	·1272	·1277	·1282	·1287
30	1·1291	1·1296	1·1301	1·1306	1·1311	1·1315	1·1320	1·1325	1·1330	1·1334
31	·1339	·1344	·1349	·1354	·1359	·1363	·1368	·1373	·1378	·1383
32	·1388	·1393	·1397	·1402	·1407	·1412	·1417	·1422	·1427	·1432
33	·1436	·1441	·1446	·1451	·1456	·1461	·1466	·1471	·1476	·1481
34	·1486	·1490	·1495	·1500	·1505	·1510	·1515	·1520	·1525	·1530
35	1·1535	1·1540	1·1545	1·1550	1·1555	1·1560	1·1565	1·1570	1·1575	1·1580
36	·1585	·1590	·1595	·1600	·1605	·1610	·1615	·1620	·1625	·1630
37	·1635	·1640	·1645	·1650	·1655	·1660	·1665	·1670	·1675	·1680
38	·1685	·1690	·1696	·1701	·1706	·1711	·1716	·1721	·1726	·1731
39	·1736	·1741	·1746	·1752	·1757	·1762	·1767	·1772	·1777	·1782
40	1·1787	1·1793	1·1798	1·1803	1·1808	1·1813	1·1818	1·1824	1·1829	1·1834
41	·1839	·1844	·1849	·1855	·1860	·1865	·1870	·1875	·1881	·1886
42	·1891	·1896	·1901	·1907	·1912	·1917	·1922	·1928	·1933	·1938
43	·1943	·1949	·1954	·1959	·1964	·1970	·1975	·1980	·1985	·1991
44	·1996	·2001	·2007	·2012	·2017	·2023	·2028	·2033	·2039	·2044
45	1·2049	1·2054	1·2060	1·2065	1·2070	1·2076	1·2081	1·2087	1·2092	1·2097
46	·2102	·2108	·2113	·2118	·2124	·2129	·2135	·2140	·2146	·2151
47	·2156	·2162	·2167	·2173	·2178	·2184	·2189	·2194	·2200	·2205
48	·2211	·2216	·2222	·2227	·2232	·2238	·2243	·2249	·2254	·2260
49	·2265	·2271	·2276	·2282	·2287	·4293	·2298	·2304	·2309	·2315
50	1·2320	1·2326	1·2331	1·2337	1·2342	1·2348	1·2353	1·2359	1·2364	1·2370
51	·2376	·2381	·2387	·2392	·2398	·2403	·2409	·2415	·2420	·2426
52	·2431	·2437	·2442	·2448	·2454	·2459	·2465	·2471	·2476	·2482
53	·2487	·2493	·2499	·2504	·2510	·2516	·2521	·2527	·2533	·2538
54	·2544	·2550	·2555	·2561	·2567	·2572	·2578	·2584	·2589	·2595
55	1·2601	1·2606	1·2612	1·2618	2·2624	1·2629	1·2635	1·2641	1·2647	1·2652
56	·2658	·2664	·2670	·2675	·2681	·2687	·2693	·2698	·2704	·2710
57	·2716	·2721	·2727	·2733	·2739	·2745	·2750	·2756	·2762	·2768
58	·2774	·2779	·2785	·2791	·2797	·2803	·2809	·2815	·2821	·2826
59	·2832	·2838	·2844	·2850	·2856	·2861	·2867	·2873	·2879	·2885
60	1·2891	1·2897	1·2903	1·2909	1·2914	1·2920	1·2926	1·2932	1·2938	1·2944
61	·2950	·2956	·2962	·2968	·2974	·2980	·2986	·2992	·2998	·3004
62	·3010	·3015	·3021	·3027	·3033	·3039	·3045	·3051	·3057	·3063
63	·3069	·3075	·3081	·3087	·3093	·3100	·3106	·3112	·3118	·3124
64	·3130	·3136	·3142	·3148	·3154	·3160	·3166	·3172	·3178	·3184
65	1·3190	1·3197	1·3203	1·3209	1·3215	1·3221	1·3227	1·3233	1·3239	1·3245
66	·3252	·3258	·3264	·3270	·3276	·3282	·3288	·3295	·3301	·3307
67	·3313	·3319	·3325	·3332	·3338	·3344	·3350	·3356	·3363	·3369
68	·3375	·3381	·3387	·3394	·3400	·3406	·3412	·3418	·3425	·3431
69	·3437	·3443	·3450	·3456	·3462	·3468	·3475	·3481	·3487	·3494

Table I.—*contd.*

Apparent specific gravity at 20° C.

Percentage of sugar by weight.	·0	·1	·2	·3	·4	·5	·6	·7	·8	·9
70	1·3500	1·3566	1·3512	1·3519	1·3525	1·3531	1·3538	1·3544	1·3550	1·3557
71	·3563	·3569	·3575	·3582	·3588	·3594	·3601	·3607	·3614	·3620
72	·3626	·3633	·3639	·3645	·3652	·3658	·3664	·3671	·3677	·3684
73	·3690	·3696	·3703	·3709	·3716	·3722	·3729	·3735	·3741	·3748
74	·3754	·3761	·3767	·3774	·3780	·3786	·3793	·3799	·3806	·3812
75	1·3819	1·3825	1·3832	1·3838	1·3845	1·3851	1·3858	1·3864	1·3871	1·3877
76	·3884	·3890	·3897	·3903	·3910	·3916	·3923	·3929	·3936	·3942
77	·3949	·3955	·3962	·3969	·3975	·3982	·3988	·3995	·4001	·4008
78	·4015	·4021	·4028	·4034	·4041	·4048	·4054	·4061	·4067	·4074
79	·4081	·4087	·4094	·4101	·4107	·4114	·4121	·4127	·4134	·4140
80	1·4147	1·4154	1·4160	1·4167	1·4174	1·4180	1·4187	1·4194	1·4201	1·4207
81	·4214	·4221	·4227	·4234	·4241	·4247	·4254	·4261	·4268	·4274
82	·4281	·4288	·4295	·4301	·4308	·4315	·4322	·4328	·4335	·4342
83	·4349	·4355	·4362	·4369	·4376	·4383	·4389	·4396	·4403	·4410
84	·4417	·4423	·4430	·4437	·4444	·4451	·4458	·4464	·4471	·4478
85	1·4485	1·4492	1·4299	1·4305	1·4312	1·4519	1·4526	1·4533	1·4540	1·4547
86	·4554	·4560	·4567	·4574	·4581	·4588	·4595	·4602	·4609	·4616
87	·4623	·4629	·4636	·4643	·4650	·4657	·4664	·4671	·4678	·4685
88	·4692	·4699	·4706	·4713	·4720	·4727	·4734	·4741	·4748	·4755
89	·4762	·4769	·4776	·4783	·4790	·4797	·4804	·4811	·4818	·4825
90	1·4832									

Table II.

Ratio q.

Percentage of sugar by weight.	·0	·1	·2	·3	·4	·5	·6	·7	·8	·9
40	0·1516	0·1520	0·1524	0·1528	0·1531	0·1535	0·1539	0·1542	0·1546	0·1550
41	·1553	·1557	·1561	·1564	·1568	·1572	·1576	·1579	·1583	·1587
42	·1590	·1594	·1598	·1601	·1605	·1609	·1612	·1616	·1620	·1623
43	·1627	·1631	·1635	·1638	·1642	·1646	·1649	·1653	·1657	·1660
44	·1664	·1668	·1671	·1675	·1679	·1682	·1686	·1689	·1693	·1697
45	0·1701	0·1704	0·1708	0·1712	0·1715	0·1719	0·1723	0·1726	0·1730	0·1734
46	·1737	·1741	·1745	·1748	·1752	·1756	·1759	·1763	·1767	·1770
47	·1774	·1778	·1781	·1785	·1789	·1792	·1796	·1800	·1803	·1807
48	·1810	·1814	·1818	·1821	·1825	·1829	·1832	·1836	·1840	·1843
49	·1847	·1851	·1854	·1858	·1861	·1865	·1869	·1872	·1876	·1880
50	0·1883	0·1887	0·1891	0·1894	0·1898	0·1901	0·1905	0·1909	0·1912	0·1916
51	·1920	·1923	·1927	·1930	·1934	·1938	·1941	·1945	·1949	·1952
52	·1956	·1959	·1963	·1967	·1970	·1974	·1978	·1981	·1985	·1988
53	·1992	·1995	·1999	·2003	·2006	·2010	·2014	·2017	·2021	·2024
54	·2028	·2032	·2035	·2039	·2042	·2046	·2050	·2053	·2057	·2060
55	0·2064	0·2068	0·2071	0·2075	0·2078	0·2082	0·2036	0·2089	0·2093	0·2096
56	·2100	·2103	·2107	·2111	·2114	·2118	·2121	·2125	·2129	·2132
57	·2136	·2139	·2143	·2146	·2150	·2154	·2157	·2161	·2164	·2168
58	·2171	·2175	·2179	·2182	·2186	·2189	·2193	·2196	·2200	·2203
59	·2207	·2211	·2214	·2218	·2221	·2225	·2228	·2232	·2235	·2239
60	0·2243	0·2246	0·2250	0·2253	0·2257	0·2260	0·2263	0·2267	0·2271	0·2274
61	·2278	·2282	·2285	·2289	·2292	·2296	·2299	·2303	·2306	·2310
62	·2313	·2317	·2320	·2324	·2327	·2331	·2335	·2338	·2342	·2345
63	·2349	·2352	·2356	·2359	·2363	·2366	·2370	·2373	·2377	·2380
64	·2384	·2387	·2391	·2394	·2398	·2401	·2405	·2408	·2412	·2415
65	0·2419	0·2422	C·2426	0·2429	0·2433	0·2436	0·2440	0·2443	0·2447	0·2450
66	·2454	·2457	·2461	·2464	·2468	·2471	·2475	·2478	·2482	·2485
67	·2489	·2492	·2496	·2499	·2503	·2506	·2509	·2513	·2516	·2520
68	·2523	·2527	·2530	·2534	·2537	·2541	·2544	·2548	·2551	·2555
69	·2558	·2561	·2565	·2568	·2572	·2575	·2579	·2582	·2586	·2589
70	0·2593	0·2596	0·2599	0·2603	0·2606	0·2610	0·2613	0·2617	0·2620	0·2624
71	·2627	·2630	·2634	·2637	·2641	·2644	·2648	·2651	·2654	·2658
72	·2661	·2665	·2668	·2672	·2675	·2678	·2682	·2685	·2689	·2692
73	·2695	·2699	·2702	·2706	·2709	·2712	·2716	·2719	·2723	·2726
74	·2730	·2733	·2736	·2740	·2744	·2747	·2750	·2753	·2757	·2760
75	0·2763	0·2767	0·2770	0·2774	0·2777	0·2780	0·2784	0·2787	0·2791	0·2794
76	·2797	·2801	·2804	·2807	·2811	·2814	·2818	·2821	·2824	·2828
77	·2831	·2834	·2838	·2841	·2845	·2848	·2851	·2855	·2858	·2861
78	·2865	·2868	·2871	·2875	·2878	·2881	·2885	·2888	·2891	·2895
79	·2898	·2901	·2905	·2908	·2911	·2915	·2918	·2921	·2925	·2928
80	0·2931	0·2935	0·2938	0·2941	0·2945	0·2948	0·2951	0·2955	0·2958	0·2961
81	·2965	·2968	·2971	·2975	·2978	·2981	·2985	·2988	·2991	·2994
82	·2998	·3001	·3004	·3008	·3011	·3014	·3017	·3021	·3024	·3027
83	·3031	·3034	·3037	·3041	·3044	·3047	·3050	·3054	·3057	·3060
84	·3064	·3067	·3070	·3073	·3077	·3080	·3083	·3086	·3090	·3093
85	0·3096	0·3100	0·3103	0·3106	0·3109	0·3113	0·3116	0·3119	0·3122	0·3126
86	·3129	·3132	·3135	·3139	·3142	·3145	·3148	·3152	·3155	·3158
87	·3161	·3164	·3168	·3171	·3174	·3177	·3181	·3184	·3187	·3190
88	·3194	·3197	·3200	·3203	·3206	·3210	·3213	·3216	·3219	·3223
89	·3226	·3229	·3232	·3235	·3239	·3242	·3245	·3248	·3251	·3255
90	0·3258									

TABLE III.

For correcting the percentages by weight (degrees Brix) observed at different temperatures to the corresponding values at 20° C.:—

Observation temperature.	Observed percentage (degrees Brix)															
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	The observed value is diminished by:															
°C.																
0	0·28	0·47	0·63	0·76	0·87	0·97	1·06	1·15	1·24	1·30	1·36	1·40	1·43	1·45	1·48	1·5
5	0·35	0·45	0·55	0·61	0·72	0·70	0·85	0·91	0·97	1·01	1·04	1·07	1·09	1·11	1·13	1·1
10	0·32	0·37	0·42	0·47	0·51	0·56	0·60	0·64	0·67	0·69	0·71	0·73	0·74	0·75	0·76	0·8
11	0·31	0·34	0·39	0·43	0·47	0·51	0·54	0·58	0·61	0·63	0·65	0·66	0·67	0·68	0·69	0·7
12	0·28	0·31	0·35	0·39	0·42	0·46	0·49	0·52	0·54	0·56	0·58	0·59	0·60	0·61	0·61	0·6
13	0·26	0·28	0·32	0·35	0·38	0·41	0·43	0·46	0·48	0·49	0·51	0·52	0·53	0·53	0·54	0·5
14	0·23	0·25	0·28	0·30	0·33	0·35	0·37	0·39	0·41	0·43	0·44	0·44	0·45	0·46	0·46	0·5
15	0·20	0·21	0·24	0·26	0·28	0·30	0·31	0·33	0·35	0·36	0·37	0·37	0·38	0·38	0·39	0·4
16	0·16	0·18	0·19	0·21	0·23	0·24	0·25	0·27	0·28	0·29	0·29	0·30	0·30	0·31	0·31	0·3
17	0·12	0·13	0·15	0·16	0·17	0·18	0·19	0·20	0·21	0·22	0·22	0·22	0·23	0·23	0·23	0·2
18	0·08	0·09	0·10	0·11	0·12	0·12	0·13	0·13	0·14	0·15	0·15	0·15	0·15	0·15	0·16	0·2
19	0·04	0·05	0·05	·006	0·06	0·06	0·07	0·07	0·07	0·08	0·08	0·08	0·05	0·08	0·08	0·1
	The observed value is increased by:															
21	0·05	0·05	0·05	0·06	0·06	0·06	0·07	0·07	0·07	0·07	0·07	0·08	0·08	0·08	0·08	0·1
22	0·10	0·11	0·11	0·12	0·12	0·13	0·14	0·14	0·14	0·15	0·15	0·15	0·16	0·16	0·16	0·2
23	0·15	0·16	0·17	0·18	0·19	0·20	0·21	0·22	0·22	0·22	0·23	0·23	0·23	0·24	0·24	0·2
24	0·21	0·22	0·23	0·24	0·25	0·26	0·28	0·29	0·30	0·30	0·30	0·31	0·31	0·32	0·32	0·3
25	0·27	0·28	0·30	0·31	0·32	0·33	0·35	0·36	0·37	0·38	0·38	0·39	0·39	0·40	0·39	0·4
26	0·33	0·34	0·36	0·38	0·39	0·41	0·42	0·44	0·45	0·45	0·46	0·47	0·47	0·48	0·47	0·5
27	0·40	0·40	0·42	0·44	0·46	0·48	0·50	0·51	0·53	0·53	0·54	0·55	0·55	0·56	0·56	0·6
28	0·46	0·47	0·49	0·51	0·54	0·55	0·58	0·59	0·61	0·61	0·62	0·63	0·64	0·64	0·64	0·6
29	0·53	0·54	0·56	0·58	0·61	0·63	0·65	0·67	0·69	0·70	0·70	0·71	0·72	0·72	0·72	0·7
30	0·60	0·61	0·63	0·66	0·68	0·71	0·73	0·75	0·77	0·78	0·79	0·80	0·80	0·80	0·80	0·8
35	0·99	0·99	1·02	1·06	1·09	1·13	1·16	1·17	1·19	1·20	1·12	1·22	1·22	1·22	1·21	1·2
40	1·41	1·43	1·46	1·50	1·54	1·57	1·60	1·61	1·63	1·64	1·64	1·65	1·65	1·65	1·63	1·6
50	2·46	2·47	2·50	2·53	2·55	2·57	2·58	2·58	2·58	2·57	2·57	2·57	2·55	2·54	2·50	2·5
60	3·69	3·71	3·73	3·73	3·72	3·70	3·67	3·64	3·61	3·59	3·57	3·54	3·50	3·46	3·41	3·4
70	5·1	5·1	5·1	5·1	5·0	5·0	4·9	4·9	4·8	4·7	4·7	4·6	4·6	4·5	4·4	4·3
80	7·1	7·0	7·0	6·9	6·8	6·7	6·6	6·5	6·3	6·1	6·1	6·0	5·9	5·8	5·6	5·5

(4) In the fourth table are given amounts of sucrose in kilos. per cub. m. corresponding to percentages of sucrose 0 to 90, the figures being calculated from the value $10pD^{20}_{4}$, in which p is the percentage number, and D the corresponding specific gravity.—J. P. O.

Sugar, Behaviour of —— in boilers. M. D. Zujew and A. V. Tereschtschenko. Mitt. d. k. k. Techn. Versuchsamtes, 1912, 1, 85—86. (See also this J., 1911, 971.)

THE sugar which finds its way in the feeding water into the boilers in sugar factories is inverted and then undergoes further decomposition into laevulinic, formic, and acetic acids, humic derivatives of an anhydride character, etc. There is no formation of caramel, as assumed by Gelis. Not only the acids, but also the insoluble humic compounds (formed in the presence of soda or ammonia), have an injurious action upon the iron of the boiler. These insoluble bodies also form deposits on the surface and may produce overheating. An addition of soda reduces the solubility of the iron, but does not entirely prevent it. The presence of ammonia appears to have no influence upon the mode of injury to the boilers. Fat when present in the feeding water affords a means for the absorption of humic substances in high-pressure boilers. The physical properties of the fat are altered, so that it forms with decomposition products of the sugar thin threads, which may be deposited in layers on the heating surface of the boiler. The only effectual remedy is to prevent the sugar finding its way into the condensed water.—C. A. M.

Sugar Beet Council; Annual Report of the British ——. 1911. G. L. Courthope, Chairman, and W. T. Chadwin, Secretary.

IN spite of the abnormally wet summer of 1910 and the drought of 1911, beet crops of good quality were grown in England in both years. Besides a number of experimental crops grown in different parts of the country, a considerable quantity of beets was produced in Norfolk for shipment to Holland. In 1910 the land under cultivation for the latter purpose was about 50 acres, but in 1911 it was increased to nearly five times this area. The results of a number of manurial trials have been published by Dyer and Shrivell, and are embodied in the accompanying table.

Fertilisers per acre (in addition to 15 tons of farmyard manure).	Without potash salts.				Same manures, but with 1 cwt. of sulphate of potash per acre added.			
	Roots per acre as washed, crowned, and trimmed.	Percentage of sugar in washed, crowned, and trimmed roots.	Sugar per acre in washed, crowned, and trimmed roots.	Coefficient of purity of juice.	Roots per acre as washed, crowned, and trimmed.	Percentage of sugar in washed, crowned, and trimmed roots.	Sugar per acre in washed, crowned, and trimmed roots.	Coefficient of purity of juice.
	Tons.		Cwt.		Tons.		Cwt.	
Superphosphate, 4 cwt.	14·4	17·5	50·4	95·5	*10·4	17·3	36·0	92·1
Superphosphate, 4 cwt. Sodium nitrate, 2 cwt.	16·2	17·1	55·4	93·5	12·7	17·1	43·4	91·0
Superphosphate, 4 cwt. Sodium nitrate, 3 cwt.	17·8	17·7	63·0	94·5	17·7	18·1	64·0	91·6
Superphosphate, 4 cwt. Sodium nitrate, 4 cwt.	19·9	17·1	68·0	90·5	*15·3	17·1	52·3	93·1

* Irregular plant.

The soil was a stiff clay loam, and, before preparation for sowing, had a dressing of 15 tons of farmyard manure and 4 cwt. of superphosphate per acre. One half had also 1 cwt. of potassium sulphate per acre. The top dressings of sodium nitrate were given in two parts, half in May and half in June. It will be seen that the sulphate of potash on this soil was of no advantage to the crop, and also that although sodium nitrate in excess of 3 cwt. per acre increased the weight of the washed roots by about 12 per cent., it led to a considerable fall in the sugar-content of the roots, and in the coefficient of purity. The goal to aim at in cultivating sugar beets is to secure not the maximum weight of roots, but the maximum weight of sugar per acre, with a purity-coefficient of not less than 89.—J. H. L.

Sugar beets grown in England in 1910 *and* 1911; *Report on* ——. Appendix to the Annual Report of the British Sugar Beet Council, 1911. A. R. Ling, 15—18.

The number of beets submitted to the author for analysis in 1910 was 126, and in 1911, 69. Although some of the roots were inferior to the average produced on the Continent, the majority were quite equal, if not superior, in shape, weight, sugar-content and purity, to the best Continental produce. Those grown in 1910 were of higher average weight than those of 1911, but the latter were richer in sugar and of higher purity. The drought of 1911 affected English-grown beets to a less extent than Continental ones. The commonest faults of the roots submitted were bad shape, the occurrence of a large number of fangs and tails, and greenness of the roots at the crowns (indicating that the roots had been allowed to grow above ground). All of these defects influence the yield of sugar, and they could be easily remedied by proper knowledge. It is pointed out also that farmers were apt to err by over-manuring, especially in the use of dung, and in applying it too late: the effect is to lower the coefficient of purity of the juice. The following tables summarise the analytical results obtained in the two years:

Sugar-content.	1910.		1911.	
	No. of samples.	Per cent. of total.	No. of samples.	Per cent. of total.
Below 12 per cent.	2	1·6	1	1·4
From 12 to 14 per cent.	18	14·3	3	4·3
From 15 to 17 per cent.	82	65·0	39	56·5
From 18 to 20 per cent.	14	11·1	25	36·2
Above 20 per cent.	10	7·9	1	1·5
	126		69	

Coefficient of purity.	1910.		1911.	
	No. of samples.	Per cent. of total.	No. of samples.	Per cent. of total.
Below 79 per cent.	3	2·4	1	1·4
From 79 to 85 per cent.	18	14·3	4	5·8
From 86 to 92 per cent.	84	66·6	36	52·1
93 per cent. and over.....	21	16·7	28	40·6
	126		69	

—J. H. L.

Nitrogen; Determination of —— in betaine (and in molasses and vinasse). H. Stoltzenberg. Z. Ver. deut. Zuckerind., 1912, 440—445.

Complete decomposition of betaine on heating with concentrated sulphuric acid alone, is attained only after several hours' boiling. By adding copper sulphate, mercuric oxide and phosphorus pentoxide (Arguntinsky) to the acid, decomposition is much accelerated. The author recommends the following procedure for the determination of nitrogen in products containing betaine, such as molasses and vinasse. Three grms. of molasses or 2 grms. of vinasse, are boiled with 25 c.c. of concentrated sulphuric acid containing 100 grms. of phosphorus pentoxide per litre. One grm. of powdered copper sulphate and 1 grm. of mercuric oxide are also added and boiling is continued for an hour after the liquid has become clear and light green in colour. After cooling and diluting with 120 c.c. of water, the liquid is treated with 2·2 grms. of powdered sodium thiosulphate and a few grms. of fragments of porcelain of the size of small shot. It is then made alkaline by addition of 90 c.c. of 22 per cent. caustic soda solution, and distilled into standard acid until bumping occurs, when the distillation is stopped.—J. H. L.

Caramel; Purified —— and the standardisation of caramel solutions. G. M. Beringer. Amer. J. Pharm., 1912, 84, 160—166. (See also this J., 1910, 506; 1911, 1179.)

Recent literature on this subject is summarised. The following method is given for the preparation of purified caramel:—1000 grms. of caramel are thoroughly mixed with 250 c.c. of boiling water, 3 litres of alcohol are then gradually added with shaking, and the mixture allowed to stand for 6 hours. The alcoholic liquid is decanted on to a filter and the precipitated caramel washed by decantation with 2 lots of 250 c.c. of alcohol (also decanting on to the filter). The precipitate is thoroughly freed from alcohol and then dissolved in 1500 c.c. of warm water, 4 grms. of monohydrated sodium carbonate are added, the solution filtered, and the filtrate evaporated to the consistence of a syrup. This is spread on glass or tin plates and scraped off in scales when dry. The product is then kept over sulphuric acid till the weight is constant. It is non-hygroscopic and readily forms clear solutions with water and alcohol. Without the addition of alkali, the purified caramel after drying was found to be incompletely soluble in water. The yield averaged 37 per cent. and the tinctorial power is 3 times that of the crude caramel. *Tincture of caramel:*—50 grms. of purified caramel are dissolved in a mixture of 740 c.c. of water, 10 c.c. of ammonia water and 250 c.c. of alcohol, and the solution filtered if necessary. The tincture appears to be permanent. 1 c.c. diluted with water to 100 or preferably to 200 c.c. forms a suitable solution for standardising commercial caramels. The employment of a colour standard other than that of the caramel colour itself is regarded as unsatisfactory.—A. Sbld.

Tragacanth; its sophistication with another gum. H. C. Fuller. Amer. J. Pharm., 1912, 84, 155—158.

The adulteration of powdered tragacanth with a substance known to the trade as Indian gum is stated to have assumed large proportions during the last few years. A complete substitution is easily detected chemically (see this J., 1909, 434): an admixture is shown by the reaction with borax (*loc. cit.*) and more readily by a micro-chemical test, Indian gum showing characteristic stone cells, derived from the bark. Tragacanth bark does not contain any substance of similar character. The acidity of the distillate obtained on boiling with mineral acids is decidedly greater in the case of the substituted gum.

—A. Sbld.

Patents.

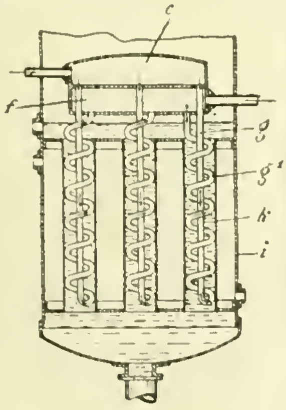
Sugar juices; Process for extracting —— from sacchariferous plants. J. J. W. G. Galloo. Fr. Pat. 436,636, Jan. 28, 1911.

The material, *e.g.*, beetroot, in the form of pulp, is introduced at the bottom of a chamber in which it is pressed between two horizontal, perforated rollers, the greater part of the juice being thus expressed. The pulp, still in a pressed state, passes through an opening at the top of the chamber into a conical sieve situated in the lower part of a vertical diffusion vessel, and, in its passage upwards through the vessel, the pulp encounters a descending stream of liquid. The extraction of the remaining sugar from the pulp is facilitated by the swelling of the latter in the liquid medium. The diffusion vessel is provided with a device for stirring the pulp, with an outlet near the bottom for diffusion juice, with an endless screw, or other device, at the top, for removing the exhausted pulp, and with inlets near the top for admission of water. —L. E.

Sugar solutions ; Concentrating and crystallising apparatus, especially for the treatment of ——. F. Tiemann. Fr. Pat. 436,672, Nov. 23, 1911. Under Int. Conv., Jan. 6, 1911.

The apparatus includes a vacuum vessel containing in its lower, conical part, a centrifugal stirrer (Fr. Pat. 386,957 of 1908, this J., 1908, 795) which carries a flange for directing the liquid against the wall of the vessel. The heating tubes, situated above the stirrer, are provided with an envelope, which is open at the top and bottom, and extends downwards in the form of a truncated cone to the stirrer and upwards nearly to the level of the liquid. In the annular space between the envelope and the wall of the vessel are a number of plates inclined upwards in the direction in which the liquid is made to circulate; these plates may be jacketed and connected with the heating device. The inclined plates direct the liquid against a number of plates from which it is deflected into the upper part of the envelope; in descending through the envelope the liquid comes into contact with the heating tubes and is subsequently returned to the bottom of the vessel, the cycle then being repeated.—L. E.

Heating device for evaporators or the like. W. Raabe. Ger. Pat. 243 188, June 7, 1910.



The evaporator is provided with tubes, *k*, for the circulation of the juice, and in each of these tubes is a heating tube composed of a straight part, *g*, and a helical part, g^1, the two parts opening into separate chambers, *c* and *f*, respectively. The chambers, *c*,*f*, and the heating tubes, *g*,g^1, form a unit movable as a whole with respect to the vessel, *i*, and the circulation tubes, *k*. The part, g^1 of the heating tube is in contact in each of its turns with the tube *g*, and the inner wall of the tube, *k*.—A. S.

Centrifugal separating apparatus. M. Naswanoff, Jaltuoschkowo, Russia. Eng. Pat. 28,140, Dec. 14, 1911.

With a view to retaining a certain definite quantity of liquor in the material which is submitted to centrifugal action,—*e.g.*, in the formation of loaf sugar to leave a sufficient portion of the clear syrup for the purpose of obtaining a harder sugar,—the mould vessels are caused to discharge their liquor centrifugally into a sleeve vessel which surrounds the end of the mould and extends along its sides towards the axis of rotation to any desired extent; the liquor which fills this sleeve, acting after the principle of a U-tube, nullifies the centrifugal action over that part of the mould which it covers. The moulds are caused to pass through holes in an inner wall of the apparatus and in which they are supported, the sleeves being attached (removably if desired) to the inside of the outer wall. —B. G. McL.

Sugar sticks ; Manufacture of ——. Dortmunder Nahrungsmittelfabrik F. Linde. Ger. Pat. 244,247 Oct. 21, 1909.

The greater part, preferably two-thirds, of the sugar is heated till transparent and of a syrupy consistence, and after cooling is mixed with the remainder of the sugar which has been dissolved. The pasty mass so obtained mixed with colouring materials, aromatic substances, and the like, worked up until it is of the desired consistence, and then formed into sticks by forcing it through dies.—A. S.

Glue and method of making the same [from cassava starch]. F. G. Perkins, South Bend, Ind. G. S. Perkins, Execx., Assignor to Perkins Glue Co. U.S. Pat. 1,020,655, March 19, 1912.

Cassava flour is heated with about an equal weight of water to a temperature (*e.g.*, about 130 F.) insufficient to cause the starch granules to burst. About 2 or 3 per cent. by weight of "strong acid" is then added and the whole agitated for 4—6 hours, after which the acid is neutralised by alkali, and the modified cassava starch is dissolved in a solvent of cellulose to form a viscous semifluid "unjellified" product.—A. S.

Glue [from cassava starch]. Process for making ——. F. G. Perkins, South Bend, Ind. G. S. Perkins, Execx., Assignor to Perkins Glue Co. U.S. Pat. 1,020,656, March 19, 1912.

Cassava starch is treated with water containing 0·25—1 per cent. of sodium peroxide solution (1 : 20 parts by weight) and with 0·25 to 0·5 per cent. of a solution of caustic soda (1 : 10 parts by weight), and after the desired modification of the starch is attained, the alkali is neutralised, and the modified starch dried and dissolved in a caustic alkali solution to form an alkaline glue.—A. S.

Concentration and crystallisation apparatus especially for sugar manufacture. F. Tiemann, Berlin. Eng. Pat. 26,710, Nov. 29, 1911. Under Int. Conv., Jan. 6, 1911.

See Fr. Pat. 436,672 of 1911 ; preceding.—T. F. B.

Glue and process for obtaining it. Perkins Glue Co. Fr. Pat. 436,297, Nov. 11, 1911.

See U.S. Pats. 1,020,655 and 1,020,656 of 1912 ; preceding.—T. F. B.

Concentration of syrupy liquids and apparatus therefor. Eng. Pat. 6866. *See* I.

Furnace [for burning megass, etc.]. Eng. Pat. 15,521. *See* I.

XVIII.—FERMENTATION INDUSTRIES.

Banana meal ; Alcohol and yeast from ——. C. Nagel. Z. Spiritusind., 1912., 35, 185.

Banana meal is prepared from the unripe fruit by peeling, slicing, drying and grinding (cp. von Sury, this J., 1910, 713). Ripe bananas cannot be treated in this way, for they form a sticky mass on drying. The meal contains small quantities of a diastatic enzyme which is responsible for the saccharification of starch during the ripening of the fruit (*loc. cit.*). By mashing banana meal, of diastatic power 4 on the Lintner scale, with addition of malt extract, and fermenting the mash, yields of pure alcohol were obtained varying, according to the method of mashing, from 42 to 47·8 litres per 100 kilos. of meal. When mashing was carried out without malt extract, the yields of alcohol were very much lower. From a wort prepared by mashing the meal with 30 per cent. of kilned malt, a yeast crop of good quality was obtained, amounting to 20 per cent. of the weight of the materials mashed. The cost of cheap banana meal is about M. 60 per 100 kilos. (30s. per cwt.).—J. H. L.

Brewing water ; An unusual increase in extract-yield due to the character of the ——, *and its relation to the fermented beer.* C. Bleisch. Z. ges. Brauw., 1912, 35. 166—168.

A case is described in which, owing to the use of an abnormally gypseous brewing water (containing sulphates corresponding to 1·1 grm. of sulphuric anhydride per litre), an increase of 3—4 in the percentage extract-yield was produced. Such an increase may be fully accounted for by the high density of the water. On analysing beers produced with this water, by ordinary chemical methods, and calculating the original wort-gravities, the values found agreed with the actual gravities of the worts before fermentation. When, however, the beers were analysed by the refractometric method (Zeiss) the original wort gravities found were considerably lower, and represented approximately the actual values corrected for the influence of the abnormal quantity of calcium sulphate present. —J. H. L.

Kephir and its preparation. W. Henneberg. Z. Spiritusind., 1912, **35**, 170—171, 177, 184—185. (See also Ginzberg, this J., 1911, 103.)

Kephir, which is largely consumed in the Caucasian districts and within the last 30 years in Germany, is a nourishing beverage produced from milk by the combined action of certain yeasts and lactic acid bacilli. These organisms agglomerate in the fermenting milk, forming lumps of cauliflower-like appearance, which can be easily separated from the liquid and used for a number of successive fermentations. Kephir-ferment from different sources may consist of different yeasts and bacilli, and the author describes a number of organisms which have been isolated from it by various investigators. For the preparation of kephir the following procedure is recommended:—Not less than 12 grms. of the ferment are added to half a litre of milk which has been previously boiled and cooled to 18°—20° C. The mixture is allowed to stand in a covered vessel, and stirred occasionally, until it curdles; this usually occurs within 30 hours. The ferment is then removed by means of a coarse sieve, and the milk allowed to undergo after-fermentation, at ordinary temperatures, in a bottle closed with a patent stopper. The bottle should be well shaken from time to time. The after-fermentation is allowed to continue for 12—24 hours, until the desired degree of acidity and production of carbon dioxide have been attained. The beverage is then ready for consumption but should be well shaken first. It is a pleasantly acid, creamy liquid, which foams moderately and contains about 0·2—0·8 per cent. of alcohol. The ferment of kephir is often sold in a dried form, but this is not to be recommended, as the drying is generally fatal to the yeasts present. Yoghourt is a sour milk beverage, which differs from kephir in that it does not foam and contains no alcohol. It is produced by the action of a lactic acid bacillus at 40°—45° C.—J. H. L.

Methyl alcohol; Non-assimilation of —— by micro-organisms capable of assimilating ethyl alcohol. P. Lindner. Z. Spiritusind., 1912, **35**, 185.

Two organisms, *Oidium lactis* and *Sach. membranafaciens*, selected for investigation on account of their marked capacity for developing by assimilation of ethyl alcohol in absence of other sources of carbon, were found to be quite unable to assimilate methyl alcohol under similar conditions.—J. H. L.

Methyl alcohol; Detection of ——. F. Wirthle. Z. Unters. Nahr. u. Genussm., 1912, **23**, 345—346.

Since the boiling points of methyl and ethyl iodides are 41°—42° C. and 71°—72° C. and their saponification values 394·3 and 358·9 respectively, the detection of methyl alcohol in ethyl alcohol may be effected by converting the alcohols into their iodides, fractionally distilling the product and determining the saponification value of the fractions. Using 100 c.c. of a 40 per cent. spirit it is possible, by this means, to detect methyl alcohol when present in ethyl alcohol to the extent of only 2 per cent. —J. A.

Determination of nitrogen in betaine (and in molasses and vinasse). Stoltzenberg. *See* XVII.

Patents.

Yeast; Process of preparing must for the manufacture of pressed ——. J. B. vel Bróg and K. Cuker. Fr. Pat. 436,401, Nov. 15, 1911.

Molasses, diluted to about 20° Bé., is decolourised with sulphur dioxide, the treatment being continued until the liquor is acid. The liquor is then treated with enough sulphuric acid to decompose all the sulphites, heated, and treated, whilst boiling, with potassium permanganate; the liquor is thus further decolourised and also sterilised and deodourised, whilst any remaining sulphurous acid is oxidised. The product is treated with nutrient substances (extract of malt embryos and superphosphate), heated to boiling, filtered, diluted and finally acidified with sulphuric acid; the solution is fermented by the aeration process with a yeast culture acclimatised to the medium, which still contains a trace of sulphurous acid. If the molasses is of sufficiently good quality it may be merely treated with warm water prior to the addition of the nutrient substances. Part of the nitrogenous nutriment added may consist of potato juice freed from starch, the juice being used in place of water for dilution.—L. E.

Yeast, Process for maintaining the vitality of the active organisms in dried ——. P. D. H. Ohlhaver. Fr. Pat. 436,915, Nov. 28, 1911. Under Int. Conv., March 1, 1911.

Dried yeast contains a certain quantity of moisture, part of which is taken up by the air in the closed vessel in which the dried yeast is kept; the moist air stimulates the enzymes of the yeast and thus brings about their destruction. According to the present process, the dried yeast and a hygroscopic substance such as calcium or magnesium chloride, or starch, are kept in separate compartments of a hermetically closed vessel, the partition between these compartments being of such construction as to permit of the passage of air. The air is thus maintained in a dry state, and the preservation of the yeast is insured.—L. E.

Fermentation; Process for accelerating ——. E. Pohl. Fr. Pat. 436,477, Nov. 16, 1911. Under Int. Conv. Nov. 17, 1910.

The process is characterised by the use of suitable, alterable zeolites, preferably in the form of a fine powder, which serve to supply inorganic nutrient and stimulating substances for fermentation processes. Thus, zeolites that have been treated with solutions of nutrient salts, washed and dried, may be used. In the malting process, the zeolites are added to the steep water, or to the germinating barley, and in the brewing process they may be added to the brewing water, or to the malt or to the wort, or with the yeast to the wort. The treatment is applicable to the manufacture of alcohol, pressed yeast, lactic and acetic acids, to the fermentation of cellulose, etc., and to the manufacture of tobacco in which last case the tobacco leaves are subjected to the treatment prior to fermentation.—L. E.

Wines, beers, ciders, and all fermentable beverages; Process of manufacturing champagne ——. Soc. Anon. d'Exploit. de Proc. de Fermentation des Boissons. Fr. Pat. 437,164, Feb. 10, 1911.

The process consists chiefly in the development and multiplication of the only alcoholic ferment that remains in champagne wine after storage under suitable conditions; this organism, which is an ellipsoideus yeast, is characteristic of the wine. Thirty litres of the best white Champagne wine, 3 or 4 years old, are treated in a small cask with 5 grms. of tannin, 3 grms. of tartaric acid, 10 grms. of lactose, 4 grms. of magnesium sulphate, and 5 grms. of calcium phosphate. The cask is then kept at a temperature of say 10°—12° C. until the added substances are dissolved, this being effected in 4 or 5 days. Four litres of the wine are then removed from the cask, treated with 120 grms. of sugar candy, and placed in a hermetically closed vessel of 6—8 litres capacity. The vessel is shaken twice daily for 8 days and allowed to stand, the liquid being in a state of fermentation at the end of 20 days; 3 litres of the supernatant liquid are then decanted, and of the remaining liquid, which contains the yeast deposit, half a litre is transferred to a stoppered bottle. Three litres of wine are removed from the cask, treated with 90 grms. of sugar, and placed in the vessel; the latter is shaken once, and fermentation is effected in 8 days. The liquid is decanted, and, as before, part of the yeast deposit is transferred to a bottle, the process being repeated until all the wine in the cask has been treated. When the last portion of this wine is fermenting, it is transferred, together with the preserved yeast crops, to a hermetically closed vat containing a quantity of wine (equivalent to about 1000 bottles) to which 25 grms. of sugar candy per bottle has been added. The whole is left for 60 days (the temperature being maintained at 14 - 15° C. during the first 20 days) and the liquid, which by this time is converted into Champagne wine, is then racked into bottles. The yeast left at the bottom of the vat suffices for pitching 10 similar vats. The Champagne wine does not require filtration, clarification or pasteurisation.—L. E.

Yeast; Process for making dry —. P. D. H. Ohlhaver. Fr. Pat. 436,914, Nov. 28, 1911. Under Int. Conv., March 1, 1911.

See U.S. Pat. 1,020,306 of 1912; this J., 1912, 401.—T.F.B.

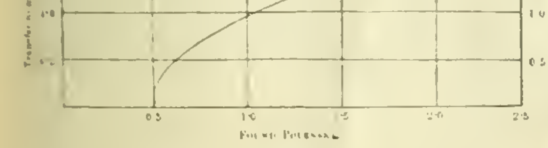
XIXa.—FOODS.

Arsenic; Presence of — *in several vegetable foods.* F. Jadin and A. Astruc. Comptes rend., 1912, **154**, 893—896.

The work of Gautier and G. Bertrand has shown that arsenic exists normally in small quantities in man and animals. The authors' work shows that the source of this arsenic may be found in the edible portions of the vegetable kingdom. Thirty-six vegetables and fruits have been examined and arsenic was found in each in quantities varying from 0·03 to 0·25 parts per million. The largest quantities were found in beans and in almonds.
—W. H. P.

Butter fat and cocoanut oil; Determination of —— *in margarine.* F. W. F. Arnaud and H. Hawley. Analyst, 1912, **37**, 122—123.

Large proportions of cocoanut oil and butter fat in margarine may be correctly calculated from the Reichert and Polenske values by the method of Cribb and Richards (this J., 1911, 975), but in the presence of less than 20 per cent. of these fats the calculated results are too high. The percentage of cocoanut oil may be found from the corrected Polenske figure, with the aid of the following formula :—$P = (P'-P'')\dfrac{R}{10}+T$, where P represents the corrected Polenske figure; P' the observed Polenske figure; P'' the Polenske figure of margarine not containing butter fat or butter (about 0·4); and T a correction ascertained from the subjoined curve :—



$$\text{Percentage of cocoanut oil} = \frac{100P}{17{\cdot}6}$$

The proportion of butter fat may then be calculated by the formula :—

$$R = (R' - R'') - \text{Reichert due to cocoanut oil} - T,$$

where R represents the corrected Reichert-Meissl value; R' the observed value; and R'', the Reichert-Meissl value of margarine not containing butter fat or cocoanut oil (about 0·6).

$$\text{Percentage of butter fat} = \frac{100R}{25}$$

The amount of butter fat may also be confirmed by Kirschner's method, with the aid of the formula :—

$$K = (K' - 0{\cdot}5)\frac{P}{10},$$

where K represents the corrected Kirschner figure, K' the observed value; 0·5 the Kirschner value of margarine free from butter; and P the Polenske value obtained.

$$\text{Percentage of butter fat} = \frac{100K}{23}$$

—C. A. M.

Malic acid [in fruit juices]; Modification in the determination of —. D. S. Pratt. U.S. Dept. of Agric., Bureau of Chem., Circular No. 87, Dec. 23, 1911.

A preliminary treatment greatly facilitates the determination of malic acid in fruit juices by the method proposed by Dunbar and Bacon (this J., 1911, 1407). 100 grms. of the juice are placed in a 500 c.c. beaker and two or three times the volume of 95 per cent. alcohol is added. After standing a few minutes the pectin bodies are filtered off and washed with 95 per cent. alcohol. The filtrate and washings are evaporated in a current of air on the water bath to about 75 c.c. When cool the solution is made up to 100 c.c., using 10—15 c.c. of 95 per cent. alcohol and distilled water. The solution is then ready for treating as in the original method.—F. Sods.

Precautions to be taken in determining the Polenske value. Arnold. *See* XII.

Patents.

Soya bean; Manufacture of food products or beverage from the ——. F. G. Lecomte, Bidirt, France. Eng. Pat. 7232, March 23, 1911.

Crushed soya-bean cake, from which the oil has been extracted as completely as possible, is finely ground, and then roasted to change its flavour and colour. The meal thus obtained may be mixed with ordinary wheaten flour or meal or other farinaceous material for use in the manufacture of bread, cakes, biscuits, etc. For the preparation of a flour for the manufacture of bread, etc., the ground cake is preferably freed from the last traces of oil by allowing it to stand in 95 per cent. alcohol for 24 hours, filtering, and washing with alcohol. The oily residue recovered from the alcohol may be used in the manufacture of soap. A substitute for chocolate is prepared by mixing the roasted meal with vegetable butter. A beverage consists of an infusion of the roasted meal.—E. W. L.

Milk; Treatment of —. [*Addition of iron glycerophosphate.*] P. Hoering, Berlin. Eng. Pat. 13,006, May 30, 1911. Under Int. Conv., July 9, 1910.

To 100 litres of neutralised skimmed milk are added 282 grms. of iron glycerophosphate dissolved in 3 litres of water; by evaporating the mixture to dryness, a yellowish white powder of agreeable odour and taste is obtained. The quantity of iron glycerophosphate added should correspond with the amount of casein in the milk.—W. P. S.

Desiccation of fluid substances [milk, eggs, etc.], Method of and apparatus for ——. The Griscom-Spencer Co. Fr. Pat. 436,762, Oct. 26, 1911. Under Int. Conv., Oct. 26, 1910.

The patent relates to modifications in the process and apparatus described in U.S. Pat. 962,781 of 1910 (this J., 1910, 932). The apparatus comprises a desiccating chamber into which the fluid is sprayed by means of an atomiser, whilst a current of hot dry air passes slowly through the chamber towards the lower end, the fluid remaining in suspension long enough to ensure desiccation. The air and the suspended solid particles leave the desiccating chamber by a contracted orifice and pass tangentially at high velocity into a separating chamber, where the bulk of the solid is deposited owing to the whirling motion of the air. The air from this chamber enters a second separator where it is washed by a heavy shower of liquid to remove the remainder of the suspended matter. For treating foodstuffs, the air is first purified and freed from dust in apparatus such as that described in U.S. Pats. 710,605 of 1902, and 853,517 of 1907, and then dried by cooling it below its dew-point.—A. T. L.

Milk, albumin, serum; Process and apparatus for the concentration and desiccation of products of animal or vegetable origin, such as ——. G. Canonne. Fr. Pat. 437,037, Nov. 30, 1911.

The liquid to be desiccated passes down from a containing vessel through a hollow vertical shaft, which rotates inside a chamber with double walls, then through radial arms provided with atomising jets, and is deposited on the inner walls of the chamber. These walls are heated by means of water or other liquid kept at a temperature below that at which the desiccated product may be injured, and a vacuum is maintained in the chamber, by means of a pump with which the chamber is connected through a tubular or other condenser. A scraper moves round just ahead of the atomisers and removes the dried material from the walls, and other scrapers keep it agitated in the bottom of the chamber. The dried material is finally removed through doors in the chamber.—E. W. L.

Fruits or vegetables; Canning acid ——. R. M. Glacken, Baltimore, Md. U.S. Pat. 1,021,770, April 2, 1912.

To avoid contamination of the material by salts of tin, the acidity is reduced or neutralised by the addition, during canning and processing, of ethyl alcohol with or without sodium acetate.—W. E. F. P.

Yeasts; Process for converting —— *into food.* W. E. Lake, London. From Soc. Anon. l'Autolyse, Liege, Belgium. Eng. Pat. 10,937, May 5, 1911.

See U.S. Pat. 1,012,147 of 1911; this J., 1912, 89. Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 19,161 of 1897.—T. F. B.

Fodder composed of peat and molasses: Process of manufacturing ——. E. Joseph, Berlin. U.S. Pat. 1,022,243, April 2, 1912.

See Eng. Pat. 23,660 of 1909; this J., 1910, 588.—T. F. B.

XIXb.—WATER PURIFICATION; SANITATION.

Nitrification: Influence of carbon upon ——. H. W. Clark and G. O. Adams. J. Ind. Eng. Chem., 1912, 4, 272—274. (See also this J., 1911, 1277.)

This piece of work was done at the Lawrence Experiment Station of the Massachusetts State Board of Health and is a continuation of similar work done by the Board and published from time to time in its Annual Reports. The present experiments extended considerably over a year and consisted in applying to sand filters, sewage freed from matter in suspension, to which was added known amounts of substances rich in carbon, namely, sugar, molasses, butyric acid and alcohol. These bodies were added in slowly increasing quantities to the sewage to be filtered, while the nitrogen present was kept constant, and analyses were made at intervals of the applied liquid and the effluent. It was found that while the ratio of carbon to nitrogen in the applied liquid remained low, nitrification was active, but when it became high, nitrification nearly ceased and was not resumed until the ratio was lowered again. With sugar, nitrification was checked when the carbon to nitrogen ratio was 13 : 1 and 15 : 1, but was active when the ratio was about 11 : 1. With butyric acid, nitrification was stopped at the ratio 27, but was active below 16. It was found that when ammonium chloride was added to the applied mixture, the check on nitrification did not take place, even if the amount of applied carbon was very high. An important practical point brought out was that even when nitrification was checked, the purification of the liquid remained good as judged by the albuminoid ammonia and oxygen consumed results. The above effects are caused by the presence of bacteria which act under conditions preventing nitrification and which decompose organic matter into carbon dioxide and nitrogen. In these experiments also, wool-scouring waste liquors, which had been filtered, were used as a source of carbon and were found to act similarly to the other carbonaceous substances. These waste liquors could be purified when treated by themselves on a sand filter, and in those cases in which the carbon to nitrogen ratio in their contents was high, almost without nitrification.—J. H. J.

Potassium chloride works; Hardening of the German river waters by the effluents from ——. Ditges. Wochenbl. Papierfab., 1912, 43, 1165—1168.

The trouble between the papermakers and the refiners of potassium chloride in Germany is reaching an acute stage, because the field of operations of the potash industry has recently been considerably enlarged. The effluents, consisting largely of the magnesium salts derived from the carnallite, are inimical to the sizing of paper and render the water unsuitable for boiler purposes. It is pointed out that the saline contamination from the potash works makes a permanent alteration in the character of the water and destroys the growth of the plankton on which fishes feed. The effluents of paper mills on the other hand, being largely organic, are eliminated in the rivers by the process of self-purification and are favourable to the growth of plankton and fish life. The granting of potash concessions is in the hands of local authorities but the effects of the pollution extend beyond their boundaries; legislation is therefore desirable. Certain potash works have been compelled at considerable expense to construct artificial conduits to carry away their effluents to the sea or lower reaches of the rivers, as for instance in the case of the Elbe.—J. F. B.

Creosote; Antiseptic properties of ——. K. W. Charitschkoff. J. Russ. Phys.-Chem. Soc., 1912, 44, 345—348.

Varying views are held concerning the particular constituents of creosote which produce its antiseptic action. The author has made a number of experiments with creosote, before and after treatment in various ways to remove the phenols, nitrogenous compounds, etc. The creosote was mixed in definite proportions with a gelatin nutrient medium, which was kept in agitation until it solidified, so that the emulsified creosote was distributed through the solid medium. *Merulius lacrimans, Penicillium glaucum* and a mould isolated in pure cultures from putrefied strawberries were then sown on the medium. The results show that, although the phenols and nitrogenous compounds by themselves exhibit considerable antiseptic properties, their presence in creosote only slightly increases the antiseptic power of the latter. Creosote freed from phenols and certain other components by treatment with sulphuric acid still exerts a decided antiseptic action.—T. H. P.

Modification of the sulphonation test for creosote. Bateman. *See* III.

Patents.

Filtering water; Apparatus for —— *or for like purposes.* W. Paterson, London. Eng. Pat. 7659, March 27, 1911.

A number of filter beds are supplied with water from a common trough. The inflowing water serves to actuate a turbine which in turn drives an air compressor. The compressed air is delivered into a reservoir from which it can be forced through a system of pipes into the filter material to agitate and aerate it.—W. H. C.

Liquids; Sterilising —— by means of ultra-violet rays. M. von Recklinghausen, Paris. Eng. Pat. 6759, March 17, 1911.

The liquid is passed through a quartz helical tube or "worm" which surrounds the lamp emitting the ultra-violet rays, and the "worm" is enclosed in a casing the interior surface of which is polished so as to reflect the rays. The whole apparatus is mounted on a platform, which may be tilted, and may be provided with an outer cover. The liquid may be heated by means of a resistance or radiator before treatment.—W. P. S.

Electrodes for arc lamps; Use of metallic tungsten and uranium for the production of ——. [Sterilisation of water, etc.]. Banque du Radium. Sixth Addition, dated Jan. 20, 1911, to Fr. Pat. 418,280, July 15, 1910 (see this J., 1911, 77, 1305; 1912, 221, 379).

The claim is for the application of a lamp with an anode of tungsten or other suitable metal and a mercury cathode as a source of ultra-violet rays for the sterilisation of water and other liquids.—A. S.

Rubbered fabrics; Process for impregnating —— with peroxide salts. E. Heinemann and D. Kirschner. Ger. Pat. 244,329, Feb. 5, 1911.

The fabric is steeped in a solution prepared by dissolving the peroxide salt (*e.g.*, perborate) at a low temperature in a solution of an aluminium salt, dried, and coated with a rubber solution to which has been added 5 per cent. of anhydroformaldehyde-aniline or other formaldehyde compound soluble in ether. Such fabrics will slowly evolve oxygen under the influence of warmth and moisture.
—T. F. B.

Disinfecting agents; Process for preparing ——. A. Liebrecht. Ger. Pat. 244,827, Feb. 23, 1908.

The disinfectants are prepared by dissolving the chloro-*m*-cresol of m. pt. 66° C. in solutions of soaps or of sulphonated fats or fatty acids; by this means solutions containing up to 20 per cent. of chloro-*m*-cresol may be obtained.—T. F. B.

Feed-water to boilers; Mechanical method of treatment of —— for prevention of incrustation, corrosion, or pitting. C. Haythorpe, London. U.S. Pat. 1,022,365, April 2, 1912.

See Eng. Pat. 23,123 of 1910; this J., 1911, 1229.—T. F. B.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Quinine; Two new processes for obtaining crystallised ——. J. Ville. Bull. Soc. Chim., 1912, 11, 398—400.

Anhydrous crystals of quinine can be easily obtained by leading air through a wash bottle containing ammonia into a solution of quinine hydrobromide heated on a water bath. The concentration of the solution of the hydrobromide may be between 1 and 20 per cent. In order to obtain crystals of the trihydrate, one litre of a 2·5 per cent. solution of quinine hydrobromide is mixed with half its volume of acetone and cooled. Twenty c.c. of a mixture of equal volumes of ammonia and water are added gradually with continual stirring. The mixture is allowed to evaporate in a dish, when long silky needles of quinine trihydrate begin to separate out.—F. Shdn.

Menthols corresponding with optically inactive menthone. Alcohols of the hydroaromatic and terpene series. Part II. R. H. Pickard and W. O. Littlebury. Chem. Soc. Trans., 1912, **101**, 109—127.

The number of the possible modifications of menthone and menthol is discussed, and adopting a nomenclature based on that used by Aschan ("Chemie der alicyklischen Verbindungen," 1905) and by Kipping and Tutin (Chem. Soc. Trans., 1904, **85**, 65), the two ketones are named menthone and *iso*menthone, whilst the alcohols derived from them are named menthol and *neo*menthol and *iso*menthol and *neoiso*menthol respectively: each of these compounds corresponds with a pair of optically active isomerides. The present paper deals with the relationship existing between the menthols corresponding with optically inactive menthone. Crude "thymomenthol" prepared by Brunel's method (this J., 1905, 248) by reduction of thymol with hydrogen in presence of finely divided nickel, was freed from unchanged thymol by washing with sodium carbonate solution. The menthols present were then converted into hydrogen phthalic esters and the residual ketones were converted into semicarbazones. Two semicarbazones were isolated: one melting at 217° C. and nearly insoluble in alcohol, and the other melting at 158° C. and much more soluble in alcohol. The former probably corresponds with isomenthone and is identical with the compound obtained by Wallach (Annalen, 1908, **362**, 272; see this J., 1908, 996), whilst the latter, which corresponds with menthone has been previously obtained by Brunel (*loc. cit.*). From the hydrogen phthalic esters, two pure products were isolated by fractional crystallisation from acetic acid. The more soluble one (m. pt. 130° C.) yields on hydrolysis menthol (m. pt. 34° C.), probably identical with Brunel's β-thymomenthol and with the menthol obtained by Kremers (Amer. Chem. J., 1896, **18**, 762). The less soluble one (m. pt. 177° C.) yields *neo*menthol (m. pt. 51° C.) identical with a menthol isolated by Beckmann (J. prakt. Chem., 1897, **55**, 30; see this J., 1897, 255). Both menthol and *neo*menthol yield menthone on oxidation. By the methods previously described (Chem. Soc. Trans., 1907, **91**, 1973) these menthols were resolved into their optically active isomerides, viz., *l*-menthol (m. pt. 43° C., $[\alpha]_D = -49^\circ$), *d*-menthol (m. pt. 43° C., $[\alpha]_D = +49^\circ$), *l-neo*menthol (b. pt. 105° C. at 21 mm., $[\alpha]_D = -19{\cdot}6^\circ$), and *d-neo*menthol (b. pt. 98° C. at 16 mm., $[\alpha]_D = +19{\cdot}6^\circ$): these four menthols have quite distinct odours. On oxidation *l*-menthol and *d-neo*menthol yield *l*-menthone, and *d*-menthol and *l-neo*menthol yield *d*-menthone. *l*-Menthol is identical with the lævo-rotatory menthol found in essential oils. Examination of residues of a "menthol"-like character left after removing *l*-menthol from Japanese peppermint oil showed the presence therein of a small quantity of *d-neo*menthol.—A. S.

Salicylic acid; New reactions for ——. E. Barral. Bull. Soc. Chim., 1912, 11, 417—420.

Two drops of a 5 per cent. solution of sodium salicylate are mixed with 2 c.c. of pure sulphuric acid and cooled. A 10 per cent. solution of sodium nitrite is added to the mixture, drop by drop, with stirring. The following colour changes are observed:—yellowish-orange, orange-red, blood-red with green dichroism, finally gooseberry-red. The spectrum of the liquid in the latter stage is almost identical with that of reduced hæmoglobin. When the acid liquid is diluted with water, a dichroic orange colour is produced. The reaction can be applied to the esters, provided that the alkyl residue has no action upon the reagent. Sulphosalicylic acid has no action. As small a quantity of the salicylic acid as 20 mgrms. can be detected. A small piece of ammonium persulphate the size of a pea can be added to 2—3 c.c. of a 1 per cent. solution of salicylic acid, and the mixture boiled. A yellow colouration appears, changing to brown, followed by the formation of a black precipitate. When cool the precipitate subsides leaving a colourless or yellowish liquid. If more persulphate be added and the boiling continued, the liquid becomes colourless. One drop of a dilute solution of salicylic acid treated with Mandelin's reagent forms blue striations rapidly changing to olive-green. The reaction becomes more sensitive by first warming the salicylic acid solution with sulphuric acid so as to cause sulphonation. Aspirin, methyl salicylate, salol, etc., give this reaction. Schlagdenhaufen's reagent gives a yellow colouration with salicylic acid solutions, changing to orange-brown on warming. Further heating produces a black precipitate and the evolution of hydrogen selenide.—F. Shdn.

Acetaldehyde in paraldehyde. Determination of ——. R. Richter. Pharm. Zeit., Feb. 14, 1912; 125. Pharm. J., 1912, **88**, 537.

The mixture is treated with a solution of sodium sulphite, which does not react with the paraldehyde, but is decomposed by aldehyde into bisulphite and caustic soda, the former combining with the aldehyde, and the latter being determined by titration. The paraldehyde to be tested must first be neutralised, and the alkalinity of the sulphite solution must also be determined and allowed for. The process is as follows:—10 grms. of paraldehyde are dissolved in 100 c.c. of water with shaking, 2 drops of phenolphthalein solution are added, and then *N*/1 potassium hydroxide, drop by drop until a pink colour is permanent; not more than 0·5 c.c. should be required, representing 0·3 per cent. of acetic acid; 20 c.c. of sodium sulphite solution (containing 25 grms. of the crystalline salt in 100 c.c.) are then added, and the liquid titrated with *N*/1 hydrochloric acid. Another 20 c.c. of the sulphite solution are mixed with 100 c.c. of water and titrated with the acid, and the amount used in this titration is deducted from that used in the former: the difference should not be more than 9·1 c.c., corresponding to 4 per cent. of acetaldehyde. Good commercial specimens of paraldehyde all showed less than 1 per cent. of acetaldehyde, and it appears that if kept in full stoppered bottles out of the light there is no need to allow any serious contamination with acetaldehyde. It is suggested that the limit for the latter should be fixed at 0·5 per cent., instead of 4 per cent., as now permitted by the Ph.G.

Determination of halogens in certain organic compounds. Monthulé. *See* XXIII.

Patents.

Citric acid and hexamethylenetetramine; Process for the production of crystallised compounds of —— and of permanent effervescent tablets therefrom. H. Sefton-Jones, London. From Chem. Fabr. Johann A. Wülfing, Berlin. Eng. Pat. 26,160, Nov. 22, 1911.

A crystalline compound of hexamethylenetetramine and citric acid is produced by adding alcohol, ether, or a mixture of the two to a concentrated aqueous solution of one molecular proportion of each of the two components, and allowing the mixture to crystallise, preferably at a low temperature. An alternative method consists in adding one mol. of powdered citric acid or an alcoholic solution of citric acid to a concentrated aqueous solution of one mol. of hexamethylenetetramine, introducing a crystal of the previously prepared compound into the solution, and allowing it to crystallise. The yields are stated to be about 95 per cent. of the possible yield. When this compound is mixed with sodium bicarbonate or anhydrous sodium carbonate and anhydrous sodium acetate, and the mixture converted into tablets, stable, effervescent products are obtained.—T. F. B.

Penta- and hexachloroethane; Process for making ——. Salzbergwerk Neu-Stassfurt und Theilnehmer, Zschernford, Germany. Eng. Pat. 1105, Jan. 15, 1912. Under Int. Conv., May 6, 1911.

Tetrachloro-ethane may be very rapidly and quantitatively converted into hexachloro-ethane by treatment with chlorine under the influence of chemically active rays of artificial light, without the aid of a chlorine carrier. As source of light, an open arc lamp or mercury vapour lamp may be used. The temperature of the liquid should not be allowed to rise above 50° or 60° C. Pentachloro-ethane is formed as an intermediate product of the reaction, and may be obtained if the chlorination is stopped when an excess of chlorine of about 10 per cent. over the amount required to produce the pentachloro-compound has been added; the product, which consists of pentachloro ethane containing about 10 per cent. of the hexachloro compound, is purified by fractionation. In the preparation of hexachloro ethane, the passage of chlorine is preferably stopped when the product consists of a thick paste; the white crystalline mass is then pressed, and the liquid is mixed with a further quantity of tetrachloro-ethane and again chlorinated.—T. F. B.

Albuminoids and their derivatives; Process for preparing salts of —— containing alkali and alkaline-earth metals, and soluble in water. W. Wolff und Co. Ger. Pat. 244,001, July 17, 1910.

The acidic groups of the albuminoid compound are partly neutralised by calcium, magnesium, or strontium, and partly by potassium, sodium, or lithium, or the neutral calcium salts of albuminoids are treated with a quantity of an alkali fluoride sufficient to remove a portion only of the calcium as fluoride. The resulting salts are separated from their solutions by precipitation with alcohol or acetone or by evaporation at low temperatures. The salts are stated to be of therapeutic value.—T. F. B.

2-Piperonylquinoline-4-carboxylic acid (piperonylcinchonic acid); Process for preparing ——. Chem. Fabr. auf Actien, vorm. E. Schering. Ger. Pat. 244,497, March 23, 1911.

2-Piperonylquinoline-4-carboxylic acid, which possesses similar antirheumatic properties to those of 2-phenylquinoline-4-carboxylic acid but has a less unpleasant taste, may be prepared by the condensation of aniline, piperonal, and pyroracemic acid.—T. F. B.

Aminoacidylphenetidines, caffeine, and mineral acids; Process for preparing compounds of —— soluble in water. Chem. Werke vorm. Dr. H. Byk. Ger. Pat. 244,740, Sept. 18, 1910. Addition to Ger. Pat. 243,069, Jan. 6, 1910.

By the interaction of aminoacidylphenetidines with caffeine in presence of mineral acid, new soluble compounds are produced in the form of crystalline powders. Their aqueous solutions are neutral to methyl orange and slightly acid to litmus; alkalis resolve them into their components. They may be used for subcutaneous injection.—T. F. B.

Pharmaceutical product [calcium salt of acetylsalicylic acid]; Manufacture of a ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 11,503, May 12, 1911.

See U.S. Pats. 1,020,121, 1,020,181, and 1,020,182 of 1912; this J., 1912, 409.—T. F. B.

Isoprene; Manufacture of ——. O. Silberrad, Buckhurst Hill. U.S. Pat. 1,022,338, April 2, 1912.

See Eng. Pat. 4001 of 1910; this J., 1911, 445.—T. F. B.

Radio-active beverages; Making ——. H. H. Hewitt, London. U.S. Pat. 1,022,551, April 9, 1912.

See Eng. Pat. 7954 of 1910; this J., 1911, 572.—T. F. B.

Pharmaceutical product [glycol ester of substituted benzoic acid]. L. Taub and H. Hahl, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,022,645, April 9, 1912.

See Eng. Pat. 8012 of 1911; this J., 1912, 151.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photographic developer, "sulphinol"; A new ——. J. Desalme. Bull. Soc. Franç. Phot., 1912, **3**, 94—96.

Of the hydroxydiphenylamine derivatives, that which has proved the most efficient as a photographic developer is *p*-amino-*p'*-hydroxydiphenylamine-*o*-sulphonic acid ("sulphinol"). It is slightly soluble in water, but readily soluble in alkalis and alkali carbonates. It gives soft images of good gradation with pure whites; under normal conditions the image appears in about three minutes and development is complete at the end of seven or eight minutes. The developer is very sensitive to bromide. A developing bath for papers may consist of sulphinol, 10—15 grms.; crystallised sodium sulphite, 40—50 grms.; "dry" sodium carbonate, 20—30 grms.; water 1000 c.c. For developing negatives satisfactory results are obtained by using sulphinol and quinol, for example, sulphinol, 10 grms.; quinol, 5 grms.; sodium sulphite, 50 grms.; sodium carbonate, 50 grms.; water, 1000 c.c. The developing solutions are stable.—T. F. B.

Photographic intensification; Method of ——. J. Desalme. Bull. Soc. Franç. Phot., 1912, **3**, 96—98.

As a result of a series of trials, it has been found that sodium stannite reduces silver chloride most energetically, and produces the most intense silver image. In carrying out the intensification by this method, the image is converted into silver chloride by means of a 2 to 3 per cent. solution of cupric chloride slightly acidified with hydrochloric acid. The bleached image is washed and redeveloped in a sodium stannite solution prepared by adding 18 c.c. of caustic soda (40° B.) to 10 grms. of stannous chloride dissolved in 100 c.c. of water, and diluting to 250 c.c. To obtain warm brown tones, the bleached image is treated with a 5 per cent. solution of caustic soda before redevelopment. The process is stated to be equally applicable to negative or positive silver images.—T. F. B.

PATENT.

Photographic films; Apparatus for the manufacture of ——. O. Wintermeyer, Leverkusen, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,022,617, April 9, 1912.

SEE Eng. Pat. 17,009 of 1909; this J., 1910, 978.—T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Guncotton; Diphenylamine test for ——. C. Kullgren. Z. ges. Schiess- und Sprengstoffw., 1912, **7**, 153—156.

THE author finds, when using a diphenylamine test paper, that if guncotton of low heat test (3—4 mins.) be heated continuously for 6—14 days at 45° C., the heat test rises to 11—12 minutes. He considers that this points to the fact that unstable bodies in the guncotton are not immediately decomposed into nitrogen peroxide but pass through one or more intermediate stages of decomposition.—G. W. McD.

PATENTS.

Propulsive explosives; Manufacture and handling of ——. Birmingham Metal and Munitions Co., Ltd., and J. H. Barker, Birmingham. Eng. Pat. 2835, Feb. 3, 1911.

REELS of cordite or other explosive are mounted on a suitable cabling machine, whereby cordite is formed into a symmetrical bundle which facilitates the loading of the cordite into cases.—G. W. McD.

Explosive. J. F. O'Brien, Chicago, Ill. U.S. Pat. 1,021,882, April 2, 1912.

POTASSIUM chlorate 75 parts, and sugar 25 parts, are mixed with a relatively small amount of Prussian blue, approximately 2 per cent., as a maximum, of the total of the above ingredients.—B. N.

Smokeless powder and gelatinised explosives; Process for the manufacture of ——. J. Delpech. Fr. Pat. 436,439, Nov. 16, 1911.

A MIXTURE of nitrocelluloses (22 kilos.) is dissolved in the solvent, preferably methylic alcohol, acetone and ether (100 litres), and 440 grms. of diphenylamine are added as a stabilising agent. The mixture is incorporated and pressed into the required form. The diphenylamine may be replaced by aniline, urea, or acetamide.—G. W. McD.

Gelatinised explosives; Recovery of solvents used in the manufacture of ——. J. Delpech. Fr. Pat. 436,440, Nov. 16, 1911.

AFTER incorporating the nitrocellulose with solvents, the paste, as it issues from the press, falls into a liquid which will absorb the solvent. The latter is then separated by distillation.—G. W. McD.

Volatile liquids [acetone vapour from cordite]; Recovering ——. C. Harrison, W. Bate, and W. G. Perks, Hayle. U.S. Pat. 1,022,416, April 9, 1912.

SEE Fr. Pat. 381,529 of 1907; this J., 1908, 140.—T. F. B.

Composition for coating the walls of coal mines, etc., for preventing or lessening the possibility of explosion of coal dust. Eng. Pat. 6773. *See* IIA.

XXIII.—ANALYTICAL PROCESSES.

Nitrogen thermometer scale from 300° to 630° C., with a direct determination of the boiling point of sulphur. A. L. Day and R. B. Sosman. J. Washington Acad. Sci., 1912, **2**, 167—176.

IN continuation of their previous work (see this J., 1910, 282 and 1911, 1158) the authors have made exact determinations of the boiling points of benzophenone and sulphur, and the melting points of zinc and antimony. In the case of the boiling point of sulphur the gas thermometer bulb itself was immersed in the vapour from boiling sulphur. In the other cases thermo-elements were calibrated at temperatures near to the fixed points in question by means of the gas thermometer immersed in a bath containing a eutectic mixture of potassium and sodium nitrates. The readings of the thermo-elements at the fixed points were then made, and the exact temperatures determined by interpolation over a very short range. The melting points of cadmium and aluminium were next obtained by interpolation with the thermo-elements. The results compared with those on the most recent Reichsanstalt scale are given in the following table:—

Point.	Temperature. Const. volume P_0 = 1 atm.	Thermo-dynamic.	Holborn and Henning, 1911 Thermodynamic.
Benzophenone (Kahlbaum) b.pt at 760 mm.	305·85	305·9	305·9
Cadmium, m.pt. ..	320·8	320·9	320·9
Zinc, m.pt	419·3	419·4	419·4
Sulphur, b.pt. at 760 mm.	444·4	444·5,	444·5, (Holborn and D...)
Antimony (Kahlbaum), m.pt.....	629·8	630·9	630·0
Aluminium, m.pt...	658·5	658·7	—

—W. H. P.

Resistance thermometer scale and the nitrogen scale ; Comparison of —— from 300° *to* 630° *C.* H. C. Dickinson and E. F. Mueller. J. Washington Acad. Sci., 1912, 2, 176—180.

THE direct comparison of the platinum resistance thermometer with the gas thermometer, shows the following differences between the Bureau of Standards resistance scale (on which the boiling point of sulphur is defined as 444·70° C.) and the nitrogen scale of Day and Sosman. Resistance minus gas at 306°, mean value, +0·18°, at 445°, +0·42°, at 630°, +0·96°. Applying these corrections to fixed points on the resistance scale, the following temperatures on the constant volume nitrogen scale are found:—Boiling point of benzophenone 305·84°, boiling point of sulphur 444·28°, freezing point of antimony, 629·75. The thermodynamic values are 305·89°, 444·38°, and 629·93° respectively. It will be seen from the previous abstract that the fixed point determinations made by transfer with the resistance thermometer agree satisfactorily with those obtained by transfer with thermoelements, but that the sulphur determination shows a decided discrepancy from that obtained by the gas thermometer directly (444·38° as against 444·55°). It is not likely that this is due to difference in the sulphur baths used or to an unusual accumulation of accidental errors, the most probable cause being a systematic error affecting all transfer values. The direct determination is probably more reliable, and the boiling point of sulphur may be taken as 444·6° to the nearest 0·1° on the thermodynamic scale.—W. H. P.

Lime ; Determination of ——, in presence of magnesia. E. C. Carron. Ann. Chim. Analyt., 1912, **17**, 127—129.

THE author remarks upon the difficulty of effecting a quantitative separation of calcium from magnesium by the usual methods, especially when a large excess of the latter constituent is present, and recommends the following process as being accurate and independent of the relative proportions of the metals. The solution of the chlorides—which may contain ammonium chloride and ammonia—is concentrated to 60 or 80 c.c. and made slightly alkaline. After the addition of 20 c.c. of ammonium bisulphite solution—prepared by saturating aqueous ammonia (22° Bé.) with sulphur dioxide—the liquid is heated to about 90° C. and, upon the appearance of a crystalline precipitate, 20 c.c. of ammonia solution (22° Bé.) are added and the mixture is well stirred. The calcium sulphite, precipitated (in crystalline form) in accordance with the equations:

$$\mathrm{CaCl_2+3NH_4HSO_3+NH_3=}$$
$$\mathrm{CaS_2O_5+2NH_4Cl+(NH_4)_2SO_3+H_2O,}$$
$$\text{and } \mathrm{CaS_2O_5+2NH_3+H_2O=CaSO_3+(NH_4)_2SO_3,}$$

is allowed to settle for an hour and is then filtered off, washed with hot, slightly ammoniacal water, dried, calcined in a muffle and weighed as calcium sulphate; before incineration, the filter paper is moistened with a saturated solution of ammonium sulphate containing free sulphuric acid to prevent the formation of calcium sulphide. After the complete expulsion of the free and combined sulphurous acid from the filtrate, the magnesium is determined by precipitation with sodium phosphate in the usual manner. It is stated that by this method a determination of calcium can be made in about three hours, the presence of zinc, nickel or cobalt being without influence upon the result. Ammonium bisulphite may be replaced by the sodium salt, but the latter frequently contains iron which may be precipitated with the calcium sulphite if the time of settling is prolonged much beyond that stated.—W. E .F. P.

Iron and aluminium ; Determination of ——. H. Borck. Z. angew. Chem., 1912, **25**, 719—720.

THE separation of iron and aluminium by heating the ignited oxides in a current of hydrochloric acid gas, so as to volatilise the iron as chloride, is found to be satisfactory when the containing vessel is of quartz; porcelain or platinum are liable to be attacked; the gas requires no special purification, and the method is recommended as being both rapid and accurate. In separating iron and aluminium from other metals by the acetate method, the author neutralises the solution by ammonia, in presence of methyl orange, and then adds a little strong ammonium acetate solution and boils the mixture, when a flocculent precipitate is produced, which is readily washed.—F. SODN.

Perchloric acid in electrochemical analysis. W. S. Hendrixson. J. Amer. Chem. Soc., 1912, **34**, 389—392.

PERCHLORIC acid is characterised by the indifference of its negative ion towards chemical reagents, especially reducing agents; apparently the only reducing agents which act upon it are freshly-precipitated ferrous oxide, sodium thiosulphate, and to a small extent some oxides of nitrogen. The only other strong acid comparable with perchloric acid in this respect is sulphuric acid, which, however, is reduced by hydriodic acid and other substances which have no action on perchloric acid under similar conditions. These properties are advantageous in electroanalytical work, since the electrolysis will not be complicated by secondary reactions. The results of some experiments are described showing that copper, silver, and cadmium can be deposited quantitatively from perchloric acid solutions, and work in this direction is being continued (see also this J., 1911, 1379). Perchloric acid readily dissolves many oxides of heavy metals, and nitrates can be converted into perchlorates by evaporation with excess of perchloric acid.—A. S.

Halogens ; Determination of ——, in certain organic compounds. Monthulé. Ann. Chim. Analyt., 1912, **17**, 133.

THE process, which is applicable to iodine derivatives of tannin, bromine derivatives of peptone, and similar compounds, is based upon the precipitation of the halogen by silver nitrate in the presence of metallic zinc and nitric acid. A known weight of the organic compound is dissolved and mixed with an excess of standard silver nitrate solution; nitric acid and zinc are then added, and, after the latter has dissolved, the liquid is diluted to a known volume. The silver nitrate remaining in solution is then determined in an aliquot part of the liquor, after filtration, the amount of halogen originally present being calculated from the data obtained.
—W. E. F. P.

Determination of moisture in coals. Archibald and Lawrence. *See* IIA.

Modification of the sulphonation test for creosote. Bateman. *See* III.

Determination of cellulose in woods and textile fibres. König and Hühn. *See* V.

Further tests on vat colours [and a test for oxycellulose and hydrocellulose]. Ermen. *See* VI.

Water of hydration and analysis of plaster. Moye. *See* IX.

Determination of vanadium [in iron and steel]. (1) Demorest. (2) Cain and Demorest. *See* X.

Rapid determination of vanadium in steels, ores, etc. Cain and Hostetter. *See* X.

Zinc dust tests. Sharwood. *See* X.

Cadmium and nickel in cyanide bullion. Dewey. *See* X.

Assay of ores containing platinum metals. Dart. *See* X.

Direct determination of small amounts of platinum in ores and bullion. Dewey. *See* X.

Determination of boric acid in nickel plating baths. Wogrinz and Kittel. *See* X.

Action of salts of mercury and mercury on aluminium. Application to the analysis of aluminium. Nicolardot. *See* X.

Precautions to be taken in determining the Polenske value. Arnold. *See* XII.

Behaviour of refined sesamé oil. Zimmermann. *See* XII.

Determination of petroleum spirit and benzene hydrocarbons in turpentine oil. Marcusson. *See* XIII.

Light leather liming control. Wood and Law. *See* XV.

Determination of calcium carbonate in soils. Shrewsbury. *See* XVI.

Valuation of the quality of the beet from the quotient of purity of the juice obtained by the digestion method. Stanek. *See* XVII.

Density tables for use in sugar analysis. Domke. *See* XVII.

Determination of nitrogen in betaine (and in molasses and vinasse). Stoltzenberg. *See* XVII.

Detection of methyl alcohol. Wirthle. *See* XVIII.

Determination of butter fat and cocoanut oil in margarine. Arnaud and Hawley. *See* XIXa.

Modification in the determination of malic acid [in fruit juices]. Pratt. *See* XIXa.

New reactions for salicylic acid. Barral. *See* XX.

Determination of acetaldehyde in paraldehyde. Richter. *See* XX.

Diphenylamine test for guncotton. Kullgren. *See* XXII.

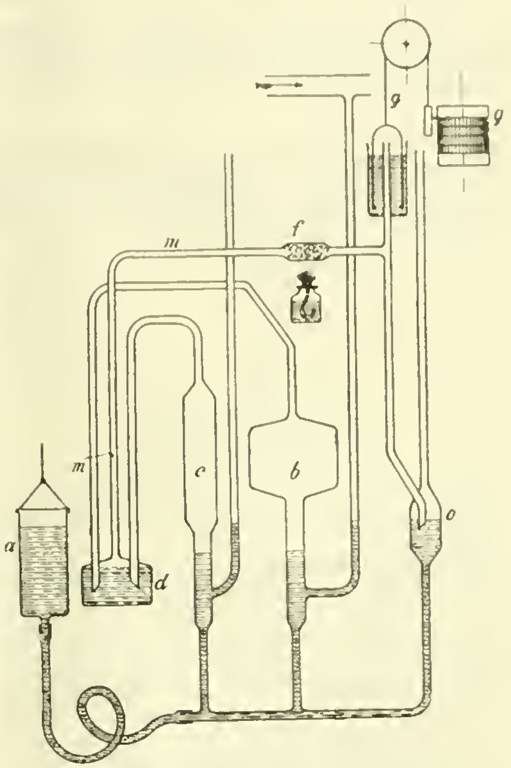
Patents.

Inflammable gases in mines and other places; Detection of ——. W. J. L. Sandy, Peckham, and H. W. Franks, Croydon. Eng. Pat. 7978, March 30, 1911.

Claim is made for the use, in an apparatus for testing inflammable gases, of metallic wire or strip coated with granular platinum which is prepared as follows:—Platinum chloride is mixed with resin oil, oil of myrrh, etc., to precipitate the metallic platinum. After removing the oil, the precipitated platinum is made into a paste and used to coat the metallic wire.—G. W. McD.

Gases; Automatic analysis of ——. G. A. H. Binz, Enfield, Middlesex. From Allgem. Feuertechnische Ges. m. b. H., Berlin. Eng. Pat. 13,692, June 8, 1911.

The apparatus is of the type in which a measured quantity of the gas to be analysed is mixed with a measured quantity of another gas capable of reacting chemically with one or more constituents thereof when the mixture is passed over a contact-substance or heated, the result of the analysis being calculated from the change in volume. The gas to be analysed and the reacting gas are drawn into and expelled from the vessels, *b*, *c*, respectively by the movement of the sealing liquid caused by the raising and lowering of the vessel, *a*, by a hydraulic motor. Upon the upward movements of the vessel, *a*, the gases are forced through a liquid valve, *d*, into a common delivery pipe, *m*, leading past the heated contact-material, *f*, to the automatic measuring-bell and recorder, *g*. The gases escape from the bell through the seal, *o*, when the vessel, *a*, is in its lower position. It is arranged that the vessel, *c*, delivers gas after the vessel, *b*, has been emptied, so that the dead space in the valve, *d*, and pipe, *m*, is filled with gas from *c*, which escapes through the seal, *o*, at the beginning of the next analysis and does not affect the result.—H. H.



Air; Apparatus for testing ——. W. S. Leech. Brooten, Minn. U.S. Pat. 1,022,955, April 9, 1912.

The apparatus comprises a board adapted for hanging on the wall and having brackets carrying a reservoir for the reagent, a spreader beneath the outlet of said reservoir, and a receiving vessel beneath the spreader. The reagent flows over the spreader so as to expose a large surface of liquid to the air, and is collected in the receiver. The reservoir is held in a spring clip so as to be easily removable for re-charging.—A. T. L.

Thermo-electric calorimetric bomb. C. Féry. Fr. Pat. 436,330, Nov. 13, 1911.

A steel bomb is suspended inside a brass cylinder by rods so that the steel and the brass form a thermo-electric couple. The difference of potential can be measured and gives a direct determination of the temperature of the bomb after firing the charge. (See also this J., 1912, 360.)—G. W. McD.

Stirrer for use in quantitative analysis by electrolysis. Gebr. Raacke. Ger. Pat. 243,761, June 18, 1910.

The stirrer has the form of a bell and is provided at its lower end with blades, after the fashion of a centrifugal pump. The movement of the electrolyte is mainly in a radial direction.—A. S.

Viscosity of liquids; Process for measuring the ——. Dr. Paul Meyer A.-G. Ger Pat. 244,098, June 16, 1911.

The method consists in measuring the time required, on application of a definite force, to raise through a definite distance a body suspended from a lever or the like and immersed in the liquid.—A. S.

Books Received.

Grundlagen der anorganischen Chemie. Von Wilhelm Ostwald. Dritte, umgearbeitete Auflage. Wilhelm Engelmann's Verlag, Leipzig. 1912. Price, bound, M. 18.

8vo volume, containing 831 pages of subject matter, with 131 illustrations, and an alphabetical index. The subject matter is classified as follows:—I. Substances and mixtures. II. Laws of conservation of mass and of energy. III. Changes of state as regards form, etc. IV. Solutions. V. Combustion phenomena. Oxygen. VI. Chemical elements. VII. Oxygen. VIII. Hydrogen. IX. Water. X. Hydrogen peroxide. XI. Chlorine. XII. Oxygen compounds of chlorine. XIII. Bromine, iodine, and fluorine. XIV. Sulphur and its compounds. XV. Selenium and tellurium. XVI. Nitrogen. XVII. Phosphorus. XVIII. Carbon. XIX. Silicon. XX. Boron. XXI. Argon. Helium. Neon. Krypton and Xenon. XXII. Potassium. XXIII. Sodium. XXIV. Rubidium, Cæsium, Lithium and Ammonium. XXV. Calcium. XXVI. Magnesium. XXVII. Strontium, Barium, Beryllium. XXVIII. Aluminium. XXIX. Iron and its group. XXX. Copper. XXXI. Lead. XXXII. Mercury. XXXIII. Silver. XXXIV. Thallium. XXXV. Bismuth. XXXVI. Antimony. XXXVII. Arsenic. XXXVIII. Vanadium group. XXXIX. Tin. XL. Uranium, Tungsten. Molybdenum. XLI. Gold and Platinum. XLII. The Periodic System. XLIII. The radio-active elements.

Investigations of Explosives used in Coal Mines. Department of the Interior. Bureau of Mines. Bull. 15. U.S.A. By Clarence Hall, W. O. Snelling, and S. P. Howell. With a chapter on Natural Gas used at Pittsburgh, by G. A. Burrell, and an Introduction by Chas. E. Munroe. Government Printing Office, Washington, U.S.A. 1912.

8vo volume, containing 194 pages of subject matter, seven plates of illustrations, and five figures; also an alphabetical index. The subject matter is classified as follows: —I. Nature and composition of explosives. II. Thermochemistry of explosives. III. Characteristics of the natural gas used at Pittsburgh. IV. Apparatus and methods for physical tests of explosives. V. Results of tests with permissible explosives. VI. Results of tests with dynamite. VII. Results of tests with black blasting powder. VIII. Results with four foreign explosives (named A, B, C and D). IX. Bureau of Mines tests of explosives. Conditions under which explosives are tested. Test requirements of explosives. Definition of permissible explosives.

Die Fabrikation von Bittersalz und Chlormagnesium als Nebenbetriebe der Chlorkalium- und Kaliumsulfat-Fabrikation. Von Dr. August Berge. Wilhelm Knapp's Verlag. Halle a. S., Germany. 1912. Price M. 3.60.

8vo volume, containing 59 pages of subject matter, with 15 illustrations, and an alphabetical index. The text is subdivided as follows:—I. By-products of potassium chloride-manufacture. II. The manufacture of Epsom salts (magnesium sulphate) from kieserite. III. The recovery of magnesium chloride from the final liquors of potassium chloride manufacture—(*a*) Fused magnesium chloride; (*b*) Oxidation and precipitation of the iron dissolved in the final liquors; (*c*) The finished magnesium chloride and its employment.

Fourth Annual Report of the Governing Body of the Imperial College of Science and Technology, South Kensington. For the year ending 31st August, 1911. (Presented to Parliament by Command of His Majesty.) Wyman and Sons, Ltd., Fetter Lane, London, E.C.; and 32, Abingdon Street, S.W. Oliver and Boyd, Tweeddale Court, Edinburgh. E. Ponsonby, Ltd., 116, Grafton Street, Dublin. 1912. Price 2½d.

Lectures on Cellulose. By C. F. Cross. The Institute of Chemistry of Great Britain and Ireland, 30, Bloomsbury Square, London, W.C. 1912. These lectures were delivered before the Institute of Chemistry, at University College, London, January 26th and February 23rd, 1912.

8vo pamphlet containing 52 pages of subject matter. Lecture I. (i), Cellulose in relation to science and industry, etc. (ii), Cellulose and derivatives. (iii), Colloids. (iv), "Normal cellulose." (v), Systematic chemistry of cellulose. (vi), Ligno-celluloses. Wood celluloses. By-products, and utilisation, etc. (vii), Special study of chlorination as a quantitative method. Lecture II. (i), Starch. "Feculose" and the true starch colloid. (ii), Hemi-celluloses from seed-endosperms. Tragasol. Cutiloid, a new colloid, and applications. (iii), Cellulose hydrates. (v), Wood cellulose and forestry, etc.

The Occurrence of Potash Salts in the Bitterns of the Eastern United States. By W. C. Phalen. U.S. Geological Survey Bulletin 530–B. 18 pages.

These papers deal with experiments now in progress in the search for potash in the United States, with the purpose of developing a home industry and reducing the importation from Germany. Chapter A tells of experiments in well drilling in Nevada, and Chapter B gives results of a systematic study of the brines, bitterns, and rock-salt deposits east of the Rocky Mountains. As yet potash in commercial quantities has not been discovered, but the information collected seems to warrant further investigation.

*New Books.

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VI. *Cappelli*, G.: La tintura del cotone e fibre vegetali affini: trattato teorico pratico ad uso degli studenti, ecc. Torino. 8°. p. 185, con. tav. 1912. Lire 6.

Gardner, P.: Die Mercerisation der Baumwolle u. die Appretur der mercerisierten Gewebe. 2, völlig umgearb. Aufl. (IV, 196 S. m. 28 Fig.) 8°. Berlin. J. Springer. 1912. Cloth M. 9.

VII. *Kailan*, A.: Ueber die chemischen Wirkungen der durchdringenden Radiumstrahlung. 2. Der Einfluss der durchdring. Strahlen auf Alkalijodide in wässer. Lösg. (28 S.). gr. 8°. Wien. A. Hölder. 1911. 85 Pf.

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XI. *Morse*, H. W.: Storage Batteries. The Chemistry and Physics of the Lead Accumulator. Cr. 8vo. Macmillan. London. 1912. Net 6s. 6d.

XIII. *Brown*, W. N.: The Principles and Practice of Dipping, Burnishing and Lacquering and Bronzing Brass Ware. 2nd Ed. Revised and Enlarged. Cr. 8vo, pp. 46. Scott, Greenwood. London. 1912. Net 3s.

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XV. *Magri*, G.: Cuoi e sostanze adoperate nella conceria; saggi fisici, chimici, tecnici o concordati. Collezione di prontuari per l'esame e l'analisi dei principali prodotti agricoli, industriali e commerciali. Torino. 16°. p. xx, 353. 1912. Lire 6.

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XXII. *Pozzi-Escot*, E.: Explosions et explosifs, phénomènes d'explosion (Actualités chimiques et biologiques). in-18. J. Rousset. Paris. 1912. Fr. 150.

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[*] Dissertations.

[Prices vary, ranging from two to three shillings.]

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IV. *Lifschitz*, J.: Ueber die polychromen Salze aus Violursäuren. Ueber die optischen Eigenschaften der Azo- und Diazoverbindungen. Leipzig. 1911. 69 S. 8°.

VII. *Doelter*, C.: Ueber Gleichgewichte in Silikatschmelzen und über die Bestimmung des Schmelzpunktes des Calciummetasilikates. Wien. 1911. 26 S. m. 3 Fig. Gr.-8°.

Kailan, A.: Ueber die chemischen Wirkungen der durchdringenden Radiumstrahlung. 1. Der Einfluss der durchdringenden Strahlen auf Wasserstoffsuperoxyd in neutraler Lösung. Wien. 1911. 16 S. Gr.-8°.

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XII. *Bubanovic*, F.: Einige Kapillaritätsbestimmungen zwischen Olivenöl und wässerigen Lösungen fettlöslichen Substanzen. Berlin. 1911. 8 S. 8°.

XIII. *Kahan*, M.: Ueber den Akkrakopal und über den Beninkopal. Beitrag zur Kenntnis der westafrikanischen Kopale. Bern. 1911. 72 S. 8°.

XVI. *Czermak*, W.: Ein Beitrag zur Erkenntnis der Veränderungen der sogenannten physikalischen Bodeneigenschaften durch Frost, Hitze und die Beigabe einiger Salze. Breslau. 1911. 42 S. 8°.

Hume, A. N.: Ueber den Einfluss der Gründüngung mit Senf in verschiedenen Entwicklungsstadien und bei verschiedener Stickstoffdüngung auf die Denitrifikation. Göttingen. 1911. 75 S. 8°.

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XVIII. *Euler*, H., u. A. *Fodor*: Ueber ein Zwischenprodukt der alkoholischen Gärung. Berlin. 1911. 13 S. 8°.

Müller, Cl.: Beiträge zur Bestimmung von Fuselöl in alkoholischen Flüssigkeiten. Leipzig. 1911. 58 S. 8°.

XIXA. *Jekelius*, W.: Inversion des Rohrzuckers und ihre Beziehungen zu den qualitativen Veränderungen verschiedener Futterrübensorten während der Lagerung. Halle. 1911. 106 S. 8°.

XX. *Bromberger*, H.: Pharmakochemische Untersuchungen über die Rinde von Rhamnuscatharticus. Bern. 1911. 45 S. 8°.

Sypkens-Toxopéus: Beiträge zur Kenntnis des Frangula-Emodins. Bern. 1911. 60 S. 8°.

XXII. *Meissner*, G.: Studien über Nitrierung der Cellulose und Zersetzung der Nitrocellulose durch Säuren und Alkali. Rostock. 1911. 51 S. 8°.

XXIII. *Hoffmann*, M.: Beiträge zur Kenntnis der analytischen Chemie des Zinns, Antimons und Arsens. Berlin. 1911. 51 S. 8°.

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[*] Compiled by H. Grevel and Co., 33, King Street, Covent Garden, London, W.C., from whom all the works in the preceding lists can be obtained.

Journal of the Society of Chemical Industry.

No. 10, Vol. XXXI. MAY 31, 1912. No. 10, Vol. XXXI.

Official Notice.

The National Physical Laboratory has commenced an investigation into the properties of glass for optical and other scientific purposes and a Committee has been appointed thereto. Members of the Society who may be able to offer assistance or suggestions bearing on the subject are requested to communicate with the Secretary of this Society.

London Section.

Meeting held at Burlington House on Monday, May 6th, 1912.

MR. E. GRANT HOOPER IN THE CHAIR.

A NEW APPARATUS FOR THE COKING TEST OF COAL.

BY R. LESSING, PH.D.

The estimation of volatile matter in coal is one of the most important, if not the most important, test for the characterisation and valuation of fuels. It consists in determining the loss in weight of a small quantity of the powdered sample, usually 1 grm. by heating it in a covered platinum crucible to a high temperature. Although this is an extremely simple operation if skilfully carried out, it may tell an observing and experienced worker more about the properties of a particular coal than analytical and calorimetric values can do. The expression of results is, however, usually restricted to a statement of the percentage quantity of volatile substance driven out upon heating the sample, with occasional notes on the appearance of the coke left behind.

The absolute accuracy of the test as a quantitative method is not of a very high order, and only when working under standard conditions, which apply even to matters of minute detail, can satisfactory results be obtained. A good deal of work has been done by various investigators for the purpose of ascertaining the experimental conditions which yield comparable results, when applied by different workers in different laboratories. It has been found that the size and thickness of the crucible, the length of flame, the quality of gas (Fieldner and Davis, J. Ind. and Eng. Chem., 1910, **2**, 304), the type of burner and its distance from the crucible, the time and periodicity of heating, and various other factors influence the yield of volatile matter and solid residue to be obtained. Even the fact of the metal of the crucible being bright or dull may have a bearing upon the results, the latter condition increasing the coke yield.

As long ago as 1899 the Committee on Coal Analysis of the American Chemical Society proposed (J. Am. Chem. Soc. **21**. 1122; this J., 1900, 174), the adoption of a method which was a modification of the method originally suggested by Hinrichs (Z. Anal. Chemie, 1869, 133). Constam and his collaborators made very exhaustive researches comparing the best known methods with each other and with the practical results obtained on the large scale. In the course of their study which extended over several years they came to the conclusion that the "American method" yielded the least discrepant results and deserved preference to its rivals. A proposal submitted by Constam to the Analytical Section of the Seventh International Congress of Applied Chemistry in favour of the "American method" led to a more general adoption of this method which had been largely used in this country and almost exclusively in America.

Practically the only point on which uniformity was so far desired and attempted, was the quantitative determination of volatile matter. Little or no consideration is being given, in most of the methods, to the properties of the coke obtained. At the best the nature of the coal is described by stating the swelling or non-swelling, the caking or non-caking character of the coal. In many cases, however, the differences between the various kinds of coal in these respects cannot be very easily defined by the product of the crucible test.

I have therefore endeavoured to devise an apparatus which will show more markedly the difference in the coke produced from various coals, and which at the same time should allow one to follow to some extent the process of carbonisation in each particular case.

Although the principal object for the design of the apparatus was the qualitative distinction of different kinds of coal, it is expected that it will also be useful for quantitative determinations, as by its construction some of the vital errors of the crucible method are obviated. The sources of error of the crucible test may be classed in two groups:—

(1) Factors tending to increase the "volatile" value. (*a*) Burning of coke in the more or less oxidising atmosphere. (*b*) "Spitting" of coal-dust due to explosive character of gasification of some coals or rush of currents produced by the flame.

(2) Factors tending to decrease the "volatile" value. (*a*) Insufficient coking of the coal. (*b*) Secondary catalytic decomposition of volatile products on the walls of the crucible. (*c*) Decomposition of volatile products by radiation in the waste space of the crucible. (*d*) Deposition of carbon during coking by too rapid primary decomposition of volatile coal substance.

These factors, being nearly always at work concurrently, may compensate each other and lead to results in fairly satisfactory agreement with large scale working results, but their presence also explains the difficulty attached to obtaining an agreement of figures under slightly altered conditions.

Various suggestions have been made to avoid the influence of the oxidising atmosphere. Finkener and after him Hinrichsen and Taczak (Glueckauf, 1908, 1325; see this J., 1908, 930) carried out the test in a current of hydrogen, but Constam and Rougeont (J. f. Gasbel., 1906, **49**. 874; Rep. 7th Int. Cong. Appl. Chem., 1910, Sect. I. 118; this J., 1909, **28**, 692), showed that the coal substance was not completely decomposed by their method. Quite recently S. W. Parr (J. Ind. and Eng. Chem., 1911, **3**. 900; this J., 1912, 17) proposed to moisten the powdered coal in the crucible with kerosene in order to establish a reducing atmosphere and also prevent the dry powder from "spitting."

The secondary decomposition of volatile products largely depends on the amount of surface with which they come in contact. The coal in the crucible, being spread in a layer only a few millimetres thick, occupies less than one-tenth of the total capacity, and the gas and tar vapours evolved upon heating come in contact with a much larger heated surface than appears to be desirable. A proof that decomposition by catalytic action takes place on the inner surface of the platinum crucible may be found in the fact, frequently observed and already referred to, that crucibles dull from constant use yield lower percentages of volatile matter and higher coke values, which may be explained by the deposition of carbon on the rough surface, whilst polished crucibles would be less likely to induce a similar action.

In order to avoid the drawbacks due to the waste space above the coal and the excessive amount of heated surface in contact with the gas and vapours in the crucible test, I prefer to carry out the test in a small cylindrical vessel, applying the heat principally to the coal itself and not to the volatilised products. The waste space above the coal is done away with by introducing a piston which rests on the powdered coal and fits loosely into the outer cylinder to allow free exit to the gas and vapours.

Fig. 1 is a diagrammatic view of the principal part of this apparatus. A is the heating tube made of quartz glass; being a non-conducting medium an electric resistance coil of platinum wire can be wound round directly. A number of quartz pin points are fused on this tube to keep the turns of the platinum coil apart. In order to concentrate the heat where it is required the platinum wire is first wound to a coil of about 3 mm. diameter and this coil is then wound round the heating tube. A further advantage of this method is the fact that the coil attaches itself very well to the tube by its own elasticity. The diagram shows how most of the heat is applied at the bottom of the tube for a distance of about 15 mm., the turns then getting wider so that the heat is just sufficient to keep the tar volatilised. The reacting vessel proper is a flanged quartz glass tube, B, which fits loosely into the heating tube. It has an internal diameter of about 10 mm. All experiments described in this paper were done in quartz tubes, but platinum tubes may be employed instead. One gram of the powdered sample of coal is placed into this tube and a third tube, C, also made of quartz glass, and loosely fitting into the reacting tube, is placed on top of the coal before the commencement of each test. By altering the weight of tube, C, or filling it with various quantities of quartz powder, the pressure on the coal during the test may be altered.

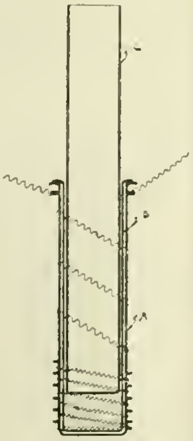


FIG. 1.

Tube A is permanently embedded in an insulating material for which kieselguhr has been chosen. Suitable resistance must be provided according to the voltage of the supply current and a rheostat is combined with the furnace itself. By this arrangement the temperature can be altered at will.

When making a test, the coal is weighed into tube B, tube C is put in, and the whole inserted in tube A. The current is then turned on and as the temperature rises, so the different stages of carbonisation can be observed. In most cases the free moisture will go off very quickly; some of the occluded gases follow immediately, and after a short time tarry vapours are evolved which increase in volume according to the coal under test. The heavier tars and pitchy matter follow and the latter condenses rapidly on the cool parts of tube C. Starting all cold, the test takes from 5 to 7 minutes. The tubes are then allowed to cool down. The tarry matter at the mouth of tube B may be burnt off in a Bunsen flame without any risk of interfering with the coke.

The practical value of this apparatus seems to me to lie principally in the fact that the coke obtained in it brings out the peculiarities of a coal in a much more striking fashion than does the coke in the crucible test.

Diagram 2 depicts the cokes obtained from twenty different coals. One gram. of each sample having been powdered to the same fineness and heated in exactly the same manner, gave these widely different results.

The following analytical data were obtained for these 20 samples:—

Lab. No.	Air-dry Coal.				Coal Substance.	
	Moisture.	Volatile matter.	Carbon.	Ash.	Volatile matter.	Carbon.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
1	0·74	30·42	64·52	4·32	32·04	67·96
2	0·48	33·92	64·04	1·56	34·64	65·36
3	0·75	27·44	63·23	8·58	30·27	69·73
4	0·65	30·55	64·23	4·57	32·24	67·76
5	0·53	28·48	64·52	6·47	30·61	69·38
6	0·87	33·67	61·82	3·64	35·26	64·74
7	0·54	33·39	61·82	4·25	35·07	64·93
8	3·88	27·31	64·68	4·13	29·68	70·32
9	1·18	36·37	59·86	2·59	37·79	62·21
10	1·18	25·89	66·41	6·52	28·06	71·94
11	1·42	37·15	58·36	3·07	38·89	61·11
12	1·54	36·80	60·06	1·60	38·00	62·00
13	3·15	35·98	58·63	2·24	38·03	61·97
14	1·62	35·93	59·92	2·53	37·48	62·52
15	9·87	32·12	50·33	7·68	38·96	61·04
16	1·70	33·12	57·42	7·76	36·57	63·43
17	5·16	33·23	54·29	7·32	37·97	62·03
18	7·77	34·14	54·15	3·94	38·67	61·33
19	7·07	35·21	54·80	2·92	39·12	60·88
20	5·63	32·19	57·05	5·63	35·74	64·26

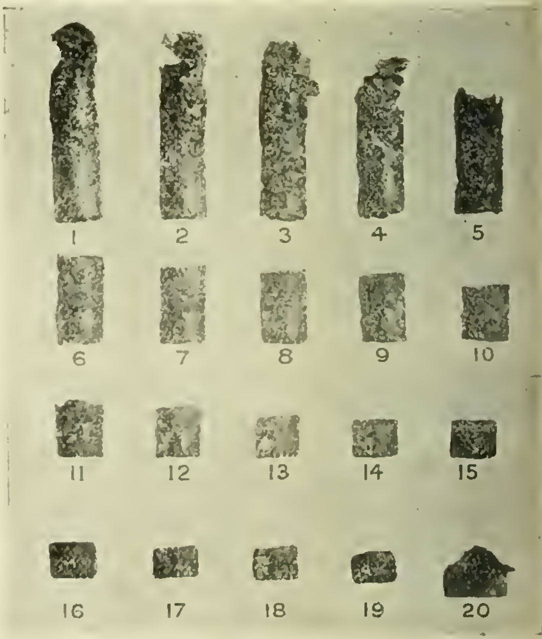


FIG. 2.

It will be seen from the values obtained for volatile matter that the approximate analysis by no means indicates the different behaviour any of these coals would undergo upon heating; this behaviour would show itself not only upon heating in a closed vessel such as a gas retort or coke oven but also in the course of combustion on the grate of an industrial furnace or a domestic fireplace.

That the differences are more marked here than in the crucible test may be seen in diagram 3, where cokes obtained in the latter test from exactly the same coals are compared with those obtained in the new apparatus.

This apparatus may, however, not only be used for a differentiation between the various species of coal, but it actually serves as a means of identification of individual kinds of coal. Any particular coal will give, at all times, when treated in the apparatus under similar conditions, a coke identical in all respects with another specimen produced from the same sample. The similarity is indeed a very striking one, and the four cokes selected at random from a very large number of specimens and reproduced in diagram 4 will illustrate this point.

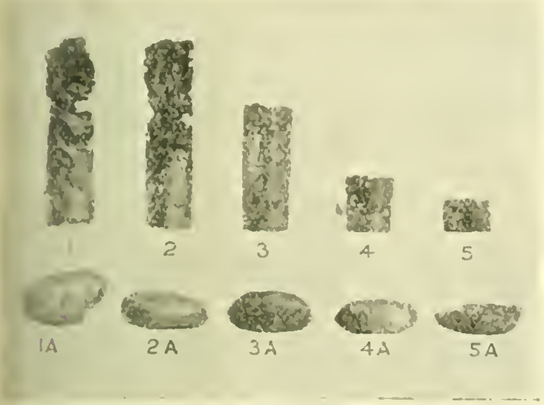


Fig. 3.

The results of three tests on each of four samples are shown here, and it will be observed that even in small details the specimens bear a very close resemblance to each other. Coals 2 and 3 always give the mushroom-like appearance when coked in the apparatus; this is no doubt due to a rapid caking of the exterior layers of the coal before the heat has reached the interior of the charge. When the heat finally penetrates the interior of the charge, the gas evolved bursts the outer crust open, with the peculiar result shown in the diagram. Coal 2 is known to have given considerable trouble both in gas and coke oven works.

The comparison of different coals and the identification of individual samples can be carried still further by making sections of the cokes obtained, and it appears that the interior structure of the coke specimens is even more distinct than their outward appearance. These sections, in conjunction with the observations made with regard to the liberation of volatile matter, also serve to permit of a good insight into the process of carbonisation and this should open a wide field for investigation.

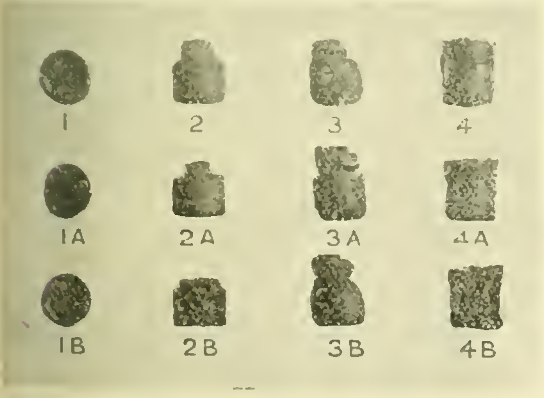


Fig. 4.

The apparatus has further proved to be of great use in investigations into the mode of coking particular kinds of coal, as it lends itself well to alterations in the conditions of carbonisation such as temperature, rate of heating, size of particles, influence of moisture, ash, addition of chemicals, and so forth. Water or steam may be introduced through a narrow silica tube, and the effect of this at various stages of gasification can be studied.

Although the principal consideration in designing the apparatus was to obtain a means for generally studying the behaviour of bituminous coals upon heating, satisfactory results have been obtained when employing it for a quantitative estimation of volatile matter. In the following table results from tests in the new apparatus are compared with those obtained by the "American crucible" method.

Volatile matter.

No.	Electric furnace.	American method.	Diff.
	per cent.	per cent.	per cent.
1...........	16·79	15·66	+1·13
2...........	25·55	25·32	+0·29
3...........	26·89	27·18	—0·29
4...........	28·30	28·18	+0·12
5...........	30·68	30·03	+0·65
6...........	34·19	34·34	—0·15
7...........	34·81	34·61	+0·20
8...........	34·95	35·41	—0·46
9...........	35·21	35·54	—0·33
10...........	40·75	41·52	—0·77

It will be seen that most figures are in fairly satisfactory agreement with those obtained by the crucible method. My explanation of the discrepancy in the case of the first coal, which is a Westphalian coal of poor gas yield, is that in the crucible test the volatile matter on account of its small quantity did not escape with the rapidity usual in richer coals, and being somewhat stagnant in the crucible was subject to excessive thermal decomposition. The formation of fixed carbon would lower the volatile value in the direction observed.

I am indebted to my assistant, Mr. A. S. Wilson, for skilfully carrying out most of the experimental work in connection with this paper, and I also wish to thank Messrs. Baird and Tatlock, Ltd., the makers of the apparatus, and The Silica Syndicate, Ltd., who supplied the quartz glass parts, for their kind assistance.

Discussion.

Mr. W. J. A. **Butterfield** said he might take a little credit, perhaps, for advocating the adoption in this country as the standard method of determining the volatile matter in coal of that recommended by the Committee of the American Chemical Society. That Committee standardised the conditions of testing with a gas flame as far as it was thought reasonable; they specified the limits of weight of the crucible, but he did not remember that they specified that it should be of any particular dimensions or proportions. Dr. Lessing had gone a long way in that direction by narrowing the vessel in which the test was carried out; and he wondered whether more consistent results would be obtained with a gas flame if a long narrow vessel, such as Dr. Lessing had used, were adopted. When watching the gasification, it occurred to him that this test could be brought more nearly into line with the practical conditions of coking in ovens or in gas works if the outer furnace tube were heated to the full temperature at the start. The period of preliminary heating up of the charge would be thus curtailed, and the large-scale conditions more nearly realised. The sample of coloured coke was very interesting, and he should like to know if Dr. Lessing had ascertained its mineral constituents. The results of the new method would be extremely useful because they would be strictly comparable, owing to the temperature being under control and the vessel being always of the same dimensions. The varying dimensions of the crucible in the old forms of test were probably responsible for many of the variations in different observers' results. One point that was often neglected in the old test was the support of the crucible. If a pipe-clay triangle were used, the abstraction of heat from the crucible was very much greater than when either silica points or a thin platinum triangle was used.

Dr. H. G. **Colman** said that the paper was of exceptional interest to those concerned with the carbonisation of coal, less perhaps from the point of view of determining the volatile matter, which was what the crucible test was generally used for, than for the purpose of ascertaining what was taking place in the carbonisation so far as the nature of coke produced was concerned. With the crucible the experienced observer could judge to a certain degree of the quality of the coke which would be produced, even on a large scale; but at the same time it did not take one very far. With the author's modification of dimensions and method of heating, the information available from this test with regard to the coke was certainly increased most remarkably. He admitted that it would not be possible to judge straight away from the examination of a coal in this apparatus, in a one gramme sample, how it would behave on a large scale, because the conditions were so different, and an unwise utilisation of these results would perhaps do harm. But that was always the case. Small scale experiments must be used with a certain amount of common-sense; and if one realised their limitations they afforded great assistance in working on a large scale. The method opened up a wide field for further work in many ways, such as in the determination of the effect of mixtures of coal on the coking. At present very little was understood of what occurred in the actual formation of coke; slight differences in conditions had a remarkable effect on the physical properties of the product. One of the most remarkable things about the method was the way in which, on repeated tests of the same sample, the physical structure of the coke was reproduced almost exactly each time.

Dr. F. M. **Perkin** asked if equally good results might not be obtained if, instead of using a piston, a vacuum was used—for which method the apparatus would readily lend itself. Different results, and possibly a different product, might be obtained. Of course, in ordinary carbonisation, a vacuum was not employed, but it might be interesting to try it in the laboratory.

Mr. **Hemingway** said that some 35 years ago Mr. E. A. Parnell, at Swansea, had drawn his attention to the curious colour effects in some coke. A suggestion was made that it must be due to copper, but Mr. Parnell said it was not.

Dr. **Lessing**, in reply, said that at first he used a crucible of cylindrical form. He began by heating this tube in a gas flame, but it was extremely difficult to do so from the side only, and not from the bottom. If heated from the bottom, the whole charge shot up, as soon as some gas was evolved; consequently, one could not keep the coal down in the heating zone. When heating from the side, that applied also to a certain extent, and for that reason he was obliged to adopt the piston, which at the same time served the additional purpose of keeping the air out. The air was effectively kept out—very much more so than in the crucible test. It would be possible to evacuate the whole system but that would not apply to the ordinary working conditions, and therefore he had not done so yet. He had thought, as others had, of applying a vacuum to get rid of the gas, and probably it would be necessary in a construction intended for collecting the gas.

With regard to starting cold, as he had already mentioned, this apparatus lent itself to variations of the working conditions and he had largely availed himself of that opportunity. For theoretical reasons, he had favoured at first, as Mr. Butterfield did, starting hot, as one would be able to reproduce the ordinary conditions better; but the carbonisation of the tar produced in the higher part of the tube presented certain difficulties. Starting cold gave very good results, and one was at least able to follow the course of carbonisation. The two methods might be compared to "continuous" and "intermittent" carbonisation in the retort—the cold being the continuous, and the starting hot the intermittent carbonisation. He was very much puzzled about the specimens of coloured coke; fortunately they had a specimen of the ash of that particular coal, which was in no way different from similar coals which did not show this effect. He believed this was purely optical, and his explanation, which he gave with caution, was that some tar would be fixed at a certain temperature in a thin film on the coke and thus produce some interference effect. Dr. Colman had mentioned the application of the test to mixtures; they were tried for commercial purposes, and gave very remarkable results. The influence of ash could also be studied, which explained some of the effects observed in coking.

Mr. **Butterfield** asked whether the effect of pressure on the piston had been tried. This might give conditions much more nearly approaching those obtained in many types of coke ovens.

Dr. **Lessing** said he had applied different pressures by using piston tubes of the same diameter but different weight; he had also filled it with fine quartz powder to increase the weight. That did not mean a great increase in the pressure, but it produced different results. Curiously enough, as a rule, the higher pressure tended to form more swelled coke than the lower pressure.

A NEW METHOD FOR THE ESTIMATION OF FERROCYANIDES.

BY H. E. WILLIAMS.

There are several methods for the estimation of ferrocyanides, but those in most general use can be classed under two heads, viz.:—(1) Titration of the ferrocyanide solution with a standard solution of a metallic salt such as the salts of zinc or copper. (2) Decomposition of the ferrocyanide into hydrocyanic acid by suitable means, absorption of the evolved hydrocyanic acid in a solution of caustic alkali, and titration of the cyanide solution with standard silver nitrate.

In the former method the heavy metal solution is standardised with a pure solution of a ferrocyanide of known strength, and all subsequent estimations must be made under exactly similar conditions to the standard to produce concordant results—that is to say, if potassium ferrocyanide is used as a standard, the ferrocyanide to be estimated must be combined with potassium; and if standardised with sodium ferrocyanide, the ferrocyanide to be estimated must be combined with sodium. Again, the presence of salts of sodium or potassium, such as the sulphate or chloride, in most cases greatly affect the result.

Decomposition of the ferrocyanide into hydrocyanic acid is free from these objections, as the cyanide solution can be titrated easily and accurately, the end point being sharp and the silver solution capable of exact standardisation. When potassium ferrocyanide is distilled with dilute sulphuric acid only about 50 per cent. of the total hydrocyanic acid is evolved according to the well-known equation. $2K_4Fe(CN)_6+3H_2SO_4=6HCN+Fe''K_2Fe(CN)_6+3K_2SO_4$. The insoluble ferrous potassic ferrocyanide formed, is decomposed by acids very slowly; by increasing the strength of the acid the rate of decomposition is slightly increased in proportion, when the solution in the still has a strength of 30 per cent. sulphuric acid most of the ferrous ferrocyanide is decomposed, but owing to the high concentration of the acid some of the hydrocyanic acid liberated is destroyed.

If sodium, ammonium, or magnesium ferrocyanide is substituted for the potassium salt, the reaction follows the same course, forming ferrous sodic, ferrous ammonic, or ferrous magnesic ferrocyanide. If however calcium, barium, strontium, or lithium ferrocyanide is heated with dilute acid, the reaction proceeds rather better, for these bases do not appear to possess the tendency to form double ferrous ferrocyanides and thus two-thirds of the total hydrocyanic acid is readily obtained according to the following equation: $3Ca_2Fe(CN)_6+6H_2SO_4=12HCN+Fe_2''Fe(CN)_6+6CaSO_4$. The remaining one-third, which exists in combination as pure ferrous ferrocyanide, is decomposed by moderately strong acid at a somewhat greater rate than the double ferrous ferrocyanides, but still this operation cannot be performed without loss of hydrocyanic acid.

In the method worked out by Feld, the ferrocyanide solution, after the addition of dilute alkali, is boiled, then an excess of magnesium chloride solution is added and boiled a few minutes and a solution of mercuric chloride is then added and again boiled and finally the whole liquor is distilled with sulphuric acid. By these operations the ferrocyanide is first converted into mercuric cyanide and then into hydrocyanic acid which is absorbed in caustic alkali solution and titrated with silver in the usual manner. This process has been the subject of some criticism by Skirrow (this J., 1910, 319) with which the writer in the main agrees. The possible errors caused by this process are due principally to the fact, that it is essential that all the ferrocyanide be converted into mercuric cyanide before distillation with the acid, and also to the possible losses occuring in the preliminary boiling operations, this latter loss occurs principally in the boiling with magnesium chloride; as much as 1 per cent. can be lost in this way.

In the process about to be described most of these possible sources of error are avoided and it is at the same time both simple and accurate. A small amount of cuprous chloride is added to the ferrocyanide to be estimated together with dilute acid, and the mixture can at once be distilled, when the whole of the cyanogen contents of the ferrocyanide is driven off as hydrocyanic acid. No preliminary boiling is necessary, and the small quantity of cuprous chloride required can be added to the still after the distillation has started without affecting the result.

The best means of carrying out the estimation according to this method is to dissolve 0·5 grm. of the ferrocyanide in 100 c.c. of water and transfer to a 250—300 c.c. distilling flask and then add 0·05—0·1 grm. of cuprous chloride, dissolved in a few drops of hydrochloric acid, or a saturated solution of sodium or potassium chloride; gently shake the flask to mix the constitnents and then add 25—30 c.c. of 4*N* sulphuric acid. The mixture is then distilled through a condenser into absorption flasks containing caustic soda or potash. The ferrocyanide is completely decomposed, and the hydrocyanic acid distilled off in about half an hour's gently boiling. The caustic liquid is washed out of the absorption flasks and the condenser with distilled water and the cyanide solution estimated in the usual manner with standard silver nitrate solution, after the addition of a few drops of a 10 per cent. solution of potassium iodide.

If desired a much larger quantity of ferrocyanide may be taken as it is as easy to decompose 25—30 grms. of ferrocyanide as half a grm. In decomposing a larger quantity of ferrocyanide the same proportion of cuprous chloride is not needed, for in the case of comparatively large quantities betewen 2—3 per cent. of the weight of the ferrocyanide is all that is required. Sufficient sulphuric acid must be added to give an excess of acid over that required to form ferrous sulphate and sodium bisulphate. Sodium bisulphate will complete the decomposition, but its action is much slower. It is advisable to wash the cuprous chloride with a little dilute sulphuric acid before adding to the ferrocyanide, to remove any cupric chloride usually present on the commercial material.

The details of the course of the reactions involved in this process are still the subject of investigation, but practically the cuprous chloride decomposes the ferrocyanide, forming cuprous cyanide, which is then decomposed by the sulphuric and hydrochloric acid present into hydrocyanic acid and reforming cuprous chloride. The cuprous chloride thus regenerated attacks a further quantity of ferrocyanide, and this cycle of reactions is continually repeated until ultimately the whole of the ferrocyanide is decomposed and cuprous cyanide remains and this in turn is decomposed into hydrocyanic acid and cuprous chloride. Thus, in the absence of any air oxidation, the cuprous chloride is left in exactly the same state as originally added and would be quite capable of decomposing a further quantity of ferrocyanide if that body were added without any further additions.

This process has been worked on an experimental scale in which 20—25 lb. of sodium ferrocyanide has been decomposed at a time, using cuprous chloride to the extent of only 2 per cent. of the weight of ferrocyanide taken and has yielded theoretical results.

By this method any ferrocyanide may be estimated, whether soluble or insoluble, the precipitated ferrocyanides of the heavy metals, such as those of iron, copper, zinc, cadmium, nickel, etc., or the double sparingly soluble ferrocyanides such as those of calcium, potassium, magnesium, ammonium, etc., being readily decomposed. If, however, the insoluble ferrocyanide taken is in the dry state it must of course be ground first to a fine powder before adding to the still and in the case of ferric ferrocyanide such as Prussian blue, more cuprous chloride than that already mentioned should be added. All that is necessary is to add 0·5 grm. of the finely-powdered ferrocyanide to the still with about 100 c.c. of water and the requisite quantity of acid and cuprous chloride.

Using this method the following results have been obtained:—With potassium ferrocyanide, 99·8, 99·6 99·85 per cent. Precipitating the ferrocyanide as ferric ferrocyanide, 99·7 per cent.; as cupric ferrocyanide, 99·68 per cent.; as zinc ferrocyanide, 99·84 per cent.; as cadmium ferrocyanide, 99·88 per cent.

In the estimation of the ferrocyanide contents of cyanogen mud or of spent oxides (products of the purification of coal gas) a weighed quantity of the dried material from which the sulphur has been removed, is boiled with caustic soda or potash, filtered, and washed to a definite volume, and a portion of this liquor is distilled with cuprous chloride and sulphuric acid in the manner already described. The results obtained by this method are generally 0·2—0·4 per cent. higher than those obtained by the titration method. The reason for this is that if the total iron content of the caustic extract is estimated it will be found to exceed considerably that combined as ferrocyanide, and if the liquor is diluted and boiled some ferric oxide is precipitated, but an excess is still left in solution and is precipitated together with a small portion of ferrocyanide and organic matter when the solution is made acid. The iron oxide is held in collodial solution by the organic matter dissolved by the caustic soda. When this solution is distilled with cuprous chloride and an acid this excess of iron has no influence on the result and thus a somewhat higher, but more accurate reading is obtained.

As an example, the caustic potash extract was made of a dry sulphur-extracted spent oxide and the ferrocyanide determined by the copper method and by titration with the following results:—

		Ferrocyanide as Prussian blue. per cent.
By distillation with cuprous chloride	=	7.65
By titration with copper sulphate solution	=	7·35
		0·30

The total iron contents determined in a portion of this liquor was 1·687 per cent. on a spent oxide basis.

Another portion of this liquor was diluted and boiled, when 0·112 per cent. of iron was precipitated as ferric oxide, thus leaving 1·575 in soluton. Now 7·65 grams of ferrocyanide contain 1·495 gramis of iron; deducting this, 0·08 of iron remains still unaccounted for; on acidification, this iron would be precipitated with the organic matter usually present in these liquids combined with equivalent ferrocyanides, and in this way would remove 0·307 grams of ferrocyanide calculated as Prussian blue.

If, however, the extracted spent oxide is boiled first with strong caustic soda or potash solution and a large excess of cuprous chloride or oxide much higher readings are obtained from the same spent oxide on subsequent distillation with sulphuric acid; this is due to the fact that certain though not all spent oxides contain compounds known as non-blueing cyanogen compounds, that is cyanogen compounds other than thiocyanates that do not form a blue colour with iron salts and are not estimated in the usual process of titration with metallic salts. The non-blueing cyanogen compounds are decomposed by the cuprous chloride in the particular manner described, and part of their nitrogen is yielded in the form of hydrocyanic acid when distilled with an acid and estimated along with that derived from the decomposition of the ferrocyanide.

The presence of these cyanogen compounds is demonstrated by the following example. A spent oxide having a moderately high Prussian blue content was carefully dried and extracted by carbon bisulphide to remove all free sulphur, and an analysis made of its nitrogen contents with the following results :—

	On extracted oxide basis.		On original spent oxide basis.	
	per cent.	per cent.	per cent.	per cent.
Total nitrogen	—	9·494	—	4·595
Ammonia and pyridine bases as nitrogen	2·551		1·238	
Prussian blue and carbonyl-ferrocyanide as nitrogen	4·959		2·400	
Thiocyanates as nitrogen .	0·434		0·210	
	7·944		3·848	
		7·944		3·848
Excess nitrogen		1·550		0·747

This leaves 1·55 per cent. of nitrogen unaccounted for on the extracted oxide basis and 0·747 per cent. on the original spent oxide basis; that this excess nitrogen is probably in the form of a cyanogen compound is shown from the following experiment.

The above spent oxide before removing the sulphur was boiled for some time with an excess of caustic soda solution with the following results :—

	On spent oxide basis.	
	per cent.	per cent.
Total nitrogen	—	4·595
Nitrogen in ammonia and pyridine	1·238	
,, ferrocyanide and carbonylferrocyanides	2·168	
,, thiocyanates..................	1·158	
	4·564	
		4·564
		0·031

Again, a weighed quantity of the spent oxide was heated with an alkali under pressure for some time with the following result :—

	per cent.	per cent.
Total nitrogen	—	4·595
Nitrogen in ammonia, etc.	1·238	
,, ferrocyanides, etc.	—	
,, thiocyanates..................	3·325	
	4·563	
		4·563
		0·032

Thus accounting for practically the whole of the nitrogen. On experimenting with various spent oxides it was found that the excess of thiocyanates that could be found varied from zero up to 3—4 per cent.

A spent oxide containing 7·94 per cent. of Prussian blue and 0·667 per cent. of thiocyanates on the dry basis and found to contain 0·24 per cent. excess nitrogen yielded by the above treatment 1·39 per cent. of excess thiocyanates calculated as sodium thiocyanate.

On boiling the sulphur-free products with strong caustic potash solution and excess of cuprous chloride and distilling with acid in the manner described, hydrocyanic acid equivalent to 8·77 per cent. of Prussian blue was obtained, or an excess of 0·83 per cent. = 1·4 per cent. as sodium thiocyanate = total excess of nitrogen found.

Again, a spent oxide containing 0·11 per cent. of thiocyanate calculated as sodium salt and 11·03 per cent. of ferrocyanide as Prussian blue estimated by the cuprous chloride method on the caustic potash extract after the removal of sulphur, furnished on boiling with excess of alkali a liquid containing 9·3 per cent. of ferrocyanide as Prussian blue and 5·51 per cent. of thiocyanate as sodium thiocyanate. By this operation 1·73 per cent. of the Prussian blue had been converted into thiocyanates = 2·94 as sodium thiocyanate, this figure, together with the 0·11 per cent. originally existing in the spent oxide, deducted from the 5·51 per cent. total, leaving 2·46 per cent. excess of thiocyanate made.

A weighed quantity of the sulphur-extracted spent oxide boiled with an excess of cuprous chloride and strong caustic potash and distilled with sulphuric acid, yielded cyanides equivalent to 12·21 per cent. of Prussian blue, an excess of 1·18 per cent. (=2·00 per cent. sodium thiocyanate).

Some spent oxides are practically free from this cyanogen compound, particularly those low in ferrocyanide compounds, for example :—

	per cent.	per cent.
Total nitrogen..................	—	1·22
Prussian blue as nitrogen..................	0·783	
Ammonia, &c., as nitrogen	0 410	
Thiocyanates as nitrogen..................	0 020	
	1·213	
		1·213
		0·007

DISCUSSION.

Dr. H. G. **Colman** said that he had made several attempts to recover the whole of the hydrocyanic acid from ferrocyanides by distillation, but without success. One method was based on the idea that if the ferrocyanide were first oxidised to ferricyanide, such a complete recovery would be possible, as in the distillation of the ferrocyanide with dilute sulphuric acid, ferrous sulphate is first formed, and unites with the excess of ferrocyanide, forming insoluble ferrous ferrocyanides, which are very stable to acid. Ferricyanide, however, yields ferric sulphate, which only forms a soluble and unstable compound with excess of ferricyanide, and it was thought that this might give off all its hydrocyanic acid on distillation. Experiment has shown, however, that while much more hydrocyanic was obtained in this way, a yield of only about 6/7ths of the total hydrocyanic acid was obtained, whereas by Mr. Williams' method a quantitative separation appeared to be possible. In many cases this would form a simple and easy method for the quantitative estimation, as it would take rather less time than the Feld method, but as he had stated on a former occasion (Analyst, 1910, **35**, 295), he was quite unable to agree with Skirrow as to the errors of the Feld method when reasonable precautions were taken, and the time of boiling was not unduly lengthened. With regard to testing spent oxide by the author's method, two possibilities of error occurred to him. The author had not stated whether the spent oxide was dried by heating or in the desiccator; he (the speaker) had found that cyanogen was lost by spent oxide at 100°. Further, in distilling the spent oxide with acid and only a small amount of cuprous chloride, there was danger that thiocyanic acid would distil over with the hydrocyanic acid, and interfere with the subsequent titration with decinormal silver nitrate.

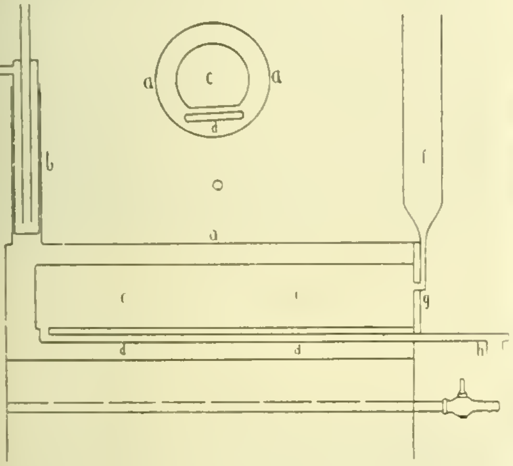
Mr. W. P. **Dreaper** said that he had watched the author's process working on the large scale, and had obtained a yield of from 98 to 99 per cent.; and there could be no doubt the process went right to the end. It might be extremely useful in estimating Prussian blue in weighted silk. At present it was practically impossible to get any result which could be relied upon; and if the hydrocyanic acid were distilled off extremely useful results would be obtained in cases of black weighted silk.

Mr. H. E. **Williams** said that, like Dr. Colman, he had tried to decompose the ferrocyanide into hydrocyanic acid, by first converting the ferrocyanide into ferricyanide, but had only obtained a yield of from 85—90 per cent., and never 100 per cent. The spent oxide was dried at 60° C., at which temperature he did not think any hydrocyanic acid was lost. The thiocyanates did not influence the reaction at all; should there be thiocyanates present, an extra amount of cuprous chloride should be added sufficient to precipitate them. Sodium ferrocyanide, or any soluble ferrocyanide, could be completely decomposed by distilling with cuprous thiocyanate and acid; and the hydrocyanic acid completely driven off, but the action was much slower than with cuprous chloride. In reply to Mr. Dreaper, Prussian blue in silk might be readily estimated by distilling the silk with cuprous chloride and dilute acid; or the silk might be digested with caustic soda solution, and the extract so obtained distilled in the manner described.

A DRYING OVEN.

BY J. H. COSTE.

An oven in which several determinations of water can be made simultaneously, which can be maintained at a known, constant and uniform temperature, and through the whole of which a sufficient stream of hot air or other gas freely circulates, is frequently desired. The apparatus described fulfils these conditions.



A cylindrical copper vessel, *a*, placed horizontally, contains a suitable quantity of a pure liquid, the boiling point of which approximates closely to the desired temperature. It is heated by a series of gas jets and the vapour is condensed at *b* and returned. The muffle-shaped drying chamber, *c*,*c*, is surrounded, with the exception of about $\frac{1}{10}$ of its total external surface (the door), by the boiling liquid or its vapour. Air which has passed through a very much flattened tube, *d*,*d*, lying under, but not in contact with, the drying chamber, enters it at the bottom of the end which is in the vapour and leaves through a slit, communicating with a chimney, *f*, in the door which is fixed tightly against the end of the chamber by means of steam rubber jointing and a screwed hinging bar against the end of the oven. The cubical contents of the drying chamber are very small relative to the area of heated surface. If desired the air may be dried before it enters the preheater at *h*, or other gases such as carbon dioxide or nitrogen may be used.

The drying chamber will take, on a copper tray which cannot be pushed back so as to close the air inlet, six watch glasses or flat weighing bottles. Drying goes on equally well in any part of the oven and substances placed in it quickly attain a temperature within 1° of that of the vapour

The air bath, with preheater, described by me in 1896, has recently been used a great deal for drying coal in a current of inert gas. Experiments with thermocouples show that in this case also coal attains the same temperature, within 1°, as is shown by the thermometer.

The oven now described was made by Messrs. Brown and Son.

Manchester Section.

Meeting held at the Grand Hotel, on Friday. May 3rd, 1912.

DR. G. J. FOWLER IN THE CHAIR.

THE INFLUENCE OF WASTE LIQUOR FROM SULPHATE OF AMMONIA PLANTS ON THE PURIFICATION OF SEWAGE.

BY G. J. FOWLER, D.SC., E. ARDERN, M.SC., AND W. T. LOCKETT, M.SC.

The investigation on the bacterial purification of ammonia recovery liquor, the results of which were communicated to this Section in December, 1910 (see this J., 1911, 180, 181), has been continued from the point of view of the effect of the addition of the waste liquor on the subsequent purification of sewage.

The sewage from the City of Manchester which passes to the Davyhulme Works contains rather more than 0·5 per cent. of the waste liquor. Experiments, therefore, have been made on the purification of domestic sewage or tank effluent obtained from the Moss Side Sewage Works, and of the same sewage mixed with 0·5 per cent. and 1·0 per cent. respectively of the waste liquor.

I. Effect of admixture of waste liquor on the purification of sewage by aeration.—In this experiment Moss Side sewage was filtered through rough filter paper to remove the suspended solids. Large bottles were then partially filled with the filtered sewage and the waste liquor added in varying proportions, one of the bottles being reserved as a control. The samples were then either shaken at frequent intervals or continuously aerated by attachment to a water pump.

In all cases the immediate result was to separate varying amounts of suspended matter. The various samples were examined from time to time in order to observe the progress of the oxidation in each case.

In the following tables are given the results of two typical experiments.

Experiment 1.

	Sewage alone.	Sewage + 0·5% liquor.	Sewage + 1·0% liquor.	Sewage + 1·5% liquor.
	Parts per 100,000.			
After 4 days aeration.				
Free and saline ammonia	7·70	7·70	7·40	7·40
After 11 days aeration.				
Free and saline ammonia	9·10	9·60	9·40	9·40
After 21 days aeration.				
Free and saline ammonia	8·00	8·60	9·00	8·90
Nitrite (as ammonia)	0·035	nil.	nil.	nil.
After 38 days aeration.				
Free and saline ammonia	2·00	8·40	9·60	9·90
Nitrite and nitrate (as ammonia)	5·00	0·54	0·12	—
After 45 days aeration.				
Free and saline ammonia	1·60	6·60	9·10	9·40
Nitrite and nitrate (as ammonia)	5·00	1·90	0·30	0·24
After 52 days aeration.				
Free and saline ammonia	1·70	4·40	9·10	9·40
Nitrite and nitrate (as ammonia)	5·00	3·50	0·66	0·24
After 66 days aeration.				
Free and saline ammonia	1·50	1·50	3·00	6·90
Nitrite and nitrate (as ammonia)	5·60	5·60	5·30	2·10

Experiment 2.

	Sewage alone.	Sewage + 0·5% liquor.
	Parts per 100,000.	
At beginning of experiment.		
Four hours oxygen absorption	5·49	8·91
Free and saline ammonia	6·30	6·40
After 4 days aeration.		
Four hours oxygen absorption	5·00	7·31
Free and saline ammonia	5·86	6·70
After 11 days aeration.		
Four hours oxygen absorption	3·83	5·54
Free and saline ammonia	6·86	7·43
After 19 days aeration.		
Four hours oxygen absorption	2·91	3·83
Free and saline ammonia	7·43	8·00
After 21 days aeration.		
Four hours oxygen absorption	2·69	3·31
Free and saline ammonia	8·00	8·29
Nitrite (as ammonia)	0·015	nil.
After 27 days aeration.		
Four hours oxygen absorption	2·63	2·91
Free and saline ammonia	7·14	8·29
Nitrite (as ammonia)	0·04	nil.
After 32 days aeration.		
Four hours oxygen absorption	2·40	2·80
Free and saline ammonia	5·29	7·43
Nitrite (as ammonia)	0·90	·015
After 36 days aeratian.		
* Four hours oxygen absorption	1·91	2·26
Free and saline ammonia	0·57	6·86
Nitrite (as ammonia)	6·10	0·64
After 42 days aeratian.		
* Four hours oxygen absorption	2·06	2·63
Free and saline ammonia	0·03	3·86
Nitrite (as ammonia)	6·56	3·16
After 54 days aeratian.		
* Four hours oxygen absorption	2·46	2·54
,, .. (filtered sample)	1·09	0·91
Free and saline ammonia	Trace	0·64
Nitrite (as ammonia)	6·56	6·91
Nitrite and nitrate (as ammonia) ..	7·30	7·30

* After destruction of nitrite.

From the above results it will be seen that while there is no difficulty in fairly rapidly reducing the oxidisable organic matter present in each case, as judged by the reduction in the permanganate absorption, there is a marked difference in the progress of the final nitrification change.

In the case of the sewage alone, nitrification is observable much earlier than in the mixture of sewage and 0·5 per cent. waste liquor, and as the proportion of waste liquor is increased so is the nitrification period delayed. This result is shown diagrammatically in the curves submitted.

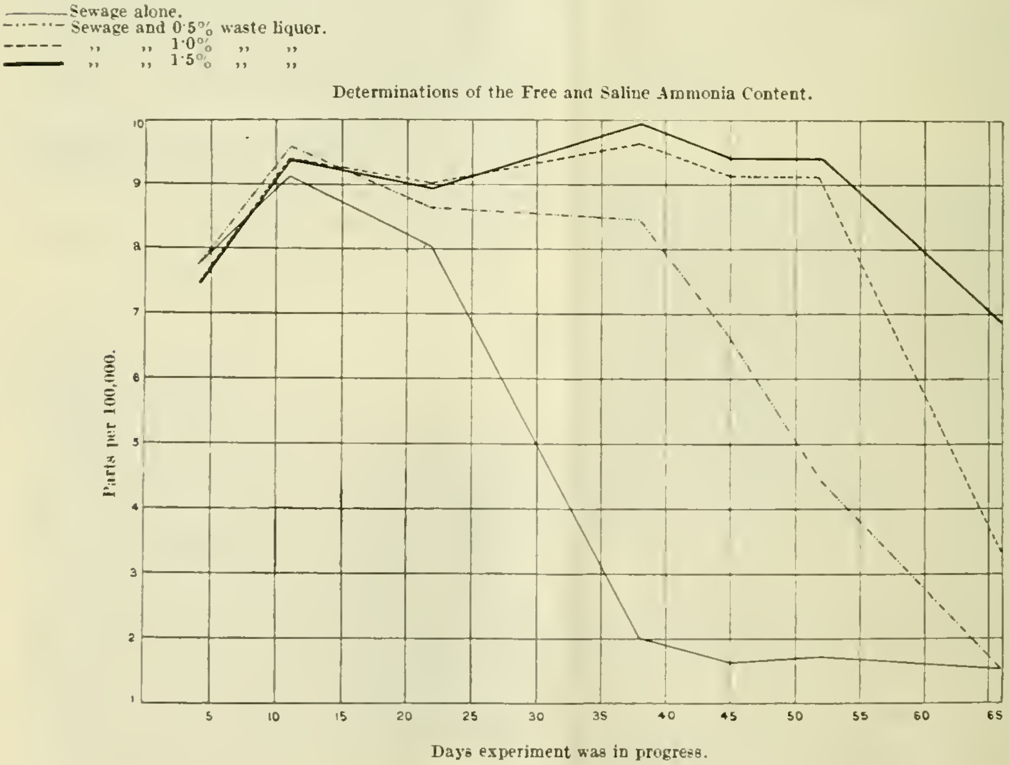
It may be mentioned that a bacterial examination of the sewage and the various mixtures of sewage and waste liquor made during the course of an experiment, showed very little reduction in numbers of organisms in the case of the mixture containing 0·5 per cent. waste liquor as compared with the sewage alone. With the addition of 1·0 per cent. and 1·5 per cent. waste liquor a definite reduction in bacterial content was noted. In all three cases however the plate colonies were very much smaller than those obtained from the sewage without waste liquor.

II. Filtration of sewage and mixtures of sewage and waste liquor.—The filters used in this experiment consisted of 4 inch drain pipes, 22 inches long, filled with clean washed clinkers. The bottom layer was composed of clinkers about 3 inch size, while the general body of the filter was filled with clinkers from ¼ inch to ½ inch size. Six filters were in operation. 3 series of primary and secondary filters. The first series dealt with tank effluent from the Moss Side Sewage Works, the second with the same sewage to which had been added 0·5 per cent. of the waste liquor, and 1·0 per cent. of the waste liquors was added to the sewage passing on to the third series of filters.

During the first four weeks of this experiment, each series received one filling only per day (except Sundays). Two fillings per day (except Sunday) were allowed during the next period of four weeks, after which the fillings were increased to three per day (except Sunday).

Direct Oxidation of Sewage and Sewage and Ammonia Recovery Liquor.

EXPERIMENT I.



In the following tables are given the average of the ults obtained during the various periods of the experi- ents.

Samples of raw sewage were taken at 11 a.m. each day at the Moss Side Works and sent direct to the Laboratory.

	Tank effluent.			Primary effluent.			Secondary effluent.		
	Alone.	Plus 0·5% liquor.	Plus 1·0% liquor.	Alone.	Plus 0·5% liquor.	Plus 1·0% liquor.	Alone.	Plus 0·5% liquor.	Plus 1·0% liquor.
	Parts per 100,000.								
rst Period. *1 filling per day.*									
our hours' oxygen absorption	4·42	7·49	10·60	1·86	3·00	1·92	1·12	1·48	2·19
ree and saline ammonia	3·84	3·89	4·14	2·63	2·51	2·86	2·25	2·11	2·40
lbuminoid ammonia	0·675	0·72	0·835	0·305	0·32	0·36	0·205	0·205	0·25
itrate (as ammonia)	—	—	—	—	—	—	0·61	0·68	0·53
hree mins. oxygen absorption before incubation	—	—	—	—	—	—	0·45	0·78	1·35
Do. after do.	—	—	—	—	—	—	0·61	0·78	1·33
utrescibility	—	—	—	—	—	—	3¾/12	3½/12	6½/12
issolved oxygen absorption	—	—	—	3·42	3·66	4·69	1·13	1·02	1·18
olloids and suspended matter	2·00	2·46	2·86	0·92	1·12	1·32	0·54	0·68	0·66
econd Period. *2 fillings per day.*									
our hours' oxygen absorption	4·21	7·14	10·43	1·48	2·36	3·82	0·83	1·13	1·69
ree and saline ammonia	2·47	2·57	2·52	1·28	1·32	1·44	0·85	0·91	1·05
lbuminoid ammonia	0·50	0·52	0·585	0·18	0·18	0·22	0·08	0·095	0·12
itrate (as ammonia)	—	—	—	—	—	—	1·02	1·03	1·03
hree mins. oxygen absorption before incubation	—	—	—	—	—	—	0·36	0·50	0·88
Do. after do.	—	—	—	—	—	—	0·25	0·32	0·46
utrescibility	—	—	—	—	—	—	¼/8	0/8	½/8
issolved oxygen absorption	—	—	—	1·82	1·90	2·32	0·74	0·86	0·96
olloids and suspended matter	2·17	2·51	2·94	0·84	1·00	1·24	0·41	0·45	0·55
hird Period. *3 fillings per day.*									
our hours' oxygen absorption	4·09	7·11	10·22	1·54	2·17	3·56	0·82	0·99	1·23
ree and saline ammonia	4·30	4·34	4·58	2·40	2·63	2·86	1·33	1·42	1·77
lbuminoid ammonia	0·605	0·665	0·735	0·25	0·27	0·305	0·125	0·135	0·15
itrate (as ammonia)	—	—	—	—	—	—	1·15	1·15	0·95
Three mins. oxygen absorption before incubation	—	—	—	—	—	—	0·33	0·41	0·52
Do. after do.	—	—	—	—	—	—	0·31	0·38	0·52
utrescibility	—	—	—	—	—	—	1/14	1/14	1/14
issolved oxygen absorption	—	—	—	1·79	2·17	2·72	0·72	0·74	0·91
olloids and suspended matter	2·59	2·99	3·49	0·88	1·10	1·23	0·44	0·50	0·63

As the results of this experiment indicated that the presence of the waste liquor at any rate in the proportion of 0·5 per cent. had little effect on the oxidation of the real sewage organic matter it was thought advisable to see whether any influence was exerted on the preliminary tank treatment.

Obviously it was very difficult to reproduce on an experimental scale the conditions prevailing in the ordinary septic tank treatment of sewage. The following experiment was, however, designed with a view of allowing a preliminary fermentation of sewage both with and without the addition of the waste liquor, prior to treatment on the experimental filters already described.

Large bottles were then completely filled early in the afternoon as follows :—

(1) Sewage alone, (2) sewage +0·5 per cent. waste liquor and (3) sewage +1 per cent. waste liquor and the bottles maintained at an average temperature of about 30° C., for from 16 to 20 hours, at the end of which period the top liquor was syphoned off and treated as in the previous experiments, on the various series of filters.

Throughout the course of this experiment three fillings per day (except Sunday) were allowed for each series.

In the following table are given the average analytical returns for the whole period of experiment which extended over four weeks.

	Tank effluent.			Primary effluent.			Secondary effluent.		
	Alone.	Plus 0·5% liquor.	Plus 1·0% liquor.	Alone.	Plus 0·5% liquor.	Plus 1·0% liquor.	Alone.	Plus 0·5% liquor.	Plus 1·0% liquor.
	Parts per 100,000.								
Four hours oxygen absorption	4·92	7·86	11·22	2·52	3·24	3·96	1·62	1·69	1·88
Free and saline ammonia	7·11	7·00	7·05	3·38	3·38	3·44	1·80	1·75	1·90
Albuminoid ammonia	0·805	0·845	0·895	0·46	0·495	0·46	0·28	0·285	0·275
Nitrate (in terms of ammonia)	—	—	—	—	—	—	1·98	1·93	1·84
Three mins. oxygen absorption before incubation	—	—	—	—	—	—	0·71	0·73	0·83
Do. after do.	—	—	—	—	—	—	0·50	0·51	0·61
Putrescibility	—	—	—	—	—	—	¼/8	¼/8	¼/8
Dissolved oxygen absorption	—	—	—	2·46	2·69	3·19	1·29	1·26	1·31
Colloids and suspended matter	3·51	3·84	4·30	1·93	2·20	1·93	1·00	1·07	1·10

It may be noted that the sewage employed in this experiment was much stronger than that in the previous experiment, on account of the fact that in this case the samples were taken for convenience at time (11 a.m.) of maximum strength instead of being an average of 24 hours.

The results of this experiment having shown no indication of retarding action owing to the presence of the waste liquor, it was considered advisable to restart experimental work using filters of coarser grade media, especially as the material originally employed was of finer size than that practical on the working scale.

The filters were accordingly emptied and the fine material replaced with clean washed cinders of the following size: Primary filters, ½ inch to 1 inch; secondary filters, ¼ inch to 1 inch.

This experiment was carried out on similar lines to the first one of the series with the exception that only one mixture with waste liquor, viz., 0·5 per cent. was made.

Average daily samples of Moss Side tank effluent were obtained and dealt with on one series of filters and a mixture of the tank effluent with 0·5 per cent. waste liquor was treated on the other series.

One filling per day was allowed during the first eleven weeks (holidays intervening extended this period), two fillings per day were given during the next fortnight while during the last three weeks of the experiment the filters received four fillings per day (except Sunday).

The results obtained are given in the following table of analytical returns.

This experiment was continued over a period of te weeks during which time the primary filters in operatio received three fillings per day (except Sunday).

The average results obtained are given in the followir table :—

	Tank effluent.		Primary effluent.	
	Alone.	+0·5% liquor.	Alone.	+0·5%
	Parts per 100,000.			
4 hours oxygen absorption	4·14	7·49	2·56	3·52
Free and saline ammonia	5·25	5·30	2·12	2·38
Albuminoid ammonia—total	0·53	0·58	0·375	0·39
,, ,, —in solution	—	—	0·10	0·13
Dissolved oxygen absorption	—	—	0·85	1·31
3 mins. oxygen absorption before 3 incubation—total	—	—	0·98	1·67
mins. oxygen absorption before incubation—in solution	—	—	0·43	0·95
3 mins. oxygen absorption after incubation—total..............	—	—	1·58	2·24
3 mins. oxygen absorption after incubation—in solution	—	—	0·36	0·85
Putrescibility—total	—	—	12/13	13/13
,, in solution	—	—	½/5	0/5
Colloids	2·27	2·50	0·98	1·16

	Tank effluent.		Primary effluent.		Secondary effluent.	
	Alone.	Plus 0·5% liquor.	Alone.	Plus 0·5% liquor.	Alone.	Plus 0·5% liquor.
	Parts per 100,000.					
FIRST PERIOD.						
1 *filling per day.*						
Four hours' oxygen absorption	4·60	7·84	2·46	4·00	1·12	1·64
Free and saline ammonia	5·60	5·59	4·22	4·15	2·48	2·54
Albuminoid ammonia	0·565	0·605	0·33	0·37	0·18	0·22
Nitrate (in terms of ammonia)........................	—	—	—	—	0·20	0·155
Dissolved oxygen absorption	—	—	5·01	5·20	1·12	1·26
Three mins. oxygen absorption before incubation	—	—	—	—	0·45	0·79
Do. after do.	—	—	—	—	0·63	1·04
Putrescibility	—	—	—	—	10/15	11½ 15
Colloids	2·50	2·69	1·33	1·46	0·59	0·74
SECOND PERIOD.						
2 *fillings per day.*						
Four hours' oxygen absorption	2·08	6·05	1·02	1·64	0·49	0·73
Free and saline ammonia	1·67	1·65	1·12	1·27	0·90	0·92
Albuminoid ammonia	0·30	0·33	0·17	0·21	0·08	0·09
Nitrate (in terms of ammonia)	—	—	—	—	0·91	0·90
Dissolved oxygen absorption	—	—	—	—	—	—
Three mins. oxygen absorption before incubation	—	—	—	—	0·22	0·36
Do. after do.	—	—	—	—	0·28	0·36
Putrescibility	—	—	—	—	0/2	0/2
Colloids	0·83	1·36	0·23	0·40	0·18	0·24

N.B.—The figures given for this period are the average of two determinations only, evidently made when the sewage was diluted by rain water.

	Tank effluent.		Primary effluent.		Secondary effluent.	
	Alone.	Plus 0·5% liquor.	Alone.	Plus 0·5% liquor.	Alone.	Plus 0·5% liquor.
THIRD PERIOD						
4 *fillings per day.*						
Four hours' oxygen absorption	5·37	8·74	2·77	4·48	1·18	1·56
Free and saline ammonia	5·85	5·91	4·05	4·42	2·82	3·08
Albuminoid ammonia	0·635	0·65	0·37	0·40	0·20	0·24
Nitrate (in terms of ammonia)	—	—	—	—	0·53	0·27
Dissolved oxygen absorption	—	—	5·01	6·30	1·08	1·21
Three mins. oxygen absorption before incubation	—	—	—	—	0·46	0·68
Do. after do.	—	—	—	—	0·49	0·84
Putrescibility	—	—	—	—	2½/8	3/8
Colloids	2·52	2·52	1·39	1·54	0·51	0·63

In order to determine the influence of the physical condition of the filtering medium on the purification effected a similar experiment to those already described, confined, however, to single contact treatment, was carried out using material taken from a contact bed which had been in operation for several years and the material of which had become spongy in character and contained considerable interstitial water.

SUMMARY OF RESULTS.

The results obtained from the various experiments described are summarised in the following paragraphs :—

1. In the proportion of from 0·5 to 1 per cent. ammonia recovery liquor exerts a definite retarding effect on the oxidation of sewage by direct aeration, more particularly in regard to the final nitrification.

Single contact treatment.

2. In the case of fine grade filters the primary effluent obtained by treatment of fresh sewage containing 0·5 per cent. waste liquor possesses a much higher permanganate absorption than the primary effluent obtained by similar reatment of sewage without the waste liquor.

3. In spite of this increase in oxidisable matter present however there is practically no evidence of less effective oxidation of the actual sewage matter as measured by the albuminoid ammonia, absorption of dissolved oxygen and incubation tests.

4. The presence of 0·5 per cent. waste liquor has apparently no appreciable effect on the rate of maturing fine grade filters.

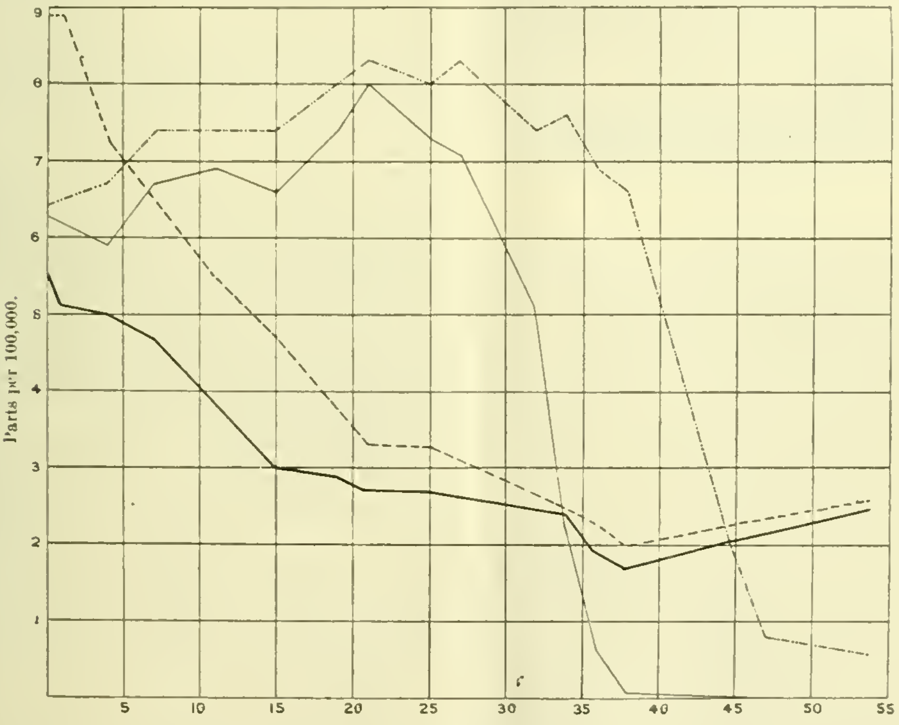
5. In the case of the filtration of sewage containing 1 per cent. waste liquor not only is the increase in the permanganate absorption more pronounced, but there is distinct evidence of a slight retarding action on the rate of maturing the filters as shown by slight increases in the albuminoid ammonia, dissolved oxygen absorption and colloid tests. In the later stages of working this effect is not nearly so marked.

Direct Oxidation of Sewage and Mixture of Sewage and 0·5 per cent. Ammonia Recovery Liquor.

Experiment II.

——— Free and Saline Ammonia Sewage alone.
-·-·- Free and Saline Ammonia Sewage and 0·5 % waste liquor.
━━━ Four Hours Oxygen Absorption Sewage alone.
- - - - Four Hours Oxygen Absorption Sewage and 0·5 % waste liquor.

Four hours Oxygen Absorption and Free and Saline Ammonia Determinations.



Days experiment was in progress.

Note.—For reasons of space, some of the determinations from which the curves are drawn have been omitted from the tables submitted.

6. That the only effect of preliminary anaerobic fermentation is to reduce the differences observed when treating fresh sewage on fine grade filters.

7. When working at moderate rates the results obtained with fine material hold good in the case of filters of coarser grade, but at high rates the differences between the primary filtrates obtained are more marked and reference to the analytical returns submitted will show that there is a definite increase in the ammonia, dissolved oxygen absorption and colloid figures for the primary effluent obtained from the coarse filter receiving sewage containing 0·5 per cent. waste liquor as compared with the primary effluent yielded by the filter receiving sewage alone.

8. That in the case of filters whose filtering medium is of somewhat unsatisfactory physical character, the differences obtained when coarse filters are worked at high rates are more pronounced, particularly so in regard to the amount of dissolved oxygen absorbed, which was found to be 50 per cent higher in the case of the primary effluent obtained from sewage containing 0·5 per cent. waste liquor than that for the filtrate from a similar filter receiving sewage alone.

Second contact treatment.

9. That the effluent obtained from second contact treatment on fine filters of sewage containing 0·5 per cent. waste liquor possesses a higher permanganate absorption than that from similar treatment of the sewage alone, but not nearly to so great an extent as in the case of single contact treatment, and otherwise the two filtrates obtained show equal sewage oxidation, the nitrates being practically identical.

10. The addition of 1 per cent. of the waste liquor accentuates the difference in the permanganate absorption figures and there is definite evidence in the earlier stages of working of slightly reduced efficiency as measured by the albuminoid ammonia, dissolved oxygen absorption and colloid determinations.

As the filters become more mature, however, apart from the permanganate absorption which remains definitely higher, there is very little evidence of lessened oxidation of sewage matter, although there is a slight increase in the albuminoid ammonia figure and decrease in the nitrate produced.

11. In the case of the coarser grade filters the difference between the two secondary filtrates obtained is more marked, particularly in regard to the amount of nitrate produced which when working at a high rate is reduced by one-half by the addition of 0·5 per cent. waste liquor.

CONCLUSIONS.

It would appear from the above results that the question of the influence of ammonia recovery liquor, in the proportion of about 0·5 per cent. on the subsequent purification of sewage, depends to a very large extent on the margin of filters provided. This is demonstrated by the fact that a maximum effect is found when sewage is oxidised by direct aeration, *i.e.*, in the absence of contact material, while when treating the sewage on fine grade filters which allow a maximum of surface contact, only a very slight retarding action, if any, is observed.

It would, therefore, seem that where sufficient surface contact obtains, the waste liquor, in the above proportion, is oxidised *pari passu* with the sewage organic matter, practically without any retarding action.

It should, however, be borne in mind that the conditions of laboratory experiment do not allow of the exact reproduction of those prevailing on the working scale, particularly in regard to the enforced high rate of working during wet weather, which may at times be extended over a considerable period. Further, in order to study the question of the effect of the waste liquor on the life of the filters, holding capacity, etc., considerable extension of the experiments would have been necessary, and it is obvious that the experiments have not reproduced the conditions prevailing in the case of filters which have been in use for some years.

It can, therefore, be safely concluded that translation to the working scale would naturally accentuate any effect noted as the results of the present experiment.

This effect would probably be greater with high speed percolating filters than with contact beds.

DISCUSSION.

The CHAIRMAN said that upon the occasion of the reading of a paper the previous year entitled "The Purification of Ammonia Liquors," sundry questions were asked which were then left unanswered, more particularly the effect of these liquors on the purification of actual sewage matter. Upon that point a large amount of research work had since been done, namely, the ascertaining of how far the addition of a certain proportion of waste liquors interfered with the normal purification process in sewage works. The paper read that evening had really been prepared by Mr. Ardern and Mr. Lockett. The question resolved itself, like so many others, into one of limits on one side or the other. It was a matter of some practical importance. Many small sewage works were chary of receiving effluents from gas works and ammonia recovery works. In some cases that fear might be well grounded, but in other cases there might not be the same necessity for apprehension. The authors of the paper had endeavoured to establish some kind of limit one way or the other. That limit varied to some extent with the lapse of time. Manchester sewage, a good many years ago, had a higher oxygen absorption figure than it had at the present day, owing to the fact that in proportion to the then sewage there was more liquor. A great addition of sewage matter now came down to the works owing to the conversion of pail closets into water closets. That had altered altogether the relative proportion of the ingredients of the sewage. Those things had to be taken into account, but where the percentage was small, and where the area of filters was ample, there would not appear to be any very serious ground for apprehension. On the other hand, of course, cases occurred where the limits were considerably overstepped, and might occasion separate treatment such as was discussed on the last occasion when the subject matter of the purification of the liquors was brought forward.

Mr. R. H. CLAYTON said Professor Percy Frankland had done some of the pioneer work in connection with the liquors dealt with at Oldbury, but the present study of the question dealt with them from a more ordinary point of view. The paper was of great practical value in its application to ordinary conditions. He, personally, was pleased to have the results placed before them in order that they might appreciate the influence of the liquors on the 1 per cent. and the ½ per cent. basis on which the investigation had been made. He did not know whether the presence of these liquors might not be described as an advantage. Did they extend the time during which sewage purification would take place?

Mr. H. L. TERRY understood that the liquor from the coke ovens in West Yorkshire and elsewhere had led to a considerable amount of trouble at different sewage works, and that efforts had been made by the coke oven people to improve the liquors, and that now the effluent from some type of ovens was comparatively innocuous. That was a modern development which would tend to do away with considerable trouble. He did not know whether that improvement could be adapted in any way to the liquors they had heard described that evening which were derived entirely from gas works. If it was possible to obtain some definite ground to go upon as to the amount of dilution which led to comparative innocuousness at the sewage outfall works then the amount of research made and the results given that evening would be of considerable value.

The CHAIRMAN agreed that the adoption of a method such as that of Otto Hilgenstock considerably reduced the amount of liquor to be dealt with, and probably rendered it more amenable in that way; though, as far as he understood the process, the liquid which would have to be dealt with would be at any rate not altogether innocuous, but there would be less of it. The composition of the particular liquor dealt with by the authors was given in the previous paper. The liquors varied very much from place to place, and the liquor that was produced in Bradford, for example was nearly twice as strong as that produced at Manchester. All those things had to be borne in mind.

Mr. W. H. COLEMAN enquired why, according to the diagram, the oxygen absorption increased. The purification of the sewage went on all right, but the oxygen absorption did not fall. It was a question as to whether the method of testing the final effluent was correct, and as to whether the oxygen absorption test, which was taken for ordinary sewage, to represent its impurity and its danger to fish life and other things, should be applied now it was known that the oxygen absorption was not affected, but that the purification of the sewage appeared to go on. He presumed that was a question for the Rivers Authorities to take into consideration.

Mr. BISHOP, referring to the remarks of Mr. Coleman, said that it was a question for the Rivers Authorities. With all respect to the authors of the paper, and with full appreciation of the hard and careful work they had done, he said that they must have something beyond laboratory experiments before they could induce the Rivers Authorities to modify their requirements.

Mr. H. J. BAILEY enquired, supposing water had only half per cent. of effluent, and it was put through the process described, and the various tests were taken throughout, would that give the difference mentioned, or was the difference caused by the action of the effluent on the sewage matter?

Mr. EDWARD ARDERN referred to the bacterial examination of the liquors during the experiments on direct oxidation. The addition of half per cent. of waste liquor had no appreciable effect on the number of organisms present, although they were decidedly smaller, that is apparently they were not so active. In the case of the addition of 1 per cent., there was originally a definite drop in the number of bacteria present; but in the course of time they came back to the same number as those present in the control sample of sewage.

In answer to Mr. Clayton, the presence of ammonia recovery liquor in the proportion of from 0·5 to 1 per cent. had a slight retarding effect upon the putrefaction of sewage. Whether that was an advantage or not from the point of view of the subsequent purification of the sewage he was not prepared to say.

The point raised by Mr. Bailey was one which the authors had endeavoured to solve. They had previously experimented with the filtration of diluted waste liquor, and then the next step was to take the sewage plus the waste liquor. The ordinary routine tests, such as the permanganate test, and the free and albuminoid ammonia tests, to some extent, were influenced by the waste liquor. Therefore, the amount of unoxidised sewage matter could not be judged by those tests; and consequently, the determination of the amount of the absorption of dissolved oxygen, which the waste liquor itself hardly affected, and also of the oxidisable colloid matter was resorted to. These tests were considered sufficiently reliable to indicate the amount of unoxidised sewage matter as apart from unoxidised waste liquor.

New York Section.

Meeting held at Chemists' Building, Rumford Hall, on Friday, March 22nd, 1912.

MR. M. C. WHITAKER IN THE CHAIR.

METALLIC CERIUM: ITS PREPARATION AND PROPERTIES, WITH SPECIAL REFERENCE TO ITS COMMERCIAL APPLICATIONS.

BY ALCAN HIRSCH.

(See Trans. Amer. Electrochem. Soc., 1911, **20**, 57—104, and this J., 1911, 1261).

This paper was presented as a thesis for the doctor's degree at the University of Wisconsin in June, 1911. The investigation was undertaken, (1) starting from as pure cerium salts as it was possible to obtain, to prepare the metal in quantity sufficient to study its chemical and physical properties and to make a large number of its alloys; (2) by preparing metal from the unpurified monazite residual by-products in the incandescent gas-mantle industry, to obtain alloys of commercial value. The application of these residues as salts being limited, their value might be increased if a useful metal or alloy be prepared from them. The paper, which appeared in abstract in this Journal for 1911, p. 1261, includes the following bibliography:—

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Nottingham Section.

Meeting held at Nottingham on Friday, April 26th, 1912.

MR. S. R. TROTMAN IN THE CHAIR.

THE TREATMENT OF WATER FOR TEXTILE FINISHING BY MEANS OF ELECTROLYTIC SODIUM HYPOCHLORITE.

BY FRANCIS D. TOYNE.

The water upon which the experiments have been carried out is a very soft one, containing only from 5 to 7 degrees of total hardness; for this reason it is not considered a suitable water for softening. By softening a water of about 2° might perhaps be obtained, but the cost of obtaining it would be out of all proportion to the benefits obtained. Softening might help to inhibit weed growth and would undoubtedly precipitate iron (of which there is a small quantity in solution).

The reasons which led to my treating the water in question with sodium hypochlorite were: (1) To inhibit certain water-borne stains which caused trouble in the finishing of white flannel. (2) To keep the water reservoir, from which the supply is drawn, clean and free from a troublesome alga, known as "Ulothrix," which under ordinary conditions thrives in this water, especially in summer time, and the spring of the year.

A microscopic examination of some of the stains pointed to the fact that they were often caused by this alga becoming detached from the bottom and sides of the reservoir, then being drawn down the service pipes, and finally becoming deposited upon the flannel, causing a greenish stain very difficult to remove. From experiments about 2 parts of active chlorine per million was found to be sufficient to kill this weed except in early spring, when it requires rather more; just now about 3 or 4 parts per million are used. It is important to avoid free chlorine in the water as supplied to the mill on account of its action upon sensitive colours. No trace of it can be found in the water as supplied to the mill—it having disappeared under the action of light and by contact with organic matter in the reservoir. Occasionally there are traces of chlorine, in the original stream water, from bleaching works higher up. This, if not used up on the filters, would of course assist in the ultimate sterilisation.

Having regard to the success attending the preliminary experiments, it was decided to find some non-variable source of chlorine which would not depend for its constancy upon the hypochlorite being of correct strength, or upon a man always mixing in exactly the right proportions. For this purpose the Haas and Oettel small T.U. type electrolyser for the production of sodium hypochlorite was finally selected. This requires 110 volts continuous current at 10 amps., which will furnish from 4 per cent. brine solution 600 litres of sodium hypochlorite having a strength of 3 grms. of active chlorine per 10-hour day. This is sufficient for the treatment of 200,000 gallons of water per 10 hour day working at 2 parts of active chlorine per million of water. The T.U. type can be worked on 6 per cent. brine producing, under these conditions, 5 grms. per litre of active chlorine, but if 6 per cent. brine is used the electrolyser is liable to heat when the reaction suffers and the apparatus is apt to crack. The electrolyser is provided with a mercury contact thermometer which rings a bell when 35° C. is reached. At this temperature the electrolyser must be stopped and allowed to cool. The cost of running the T.U. type in the present case is approximately as follows:—Salt, 4s. 6d. per week. Power 1.1 B.T.U. at rather over ½d. per unit per hour. Labour (about) 1s. 2d. per week. Cost (without depreciation) about 8s. a week.

The chief benefits derived from the use of the electrolyser are (1) uniformity; (2) minimum of attention; (3) negligible cost of upkeep. Regarding the latter, the only items of importance are the carbons (a set of the middle carbons lasts about 18 months and costs 30s., while the end carbons last two or three years and cost about £2 a set) as there is practically no depreciation of the vessel itself, cost for renewals per annum amounting to something like £2.

Some few days after the commencement of the process the alga showed signs of disappearing, and in about ten days the sides of the reservoir were free from further growth. After a month's use the treatment with electrolytic sodium hypochlorite had entirely done away with the objectional green slime and inhibited its further growth.

This method of treatment was continued throughout the summer, but was twice stopped during the winter, as it was thought there would not be trouble then, owing to the fact that growth of the alga would have ceased for the time being, but on each occasion when the plant was not running certain stains in the flannel again made their appearance, despite the absence of slime. When the electrolyser re-started, these stains became less frequent.

Another aspect of the case is the possibility of stains, especially on cotton goods, being brought about by certain chromogenic organisms, which under favourable circumstances may result from the use of polluted water. This has already been referred to by Trotman (this Journal, 1909, 1237).

Since the commencement of this treatment I hav examined the water before and after treatment by bacteriological methods on a good many occasions, usin approximately 2 parts of active chlorine per million o water, a water is obtained, under normal condition almost sterile, with but few organisms growing on nutrien gelatin. Further, although the filtered water almos invariably gave positive results in 5 c.c. and often i 2 c.c. and 1 c.c. for *Bacillus coli communis*, yet on severa occasions negative results have been obtained in 50 c.c of the treated water. There appear to be certain liquefyin organisms, however, not quite so susceptible to the actio of chlorine. Very satisfactory bacteriological results hav also been obtained at Reading, where the drinking wate is treated with about 1 part of chlorine per million

It may be concluded that chlorine, properly used is most valuable for the treatment of impure water fo textile finishing in that weed growths in the water, which so often cause stains in finishing, are destroyed by its moderate use, and many organisms also are destroyed wholesale by this treatment. It has been shown that stains caused by the water under consideration not du to algae are considerably decreased, owing possibly to the fact that chromogenic organisms and harmful moulds capable of developing on the fibre under advantageous conditions have been destroyed. I hope to continue the study of the action of chlorine upon water which is to be used for textile finishing in the hope of obtaining more definite data regarding the part played by chromogenic organisms in causation of stains affecting finished textiles, and also to obtain more definite knowledge of the organisms themselves.

Discussion.

Mr. J. T. Wood enquired whether the process was suitable for sterilising drinking water, and if so, whether chlorine could be detected in the water by taste.

The Chairman said he believed the process, followed by treatment with sodium thiosulphate, was recommended for the Royal Army Medical Corps on active service. No taste could be detected in the water and as an extreme measure it was one of the best for dealing with really bad water.

Mr. E. Reuss referred to the important part played by light in ridding the water of its chlorine.

Mr. L. Archbutt enquired whether the author had tried the effect of copper on the water. He had known cases in which the growth of algae in water had been prevented by the introduction of copper plates. Copper sulphate was also sometimes employed. With regard to the sterilisation of water by softening, he had found that about 95—98 per cent. of the bacteria were carried down during the softening process and that the water was left, if not completely sterile, yet very nearly so.

Mr. Merriman enquired whether the hypochlorite in the water was determined by analysis or by the amount of electricity employed.

Mr. Toyne, in reply, said that water treated by hypochlorite for drinking purposes was usually passed through a filter known as the De Clor filter which rid it completely of free chlorine. This filter consisted of three compartments, the two outer ones containing specially graded silica, while the central one contained the active agent consisting of specially prepared carbon or charcoal. Light played no part in this filter, although it was a very important agent for removing chlorine. Some preliminary experiments had been conducted by him on the use of copper sulphate, but without satisfactory result. The amount of hypochlorite was determined by estimating the amount of available chlorine by the usual methods.

The Chairman said that the copper process might be suitable for drinking water but would be quite inadmissible for water employed for cotton fabrics since it would lead to the formation of copper soaps.

Journal and Patent Literature.

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German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

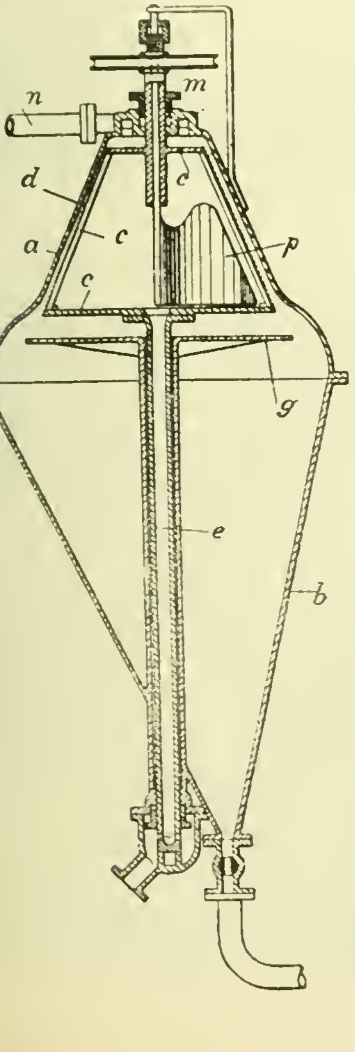
Patents.

Pipes or launders for conveying abrasive or corrosive material. J. L. Clark, Johannesburg, Transvaal. Eng. Pat. 9296, April 13, 1911.

A rigid but slightly elastic pipe or launder is formed of a sheet of canvas which is waterproofed, dried, coated with an abrasion-resisting material such as finely crushed flint, cement, sand, emery, carborundum or vitreous material in admixture with an agglutinant such as a solution of bitumen in spirit, and finally formed into a pipe upon a mandrel. The pipe may be strengthened by battens of wood and outer wrappings.—H. H.

Filtering liquids. R. Freygang, Hamburg. Eng. Pat. 26,625, Nov. 28, 1911.

The liquid to be filtered is fed through the pipe, *n*, and the head, *m*, into the narrow annular space between the outer conical casing, *a*, and the surface of the filter cloth, *d*, fastened to the rotating conical chamber, *c*. The liquid passes through the filter cloth into the interior of *c*, is directed to the centre by the fixed vane, *p*, and flows away by the hollow shaft, *e*. The solids pass down the inclined outer surface of the cone, *c*, and are discharged into the lower settling chamber, *b*, whence they pass directly to a filter press. The disc, *g*, prevents the contents of the lower chamber, *b*, from being too greatly agitated by the rotation of the cone, *c*.—W. H. C.



Separating materials of different specific gravities; Jigging process for —— and apparatus to be employed therein. W. Seltner, Schlan, Bohemia. Eng. Pat. 18,057, Aug. 9, 1911.

The jigging bed is formed of wire gauze which allows water but not the solids to pass through. The jigging motion produced by the movement of the bed itself, or of a suitable plunger or plungers is gradually diminished from the inlet to the outlet through which the specifically lighter materials are discharged.—W. H. C.

Gas-liquefying apparatus; Accumulator and separator attachment for ——. F. C. Bell, Alameda, Cal., Assignor to Pacific Refrigerating Machine Co., San Francisco, Cal. U.S. Pat. 1,024,433, April 23, 1912.

A vertical cylinder is interposed between the condenser and the receiver of the liquefying apparatus. The inlet and outlet pipes are opposite one another, and at some little distance above the bottom of the cylinder. The part of the cylinder below the pipes serves as a liquid reservoir and that above as a gas reservoir. A tap is provided at the top of the cylinder for discharging gas and one at the bottom for discharging liquid.—W. H. C.

Cold; Process and apparatus for the production of ——. E. Josse and W. Gensecke. Fr. Pat. 436,244, Oct. 26, 1911. Under Int. Conv., Oct. 29, 1910.

The vapours are withdrawn from the evaporator cooler by a steam injector, compressed, and delivered into a tubular surface condenser. The condensed liquid and gases, are withdrawn from the condenser by a water jet ejector, which is actuated by a portion of the cold water from the surface condenser.—W. H. C.

Still. C. Coyac. Fr Pat. 436,420, Nov. 15, 1911.

The vapours from the still pass through a pipe, which has a lenticular expansion, surrounded by a chamber superposed on the still, to a condenser, and the condensed liquid flows back to the above-mentioned chamber, where it is re-volatilised and passes away through a pipe to a second condenser. A rectified product is thus obtained in one operation.—W. H. C.

Kilns; Revolving tubular ——. L. Bahler, Wolgast, Germany. Eng. Pat. 17,695, Aug. 3, 1911.

See Fr. Pat. 432,757 of 1911; this J., 1912, 111.—T. F. B.

Filtering apparatus. W. Paterson. Fr. Pat. 437,697, Dec. 15, 1911. Under Int. Conv., Jan. 3, 1911.

See Eng. Pat. 146 of 1911; this J., 1912, 178.—T. F. B.

Compressing gases and utilising their expansive force; Methods of ——. H. A. Humphrey. Fr. Pat. 437,800, Oct. 25, 1911. Under Int. Conv., Jan. 17, 1911.

See Eng. Pat. 1241 of 1911; this J. 1912, 216.—T. F. B.

Extraction of liquid or gas from masses, or the saturation of the same with liquid, in centrifuging mixtures in moulds or forming moulded pieces, especially in the manufacture of sugar; Apparatus for regulating the ——. M. Naswanoff. Fr. Pat. 437,920, Dec. 20, 1911.

SEE Eng. Pat. 28,140 of 1911; this J., 1912, 453.—T. F. B.

IIA.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal. A. Wahl. Comptes rend., 1912, **154**, 1094—1097.

A NUMBER of finely powdered coals were extracted with pyridine (this J., 1908, 147) and determinations made of the amount of volatile matter in the coal before and after extraction. The amount dissolved varied from about 18 to 25 per cent., excepting for anthracites, of which very little was soluble. The amount of volatile matter was usually from 3 to 5·8 per cent. after extraction. The coke given by the coal after extraction was harder, more compact and less bulky than that given by the original coal. Correspondingly the products soluble in pyridine form an exceedingly voluminous coke. When they are mixed with the extracted coal in the proper proportions and coked, a normal coke is obtained. The portion soluble in pyridine is an amorphous brown powder insoluble in water, alkalis or acids, with the exception of fuming nitric acid by which it is oxidised: it is partly soluble in organic solvents giving yellow or brown solutions with an intense fluorescence. It has much the same elementary composition as the original coal but contains a slightly greater proportion of hydrogen. Thus the ratio C/H=15·5 in the original coal changed to C/H=16·1 in the residual coal after extraction.—E. F. A.

Carbon dioxide; Rate of reduction of —— by carbon. T. F. E. Rhead and R. V. Wheeler. Chem. Soc. Proc., 1912, **28**, 104. (See also this J., 1911, 129.)

THE velocity of the reaction $CO_2+C \rightarrow 2CO$ at different temperatures has been determined. The velocity of reaction increases with increase of temperature, the mean velocity ratios for a temperature interval of 10° diminishing fairly regularly as the temperature scale is ascended.

Thus, in a series of experiments in which a mixture containing 20 per cent. of carbon dioxide and 80 per cent. of nitrogen was employed, the following mean values of k at different temperatures were obtained $\left(k=\frac{1}{t}\cdot\log\frac{C_o}{C_t}\right)$:

Temperature.	k(t=1 minute).
900°	0·00060
950	0·00374
1000	0·01764
1050	0·05760
1100	0·10570

The mean velocity ratios for an interval of 10°, obtained from the expression $\frac{k_{t+10}}{k_t}=10^{10b}$, are given in the following table, together with the values of b obtained from the experimental numbers:—

Temperature range.	b.	$\frac{k_{t+10}}{k_t}$
900— 950°	0·01589	1·44
950—1000	0·01346	1·36
1000—1050	0·01028	1·27
1050—1100	0·00527	1·13

Carbon; Combustion of ——. T. F. E. Rhead and R. V. Wheeler. Chem. Soc. Proc., 1912, **28**, 105.

WORK by previous experimenters regarding the first reaction that takes place when carbon burns in oxygen was discussed.

The alternatives are:—

(*a*) $C+O_2=CO_2$, followed by
(*b*) $CO_2+C=2CO$:

and

(*c*) $2C+O_2=2CO$, followed by
(*d*) $2CO+O_2=2CO_2$.

The authors attempted to obtain evidence as to whi reaction is most likely to take precedence at differe temperatures, by determining the relative velocities the above reactions under the same experimental co ditions.

The results obtained showed (1) that some carbo monoxide is produced during the oxidation of carbon low temperatures, under conditions which do not adm of the reduction of carbon dioxide by carbon. On th other hand, (2), carbon dioxide is produced at low ten peratures in quantity which cannot be altogether accounte for by the supposition that carbon monoxide is first forme and then oxidised to carbon dioxide.

When carbon is burned at low temperatures, therefor carbon dioxide and carbon monoxide are produced simul taneously.

Corrosion of metals in [gas] purifier houses. J. T. Haddock J. Gas Lighting, 1912, **118**, 370—371.

A STEEL pipe, ⅜ in. thick, forming the inlet to the purifiers was found to be corroded and eaten through from th inside after 3½ years' use. Examination showed that th deposit in the steel pipe was deeper than in the section of cast-iron pipe, and the sludge contained more iron Analysis of the sludge gave—

	Steel pipe. per cent.	Cast-iron pipe. per cent.
Moisture	19·0	28·8
Iron oxide	53·0	23·0
Sulphur	14·6	7·6
Cyanogen	1·6	0·6
Ammonia	6·3	5·9
Carbon	8·4	5·5
Carbon dioxide	1·2	1·5

It is supposed that the corrosion is due to electrolytic action between carbon, iron and the hydrogen sulphide and other impurities in the sludge. Pieces of steel and cast-iron were found to lose weight when placed in the sludge taken from the cast iron pipe, steel losing 13 per cent. and cast-iron 3 per cent. in 6 days. These metals also lost weight in various solutions such as ammoniacal liquor, and potassium or ammonium thiocyanate, and the corrosion was usually increased by the presence of carbon.
—A. T. L.

Mineral oil industry of the Caucasus. Board of Trade Journal, May 2, 1912 (see also this J., 1912, 423). [T.R.]

Production.—The output of crude oil from the Balakhani and Bibi-Eibat fields shows a material decrease, and the production from these fields in 1911 will not reach 6,871,000 tons, which is a decrease of over 806,000 tons on the production of 1910. Excluding the year 1905, when more than half the field was destroyed by fire, the oil yield of 1911 is the lowest obtained since the opening up of the entire field in 1898. About 645,000 tons produced by the outlying fields of Binagadi, Surachani, and Tcheleken have to be added to the 6,871,000 tons, when this last figure shows an increase of some 242,000 tons on the preceding year, and, therefore, reduces the decrease of 806,000 tons mentioned above to 564,500 tons.

This points to a gradual exhaustion of the present two fields. During the quinquennial period 1901–05 a yearly average output of from 4435 tons to 4677 tons per well was obtained from 1500 to 2000 wells, whereas during the five years ending 1911, this average was reduced from 2822 tons to 3225 tons, from 2000 to 3000 wells.

Prices.—The decrease in production was counterbalanced by rise in prices. In the years 1901, 1902, and 1903, when the production was over 9,677,000 tons, the price for crude oil ranged from 1¾d. to 2¼d. per poud (36 lb.), whereas the average price in later years ranged between 5d. and 7d. per poud.

There was a slight decrease in the export of crude oil, 822,600 tons having been sent from Baku in 1910, and 758,000 tons in 1911. The exports of benzine, gasoline, and other minor products increased slightly, viz., 25,160 tons in 1911, as against 21,350 tons in 1910. The increase in exports on a decreased production is largely accounted for by the difference in stocks at the beginning and end of the year.

New lands. Owing to the decrease in the production of rude oil at Balakhani and Bibi-Eibat, considerable ttention is being paid to outlying lands, and much rospecting work is being carried on.

etroleum production of Roumania. Ch. of Comm. J., May, 1912. [T.R.]

n 1911 1,404,400 metric tons of petroleum were delivered o Roumanian refineries, compared with 1,215,300 metric ons in 1910, an increase of over 15 per cent. The yield rom the refineries in 1911 was:—Benzine, 260,653 metric ons; burning oil, 312,711 metric tons; mineral oil, 4,703 metric tons; and residue, 783,136 metric tons. About half the production was used in Roumania.

Patents.

Fuel briquettes; Manufacture of ——. A. V. Board, Liverpool. Eng. Pat. 12,154, May 19, 1911.

Coke breeze, anthracite, bituminous or other coal dust is briquetted with 2 to 2·5 per cent. of a binder consisting of sun-dried manioc root which has been finely ground and sifted to remove fibrous material. The mixture is placed in a steam-jacketed pan and kept at 160—175° F., whilst steam is blown through the mass for 7 to 10 minutes to gelatinise the flour. The mass is then briquetted and the briquettes dried, or allowed to dry naturally. A preservative such as mercuric chloride, formaldehyde or phenol may be mixed in with the other substances, if desired.—A. T. L.

Fuel; Manufacture of compressed ——. L. J. Thomas, Hoylake. Eng. Pat. 12,196, May 20, 1911.

Anthracite "duff," consisting of small grains and powder, is washed, then brought to a moist heated condition by stirring it in a steam-heated pan and introducing saturated steam or a fine water-spray, and whilst in this condition, it is mixed with 3 to 5 per cent. of a binder containing starch and pitch, with or without asbestos. The mass is briquetted whilst hot, the temperature being first raised to 300° F. The binder is prepared by mixing together 7 parts (by bulk) of maize, sago, or other flour, 1 part of powdered asbestos, and 2 parts of powdered pitch or bitumen, and treating the mixture with steam until it becomes liquid.—A. T. L.

Fuel; Manufacture of ——. E. W. Smith, Manchester. Eng. Pat. 7274, Sept. 23, 1911.

In making smokeless fuel by the partial coking of bituminous coal, the retorts are heated by furnace gases to 1200° F. in order to obtain a temperature of about 1000° F. within the retort. The benzol or light hydrocarbons obtained from the tar may be sprayed into the retort during the distillation, in order to enrich the gas and increase its volume and to increase the value of the smokeless fuel. The retorts may be of the kind described in Eng. Pat. 7273 of 1911 (this J., 1912, 219). Eng. Pats. 569 of 1873, 580 of 1905, 14,365 of 1906, and 10,801 of 1907 (this J., 1906, 171; 1907, 1030; 1908, 619) are referred to.—A. T. L.

Combustibles; [Smokeless ——]. H. Clarke and J. A. Campbell. Fr. Pat. 436,918, Nov. 29, 1911. Under Int. Conv., July 7, 1911.

Bituminous coal is carbonised in suitable vertical retorts at a temperature of from 700° to 760° C. for from seven to eight hours, until a skin of hard coke has formed round the mass, which on opening the bottom door of the retort falls out as one piece. The fuel thus obtained is said to bear transport well, to ignite readily, and to burn without smoke. It contains from 6 to 10 per cent. of volatile matter.—W. H. C.

Coke; [Metallurgical ——]. J. Guebels et Cie. Fr. Pat. 437,231, Dec. 6, 1911. Under Int. Conv., Dec. 8, 1910.

The finely divided coal is intimately mixed with suitable fluxes such as partially burned dolomite before coking. The coke obtained is said to be more economical than ordinary coke, when used in metallurgy, as the ash being fusible at a low temperature does not occlude particles of carbon, and a very fluid slag is obtained which renders the addition of fluxes unnecessary.—W. H. C.

Illuminating gas; Process of making ——. L. L. Summers, Chicago, Ill. U.S. Pat. 1,023,446, April 16, 1912.

A mixture of coal and hydrocarbon oils is introduced into a closed retort and the mixture is distilled, whilst the volatilised products are moved toward the source of heat. Thus the products distilled at the lower temperatures are caused to pass to zones of higher temperatures in immediate contact with products distilled from the mixture at the higher temperatures. Instead of coal and oil, the principle may be applied to mixtures of hydrocarbons which are volatilised within a comparatively wide range of temperatures.—J. F. B.

Gas-producer. W. R. Hüttinger, Beverly, N.J. U.S. Pat. 1,023,567, April 16, 1912.

The producer is water-jacketed at the top and at the sides, the two jackets, which are connected with one another, forming an upper and a lower vapourising chamber respectively. The fuel-feeding device passes centrally through the upper water-jacket into a depositing chamber, the floor of which slopes towards the centre, thus directing the fuel into the upper end of the central combustion chamber. Near the top of the depositing chamber is a deflector wall by which the products of combustion are directed to a restricted lateral outlet opening at right angles to the side wall. On the outer side of the deflector wall is an expansion chamber communicating with the lateral outlet. From the outlet, the hot gases pass away through flues extending through the lower vapourising chamber. The upper vapourising chamber has an air inlet, and the lower vapourising chamber is connected with the fuel chamber "in advance of the point of combustion therein."—A. S.

Natural gas; Process of treating ——. I. N. Knapp, Ardmore, Pa., Assignor to The United Gas Improvement Co., Philadelphia, Pa. U.S. Pat. 1,023,783, April 16, 1912.

Natural gas is passed through an incandescent bed of carbon from which air is excluded, the temperature of the bed being maintained above that of its ordinary or atmospheric combustion, in order that the methane of the natural gas may combine with carbon and be converted into acetylene.—W. C. H.

Methane; Process for the transformation of the carbon monoxide of water-gas into ——. L. Vignon. Third Addition, dated Feb. 6, 1911, to Fr. Pat. 416,699, Aug. 12, 1909. (See this J., 1910, 1366; 1911, 75; 1912, 117.)

The claim is for the realisation of the process described in the principal patent in a single apparatus, worked continuously. Steam is passed continuously through a chamber packed with an intimate mixture of about 100 parts of coke and 250 parts of quicklime, and heated from without to 600° or 800° C.—W. H. C.

Combustible gas; Manufacture of a ——. C. Harting, H. Jordy geb. Albert, and H. F. Jordy. Ger. Pats. 245,058 and 254,059, Dec. 9, 1910, and March 12, 1911.

(1) Glycerin, or sugar, and water are mixed with potassium permanganate. (2) Glycerin or sugar, or a mixture of the two, is mixed with a mineral oil, *e.g.*, vaseline oil, and decomposed by means of potassium permanganate. By the first process a mixture of 200 grms. of permanganate and 200 grms. of glycerin gives 50 litres of a gas containing 28·2 per cent. (by vol.) of carbon dioxide, 21 of carbon monoxide, 31 of hydrogen, and 0·4 of methane. By the second process, a mixture of 200 grms. of permanganate, 100 grms. of vaseline oil, 100 grms. of sugar, and 20 grms.

of glycerin gives 50 litres of gas containing 15·2 per cent. (by vol.) of carbon dioxide, 27·2 of carbon monoxide, 22·2 of hydrogen, 1·8 of methane, and 5·2 of heavy hydrocarbons.—A. S.

Coal gas; Removal of naphthalene from ——. E. D. Simon, Manchester. Eng. Pat. 5651, Mar. 7, 1911.

Naphthalene is removed from coal gas by subjecting the gas to centrifugal action in a chamber into which tar is sprayed, the naphthalene being deposited upon the walls of the chamber with the tar.—H. H.

Ammonium chloride; Production of liquor containing —— in the carbonisation of coal or the like. W. Beimann, Wakefield. Eng. Pat. 9358, April 15th, 1911.

The water vapour in the volatile products from a chamber in which coal or the like is carbonised is condensed fractionally, so that there may be obtained a liquor which is relatively rich in ammonium chloride, and the first fraction or earlier fractions are returned to the carbonising chamber (for instance, by spraying the liquor directly into the chamber or by feeding the liquor on to the coal, in the drainage bunkers) as often as may be necessary until a liquor is obtained sufficiently rich in ammonium chloride to pay for evaporating. The invention refers particularly to the known process of freeing coke-oven gas from tarry substances at temperatures near to the dew point of the water it contains, by means of a tar spray or the like, the liquor which settles out of the tar being mixed with the coal before this is charged into the oven, or after charging. —F. Sodn.

Hydrocarbon oils; Solidification of ——. J. T. Armstrong, London, and J. Mordan, Hughenden, Bucks. Eng. Pats. (1) 868, Jan. 12, and 10,119, April 26, 1911, and (2), 869, Jan. 12, 1911.

(1) The claim is for the addition of a large proportion of "paddy husk" or husks of other grains or seeds or various grasses to the emulsion of hydrocarbon oil and glue solution. Iron sulphate is added to act as a stiffener. (2) The solution of glue in excess of water which is used as the emulsifying and binding agent is put into a high-speed mixing apparatus and the petroleum or other hydrocarbon oil slowly added till the emulsion is satisfactory. A small quantity of iron sulphate is then added and the mixing continued at a higher speed until a "fluffy" product is obtained. This is then moulded into blocks for use.—W. H. C.

Distillation apparatus [for oil]. J. T. Davis, Alameda, Cal., Assignor to The Technical Development Co., San Francisco, Cal. U.S. Pat. 1,023,244, April 16, 1912.

The oil to be distilled is admitted to a long trough or vessel situated in the upper part of a heating chamber through which products of combustion for heating the oil pass. The sides of the trough converge downwards and the upper parts of the walls of the heating chamber are correspondingly inclined to leave a narrow space between them and the trough. The residual oil not vaporised in the trough is led through pipes to a series of troughs or channels running along the outer surfaces of the lower parts of the heating-chamber walls, these troughs being suitably enclosed to form vapourising chambers from which the distillate is led off.—H. H.

Coal; Process for washing fine ——. O. Rindfleisch. Fr. Pat. 438,017, Dec. 22, 1911. Under Int. Conv., Jan. 10, 1911.

See Eng. Pat. 10,521 of 1911; this J., 1912, 219.—T. F. B.

Coke; Process for the manufacture of ——. L. H. Diehl, London, and P. Faber, Paris. Eng. Pat. 20,980, Sept. 22, 1911. Addition to Eng. Pat. 6622, March 16, 1910.

See Fr. Pat. 433,695 of 1911; this J., 1912, 219.—T.F.B.

Coke oven; Regenerative ——. A. Gohmann, Stett Germany. Eng. Pat. 25,960, Nov. 21, 1911.

See Fr. Pat. 436,611 of 1911; this J., 1912, 123.—A

Coke; Process and apparatus for obtaining different gra of —— in horizontal or inclined ovens. H. Koppe Fr. Pat. 437,354, Dec. 1, 1911. Under Int. Co June 29, 1911.

See Eng. Pat. 27,624 of 1911; this J., 1912, 323.—T.F

Gas-generating apparatus. M. and J. H. White, Lut U.S. Pat. 1,023,978, April 23, 1912.

See Eng. Pat. 10,357 of 1910; this J., 1911, 481.—T. F.

Gas; Apparatus for generating or producing ——. A. Cambridge, Keighley. U.S. Pat. 1,024,117, April 1912.

See Eng. Pat. 19,639 of 1909; this J., 1910, 1148.—T.F.

Gas-producing oven. A. Gohmann, Assignor to Stetti Chamotte-Fabrik Act.-Ges. vorm. Didier, Stett Germany. U.S. Pat. 1,024,128, April 23, 1912.

See Eng. Pat. 6924 of 1911; this J., 1911, 1042.—T. F.

Apparatus for automatically recording the percentage carbon monoxide in gaseous mixtures. Eng. Pat. 12,8 *See* XXIII.

Means for analysing flue gases. U.S. Pat. 1,023,1 *See* XXIII.

Obtaining dry ammonium sulphate from gases. Ger. P 244,924. *See* VII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

Supporting rod [of fused quartz] for mantles for uprig incandescence gas burners. Deutsche Gasglühlicht A.- (Auergesellschaft). Ger. Pat. 244,959, July 8, 1910.

The rods are made of fused quartz (quartz glass).—A.

Filaments; Manufacture of metallic —— for incandesc electric lamps. H. Bresler, Charlottenburg, German Assignor to General Electric Co., New York. U.S. P 1,023,295, April 16, 1912.

The finely divided metal such as tungsten is held in binder of viscose, preferably ammonium-viscose.—H.

Metal filament. M. A. Hunter, Schenectady, N.Y Assignor to General Electric Co., New York. U.S. P 1,023,315, April 16, 1912.

The process consists in heating a filament of substantial pure tantalum in an atmosphere of nitrogen, wherel the electrical resistance of the filament is increased.—H.

Electric incandescence lamps; Process for heating met filaments for ——. J. Pintsch A.-G. Ger. Pat. 245,47 Oct. 6, 1910.

The filaments are heated in a special furnace, without t passage of an electric current. Each filament is be into the shape of a hair-pin which is suspended at the ben and the free ends are loaded. The loading may be effect by thickening the filament at the ends, *e.g.*, by dippi the ends into, or coating them with, some of the mixtu from which the filament was formed.—A. S.

Ovens for coking or carbonising peat, wood, or the lil K. R. A. Wengler, Zwickau, Saxony. Eng. Pat. 12,73 May 26, 1911.

See Fr. Pat. 430,257 of 1911; this J., 1911, 1304.—T. F.

phorous substances for ignition and illumination ; Process for the production of ——. A. Lesmüller, Munich, Assignor to L. Weiss, Barmen-Rittershausen, Germany. U.S. Pat. 1,023,208, April 16, 1912.

e Eng. Pat. 27,311 of 1908 ; this J., 1909, 973.—T. F. B.

lectrode [for arc lamps]. J. Hardén, Schenectady, Assignor to General Electric Co., New York. U.S. Pat. 1,024,257, April 23, 1912.

e Eng. Pat. 13,381 of 1905 ; this J., 1905, 1102.—T. F. B.

olding electric conductors and the like. Eng. Pat. 11,841. *See* X.

III.—TAR AND TAR PRODUCTS.

Patent.

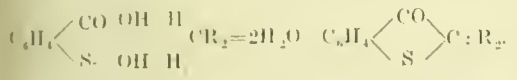
hydroisoquinoline derivatives ; Process for preparing ——. H. Decker. Ger. Pat. 245,095, July 30, 1910. Addition to Ger. Pat. 231,850, May 11, 1910 (see this J., 1911, 923)

ormyl- and oxalyl-compounds of ω-phenylethylamine re treated with acid condensing agents (phosphoric nhydride being excepted in the case of formylhomopiperonylamine), and the dihydroisoquinoline derivatives thus roduced are methylated if desired. The products nsist of dihydroisoquinolines in which the carbon in the position is not alkylated, and of derivatives of a 3·4-hydroisoquinoline-1-carboxylic acid (compare Ger. Pat. 35,358 ; this J., 1911, 1088).—T. F. B.

IV.—COLOURING MATTERS AND DYES.

3-Oxy-(1)-thionaphthene [and thioindigo] ; Syntheses of ——. A. M. Hutchison and S. Smiles. Chem. Soc. Trans., 1912, **101**, 570—576.

By the condensation of o-thiolbenzoic acid or o-dithiobenzoic acid with malonic acid or ethyl acetoacetate, in presence of sulphuric acid or chlorosulphonic acid, 3-oxy-(1)-thionaphthene is formed, yielding thioindigo on oxidation. The possibility of the condensation is considered to be due to the formation of a sulphoxylic acid in the mixture of sulphuric acid with thiolbenzoic acid (by oxidation) or dithiobenzoic acid (by hydrolytic fission), the sulphoxylic acid then condensing directly with the methylene derivative (malonic acid, etc.), as in the following equation :



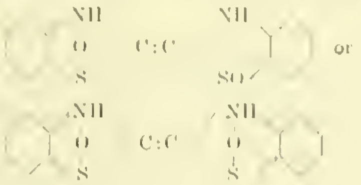
$$C_6H_4\begin{matrix}\diagup CO\;OH\quad H\\ \diagdown S\cdot\;OH\quad H\end{matrix}CR_2=2H_2O\quad C_6H_4\begin{matrix}\diagup CO\diagdown\\ \diagdown S\diagup\end{matrix}C:R_2.$$

The best yield of thioindigo is obtained by the condensation of *o*-thiolbenzoic acid with malonic acid in presence of chlorosulphonic acid. Very finely divided thiolbenzoic acid is added gradually to a cold mixture of rather more than the molecular proportion of malonic acid with chlorosulphonic acid. When the interaction has subsided, the mixture is warmed to 45° C. for about 2 hours, poured on to ice, and the precipitated dyestuff collected. Some thioindigosulphonic acid is produced in addition to thioindigo, and the yield of the two substances together is not far from the theoretical yield.

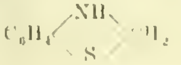
The authors consider it probable that sulphoxylic acids are also formed as intermediate products in the preparation of thioindigo by oxidation of *o*-thiolacetophenone or its derivatives by means of air in alkaline solution (Ger. Pat. 198,509 ; this J., 1908, 801) and by interaction of sulphur chloride and acetophenone in the presence of chlorosulphonic acid (Eng. Pat. 16,517 of 1910 ; this J., 1911, 677).
—A. S.

Thionylindigo. M. Claasz. Ber., 1912, **45**, 1015—1032.

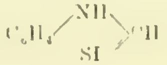
With the object of throwing light on the origin of the colour of indigo, the author has prepared thionylindigo :—



where the chromophore of indigo, CO·C·C : CO has its carbonyl groups substituted by SO. The starting point in the synthesis was *o*-aminothiophenol which is condensed with formaldehyde to the benzthiazolin (I) :—



(I)



(II)

this, in potassium iodide solution yields the sulphine-iodide (II) which on oxidation with hydrogen peroxide in glacial acetic acid gives the hydriodide of thionylindigo from which the latter is obtained by treatment with alkalis. Thionylindigo is a deep blue powder resembling indigo ; it gives, on reduction, a brown vat which is oxidised easily by hydrogen peroxide (not by air) to thionylindigo. The substance has scarcely any affinity for the fibre.—J. C. C.

Patents.

Acid [indigo] dyestuff ; Process for preparing a yellow ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 244,226, March 24, 1911.

When the product produced by the action of benzoyl chloride on indigo, is heated with fuming sulphuric acid, a yellow acid dyestuff, soluble in water, is produced, which dyes wool or silk pure yellow shades from acid baths (compare U.S. Pat. 994,988 ; this J., 1911, 886).
—T. F. B.

Aminoanthraquinonyltriazoles ; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 245,191, Dec. 22, 1910.

The diazo derivatives of aminoanthraquinones are combined with such amines as will furnish *o*-aminoazo dyestuffs ; these are oxidised to produce anthraquinonyltriazoles, which are treated with nitrating agents and the nitro groups reduced. The aminoanthraquinonyltriazoles are either vat dyestuffs or are suitable for use in making vat dyestuffs.—T. F. B.

Vat dyestuff of the anthraquinone series containing sulphur ; Process for preparing a ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 245,234, Sept. 30, 1910.

The product obtained by condensing formaldehyde with β-aminoanthraquinone, is heated with sulphur to a high temperature, or the condensation and the heating with sulphur may be performed in one operation. The yellow product dyes cotton from the vat in golden yellow shades of considerable fastness to chlorine.—T. F. B.

Wool [azo] dyestuff suitable for use in the single-bath chrome process ; Process for preparing a blue ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 245,280, Dec. 24, 1910.

A dyestuff which dyes wool in the single-bath chrome process, fine level blue shades, fast to milling and fulling, is obtained by combining diazotised *p*-chloro-*o*-aminophenol with a monoalkyl ether of 1·8-dihydroxynaphthalene-4 or-5 -sulphonic acid.—T. F. B.

Acid dyestuffs of the anthracene series; Process for preparing ——. R. Wedekind und Co. Ger. Pat. 244,372, Dec. 30, 1910. Addition to Ger. Pat. 235,776, Sept. 14, 1909 (see U.S. Pat. 996,487 of 1911; this J., 1911, 947).

In order to obtain dyestuffs producing pure shades, it is necessary for the sulphonation product of anthraflavic acid to be free from the sulphuric ester. To obtain this result one of the following methods is used: (*a*) Excess of fuming sulphuric acid is avoided when sulphonating the anthraflavic acid, and the product is nitrated and condensed with an aromatic amine; (*b*) after sulphonation of the anthraflavic acid, boric acid is added to convert the sulphuric ester into the boric ester, which is then nitrated and condensed as before; (*c*) the sulphuric ester of the sulphonation product is decomposed by heating its solutions in presence of alkali.—T. F. B.

Acid dyestuffs of the anthracene series; Process for preparing ——. R. Wedekind und Co. Ger. Pat. 245,014, Jan. 19, 1911. Addition to Ger. Pat. 235,776, Sept. 14, 1909 (see U.S. Pat. 996,487 of 1911; this J., 1911, 947)

By heating the products obtained by condensation of dinitrodisulphoanthraflavic acid and aromatic amines, dyestuffs are formed which differ in some respects from the unheated compounds. Thus, the original dyestuff dyes wool violet-red, converted into indigo-blue on chroming, whilst the heated dyestuff dyes chromed or unchromed wool blue shades, which are fast to light, soaping, and fulling. They are also suitable for use in dyeing silk and in printing silk and wool. Their blue barium lakes on an alumina substratum are fast to light.—T. F. B.

Mordant acid dyestuffs; Process for preparing violet to red ——. Farbwerke vorm. L. Durand, Huguenin, und Co. Ger. Pat. 244,653, Nov. 18, 1910. Addition to Ger. Pat. 244,652, May 10, 1910 (see U.S. Pats. 1,002,825 and 1,003,257; this J., 1911, 1204, 1205).

Dyestuffs which resemble closely those from which they are derived, except that they are soluble in alkalis, are obtained by treating with sulphonating agents the dyestuffs described in the principal patent, or the unsulphonated Rhodoles obtained by condensing dialkylaminohydroxybenzoylbenzoic acids with resorcinol and esterifying, or the carboxylated Rhodoles obtained by condensing substituted aminohydroxybenzoylbenzoic acids with β-resorcylic acid. —T. F. B.

Nitro-dyestuffs of the Rhodole [phthalein] series; Process for preparing mordant ——. Farbwerke vorm. L. Durand, Huguenin, und Co. Ger. Pat. 245,231, July 18, 1911.

The dyestuffs are prepared (1) by the nitration in a suitable medium (*e.g.*, sulphuric acid) of the Rhodoles derived from phthalic acid and resorcinol, its sulphonic acids, or β-resorcylic acid; (2) by condensing nitroresorcinols, nitroresorcinolsulphonic acids, or nitro-β-resorcylic acids with an amino-*m*-hydroxybenzoylbenzoic acid, substituted in the amino group; the products obtained by either method are converted into the more soluble alkali salts. The new dyestuffs produce more yellowish shades in dyeing than the non-nitrated rhodoles, whilst their fastness in many cases is improved, particularly in the case of the dyeings on chrome-mordanted wool. The shades produced on chrome-mordanted fibres vary from yellow to bluish red. Some of the unsulphonated rhodoles, notably those having a benzylamino- or phenylamino-group, are rendered much more soluble by sulphonation. —T. F. B.

Azo dyestuffs; Process for preparing red to brown chrome ——. Farbwerk Mühlheim vorm. A. Leonhardt und Co. Ger. Pat. 245,230, Feb. 21, 1911. Addition to Ger. Pat. 238,596, June 28, 1910 (see this J., 1911, 1306).

The diazo compounds of *o*-aminophenol or its sulphonic acids, or of their homologues or derivatives, or of aminosalicylic acid ($NH_2 : OH : COOH = 1 : 2 : 3$), its homologues or derivatives, are combined with one of the *m*-aminophenolsulphonic acids ($NH_2 : OH : SO_3H = 1 : 3 :$ or $1 : 3 : 6$) in which the amino-group contains substituent —T. F. B.

Vat dyestuff from ψ-cumylthioglycollic acid; Process f preparing a ——. Kalle und Co. Ger. Pat. 245,63 Jan. 13, 1907. Addition to Ger. Pat. 198,864, Jan. 1 1906.

A dyestuff which dyes cotton extremely fast violet-bl shades from alkaline vats, is produced by treating cumylthioglycollic acid with sulphuric acid, with without addition of a substance which favours condens tion. The dyeings on wool are violet red.—T. F. B.

Vat dyestuff from 2-methyl-4-chlorophenylthioglycollic acid Process for preparing a ——. Kalle und Co. Ger. Pa 245,631, Jan. 13, 1907. Addition to Ger. Pat. 198,86 Jan. 18, 1906.

By treating 2-methyl-4-chlorophenylthioglycollic ac with sulphuric acid, with or without another condensi agent, a dyestuff is obtained by which wool and cotton a dyed very fast reddish-violet shades (compare precedi abstract).—T. F. B.

Sulphur colouring matters; Manufacture of ——. J. Johnson, London. From Badische Anilin und So Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pa 18,239, Aug. 11, 1911.

See Fr. Pat. 433,323 of 1911; this J., 1912, 119.—T. F.

Azo dye. A. Blank, Leverkusen, Assignor to Farbenfa vorm. F. Bayer und Co., Elberfeld, Germany. U. Pat. 1,023,120, April 16, 1912.

See Eng. Pat. 412 of 1911; this J., 1911, 534.—T. F.

Azo dyes. H. Jordan and W. Neelmeier, Leverkuse Assignors to Farbenfabr. vorm. F. Bayer und C Elberfeld, Germany. U.S. Pats. 1,024,080 and 1,024,08 April 23, 1912.

See Eng. Pats. 974 and 5955 of 1911; this J., 1911, 110 and 1912, 182.—T. F. B.

Azo dye. H. Schweitzer, Elberfeld, and A. Zart, Vo winkel, Assignors to Farbenfabr. vorm. F. Bayer u Co., Elberfeld, Germany. U.S. Pat. 1,024,031, April 2 1912.

See Eng. Pat. 12,433 of 1910; this J., 1911, 612.—T. F.

[*Azo*] *dyestuffs for wool; Process for producing morda* ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pa 437,939, Dec. 20, 1911. Under Int. Conv., Jan. 19, 191

See Eng. Pat. 2797 of 1911; this J., 1911, 1371.—T. F.

Vat [anthracene] dye. H. Friedmann, Assignor to Farbe fabr. vorm. F. Bayer und Co., Elberfeld, German U.S. Pat. 1,023,248, April 16, 1912.

See Ger. Pat. 238,982 of 1910; this J., 1911, 1372.—T.F.

[*Triarylmethane*] *dye.* M. Weiler, Assignor to Farbenfab vorm. F. Bayer und Co., Elberfeld, Germany. U. Pat. 1,023,977, April 23, 1912.

See Fr. Pat. 419,902 of 1910; this J., 1911, 125.—T. F.

Beta-naphthol-ortho-[hydr]oxyazo dye; Manufacture a ——. K. Elbel, Assignor to Kalle und Co., Akt.-Ge Biebrich, Germany. U.S. Pat. 1,023,199, April 1 1912.

See Fr. Pat. 434,405 of 1911; this J., 1912, 327.—T. F.

Azo colouring-matters containing a carbazole derivativ Manufacture of ——. H. Bucherer, Assignor to Ka und Co., Akt.-Ges., Biebrich, Germany. U.S. Pa 1,024,308, April 23, 1912.

See Eng. Pat. 8127 of 1910; this J., 1910, 1051.—T. F.

Vat [anthracene] dyestuff; Alizarin-red —— and process of making same. M. Hessenland, Assignor to Farbwerke vorm. Meister, Lucius, und Bruning, Höchst on Maine, Germany. U.S. Pat. 1,023,817, April 23, 1912.

See Fr. Pat. 422,202 of 1910; this J., 1911, 613.—T. F. B.

Vat dyestuffs of the anthraquinone series; Process for making ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 437,461, Dec. 11, 1911. Under Int. Conv., Feb. 6, 1911.

See Eng. Pat. 29,031 of 1911; this J., 1912, 223.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Wood pulp yarn; Manufacture and uses of ——. W. P. Dreaper. J. Soc. Dyers and Col., 1912, 28, 178—179.

A general account of the industry in "paper" yarns is given. Wood pulp yarns are now being produced in Germany in large and increasing quantities chiefly for the manufacture of sacking cloths, carpets and mats. The chief defects of the material are its insufficient tensile strength and the serious weakening which it suffers on wetting.—P. F. C.

Patents.

Wool and other fibrous materials; Machinery for scouring and washing ——. W. McNaught, Rochdale. Eng. Pat. 12,351, May 22, 1911.

Means are introduced whereby ready access is afforded to the chute-plate and squeezing rollers during working; the machine may be readily converted so as to work as a "rake" type or "harrow" type indifferently and a deeper trough is provided in conjunction with an inclined shallower delivery-end.—J. F. B.

Waterproofed fabrics; Manufacture of ——. N. B. Roy, Glasgow. Eng. Pat. 23,973, Oct. 30, 1911.

Both sides of a ply of fabric, or one side of a ply of previously waterproofed fabric, are coated with a film of oily composition, consisting of about 93 parts of linseed oil and 7 parts of manganese dioxide, the film is "dried" at a temperature of about 95° C. so as to partially oxidise it, the ply is pressed between two other plies or with its oiled face adjacent to a single ply of fabric or the like, and the compound fabric is finally matured by exposing it to the action of air.—J. F. B.

Silk and cellulose; Manufacture of threads, films, ribbons, etc., from pure silk or mixtures of ——. D. Lance First Addition, dated Jan. 28, 1911, to Fr. Pat. 435,156, Dec. 17, 1910 (this J., 1912, 328).

In addition to silk, other proteins of animal or vegetable origin, such as gluten, blood-fibrin, ossein, etc., ordinarily insoluble in water, may be dissolved in the reagents specified (*loc. cit.*). The solutions are coagulated in baths of organic or mineral acids of weak acid function, and the products are protected from oxidation by performing the coagulation and subsequent operations in media containing reducing agents, such as formaldehyde, acetaldehyde, etc. —J. F. B.

Plastic masses, particularly acetylcellulose; Process and apparatus for manufacturing solid bodies from ——. E. Ichenhäuser. Fr. Pat. 436,538, Nov. 18, 1911.

The difficulties connected with the production of solid bodies by the evaporation of a solution of cellulose acetate, *e.g.*, in acetone, are overcome by preventing the evaporation of the solvent from the upper surface of the plastic solution, and permitting evaporation only from the sides and bottom of a porous mould. The moulds are made of unglazed earthenware or compressed fabric, and are hermetically connected at their upper end with a vessel containing the solution of cellulose acetate. This vessel is also sealed by connection with a vessel containing some of the solvent, through which the air is compelled to pass as the plastic solution is delivered into the moulds. The solid body is gradually formed by evaporation in the mould and the solution is continuously supplied as the body in the mould becomes more concentrated.—J. F. B.

Cellulose; Preparation of ammoniacal cupric oxide solutions of —— for the manufacture of threads and other artificial products. E. de Haen Chem. Fabr. "List." Fr. Pat. 436,968, Nov. 29, 1911. Under Int. Conv., March 10, 1911.

In the manufacture of an ammoniacal solution of cupric hydroxide for dissolving cellulose, copper sulphate is decomposed by potassium hydroxide instead of by sodium hydroxide. Two to four parts of copper sulphate are dissolved in 10 parts of 25 per cent. ammonia solution and potassium hydroxide is then added. The crystals of potassium sulphate separate from the solution at the ordinary temperature and the process of artificial cooling, which is necessary when sodium hydroxide is used, is dispensed with.—J. F. B.

Cellulose; Coagulating bath for filaments from cuprammonium solutions of ——. J. Delpech. Fr. Pat. 437,014, Feb. 6, 1911.

The addition of dextrin to the alkaline baths employed for coagulating filaments from cuprammonium solutions of cellulose is claimed. It is stated that this addition increases the lustre of the threads.—J. F. B.

Paper pulp; Plant for producing —— and freeing it from liquid. H. Strieth, Nüremberg, Germany. U.S. Pat. 1,023,445, April 16, 1912. (Compare Fr. Pat. 433,467 of 1911; this J., 1912, 226).

The plant comprises an agitator with rotary knives for cutting up the material to form a pulp, a receptacle, means for discharging the contents of the agitator vessel into the receptacle, in which the action of the chemicals is completed and the heavier impurities are precipitated, a press adapted to squeeze out the liquid from the pulp, means for transferring the pulp from the receptacle to the press and for carrying away the pressed pulp from the press, a second agitator vessel for receiving the liquid removed by the press, in which this liquid is purified and filtered through filters contained in the lower portion of the vessel. The whole apparatus is connected in circuit with a source of compressed air, by which the passage of the fluids through the apparatus is effected.—J. F. B.

Paper pulp; Manufacture of —— from fibres, textiles, waste papers, wood-waste and similar materials. L. Herz. First Addition, dated Nov. 6, 1911, to Fr. Pat. 422,490 Nov. 12, 1910 (this J., 1911, 533).

For carrying out the operation described in the original specification for washing the pulp free from impurities, a centrifugal separator is employed, consisting of a fixed external drum and a rotary perforated internal drum, both having a great height in relation to their diameter. Inside the drum are carried on fixed supports a scraper set at an acute angle to the wall of the drum in the direction of its travel, but not touching the drum, and a brush resting at right angles against the wall of the drum, with a free space for circulation between the scraper and the brush. The scraper is carried preferably on the shorter arms, and the brush on the longer arms, of steel springs, adjustable in position by means of screws.—J. F. B.

Artificial silk [from milk albumin]; Manufacture of ——. H. Timpe, Amsterdam. Eng. Pat. 14.266, June 15, 1911.

See Ger. Pat. 236,908 of 1910; this J., 1911, 1050.—T.F.B.

Ammonia; Method of recovering —— in the cuprammonium cellulose precipitation. E. Bronnert, Niedermorschweiler, Assignor to Verein. Glanzstoff-Fabriken A.-G., Elberfeld, Germany. U.S. Pat. 1,023,548, April 16, 1912.

See Eng. Pat. 27,539 of 1910; this J., 1911, 415.—T. F. B.

Cellulose acetate or acetylcellulose ; Treatment and manufacture of ——. Snowdon and Co., Ltd. Fr. Pat. 437,473, Dec. 12, 1911. Under Int. Conv., Dec. 12, 1910.

See Eng. Pat. 28,848 of 1910 ; this J., 1912, 123.—T. F. B.

Cardboard or the like and method of manufacturing same. L. H. Baekeland, Harmony Park, N.Y., U.S.A. Eng. Pat. 26,614, Nov. 28, 1911. Under Int. Conv., Nov. 30 1910.

See U.S. Pat. 1,019,406 of 1912 ; this J., 1912, 329.—T. F. B.

Paste which can be used for coating purposes [weavers' glue] ; Process for making a ——. F. W. Rogler and P. Reimann. Fr. Pat. 437,541, Aug. 19, 1911.

See Eng. Pat. 19,689 of 1911 ; this J., 1912, 381.—T. F. B.

VI.—BLEACHING ; DYEING ; PRINTING ; FINISHING.

Bleaching process ; Experimental investigation of the ——. *Part II. The action of neutral salts on bleaching solutions.* Sydney Higgins. Chem. Soc. Proc. 1912, 28. 130—131.

The author showed that chlorides of sodium and calcium stimulate the bleaching actions of chlorine-water and of hypochlorous acid as well as that of hypochlorite solutions. In all cases the action is precisely the same : it is an immediate one, after which action the solutions behave as though the chlorides had not been added. These observations are opposed to the representation of the bleaching action of hypochlorites in the presence of chlorides as being due to the development of chlorine according to the equation : $NaCl+NaOCl+H_2O=2NaOH+Cl_2$, for this explanation does not account for the observations on the other bleaching solutions, and if it were true one would expect sodium chloride to cause a steady acceleration (and not a sudden action) as long as any sodium hypochlorite remained in solution. The reversible actions : (1) $HCl+HOCl=H_2O+Cl_2$, (2) $NaOH+Cl_2=NaCl+HOCl$, were found to explain all observations, including the behaviour of bleaching powder solution with neutral chlorides. The bleaching trials were performed on weak solutions of dyestuffs, and on the colouring matters of cotton and linen cloth. In all cases practically the same results were obtained, showing that the same chemical actions took place during the oxidation of all the colouring matters used. The action of carbon dioxide on bleaching powder was discussed from equation (2) in support of the author's previous statement (this J., 1911, 485). Solutions of neutral salts were also found to decrease the stability of solutions of potassium permanganate in air and to increase their bleaching effect, so that for permanganate solutions, as for hypochlorites, it is evident that instability and bleaching effect are related.

Methylene Blue ; Bleaching of —— *in the visible spectrum.* K. Gebhard. Z. physik. Chem., 1912, 79, 639—640.

Methylene Blue exposed to strong sunlight *in vacuo*, is rapidly bleached, the process being one of reduction. A blue colour is restored on exposing to oxygen in the dark (see also Lasareff, this J., 1912, 226). The bleaching by reduction is not prevented, if the light is sufficiently strong, by atmospheric oxygen, but darkness restores only a decided violet colour (probably Methylene Blue with an amino group replaced by hydroxyl). It is therefore apparent that oxidation takes place as well as reduction during ordinary atmospheric bleaching, and the conditions for oxidation being usually much more favourable than those for reduction, it is usual for the colour to be completely destroyed and not restored in the dark. The reducing bleaching, in fact, only takes place in sunlight of considerable intensity even *in vacuo*. Also, contrary to the observations of Lasareff, the reduction of Methylene Blue in dyed films of gelatin only takes place in th presence of glycerin.—W. H. P.

Tannin materials and their analysis from the dyer's stanc point ; Notes on the use of ——. G. E. Knowles. J. Soc Dyers and Col., 1912, 28, 174—178.

If a maximum of fixing power for a given cost is desire the pyrogallol series of tannins such as nut galls, gall tannic acid, sumac, and myrobalans give the best result to the dyer. If weighting effect is demanded, chestnut valonia or oakwood extracts are more valuable. Sinc cotton behaves differently from hide towards tanni materials, the hide powder method of tannin analysis i unsatisfactory from the dyer's standpoint. On the othe hand, Loewenthal's permanganate process is inexact, an the author therefore recommends that the valuation different tannins for dyeing purposes should include series of comparative dyeing trials in imitation of th practical application of the tannins to the fibre.—P. F. C

Reserving the selvages in cotton piece goods to be dyed age Aniline Black. E. Santucci. Rev. Gen. Mat. Col. 1912, 16. 122—123.

Cotton yarn is sized at 25—30° C. with a mixture of 20 grms. of petroleum benzine of high boiling point, 400—50 grms. of paraffin wax (m. p. 72°—75° C.) and 400—50 grms. of precipitated calcium or barium hydroxide, an the sized yarn is used for making the selvage of cotto piece goods. If Aniline Black is subsequently produce on the goods, the paraffin wax acts as a mechanical and th calcium hydroxide as a chemical reserve to the paddin liquor, so that the selvage after ageing and chromin remains white. High temperatures must be avoided in th preparing processes previous to dyeing.—P. F. C.

Patents.

Dyeing, sizing, bleaching, mordanting, scouring and lik processes ; Machine for —— *cotton, wool, silk, linen, an other materials in the hank.* G. S. Lord, Whitefield Lancs. Eng. Pat. 7701, Mar. 28, 1911.

This is a machine of the type in which the hanks ar supported by flat carriers arranged across the vat, an these carriers are alternately raised from and lowered int the liquor by automatic means.—P. F. C.

Multicoloured effects in textile goods ; Production of —— R. B. Ransford, London. From L. Cassella und Co. Frankfurt-on-Maine, Germany. Eng. Pat. 10,83 May 4, 1911.

Some of the yarn to be woven into a fabric is impregnate with suitable metals or metallic compounds. The fabri is then dyed with suitable dyestuffs and after-treated in hydrogen peroxide bath ; the metallic component acts a an oxidation catalyst and causes the colour on the impregnated yarn to be destroyed. Example : Yarn mordante with 3—5 per cent. of tannic acid is treated for 30 minute in a solution of cupric acetate of 7°—9° Tw., then dried an treated at 30°—40° C. in a 1 per cent. solution of crystallise sodium sulphide. The yarn thus prepared is woven wit an untreated yarn and the fabric is dyed with 4 per cent of Diamine Sky Blue FF. The washed material is finall worked in a warm bath of hydrogen peroxide until th colour on the prepared yarn is entirely destroyed.—P. F. C

Textile and like fabrics and articles manufactured therefrom Ornamentation of ——. R. Gottlieb, Brünn, Austria Eng. Pat. 21,398, Sept. 28, 1911. Under Int. Conv., Sept. 30, 1910. Addition to Eng. Pat. 1579, Jan. 22 1909 (this J., 1910, 149).

The cost of working the machine described in the principal patent is lessened by using a container (for the dyestuf solution) which is much smaller than the width of th cloth to be treated. This reduction is compensated fo by imparting a suitable to and fro motion to the container. —P. F. C.

yeings on the fibre [by means of triphenylmethane dyes]; Process for producing fast ——. Act.-Ges. f. Anilinfabr., Treptow, Germany. Eng. Pat. 3133, Feb. 7, 1912. Under Int. Conv., March 2, 1911. Addition to Eng. Pat. 25,007 of 1910, dated Jan. 12, 1910.

See Addition of Oct. 17, 1911, to Fr. Pat. 421,561 of 1910; this J., 1912, 383.—T. F. B.

VII. ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Tower or chamber system [of sulphuric acid manufacture]. H. Petersen. Z. angew. Chem., 1912, 25, 762—765.

The author makes the following comments on Hartmann's publication (this J., 1911, 1119). The "double ring" arrangement of the author was really the initiation of the tower system, and the author as early as 1905 proposed to patent this extension of his idea. Hartmann is not justified in taking the Glover tower as typical of all the towers in the tower system: the function of the Glover tower is to denitrate the nitrous vitriol which is freely supplied to it, and it probably produces no more than 1 molecule of sulphur trioxide for each molecule of nitrogen trioxide supplied. The sulphuric acid formed in the kilns and in the flue-dust canal is also counted with the yield of the Glover tower, though not actually produced there. Calculations of the yield of towers based on the cubic capacity of the towers have no significance, for the packing of the tower may alter its actual capacity to any extent: what is important is the supply of nitrogen oxides in liquid form—the volume of the acid sprayed into the tower, its strength and its content of nitrogen oxides. Hartmann gives no figures for this, but one can calculate from his figure of 1000 cub. m. of air used in the compressors to lift the spraying acid in a system yielding daily 18 tons of acid of 1·65 sp. gr. that 1200 tons would be raised 15 metres, or 200 tons for each of the 6 towers. This is more than 10 times the yield, whilst in the chamber system twice the yield may be reckoned as sufficient. As to the cost of installation, the Falding system does not require more, but probably less, ground area than the tower system. A Falding system would require for a daily yield of 35 tons 456, of 70 tons 864, of 105 tons 1272 sq. metres, against 320 quoted by Hartmann for a tower system yielding 22½ tons of acid of sp. gr. 1·5. Moreover, the chambers form a reservoir for a considerable quantity of acid without further ground space. The three Falding systems just mentioned would cost to erect respectively £9170, £16,300, and £21,190, assuming a daily production of 7 kilos. per cub. metre. These estimates do not include ground, kilns and accessories, cost of energy for power and light, nor charge of the building; but include architects' fees, licenses, cooling-water arrangements, air-compressing arrangements for the spraying acid, hard lead fans, pulsometers, nitric acid distribution, spraying arrangements. Lead is taken at £20 per ton, and its thickness is for the Glover tower 8—10, for the connexion of Glover to chambers 5, for the chamber walls 3, and for all other places 4 mm. These costs compare favourably with those for the tower system: and the estimated production can be readily increased by 40 per cent., still using only 0·8 per cent. of nitric acid of 1·3 sp. gr. (calculated on the yield of acid of 1·5 sp. gr.). The process costs in the two systems will be alike as far as the production of sulphur dioxide, the consumption of nitric acid, labour, repairs, and general cost of maintenance are concerned; nor will there be much difference—certainly not a difference against the Falding system—in depreciation and interest. Power will cost much less in the Falding system than in the other: the enormous volume of spraying acid to be raised in the tower system, already referred to, will cost for a 35 ton-day installation probably £550 annually more than the corresponding work to be done with the Falding chambers. Nor does the author agree that attendance and supervision will cost less in the tower system, for that is very dependent for its efficiency on the rigid adherence to fixed conditions of working.—J. T. D.

Sulphuric and nitric acids; Application of the electrical conductivity method to the analysis of mixtures of ——. H. Corvazier. Monit. Scient. 1912, 76, 322—323.

The mixed acid is first titrated with baryta solution in order to determine the amount of the two acids together, and then the electrical conductivity of the solution is measured at intervals whilst a standardised solution of sodium carbonate is being added. The conductivity falls slowly at first and then, after the barium nitrate is completely converted into carbonate, increases rapidly. The results are plotted and from the slope of the two branches of the curve, the exact point at which the whole of the barium is precipitated is obtained by interpolation. The number of c.c. of sodium carbonate corresponding to this point is equivalent to the nitric acid, and the sulphuric acid is then calculated by difference. The results agree well with those obtained by the evaporation method.—A. S.

Iodic acid: Preparation of —— *with a view to the determination of carbon monoxide.* M. Nicloux. Comptes rend., 1912, 154, 1166—1168.

Iodic acid is obtained in good yield by Stas' method (oxidation of iodine with fuming nitric acid), if nitric acid of sp. gr. 1·515—1·520 be employed, and the iodic acid thus prepared is specially suitable, after repeated crystallisation from water and heating to 175—200° C., for the determination of traces of carbon monoxide in air (see this J., 1905, 154). Nitric acid of a lower sp. gr. than 1·480 has no appreciable action on iodine.—F. Sodn.

Potassium iodate; Method of estimating ——. J. E. Myers. Chem. Soc. Proc., 1912, 28, 99.

When solutions of potassium iodate and oxalic acid are mixed together, or the substances suspended in water, a slight yellow colour is developed after several hours at the ordinary temperature. On heating the mixture to 80° C., a vigorous reaction commences, and continues without any further application of heat, with the evolution of carbon dioxide and iodine. This reaction was examined quantitatively by Chrétien (Ann. Chim. Phys., 1898 [vii], 15, 358), and he found that the whole of the iodine present in the iodate was evolved in the free state. The present method is similar to Chrétien's, but can be carried out much more quickly. A weighed amount of pure potassium iodate is placed together with an excess of pure oxalic acid in a flask fitted with a ground-glass joint, which carries the exit tube. A tube for conducting steam into the flask is sealed into the side of the neck, and reaches nearly to the bottom of the flask. The arrangement of these tubes prevents the existence of the cul-de-sac which exists in an ordinary steam-distillation apparatus, and so allows the iodine to be swept out by the steam without obstruction. Steam is passed into the mixture so as to attain the temperature of reaction. When the iodine commences to be evolved, the flow of steam is slackened, and the iodine gradually swept out of the flask into a receiver cooled in ice, containing potassium iodide solution. If desired, this solution may be replaced by a mixture of potassium iodide and a known volume of standard sodium thiosulphate. After a short time the contents of the reaction flask become quite colourless, and no iodine remains in the delivery tube. After the steam has been stopped, the receiver is removed, and the tip of the delivery tube washed, the washings being placed in the receiver. If the iodine is collected in potassium iodide, this is titrated with standard sodium thiosulphate solution: if collected in thiosulphate solution the excess of this reagent is titrated with standard iodine. In either case a measure of the amount of iodine produced in the reaction is obtained. The effects of various salts on the reaction are as follows:—*Potassium nitrate.*—The amount of iodine produced as determined by titration is too high, probably owing to the formation of a little nitric acid which passes over to the potassium iodide solution and liberates iodine. *Potassium chromate and sulphate.*—These salts do not affect the reaction. *Potassium chloride and chlorate.*—These salts prevent the formation of iodine, although in the case of chlorate carbon dioxide is given off. *Potassium bromate.*—On gently warming the mixture to about 30°, the bromate and oxalic acid react to form bromine and carbon dioxide. After some time the bromine ceases to be evolved, and the solution may be almost freed from bromine by gentle warming. On heating to about 80° the iodate and oxalic acid react to produce iodine and carbon dioxide. This reaction presents a convenient method of detecting, qualitatively, a mixture of potassium bromate and iodate. The action of oxalic acid on potassium bromate, both alone and in presence of other salts, is under investigation.

Sodium hyposulphite (hydrosulphite) on copper sulphate; The action of —— in aqueous solution. J. B. Firth and J. E. Myers. Chem. Soc. Proc. 1912, **28**, 101.

THIS reaction has been examined under various conditions, and it has been found that the final products vary with the relative amounts of the reacting substances. When the copper salt is in excess the product is chiefly metallic copper, and this may be precipitated in a very active form, which on exposure to the air becomes light brown, and has then a composition indicating the presence of cuprous oxide. If the sodium hyposulphite (*hydrosulphite*) be in excess, the product is chiefly cupric sulphide. The authors are unable to confirm the observation of Schützenberger that copper hydride is produced in the reaction.

Thiosulphate of bismuth and sodium; Carnot's reagent [for the detection of potassium] and the preparation of the double ——. J. A. Sanchez. Bull. Soc. Chim., 1912, **11**, 440—443.

IN order to prepare the double thiosulphate of bismuth and sodium, bismuth nitrate is dissolved in concentrated acetic acid. The solution is boiled and cooled, and then a solution of sodium thiosulphate is slowly added. Aniline is added with shaking, and the mixture freely diluted with alcohol. After shaking well, a canary-yellow microcrystalline precipitate of the double thiosulphate is produced. This double salt is the essential constituent of Carnot's reagent for the detection of potassium, the corresponding potassium salt being insoluble in acidulated alcohol.—F. SHDN.

Insoluble sulphides; Determination of sulphur in ——. T. St. Warunis. Ber., 1912, **45**, 869—870.

THE finely powdered sulphide (0·5 grm.) is intimately mixed in a capacious porcelain crucible with a mixture of 4 parts of anhydrous sodium carbonate and 3 parts of cupric oxide, covered with a thin layer of the mixture, and the crucible (in a hole in asbestos board) is heated very gently at first, then more and more strongly, till finally it has 2 hours at the highest temperature of the Bunsen flame. The mass is stirred from time to time during the heating, and after cooling the residue is extracted with hot water, afterwards boiled with sodium carbonate solution, finally washed with water till free from alkali. The alkaline filtrate is acidified with hydrochloric acid, boiled to expel carbon dioxide, evaporated to dryness to remove silica if necessary, taken up again with acid and water, and the filtrate from the silica precipitated by barium chloride.—J. T. D.

Caesium and rubidium chlorides; Double salts of ——, with ferrous chloride. E. Wilke-Dörfurt and G. Heyne. Ber., 1912, **45**, 1012—1014.

BY evaporating mixtures of solutions of the chlorides, containing excess or deficit of the alkali-metal chloride, over sulphuric acid in hydrogen under reduced pressure, salts were obtained with each metal of formulæ, $2MCl,FeCl_2,2H_2O$, and $MCl,FeCl_2,2H_2O$; the former salts colourless, the latter faintly green, all oxidising rapidly when exposed to air. The salt described by Schabus, $2KCl,FeCl_2,2H_2O$, and that described by Boeke, $KCl,FeCl_2,2H_2O$, probably both exist, therefore, and both may have taken part in the formation of carnallite in the Stassfurt deposits, as have no doubt the salts now described in the formation of caesium- and rubidium-carnallite.—J. T. D.

Bromides; Method of preparing anhydrous ——. Barre. Bull. Soc. Chim., 1912, **11**, 433—440.

SULPHUR is dissolved in bromine, the resulting liquid is heated, and the vapour passed over heated metallic oxides. With the majority of oxides, decomposition takes place with the formation of the anhydrous bromide. For instance, nickel oxide heated to about 700° C. in the vapour of sulphur bromide is rapidly converted into nickel bromide (see this J., 1910, 1303). The preparation of the bromides of lanthanum, cerium, thorium, cobalt iron, chromium, aluminium, manganese, copper, tin, lead, cadmium, zinc, magnesium, and uranium is also described.—F. SHDN.

Comparative experiments on the oxidation of nitrogen in the high-pressure electric flame arc. Tausent. *See* XI.

Electric pressure furnace. Strontium peroxide from strontium oxide and oxygen. Preparation of lead dioxide from lead oxide, and the dark brown compound, Pb_5O_8. Alkali peroxides from alkali hydroxides and oxygen. Fischer and Ploetze. *See* XI.

Constituents of ozone. [Ozonides of unsaturated organic compounds, including caoutchouc.] Harries. *See* XX.

Spanish tartaric acid and cream of tartar. Ch. of Comm. J., May, 1912. [T.R.]

OWING to foreign competition the manufacture of tartaric acid and cream of tartar in Spain has been abandoned. There are, however, some large exporters of the raw material in the Barcelona district, the exports for 1910 being as follows:—Tartaric acid crude, and wine lees, 12,009,181 kilos., value Ptas. 5,644,315, of which 1,512,500 kilos. were exported to Great Britain; tartrate of lime, 672,946 kilos., value Ptas. 336,473, and 60,932 kilos. to Great Britain; those of crude tartaric acid to Great Britain through Barcelona, in the last quarter of 1911 amounted to 267,091 kilos. Exports of cream of tartar in 1910 were only 147,372 kilos., value Ptas. 294,744, and of these over 100,000 kilos. were shipped to Great Britain. Imports of citric and tartaric acids, during the same year, amounted to 217,059 kilos., value Ptas. 759,707, of which 60,730 kilos. came from Great Britain.

Potash from alunite. Oil, Paint, and Drug Reporter, April 22, 1912. [T.R.]

ON account of the continued interest displayed in many quarters in the prospective discovery of potash in the United States, the Geological Survey has reissued a report made by Hoyt S. Gale on alunite, a potash bearing mineral, found in a newly discovered deposit near Marysvale, Utah. Special interest attaches to alunite, for the potash which it carries is believed to be commercially soluble—that is, it can be reduced to fertilizing material by a simple process of roasting and leaching the rock. The bulletin issued by the Survey describes a vein which is believed to be of considerable size, and although it can by no means supply the American demand for potash, it may meet local needs. The commercial development of this deposit will be of greatest importance perhaps in stimulating exploration for other similar deposits. Alunite has been observed by other members of the Geological Survey at several points in a number of Western States, and it may therefore be expected that further prospecting and investigation will disclose deposits that may yield a large tonnage.

PATENTS.

Sulphuric acid; Method of and apparatus for concentrating ——. H. E. Green, Birmingham. Eng. Pat. 27,209 of 1910, date of appl., May 4, 1911.

IN apparatus of the cascade type, rectangular trays are mounted in a run, in such a manner that, during the first stage of the concentration (which is effected with the aid of hot gases from a single source of heat), the weak acid flows in parallel paths, through trays arranged side by side in pairs, and at a later stage through singly arranged trays, the run being divided into two or more oppositely inclined portions in close proximity one to the other, so as to produce a compact, self contained plant. The capacity of the run, during the latter part of the concentration, is either reduced by employing only one series of singly disposed trays or is maintained constant by employing two separated series, and one or more curtains of acid-resisting material, having a small aperture through which acid may flow, may be interposed between the portion of the cascade containing trays in pairs and that containing single trays.—F. Sodn.

Phosphoric acid; Process for the manufacture of pure ——. M. Dittmar, Wülfel, Germany. Eng. Pat. 8317, April 3, 1911. Under Int. Conv., Jan. 5, 1911. Addition to Eng. Pat. 8094 of 1910, dated Nov. 6, 1909 (this J., 1910, 1250).

Calcium phosphate is decomposed with sulphuric acid, the solution is filtered, concentrated, and treated with hydrochloric acid gas, with the formation of pure phosphoric and hydrochloric acids, which are separated by distillation. —O. R.

Nitric acid: Production of ——. F. W. de Jahn, Assignor to General Chem. Co., New York. U.S. Pat. 1,023,133, April 16, 1912.

A nitrate and an acid (especially sodium nitrate and sulphuric acid) are stirred together in a rarefied atmosphere, whilst being heated to a temperature at which the nitric acid produced distils off; the acid may then be condensed and the escaping gases passed through an absorbing tower. The temperature adopted should be below the melting point of the nitre cake formed (preferably below 381° F.).—F. Sodn.

Sulphurous acid from sulphur; Impts. in and apparatus for the production of ——. W. Feld, Linz-on-Rhine, Germany. Eng. Pat. 21,996, Oct. 5, 1911.

Sulphur is introduced into the lower of two chambers and is partially burnt with a restricted supply of air, the heat of combustion causing the unburnt sulphur to volatilise: the volatilised sulphur, carried along with the sulphur dioxide, passes into the upper chamber, where it comes in contact with a fresh and adequate supply of air, which has been preheated by contact with the lower chamber, the vapourised sulphur being thereby completely oxidised to sulphur dioxide.—O. R.

Gases [containing sulphur dioxide]; Purification of ——. W. R. Whitney, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,022,012, April 2, 1912.

Waste gases containing sulphur dioxide are mixed with water vapour and nitrous gases, and passed over electrodes of widely separated electric potential, with the formation of sulphuric acid.—O. R.

Hydrocyanic acid; Process for recovering the —— contained in gases. G. P. Guignard and H. L. A. M. Watrigant. First Addition, dated Feb. 10, 1911, to Fr. Pat. 436,185, Jan. 16, 1911.

See Eng. Pat. 14,588 of 1911; this J., 1911, 1381. The alcohol may be replaced by glycerin or any other solvent of alkali in which cyanide is insoluble.—T. F. B.

[Sodium] sulphites and bisulphites; Process of making anhydrous ——. E. H. Strickler, White Plains, N.Y., Assignor to General Chem. Co., New York. U.S. Pat. 1,023,179, April 16, 1912.

Sulphur dioxide and sodium carbonate are brought together suspended in a suitable vehicle (such as sodium sulphite solution), the affinity of which for sulphur dioxide is not greater than that of the sodium carbonate. After removing the solid sodium salt formed, the supernatant liquid may serve as a vehicle for a fresh amount of sodium carbonate.—F. Sodn.

Alkali silicate in powder form; Method of manufacturing readily soluble ——. P. M. Justice, London. From Henkel und Co., Dusseldorf, Germany. Eng. Pat. 23 391, Oct. 23, 1911.

A hot, concentrated solution of an alkali silicate is forced out of an autoclave at about eight atmospheres pressure through a spraying nozzle with orifices about 1½ mm. in diameter. On coming into contact with cold air at atmospheric pressure, the solution is transformed into a dry powder, which is readily soluble even in cold water. —O. R.

Copper liquors; Method of treating ——. J. H. Thwaites. Fr. Pat. 437,686, Dec. 15, 1911. Under Int. Conv., April 13 and Nov. 24, 1911.

In the process described in Eng. Pat. 9174 of 1911 (this J., 1912, 431), after the removal of the copper, the residual barium sulphate is treated with a solution which will convert the silver present into a compound such as the chloride, and with a solvent for this silver compound. These two operations may be performed simultaneously, by using a solution of cuprous and sodium chlorides, or separately, using a thiosulphate as the solvent.—T. F. B.

Sodium borate readily soluble in water; Process for preparing an acid ——. Saccharinfabr. A.-G. vorm. Fahlberg, List, und Co. Ger. Pat. 244,778, April 22, 1909.

Concentrated solutions are prepared from boric acid and an alkali or alkali salt, or from a borate and an acid (*e.g.*, boric acid), containing four mols. of boric acid to one mol. of alkali, and the acid borate is separated from these solutions by suitable means. The resulting salt has the formula, $NaHB_4O_7+4\frac{1}{2}H_2O$: its solubility in water is 15 to 25 times that of borax and boric acid. It is a white, non-hygroscopic crystalline powder with a slightly acid taste.—T. F. B.

Per-salts; Process for utilising the mother-liquors from the manufacture of ——. Chem. Werke vorm. Dr. H. Byk. Ger. Pat. 244,879, Nov. 25, 1910.

The liquors are treated with a small quantity of a magnesium compound and evaporated to dryness, whereby a solid, stable mixture of per-salts is obtained. In presence of the magnesium compound the liquors are sufficiently stable to withstand evaporation without appreciable decomposition.—A. S.

Alkali antimonates; Preparation of ——. R. Rickmann. Ger. Pat. 244,880, Aug. 26, 1911. Addition to Ger. Pat. 134,774, Aug. 14, 1901.

According to the chief patent, alkali antimonates were obtained in the form of a white amorphous powder, by adding such substances as alkali chlorides, carbonates, sulphates, etc., for the purpose of retarding the reaction and preventing agglomeration of the alkali antimonate. According to the present patent, instead of such additions, a larger quantity of alkali hydroxide or nitrate is used than is necessary for the production of the alkali antimonate.—A. S.

Ammonium sulphate; Process for obtaining dry —— from gases by use of an absorbent material saturated with sulphuric acid. Laymann und Co. Ger. Pat. 244,924, Jan. 5, 1911.

Lignite dust is used as absorbent material. One part of lignite dust is capable of taking up 4 parts of concentrated sulphuric acid without losing its pulverulent condition, hence only a comparatively small quantity of the dust is needed, indeed so small that it becomes completely oxidised by the sulphuric acid under the influence of the heat developed in the formation of ammonium sulphate, and pure ammonium sulphate is obtained direct.—A. S.

Nitrogen; Method of and means for heating gases to high temperatures for the production of endothermic reactions such as the oxidation of ——. C. F. R. von Koch. Stockholm. Eng. Pat. 14,528, June 19, 1911. Under Int. Conv., June 21, 1910.

The gases, preheated in some suitable manner, are introduced into the reaction zone of a furnace, such as an electric arc, and are simultaneously surrounded by a parallel current of cooler gases, which serve to obviate overheating and at the same time to protect the electrodes. This may be effected by introducing the preheated gases through one or more central supply openings, and the cooler gases through one or more supply openings situated around the former; one or more of the cooling-gas openings may be set tangentially or obliquely, so that the gases are thereby caused to rotate.—O. R.

Oxygen; Preparation of —— from mixtures of persulphates, especially sodium and potassium persulphates, with oxides or peroxides, especially those of alkali or alkaline-earth metals, or with hydrates of these substances. D. Helbig. Ger. Pat. 244,839, Dec. 18, 1910.

Substances rich in oxygen, especially alkali chlorates or perchlorates, are added to the mixtores mentioned in the title in order to obtain oxygen-yielding mixtures, in which after the reaction has been once initiated by heating or by sprinkling on water, it is propagated spontaneously throughout the whole mass.—A. S.

Organic acids; Manufacture of volatile —— from their calcium salts. R. S. Swinton, Linden, N.J., Assignor to W. J. Bush and Co., Inc., Dover, Del. U.S. Pat. 1,023,281, April 16, 1912.

See Eng. Pat. 4976 of 1910; this J., 1911, 129.—T. F. B.

Ammonia, or of ammonia and sulphuretted hydrogen, contained in gases, vapours, or liquids; Effecting the combination, with sulphurous acid, of ——, and the obtainment of ammonium sulphate. W. Feld, Linz on Rhine, Germany. Eng. Pat. 5838, March 8, 1911.

See Fr. Pat. 431,241 of 1911; this J., 1911, 1381.—T.F.B.

Bleaching liquors; Manufacture of ——. H. Wilsing, Bernburg, Germany. U.S. Pat. 1,023,287, April 16, 1912.

See Eng. Pat. 21,411 of 1910; this J., 1911, 205.—T.F.B.

Cream of tartar; Manufacture of ——. J. M. Periguy, Lyons, France, Assignor to Gallia Soc. Anon., Geneva. U.S. Pat. 1,023,528, April 16, 1912.

See Fr. Pat. 434,223 of 1910; this J., 1912, 230.—T. F. B.

Oxides; Reduction of ——. W. C. Arsem, Schenectady, Assignor to General Electric Co., New York. U.S. Pat. 1,023,290, April 16, 1912.

See Eng. Pat. 5821 of 1909; this J., 1909, 982.—T. F. B.

Production of liquor containing ammonium chloride in the carbonisation of coal and the like. Eng. Pat. 9358. *See* IIA.

Electric furnace for use in the manufacture of silicates, the ceramic art, and electrometallurgy. Fr. Pat. 436,917. *See* XI.

VIII.—GLASS; CERAMICS.

Glass; Formation of badly conducting layers in the electrolysis of ——. G. Schulze. Ann. Physik., 1912, [4], **37**, 435—471. Chem. Zentr., 1912, 1, 1354.

Warburg in 1884 showed that by the electrolysis of glass at about 300° C., between mercury electrodes, a badly conducting layer was formed, whilst there was no increase of resistance when sodium-amalgam was used a anode. In the author's experiments, anodes of platinum, graphite, and metallic oxides proved unattackable; oxygen was separated at the anode. On the other hand with anodes of mercury, cadmium, bismuth, tin, iron, lead, copper, alkali metals, thallium, and silver, the metals appeared to migrate quantitatively (according to the current) into the glass. Lithium and silver diminished the resistance of the glass; sodium had no influence; the other metals increased the resistance, in some cases very strongly. The resistance of the layer produced increased considerably with diminution of the current-strength. If the direction of the current were reversed whilst keeping the metal electrodes unchanged, the metal remained in the glass, which was pierced by numerous fine sparks, but if the metal electrodes were replaced by an electrolyte (*e.g.*, a mixture of potassium and sodium nitrates), then on reversing the current, the metal partially passed out of the glass. (See also this J., 1910, 1057).—A. S.

Porcelain; Diffusion of organic substances from hard-fire colours in ——. E. Berdel. Sprechsaal, 1912, **45**, 255—256.

The medium of oil of turpentine or "thick oil" which is used in applying many stains may cause bubbling, deposition of carbon and other losses. To prevent it, the body should contain no chalk or dolomite which would cause a spongy texture in the first firing, but should be felspathic in base. The second firing should be strongly oxidising at first in order to burn away the organic substances.
—H. H. S.

Pottery found by excavation at Susa; Technique of manufacture of ——. A. Granger. Comptes rend., 1912, **154**, 1162—1164.

The Morgan mission deposited ware and fragments at the Louvre which belong to what are termed the "first and second periods," the earlier being superior in execution and finish. Some pieces were hand-worked and the rest turned. Ware of the same epoch showed evidence of great differences in the skill of the makers. The local clay is a ferruginous marl of the composition: clay 28·57, sand 27·10, chalk 37·58, combined water 4·05, moisture 2·70. It melts to a brown glass at 1400° C. The pottery was fired at less than 1000° C. Kilns were found, but in such ruin that it was impossible to reconstruct them. The stains used in the ware were iron and a little manganese, probably as a natural manganiferous oxide of iron (see also Foster on Greek vases, this J., 1910, 1251). In the "first period" the stain was fired with a flux; in the second, it was simply brushed on and not fired.—H. H. S.

Patents.

Furnaces; Glass ——. W. W. Pilkington, Prescot, Lancs. Eng. Pat. 9244, April 13, 1911.

In a furnace for heating pots from which glass is drawn, while one passage is supplying gas to the furnace, the other gas passage is cleaned of any tar or other impurities deposited from the gas, by introducing air into it at a time when it is hot and is neither supplying gas to, nor taking burnt gases from, the furnace. Where one or more pairs of gas passages are employed, each passage of each pair is used in turn to supply gas to the furnace, while the other passage is disconnected with the gas supply conduit, by a valve, and has air introduced into it. The walls of the passages, which are cleaned by this introduction of air from time to time, are heated by conduction from the outlet passage or passages.—W. C. H.

Quartz apparatus; Manufacture of ——. W. R. Whitney, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,022,910, April 9, 1912.

Transparent quartz vessels are made by fusing and shaping quartz "in a substantial vacuum," suitable apparatus for the purpose consisting of a crucible and mould of refractory inert material, both of which, together with heating means for the crucible, are contained in a vacuum chamber, and means for discharging the fused quartz into the mould, within the vacuum chamber.
—F. Sodn.

Salt glaze on stoneware; Process for producing ——. Hager und Weidmann Ges. m. b. H. Ger. Pat. 245,212, Oct. 4, 1911.

In the salt glazing of stoneware burned in a gas-fired kiln, claim is made for the addition of the salt to the gas producer. After the kiln has attained the requisite temperature, the producer is so worked that the surface of the charge therein is heated to redness. The salt is then added in measured portions at short intervals.—A. S.

Oven for use in the manufacture of tiles, pottery, and the like. C. Dressler, London. U.S. Pat. 1,023,628, April 16, 1912.

See Eng. Pats. 18,114 and 28,617 of 1910; this J., 1911, 1254.—T. F. B.

Enamels; Process of producing a filler for white ——. I. Kreidl, Vienna. U.S. Pat. 1,024,405, April 23, 1912.

See Fr. Pat. 429,665 of 1911; this J., 1911, 1213. T. F. B.

Supporting rod [of fused quartz] for mantles for upright incandescence gas burners. Ger. Pat. 244,959. *See* IIb.

Electric furnace for use in the manufacture of silicates, the ceramic art and electrometallurgy. Fr. Pat. 436,947. *See* XI.

IX.—BUILDING MATERIALS.

Lime-sand stones; The calcium silicates of ——. B. Kosmann. Tonind.-Zeit., 1912. 36, 693—696.

A historical account and discussion of results of investigations both synthetical and analytical into the constitution of lime-sand bricks. It has been assumed by many authors that calcium metasilicate or hydrometasilicate is the binding substance, produced by reaction of the lime on the silica at the temperature of the superheated steam; but it may be that some of the calcium hydroxide is present not as such, but combined with hydrometasilicate, $CaSiO_2(OH)_2+Ca(OH)_2$, forming really a hydro-orthosilicate. Moreover, colloidal silica seems to be always present also, formed, no doubt, by reaction between the silicate and carbonic acid during the exposure of the product to carbon dioxide after the steaming, and this probably also contributes, both individually and by subsequent slow reaction upon the lime, to the binding of the brick. Other hydrous silicates, more or less basic, analogous to the zeolites, are probably also present.
—J. T. D.

Iron-Portland cements; Strengths of ——. C. Goslich. Chem.-Zeit., 1912, 36. 464.

Mixtures of Portland cement and of iron-Portland cement with the blast-furnace slag, fine sand, and standard sand, were made up and tested after five years with the following results:—

Mixture	Crushing strength in kilos. per sq. cm.	
	Portland cement.	Iron-Portland cement.
0·7 cement + 0·3 slag + 2 sand ..	642	551
0·7 „ + 0·3 fine sand + 2 sand	642	
0·7 „ + 0·3 slag + 5 sand ..	341	238
0·7 „ + 0·3 fine sand + 5 sand	249	
0·7 „ + 0·3 slag + 7 sand .	157	117
0·7 „ + 0·3 fine sand + 7 sand	122	

—O. R.

Portland cement clinker; Investigation of ——. The hypothetical compound, $8CaO,Al_2O_3,2SiO_2$. G. A. Rankin and F. E. Wright. Z. anorg. Chem., 1912, 75, 63—67.

The authors claim to have shown, by a thermal and microscopical examination of synthetic preparations, that Janecke's supposed compound, $8CaO,Al_2O_3,2SiO_2$ (this J., 1911, 1153; 1912 74, 387), does not exist. Below 1404 C., it is considered to be a mixture of the compounds, $3CaO,SiO_2$, $2CaO,SiO_2$, and $3CaO,Al_2O_3$.
—F. Sodn.

Concrete; Action of acids on ——. E. Neumann. Tonind.-Zeit., 1912. 36, 601—604.

The author quotes a number of cases in which concrete drains have suffered greater or less damage, some of them in comparatively short periods from the time of their construction. In every case the destructive action was traced to the presence of acid in the water which had access to the drains, either internally or externally. In one instance the swampy soil surrounding the drain contained iron pyrites, and the water became charged with sulphuric acid; in other instances the atmosphere inside the drains became heavily laden with hydrogen sulphide, which slowly oxidised to sulphur and sulphuric acid; although sulphuric acid was the most frequent and also the most potent destroyer of underground concrete, other mineral and organic acids, such as hydrochloric, oleic, acetic acid, etc., and also carbon dioxide were found to be almost as harmful. The author concludes that the destructive action of acids is due to two causes, *viz.*, (1) The formation of certain calcium and aluminium compounds (especially calcium sulphate), which is accompanied by a large increase in volume; (2) the formation of soluble compounds (especially calcium bicarbonate), which go into solution and cause the concrete to collapse. The chief remedies proposed are: To provide adequate ventilation inside the drains; to use as basis for the concrete dense, non-porous clinker poor in lime; and to cover the exposed surfaces of the concrete with a coating of tar, or best of all, to protect the foundations of the drains with tar-felt or asphalt.—O. R.

Patents.

[Constructional] Matter; Composition of ——. A. G. Harris, Lincoln, Nebr., U.S.A. Eng. Pat. 26,544, Nov. 27, 1911.

The composition consists of cement, lumps of hydrous magnesium silicate in the form of serpentine, which has the power of giving up its water of hydration (mechanically combined water) to the cement during the setting of the latter, and some filling material, such as cinders.—W. C. H.

Construction material, and binding or cementing material. J. M. Neil, Assignor to A. M. Hay, Toronto, Canada. U.S. Pats. 1,023,673 and 1,023,674, April 16, 1912.

(1) The building material is composed of a filler and a binding material. The latter comprises a dry soluble compound, obtained by treating sodium silicate with an alkali and evaporating to dryness, and a dry soluble mixture of trisaccharate of lime and sodium bicarbonate. (2) The composition consists of a filler and a binding material, composed of a mixture of a dry powdered alkaline silicate and dry powdered calcium acetate.
—W. C. H.

Sorel cement; Process for preventing efflorescence on masses prepared with ——. R. Eberhard. Ger. Pat. 245,165, April 19, 1910.

The blocks or articles are treated with a solution of lead chromate in alcoholic potassium hydroxide solution or in aqueous potassium hydroxide solution to which alcohol has been added. In this way any uncombined magnesium chloride in the material is converted into chromate.—A. S.

Timber ; Process of preserving cut —— and product thereof. Preserved wood and process of making same. R. A. Marr, Blacksburg, Va. U.S. Pats. 1,023,745 and 1,023,784, April 16, 1912.

(1) Raw cut timber is saturated in an open tank at atmospheric temperature with a low-boiling petroleum distillate, *e.g.*, commercial benzine, and then subjected, in a suitable containing vessel which can be heated, for a period of one to four hours, to the action of commercial paraffin, solid at ordinary temperatures, but melted for this purpose at a temperature below 212 F. Diatomaceous earth is carried in suspension in one of the impregnating agents used. The product claimed consists of cut timber, the pores, ducts and cellular tissue of which contain deposited diatomaceous earth together with re-solidified paraffin. (2) The pores, cells and ducts of the tissue of timber are impregnated by subjecting the cut timber to the action of a mixture of melted naphthalene and paraffin ; the contents of the bath are maintained in a melted condition at a temperature below 212° F., and are allowed to cool gradually, but not to the point of solidification, before the timber is removed. Cut timber, the pores, cells and tissue ducts of which are encysted with a mixture of naphthalene and paraffin is claimed as the product of the process.—W. C. H.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron ; Influence of silicon on the properties of ——. P. Paglianti. Metallurgie, 1911, 9, 217—230.

A series of iron-silicon alloys was prepared containing from 0·24 to 5·26 per cent. of silicon, 0·12 to 0·15 of carbon, 0·23 to 0·60 of manganese, 0·04 to 0·064 of sulphur, and 0·031 to 0·045 of phosphorus. They were examined in the cast, annealed, and quenched condition with regard to their fracture, tenacity, elongation, contraction of area, hardness, resistance to bending, specific gravity, electrical conductivity, and magnetic permeability, and the results are tabulated and illustrated by curves. It is concluded that :—(1) Silicon raises the yield point and increases the hardness and tenacity, while it diminishes the elongation and contraction in area of untreated, annealed, and quenched alloys. (2) The resistance to bending (of notched bars) in the case of untreated alloys is changed very little up to 1·40 per cent. of silicon, and is diminished when the silicon content rises above 1·60 per cent. ; annealing and chilling produce an increase of brittleness. (3) The specific gravity diminishes with increasing silicon content. (4) The electrical resistance rises with increasing silicon content, but heat treatment and the rate of cooling have no influence on the electrical properties. (5) The addition of silicon to iron improves it magnetically by increasing the permeability and lessening the hysteresis, very good results being obtained with a two per cent. silicon content. The best magnetic results were obtained by annealing a two per cent. silicon alloy. The paper is illustrated by ten microphotographs, and a summary is given of previous work.—A. H. C.

Steel for guns ; Manufacture and treatment of ——. L. Cubillo. Iron and Steel Inst., May, 1912. [Advance proof.]

In a general review of the subject the properties, preparation, melting, casting and heat treatment of the metal are successively considered, special reference being made to the methods in use at the Spanish Arsenal at Trubia. With regard to the application of pressure as a means of preventing segregation during casting, the author considers that although materially increasing the proportion of usable metal in the ingot, fluid compression processes effect little or no improvement in the mechanical qualities of the metal. The heat treatment of the metal is discussed at some length, the forging, annealing, hardening and tempering of the pieces being considered from both theoretical and practical standpoints. The relative merits of oil- and water-hardening processes are also considered and it is pointed out that whereas metal hardened by the former process requires only a low temperature for the subsequent tempering, the water-hardened metal (containing 0·5 per cent. of carbon) must be tempered at a temperature approaching that of its transformation point.—W. E. F. P.

Steel ; "Burning on" in ——. J. S. Hughes. Engineering, 1912, 93, 516—517.

It having become necessary to increase the size of the boss on some wrought iron railway wagon wheels, an attempt was made to do this, with complete success, by casting or "burning on" acid mild steel. The wheel (2 ft. diam.) was disposed in a mould, with an annular space of 1 in. around the boss, and this mould was placed directly above a second mould requiring about 2¼ cwt. of steel to fill it. Molten acid steel from a 2-ton Tropenas converter, containing about 0·17 per cent. of carbon and 0·25 of silicon, and at a temperature of about 1625° C., was poured directly on to the wheel, and as the inlet to the mould was about twice the size of the outlet, the annular space around the boss quickly filled, and molten steel flowed slowly out into the second mould below. The wheel was in contact with a constantly changing supply of molten steel for about 50 seconds. By cutting two grooves in concentric circles in the upper half of the mould, so as to leave two thin fins on the new boss, cracking during cooling was entirely prevented. The fins were afterwards chipped off and the boss machined to size. There was a perfect weld between the wrought iron and steel, no sign of a joint being observable on cutting through the boss.—A. S.

Cementite ; Solubility of —— *in hardenite.* J. O. Arnold and L. Aitchison. Iron and Steel Inst., May, 1912. [Advance proof.]

Two steels were prepared by the crucible process having a carbon content of 1·05 and 1·46 per cent. respectively and each containing 0·046 per cent. of silicon, 0·10 of manganese, 0·023 of sulphur, and 0·012 of phosphorus. In the former the Ac. 1.2.3. point occurred at 727° C. and in the latter at 728° C. Circular rods 1½ in. long and ¾ in. in diam. were prepared, each with microsections at the ends attached by narrow necks to the main body of the rod in which was a recess for a thermocouple. They were heated in a salt bath to definite temperatures and rapidly quenched in cold water or brine. The pair of sections were broken off at the neck, and after grinding and polishing were etched with either picric or nitric acids. About 250 microsections were examined and it is shown that the change of pearlite into hardenite or the solution of pearlitic cementite in iron is very rapid and occurs during a range of temperature not exceeding 3° C., while free cementite requires a range of 190° C. for its complete solution. It is suggested that the diffusion of carbide into hardenite is a normal act of diffusion, whilst that of cementite into iron is of the nature of a reduction producing a lower compound (hardenite) unique in its "remarkable attenuation."—A. H. C.

Iron, vanadium, and carbon ; Chemical and mechanical relations of ——. J. O. Arnold, and A. A. Read. Iron and Steel Inst., May, 1912. [Advance proof.]

In continuation of previous work on similar alloys containing manganese (this J., 1911, 688), a series of iron-vanadium-carbon alloys was prepared by the coke crucible process from Swedish bar iron, American washed iron, and 38 per cent. ferrovanadium. Analyses showed them to contain from 0·60 per cent. of carbon and 0·71 of vanadium to 1·10 of carbon and 13·45 of vanadium. The carbides were separated as described in the previous paper, and the results of their analysis is tabulated. It is shown that :—1. When vanadium is present to the extent of 0·71 per cent. it replaces iron in the carbide with the formation of a mechanical mixture corresponding to $11Fe_3C+V_4C_3$. At 2·32 per cent. of vanadium the carbide has the composition, $2Fe_3C+V_4C_3$, and in all higher percentages it corresponds to the formula, V_4C_3. The turning characteristics, mechanical properties, and alternating stress tests are tabulated. Microscopical examination revealed that :—1. Vanadium pearlite is incapable of segregating into the laminated variety, and presents itself only in the troositic and sorbitic forms. 2. Vanadium cementite (a decomposition product of vanadium pearlite) is not so mobile as cementite, and segregates as minutely irregular masses. 3. There is no double carbide of iron and vanadium, since when cementite (Fe_3C) and vanadium cementite (V_4C_3) are together in a well annealed steel the former segregates as usual whilst the latter remains in the sorbitic form. The paper is illustrated by four microphotographs which are described in the text. In an appendix it is stated that when a steel containing 0·63 per cent. of carbon and 2·32 of vanadium was cooled from 1020° C. it showed no Ar_3, that Ar_2 occurred at 791° C. and Ar_1 at 720° C. In a steel containing 1·07 per cent. of carbon and 10·3 of vanadium there was neither Ar_3 nor Ar_1, and Ar_2 occurred at 830—816° C. This steel was quite soft when quenched from all temperatures up to 1050° C., but stripped a new file when quenched from 1300° C., and it is suggested that :—1. Ar_1 marking the formation of vanadium pearlite from vanadium hardenite occurs between 1200° and 1400° C. 2. Although the steel be quenched in the beta range it is still quite soft. 3. The hardening of steel is brought about by carbon in some form, irrespective of the range of temperature. It is further stated that vanadium hardenite has been formed at 1400° C.; it resembles iron hardenite and is as hard as topaz.—A. H. C.

Passivity of iron: Cause of the ——. F. Flade and H. Koch. Z. Elektrochem., 1912, 18, 335—338. (See also this J., 1911, 694.)

To decide between the two views of passivity, the author has heated active iron in a vacuum and found that it remains active. This is in accordance with the view that the natural state of iron is active and that passivity is caused by the presence of oxygen in some form, and opposed to the view that the natural state is passive, and that activity is caused by the presence of hydrogen. An attempt was made to confirm this by heating passive iron in carbon monoxide, with the expectation that it would become active on the removal of the oxygen. The activity was not produced, however. This is accounted for by the fact that on long heating in carbon monoxide active iron becomes passive, probably owing to the action of oxygen which is separated in small quantity from the carbon monoxide at high temperatures.—W. H. P.

Iron; Influence of carbon on the corrodibility of ——. C. Chappell. Iron and Steel Inst., May, 1912. [Advance proof.]

In continuation of previous work (this J., 1911, 1119) it is shown that the electromotive forces between the pearlite and ferrite, and between the components of the pearlite itself, are the principal factors determining the corrodibility of unsaturated pearlitic steels containing more than 0·4 per cent. of carbon. In mild steels this is accompanied by galvanic action between the ferrite crystals themselves. The state of division of the pearlite and the presence of internal stresses may also exert a modifying influence. In a low-carbon steel the influence of time is shown to be directly proportional to the length of immersion. The influence of corrosion on the resistance offered to alternating stress is not appreciable, and decarbonisation increases the resistance to corrosion. A similar series of experiments was carried out on tungsten-carbon steels and it is concluded that 3 per cent. of tungsten produces practically no change in the corrodibility of carbon steels.—A. H. C.

[*Iron and steel*]. *Corrosion; The mechanism of* ——. J. N. Friend, J. L. Bentley and W. West. Iron and Steel Inst., May, 1912. [Advance proof.]

A number of square plates of pure iron foil were suspended in stationary water in separate earthenware vessels; the plates were arranged at various distances from the sides of the vessels, the latter being then kept in the dark for some days at room temperature. The amount of corrosion being determined for each plate by the loss in weight after cleaning, maximum corrosion was found to have occurred when the distance of the metal from the side of the containing vessel was equal to (or greater than) the length of the plate. The authors are of opinion that many of the discrepancies observed in the relative corrosion of iron and steel by immersion in still liquids are due to the incorrect placing or spacing of the test pieces in the corroding medium. As regards the well-known action of light in accelerating the corrosion of iron, the authors consider—from the results of experiments made with solutions of ferrous sulphate and with pure iron—that light accelerates both the initial oxidation of the metal and the conversion of the ferrous oxide into ferric oxide, its influence being, however, more pronounced in the former than in the latter reaction.—W. E. F. P.

Nickel, chromium, and nickel-chromium steels; The corrosion of ——. J. N. Friend, J. L. Bentley and W. West. Iron and Steel Inst., May, 1912. [Advance proof.]

Of the ten steels used in the investigation, three contained nickel (3·7, 6·1 and 26·2 per cent. respectively), three contained chromium (1·1, 3·6 and 5·3 per cent. respectively) and two contained both nickel and chromium, about 3·5 per cent. of the former and 1·0 of the latter metal being present; the remaining two were carbon steels used as standards for purposes of comparison. Discs of each metal, all of the same dimensions, were exposed for periods of from 52 to 64 days to the corroding action of tap-water, sea-water, 0·05 per cent. sulphuric acid or 0·5 per cent. sulphuric acid, or to alternate wetting (with tap-water) and atmospheric drying. The experiments were conducted in the dark, contact between the metal discs and the containing vessels being prevented by the use of paraffin wax. The action of the very dilute acid was found to be similar to that of the "neutral" corroding media, the corrosion of the two standard steels being practically the same in the tap-water, sea-water, wet and dry, and 0·05 per cent. acid tests. In the 0·5 per cent. acid, however, one of the standard steels was corroded 2½ times as much as the other and large discrepancies also occurred with the two nickel-chromium steels, although the latter behaved alike in the other tests. The authors are therefore of opinion that "acceleration tests" as usually conducted with sulphuric acid are apt to yield very misleading results as to the general corrodibility of the metals tested. The results also indicated that there is an optimum concentration of chromium which yields the maximum resistance to acid attack and that if this amount be exceeded, the steel becomes less resistant; in the neutral corroding media the resistance offered to corrosion increased with the percentage of chromium, this being particularly noticeable in sea-water. The nickel steels were found to be resistant to both acid and neutral corroding media, the resistivity increasing with the percentage of nickel; the steel containing 26 per cent. of nickel was very resistant towards the 0·5 per cent. acid.—W. E. F. P.

Gold-silver alloys. U. Raydt. Z. anorg. Chem., 1912, **75**, 58—62.

Thermal and microscopical investigation of the gold-silver alloys has given results in agreement with those of Jänecke (this J., 1911, 1259). The mixed crystals obtained are, contrary to the assertion of Rose and Roberts-Austen (Chem. News, 1903, 1), homogeneous in character.—F. Sodn.

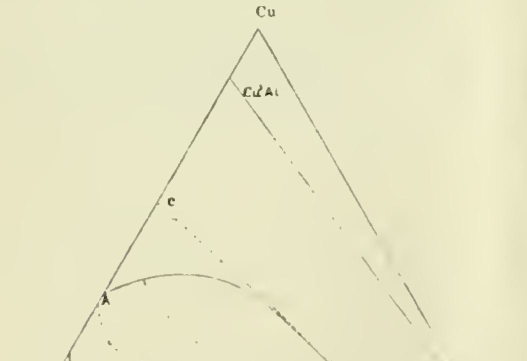
Alloys of aluminium and zinc. Tenth Report to The Alloys Research Committee. (With an appendix on a ternary alloy of aluminium with zinc and copper). W. Rosenhain and S. L. Archbutt. Inst. Mech. Eng., April 19, 1912. [Advance proof, by permission of the Council of the Institution.] (See this J., 1911, 1166).

The results of a comprehensive series of mechanical tests on aluminium-zinc alloys are given in tables and curves. Contrary to the widely held view that these alloys when cast tend to crack in cooling, the authors found that by using sufficient head and with careful following up in order to neutralise shrinkage, perfectly sound castings, even of complicated shape, can be obtained. The mechanical tests indicate that alloys containing from 15 to 25 per cent. of zinc (with or without addition of copper) would be more serviceable than alloys containing less than 15 per cent. of zinc, which are much more widely used in present practice. If dynamic as well as tensile tests be taken into consideration, the alloy containing 20 per cent. of zinc appears to be the most useful of the binary alloys. A characteristic feature of the alloys is the very large effect produced upon them by hot work. When the alloys are heated, the tensile strength falls rapidly, but the hot alloys exhibit a considerable amount of ductility, so that it is possible to roll into bars alloys which are brittle in the cast state. The alloys containing respectively 25 and 20 per cent. of zinc attain their maximum tensile strength when in the form of rolled bar 1¼ in. diam., the figures for the two alloys being: ultimate stress, 27·5 and 22·64 tons per sq. in.; yield point, 25 and 17·3 tons per sq. in.; elongation on 2 ins., 16·5 and 20·5 per cent. respectively. The alloys, with and without addition of copper, differ from most non-ferrous alloys, in that in the rolled condition, they exhibit a definite and well-marked yield point. All of the alloys containing from 10 to 30 per cent. of zinc are very easily machined. Corrosion tests in the sea showed that the loss of weight increases with increasing zinc content: in the case of the cast alloys, the loss of weight, allowing for differences in density, is from 1⅓ times that of Naval brass to 1½ times that of Muntz metal. Further corrosion tests are being made with annealed alloys, which are more resistant. The rapid corrosion (especially in moist air) frequently observed with commercial aluminium-zinc alloys is due to the presence of impurities derived from the spelter employed.

Some preliminary results with a ternary alloy containing 72 per cent. of aluminium, 25 of zinc and 3 of copper are also given. This alloy can be rolled hot. A ⅜ in. rod cold drawn from a ½ in. hot-rolled bar showed an ultimate stress of 34 tons per sq. in., while the resistance of the alloy to repeated bending impact was over 4500 blows as compared with 3400 for the best of the binary alloys. The report is accompanied by 70 photomicrographs.—A.S.

Aluminium, zinc, and copper; Light alloys of ——. M. Levi-Malvano and M. Marantonio. Gaz. chim. ital., 1912, 42, I., 353—360.

In continuation of previous work on the ternary alloys of aluminium, zinc, and copper (see this J., 1911, 1390), the results of a thermal and micrographic investigation confined mainly to the light alloys rich in aluminium are now given. These alloys all fall within the triangle corresponding to the system, Cu_3Al-Al-Zn (see fig.). In the figure the dotted line, *ab*, represents the composition of the saturated ternary mixed crystals, the curve, AB, is an eutectic curve joining the eutectic points of the two binary systems, Cu_3Al-Al and Al-Zn respectively, and the curve, *cd*, is one of two curves starting from transformation points in the Cu_3Al-Al diagram and extending to the eutectic curve, AB, thus producing an invariant point, *d*, which is indicated by a halt at 400° C. during cooling. The alloys in the field Al*ab* are composed of unsaturated ternary mixed crystals, whilst those within the field, AB*ba*, are composed of saturated ternary mixed crystals and a binary eutectic. Two photomicrographs accompany the paper.—A. S.



Alloys; Increase in chemical resistance of —— capable of being mechanically worked, and suitable for constructional use. O. Barth. Metallurgie, 1911, 9, 261—276.

PART I.—*Bronzes containing cobalt; Improvement of the mechanical and chemical properties of* ——.

A SERIES of cobalt-tin alloys containing from 0 to 90 per cent. of cobalt by differences of 10 per cent. was prepared and subjected to the action of nitric acid of varying concentration, the results being tabulated and graphically illustrated. An alloy containing 60 per cent. of tin and 40 per cent. of cobalt was shown to be scarcely attacked by nitric acid at all concentrations. Using this alloy a further series of cobalt-tin bronzes containing from 0 to 90 per cent. of copper in 10 per cent. stages was prepared by dissolving the calculated quantity of the alloy in molten copper. Golden yellow alloys were obtained having good mechanical properties. They were subjected to the action of from one to five per cent. nitric acid and the results which are tabulated show that they were moderately resistant at these concentrations.

PART II.—*Aluminium: Influence of cerium on the mechanical and chemical properties of* ——.

A SERIES of alloys containing from 0·05 to 13·0 per cent. of cerium, and from 0·017 to 0·106 of silicon was prepared by the electrolysis of cerium fluoride and cryolite, and the results of the mechanical tests are tabulated. Cooling curves were taken and the equilibrium diagram for alloys up to 11 per cent. of cerium is given. The alloys were also subjected to the action of five per cent. hydrochloric and nitric acids, and potassium hydroxide. It is shown that:—1. Small quantities of cerium fluoride, up to two per cent., gave in the electrolysis aluminium alloys poor in cerium. Aluminium heated with cerium fluoride to 1000° C. gave similar alloys. 2. The addition of from 0 to 2 per cent. of cerium increased the tensile strength and elongation of aluminium without affecting its capability of being worked. 3. The presence of a small proportion of cerium does not affect the solubility of aluminium in hydrochloric acid and potassium hydroxide, but increases its solubility in dilute nitric acid. 4. The influence of cerium is not due so much to its presence as to its refining effects. The paper is illustrated by twelve microphotographs.—A. H. C.

Heusler [magnetic] alloys; The nature of the ——. F. Heusler and E. Take. Faraday Soc., April 23, 1912. [Advance proof.]

THE view of Guillaume that the magnetism of the ferromagnetic alloys of manganese (see this J., 1905, 1237; 1906, 318, 849; 1907, 436; 1908, 1066; 1909, 246, 1041; 1910, 1163), may be due to the manganese, whose transition point from the magnetic to the non-magnetic condition has been greatly raised by the presence of tin or aluminium, is not in accordance with facts, and it does not account for magnetic alloys of manganese and copper with arsenic, antimony, bismuth, and boron. The sounder view is that of Heusler, who holds that the ferromagnetism is caused by certain definite compounds. In the case of aluminium-manganese-copper alloys the cause of magnetism is the compound, $AlCu_3$, in which some of the copper is isomorphously replaced by manganese. The aluminium manganese bronzes are capable of undergoing a remarkable series of changes with varying thermal treatment and ageing at different temperatures. The freshly cast bronzes are not in general strongly magnetic, but suitable ageing yields a strongly magnetic material with small hysteresis, while another ageing process gives a permanently magnetic modification of exceedingly high intensity. The ageing process is probably accompanied by two transformations, the first being the gradual formation of the ferromagnetic compound $Al(Cu,Mn)_3$ and the second the formation of complexes of the elementary magnets. In regard to other manganese alloys it is known that the boride, MnB (this J., 1907, 927), the arsenide, MnAs (this J., 1911, 1216, 1260), and the antimonides Mn_2Sb and Mn_3Sb_2 (this J., 1907, 927) are pronouncedly ferromagnetic. Both manganese and manganese copper give magnetic alloys with bismuth, although the magnetic compounds have not yet been identified. Further, manganese tin is ferromagnetic and remains so when copper is introduced, while manganese-copper becomes magnetic when tin is introduced. Probably the formation of the compounds, Mn_4Sn and Mn_2Sn (this J., 1907, 927) is the cause of the magnetism in these cases.—W. H. P.

Heusler [magnetic] alloys. A. A. Knowlton and O. C. Clifford. Faraday Soc., April 23, 1912. [Advance proof.] (See preceding abstract.)

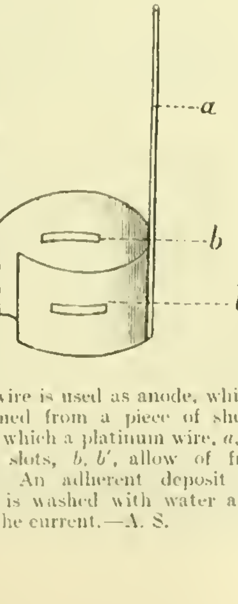
The results are given of a series of experiments with nine aluminium-manganese bronzes, varying in composition, in thermal treatment, and in thoroughness of mixing, with a view to deciding the effect of each of these factors on magnetic properties. A comparison of the results shows that the percentage composition plays a relatively unimportant part as compared with heat treatment, and that sensitiveness to heat treatment is probably greatly increased by thoroughness of mixing. Beyond this no definite statements can be made, although it appears that sensitiveness to heat treatment and magnetic hardness are closely dependent on the proportion of aluminium present, while the transformation temperatures depend largely on the percentage of copper. These are by no means the only effective factors, however.—W. H. P.

Heusler magnetic alloys; Magnetic properties and micro-structure of ——. A. D. Ross. Faraday Soc., April 23, 1912. [Advance proof.] (See preceding abstracts.)

The author restates results previously published (see this J., 1910, 1163) together with an account of the micro-structure of some copper aluminium alloys with low manganese content. The view is upheld that the magnetism is due to solid solutions probably composed of the compounds, Cu_3Al and Mn_3Al.—W. H. P.

Antimony in white bearing metals; [Electrolytic] separation and determination of ——. I. Compagno. Atti R. Accad. dei Lincei, Roma, 1912, 21, I., 473—478.

By using the cathode described below, antimony can be accurately determined without, in most cases, filtering the solution before electrolysis. 1 grm. of the alloy is dissolved in a mixture of 4 c.c. of concentrated hydrochloric acid and 4 c.c. of nitric acid of sp. gr. 1·2 in a covered beaker, and after expelling the nitrous fumes, the cover is rinsed with 5 c.c. of water, the solution is neutralised, then treated with 10 c.c. of sodium hydroxide solution of 43° B., 80 c.c. of sodium sulphide solution of sp. gr. 1·225, and 6 grms. of potassium cyanide. After boiling for 5 minutes, the walls of the beaker are washed down with 20 c.c. of water and the solution is electrolysed, preferably over night, with a current intensity of 0·1 ampère. A coil of platinum wire is used as anode, whilst the cathode (see fig.) is formed from a piece of sheet platinum (13 cm. by 9 cm.) to which a platinum wire, *a*, is autogenously soldered. The slots, *b*, *b′*, allow of free diffusion of the electrolyte. An adherent deposit of antimony is obtained, which is washed with water and alcohol, without interrupting the current.—A. S.



Arsenic-antimony alloys. N. Parravano and P. De Cesaris. Gaz. chim. ital., 1912, 42, I., 341—345.

A thermal and micrographic study of arsenic antimony alloys containing up to 40 per cent. of arsenic, showed that within this range the two metals form a continuous series of mixed crystals, with an eutectic point at 612° C. and about 82·5 per cent. of antimony.—A. S.

Zinc oxide; Reduction of —— by hydrogen. C. Gillet. Bull. Soc. Chim. Belg., 1912, 26, 106—107.

Zinc oxide is completely reduced to metal on heating in a slow current of dry hydrogen, and, as in the reduction by nascent hydrogen (*loc. cit.*, 1910, 24, 146), the reaction is reversible, since complete reduction cannot be effected unless the hydrogen is quite dry.—L. E.

Tin in its ores, alloys, and compounds; Method of estimating ——. By M. N. Banerjee and S. C. Banerjee. Chem. Soc. Proc., 1912, 28, 102.

Stannous chloride, prepared from tin ores, alloys, and compounds, is easily titrated with N/10 mercuric chloride solution, the indicator used being potassium iodide solution. The solution is "spotted" on a porcelain tile, and the end reaction is indicated when a drop of the tin solution under titration colours the iodide yellow owing to excess of mercuric chloride.

Zinc-cadmium alloys; Theoretical considerations derived from the study of the constitution of ——. W. Guertler. Internat. Zeits. Metallog., 1912, 11, 90—102, 172—177.

The discussion of the following theoretical considerations has resulted from the study of a number of experimental facts discovered in connection with the constitution of cadmium-zinc alloys. (1) The transformations occurring in the solid alloys are not as a rule completed, while being thermally investigated, and the position of the maximum thermal effect does not determine the composition of the resulting crystalline phase. The manner in which the completion of the reaction is dependent on the micro-structure and the most rational method of locating the position of this maximum are discussed. (2) The primary crystals of the phase present in excess during the crystallisation of eutectics exerts an attractive influence on the same constituent of the eutectic thus leading to the formation of sheaths of the other constituent in their immediate vicinity. (3) It is essential to search for surfusion effects when attempting to fix the position of the eutectic point by means of the microscope since concentrations other than that of the pure eutectic, may exhibit a purely eutectic structure. (4) Reactions between two crystalline phases are largely affected by the microscopic arrangement of the reacting crystals. (5) The observations of Rosenhain that in the crystallisation of eutectics the crystals of the constituent possessing the more pronounced power of crystallising acts as a dominant crystal determining the structure of the whole eutectic and that the eutectic crystallises from single centres are confirmed. (6) The occurrence of typical troostitic structures is not confined to carbon steels; they are met with in alloys where one metal undergoes allotropic modifications and at the same time rejects from its solution part of its previous content of another substance. (7) The possibility of obtaining reliable comparable values of the thermal effects by means of graphic constructions applied to ordinary cooling curves is discussed. The paper is illustrated by seven microphotographs.—A. H. C.

Cerium-aluminium alloys. R. Vogel. Z. anorg. Chem., 1912, 75, 41—57.

The alloys of cerium with aluminium have been submitted to a combined thermal and microscopical examination, and an equilibrium diagram of the system is given. The metals combine to form the compounds, Ce_3Al, Ce_2Al, CeAl, $CeAl_2$, and $CeAl_4$, the last of which undergoes transformation at 1005° C., the β form passing on cooling, with a contraction in volume, into the more stable α form. The alloys, unlike those of cerium with lead and tin (this J., 1911, 1262), are almost unaffected by air or water, only those containing less than 25 atoms per cent. of aluminium being very slowly attacked. The compound, $CeAl_2$, is not appreciably affected by strong hydrochloric, nitric or sulphuric acid, and the alloys generally are less readily attacked by acids than the constituent metals. They may be burnt in the Bunsen flame, but only those rich in cerium, are pyrophoric. The maximum hardness (about 6 on Mohs' scale) is exhibited by the compound, $CeAl_2$, which is also very brittle and has a melting point 600° C. above that of cerium and 800° C. higher than aluminium.—F. Sodn.

Radium; Alloys and electrolytic deposits of ——. F. de Mare and C. Jacobs. Bull. Acad. roy. Belg., Classe des sci., 1912, 53—54. Chem. Zentr., 1912, **1**, 1430.

By reduction of a mixture of silver chloride and radium sulphate with calcium carbonate and charcoal in a gas furnace, a radium-silver alloy was obtained. This was radioactive, had a yellow colour, showed a grey fracture, and with some care could be drawn into thin wire.

By electrolysis of a solution of radium acetate between platinum electrodes, a coherent, brown, very active deposit was obtained on the cathode. It is stated that at a definite thickness quartz allows the passage of the light rays emitted by a radium salt, whilst absorbing the α, β, and γ-rays.—A. S.

Antimony trisulphide—stannous sulphide; The system ——. N. Parravano and P. De Cesaris. Atti R. Accad. dei Lincei, Roma, 1912, **21**, 1., 535—540.

The authors have investigated mixtures of antimony trisulphide (m. pt. 545° C.) and stannous sulphide by the thermal method, the melting and cooling being effected in an atmosphere of nitrogen. The eutectic point is 460° C. (about 20 per cent. of stannous sulphide), but there is also an arrest at 480° C., due to the heat of formation of a compound, probably Sb_2S_3,SnS, formed by interaction of separated stannous sulphide and the residual melt. Antimony trisulphide does not retain any stannous sulphide in solid solution, but stannous sulphide holds up to 15 per cent. of antimony trisulphide in solid solution. —A. S.

Corrosion of metals in [gas] purifier houses. Haddock. *See* IIa.

Determination of sulphur in insoluble sulphides. St. Warunis. *See* VII.

Patents.

Steel; Production of high grade ——, *and slag rich in soluble phosphates.* Deutsch-Luxemburgische Bergwerks u. Hütten-Akt.-Ges, Bochum, and A. Vögler. Dortmund, Germany. Eng. Pat. 19,640, Sept. 4, 1911.

A tilting furnace is charged with scrap, pig iron, and the necessary lime and ore. As soon as the charge is in a molten condition, and the slag is sufficiently liquid, as well as containing the proper percentage of soluble phosphates, it is removed by blowing either with compressed air or gas and constitutes the finished slag, a material at least equivalent to Thomas slag. Suitable additions are now made to the metal left in the furnace and its treatment completed, when, by tilting the furnace, it is tapped off from beneath the slag formed during this finishing process and which is left in the furnace. The furnace is now returned to its normal position and the process repeated when the slag previously left in the furnace is now removed as finished slag rich in phosphates.—A. H. C.

Iron and steel; Refining of ——. K. A. F. Hiorth, Kristiania, Norway. Eng. Pat. 25,915, Nov. 20, 1911. Under Int. Conv., Nov. 20, 1910.

The metal produced in the usual way is first dephosphorised and the iron poured into a ladle either completely or else leaving some metal in the furnace. If it be all poured off then some "cheap" iron is added to the slag in the furnace which is rich in phosphorus. By now adding carbon, a rich phosphatic iron, of value in the basic Bessemer process, and a dephosphorised slag are obtained. The small quantity of phosphatic iron is poured off, the iron in the ladle returned to the furnace and its treatment completed, the residual slag being used for a further charge.—A. H. C.

Steel; Manufacture of cast —— *electrically.* G. Fischer and B. Schüdel. Fr. Pat. 436,937, Nov. 28, 1911. Under Int. Conv., Dec. 7, 1910.

Scrap-iron, or waste from electric foundries, etc., is employed, the material being chosen so that its chemical composition, both qualitatively and quantitatively, agrees as closely as possible with the final product required. The material is smelted with a basic slag, and, immediately after removal of the slag, substances are added so as to raise the quantity of carbon, silicon, or manganese, to the amount required in each case.—B. N.

Metals; Smelting and refining of —— *in crucibles.* H. G. Solomon, London. Eng. Pat. 9031, April 11, 1911.

The transformer of an induction furnace has one of its limbs adapted to be surrounded by an annular crucible and a chamber. The bridge piece of the transformer is fixed to a movable lid which closes the chamber, and arranged so that the circuit of the transformer is only closed when the crucible with its charge, and the lid are in position. The crucible rests upon a movable platform which can be lowered by a suitable mechanical device when it is necessary to draw the charge.—A. H. C.

Furnace; Electric —— *[metallurgical].* R. Chavarria-Contardo. Fr. Pat. 436,183, Jan. 16, 1911.

The horizontal electrodes are disposed a certain distance above the base or the crucible of the furnace, the latter being provided with lateral inclined bases which converge towards the centre of the furnace. The ore is supplied to these bases, and takes the form of a talus slipping down continuously into proximity with the electrodes, the unmelted ore at this point floating on the molten material in the bath where it receives the maximum heat from the arcs. Perfect fusion is thus obtained, without choking, and the arcs radiate over large surfaces of the ore and the bath. A short distance below the arched roof, a reverberatory arch of carborundum is arranged, the rays emitted towards the roof being thrown back, and a gaseous cushion is provided between the carborundum arch and the roof, thus protecting the latter. The gases escape from this space through suitable orifices, and are thus brought into contact with the material entering the furnace. The central part of the crucible is enlarged, so as to prevent deterioration of the walls by direct radiations of the arcs. By means of a stuffing-box containing asbestos, the latter being pressed between blocks of refractory material, the electrodes may be displaced whilst retaining a tight joint. The current is brought to the electrodes through blocks of graphite, surrounding and in contact with the electrodes, these blocks being fitted into copper plates receiving the current. —B. N.

Soldering electric conductors and the like. C. E. Egnér, Stockholm, Sweden. Eng. Pat. 11,841, May 16, 1911.

Soldering tin for joining electric conductors, etc., is surrounded when in place on the joint by a strip of aluminium which does not solder with the tin when heated but serves to protect the tin from contact with the combustion gases and to spread the heat more evenly round the joint. The aluminium strip is removed after the soldering operation.—H. H.

Precious metals; Extraction of —— *from pulp and solutions.* Turbo and Amalgamator Co., London, and A. A. Lockwood, Honor Oak, Surrey. Eng. Pat. 22,627 Oct. 13, 1911.

The pulp or solution is contained in a reservoir and circulated through the amalgamating vessel by means of a pump in series with them. The reservoir is provided with aerating pipes, or mechanical agitators may be employed. The amalgamating vessel may be rotated, and has copper plates projecting from its sides so arranged as to keep the pulp in motion and lift the mercury which flows over them and through the pulp. Connections are provided for an electric current when electrolysis is employed.—A. H. C.

Precious metals; Precipitation of —— from cyanide solutions. J. M. Neil, Assignor to A. M. Hay, Toronto, Canada. U.S. Pat. 1,023,524, April 16, 1912.

Finely divided lead is added to the cyanide solution, which is then agitated and the precious metals are precipitated by the addition of finely divided zinc and then recovered from the precipitate.—A. H. C.

Alloys of the precious metals, and methods of increasing hardness of such alloys. A. J. Rossi, Niagara Falls, N.Y. Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pats. (1) 1,022,596 and 1,022,600, April 9, 1912, and (2) 1,023,332 and 1,023,334, April 16, 1912.

(1) Gold or silver, and a harder metal such as copper alloyed with sufficient titanium to combine with undesired elements and compounds, are mixed in a molten state to obtain a final product containing only traces of titanium. (2) Gold or silver, a harder metal such as copper, and titanium, are brought together in the molten state so as to obtain an alloy containing them.—A. H. C.

Electroplating apparatus. G. A. Lutz, Plainfield, N.J., Assignor to American Circular Loom Co., Portland, Me. U.S. Pats. 1,022,487 and 1,022,561, April 9, 1912.

(1) The apparatus comprises a tank with a cathode frame, provided with hollow conductors to support the articles to be plated and movably connected to the frame, the latter being supported over the tank. Anodes are suspended movably from an anode frame so as to extend within the hollow connections, and means are provided for supporting the anode frame above the cathode frame but out of contact with it. A second set of anodes is provided with means for suspending the same within the tank, and means for connecting the two sets of anodes in the same side of a circuit. (2) The apparatus comprises a tank, a number of conductors adjacent to the tank, spaced apart and located in the same circuit, with means for suspending anodes from the conductors. Means are also provided for suspending a cathode between such anodes, with supports for the cathode adjacent to the wall of the tank and insulated from the conductors, and means for removably securing the cathode to the supports.—B. N.

Nickel; Process for making tubes, plates, and other utensils electrolytically in thick and sound layers of ——. E. Levi. Fr. Pat. 436,380, Jan. 20, 1911.

The nickel is deposited by electrolysis from an acid aqueous solution of nickel sulphate, the bath being preferably hot, and in order to obtain uniform density in the deposits, the electrolyte is circulated or agitated, or the objects themselves are moved or rolled. By employing a hollow mandrel of aluminium or other metal, and supporting this on a stretched wire or cable on which the mandrel turns during the electrolysis, the nickel may be deposited in the form of long tubes, the aluminium being afterwards removed by solution or fusion. In the making of tubes or other objects, one or more layers of metals, either cheaper than or possessing properties different to the nickel, may be deposited between layers of nickel.—B. N.

Manganese and titanium; Alloys of ——. A. J. Rossi, Niagara Falls, N.Y., Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pats. 1,022,595 and 1,023,331. April 9, 1912.

(1) The oxides of manganese and titanium are mixed with aluminium and heated to a sufficiently high temperature to ensure the reduction of the oxides and the production of a molten alloy of the metals. (2) The oxides of manganese and titanium are heated with carbon to a sufficiently high temperature to produce a bath of molten manganese and effect reduction of the titanium oxide, thereby obtaining an alloy of manganese and titanium containing more than one per cent. of carbon.—A. H. C.

Titanium and zinc; Alloy of ——. A. J. Rossi, Niagara Falls, N.Y., Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,022,597, April 9, 1912.

Titanium oxide is reduced by carbon either in the presence of oxide of zinc or in a bath of molten zinc, producing an alloy of titanium and zinc containing more than one per cent. of carbon.—A. H. C.

Titanium and tin; Alloy of ——. A. J. Rossi, Niagara Falls, N.Y., Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,022,598, April 9, 1912.

Titanium oxide is reduced by carbon either in the presence of oxide of tin or in a bath of molten tin, producing an alloy of titanium and tin containing more than one per cent of carbon.—A. H. C.

Titanium and copper; Alloy of ——. A. J. Rossi, Niagara Falls, N.Y., Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,022,599, April 9, 1912.

Titanium oxide is reduced by carbon either in the presence of oxide of copper or in a bath of molten copper, producing an alloy of titanium and copper containing more than one per cent. of carbon.—A. H. C.

Titanium and lead; Alloy of ——. A. J. Rossi, Niagara Falls, N.Y., Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,022,799, April 9, 1912.

The oxides of titanium and lead are reduced by carbon at a temperature sufficiently high to produce the molten metals, and an alloy of them.—A. H. C.

Copper, titanium and silicon; Alloy of ——. A. J. Rossi, Niagara Falls, N.Y., Assignor to Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,023,333. April 16 1912.

Copper or a "cupric material," and oxides of silicon and titanium are heated with carbon to a sufficiently high temperature to reduce the oxides and produce an alloy of copper, silicon, and titanium.—A. H. C.

Matter; Composition of ——. [Hardening copper.] L. Gross, Homestead, Pa., Assignor to C. Gross, McKees Rocks, Pa. U.S. Pat. 1,023,642, April 16, 1912.

Copper is hardened by heating to slightly below its melting point, adding a mixture of borax and coal ashes, and finally raising the temperature so as to melt the copper.—A. H. C.

Nickel ores or metallurgical products containing iron and copper; Process for the treatment of sulphide ——. W. Borchers and H. Pedersen. Ger. Pat. 245,198, March 23, 1911.

The process is specially applicable to low-grade sulphide nickel ores rich in copper. A crude matte low in copper and nickel, rich in iron and sulphur, is first produced, and this is roasted in an oxidising atmosphere at a temperature near 600°C. The sulphates of nickel and copper thus produced are removed by lixiviation with acidulated water, the residue being added to the next charge of ore to be smelted. From the solution the sulphides of copper and nickel are precipitated separately by gradual addition of an alkaline-earth sulphide, or preferably an alkali sulphide, and the dried sulphides are smelted separately with limestone and charcoal in order to obtain the metal (copper or nickel) and a calcium sulphide slag, which is either used directly for precipitating a further quantity of copper and nickel sulphides, or is converted into sodium sulphide to be used for the same purpose.—A. S.

Steel; Manufacture of ——. F. A. Wilmot. Fr. Pat. 437,303, Nov. 3, 1911.

SEE U.S. Pat. 1,012,310 of 1911; this J., 1912, 77.—T. F. B.

Steel; Process and apparatus for making ——. G. F. Forwood and T. D. Mackie. Fr. Pat. 437,307, Nov. 9, 1911.

SEE Eng. Pats. 22,569 of 1910 and 8498 of 1911: this J., 1911, 1391.—T. F. B.

Steel and slag rich in soluble phosphoric acid; Process for making high-grade —— in the Siemens-Martin or the electric furnace. Deutsch-Luxemburgische Bergwerks- und Hütten-A.-G. Fr. Pat. 437,999, Dec. 22, 1911.

SEE Eng. Pat. 19,640 of 1911; preceding.—T. F. B.

Copper bearing substances; Method of treating ——. C. S. Bradley, New York. Eng. Pat. 12,304, May 22, 1911. Under Int. Conv., June 23, 1910.

SEE U.S. Pat. 1,011,562 of 1911; this J., 1912, 78.—T.F.B.

Pyrophorous metal. F. Krieger. Assignor to Zundmetall-Ges. m. b. H., Berlin. U.S. Pat. 1,023,661, April 16, 1912.

SEE Fr. Pat. 419,388 of 1910: this J., 1911, 136.—T. F. B.

Nickel sulphide ores containing iron and copper, or other foundry products: Process for treating ——. *by combined operations of melting, roasting, lixiviation, and precipitation.* V. von Hartogensis. Fr. Pat. 437,774, Dec. 18, 1911. Under Int. Conv., March 22, 1911.

SEE Ger. Pat. 245,198 of 1911; preceding.—T. F. B.

Welding or cutting metals by means of the blowpipe flame; Processes for ——. A. E. Knowles. Fr. Pat. 438,012, Dec. 22, 1911.

SEE Eng. Pat. 4487 of 1911; this J., 1912, 236.—T. F. B.

[*Metallurgical*] *coke.* Fr. Pat. 437,231. *See* IIA.

Electric furnace for use in the manufacture of silicates, the ceramic art, and electrometallurgy. Fr. Pat. 436,947. *See* XI.

XI.—ELECTRO-CHEMISTRY.

Electric pressure furnace; Investigations in the ——. (1) *Construction of the furnace and its temperature gradient under pressure.* (2) *Strontium peroxide from strontium oxide and oxygen.* (3) *Experiments on the preparation of lead dioxide from lead oxide and on the dark brown compound,* Pb_5O_8. (4) *Alkali peroxides direct from alkali hydroxides and oxygen.* F. Fischer and H. Ploetze. Z. anorg. Chem., 1912, 75, 1—40.

(1) THE furnace described, in which temperatures up to 1000° C. can be maintained under a pressure of 100 atmos., consists of an unglazed porcelain tube covered with layers of heat-insulating material, in which a coil of platinum wire is embedded, the whole being enclosed in a closely fitting tube of soft steel, provided at either end with stout flanges and caps, through which pass the necessary connecting tubes and wires (gas-tight joints being secured by packing of vulcanised fibre). The apparatus is rigidly suspended in a stout frame and, during use, is cooled externally by water. The internal temperature is thus greatest at the middle of the tube, falling off towards the ends, and a table is given showing the temperature gradient, under 100 atmos., corresponding to various temperatures indicated by the fixed thermo-element employed. (2) Strontium peroxide has been directly synthesised in this furnace from strontium oxide and oxygen, but attempts to prepare calcium peroxide in a similar manner, with and without catalysts, were unsuccessful, the dissociation pressure, at the temperature necessary for the reaction, being apparently greater than 100 atmos. (3) Attempts to prepare lead peroxide faile but lead oxide or lead peroxide, heated in oxygen, a 400°—450° C., under 100 atmos. pressure, gave a dar brown compound, Pb_5O_8, which is regarded as the lea salt of pyroplumbic acid, $H_4Pb_3O_8$; with red lead, und similar conditions, no oxidation was effected. A mixtu of lead oxide and dry powdered potassium hydroxid heated to 375° C., gave a dark red product which evolve oxygen on treatment with water. (4) The hydroxides potassium, rubidium, and cæsium, when heated in oxyge under high pressure, were converted into peroxides, th proportion formed being greatest in the case of cæsium and least with potassium; lithium and sodium hydroxide gave no peroxide under like conditions. Potassiu hydroxide was found to behave towards air (free from carbon dioxide), at 350° C. and under 100 atmos. pressure exactly as towards oxygen under 20 atmos. pressure the formation of nitrite or nitrate was not observed.
—F. SODN.

Nitrogen; Comparative experiments on the oxidation of —— *in the high-pressure electric flame arc.* M. Tauscnt Z. Elektrochem., 1912, 18, 314—319.

THE yield of nitric acid per kilowatt-hour in the alternating current high pressure arc is greater in a vertical arc than in a horizontal one. The author describes simple apparatus for carrying out laboratory experiments with a vertical arc. The arrangement is similar in principle to that of Grau and Russ (this J., 1908, 945). A water-cooled thin glass tube 20 cm. long and 18 mm. internal diameter is closed at the upper end by a stationary electrode, consisting of a copper capillary tube with a brass water jacket (Fig. 1). The lower electrode (Fig. 2) which is movable, serves also to admit the air which passes in through *a*, and into the reaction vessel through small holes at *c*. The stopper, *f*, and the handle, *g*, for insulation and for moving the electrode are made of vulcanite fibre. The copper electrode, *d*, is screwed to the end of the brass tube, and to it is attached the Nernst pencil, *e*. Through the core of the pencil passes a thin platinum wire, which projects about 0·5 mm. and serves to strike the arc by short-circuiting. At the lower end the wire is bound to the copper tube, *d*, by means of thin copper wire. The air is sucked out from the flame through the upper electrode. The flame of the vertical arc is much steadier than that of the horizontal arc and therefore shows more favourable results in respect to potential. A 3 cm. long vertical arc of 0·2 amp. burns with 650 volts, while a 1 cm. long horizontal arc of 0·25 amp. is only stable with from 390 520 volts to under otherwise practically similar conditions.—W. H. P.

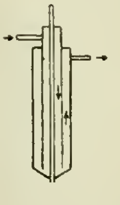


FIG. 1.

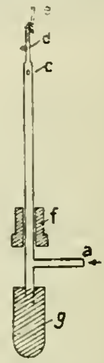


FIG. 2.

Formation of badly conducting layers in the electrolysis of glass. Schulze. *See* VIII.

PATENTS.

Furnaces; Electric ——. H. Plauson, W. Zsvetaeff, and G. Tistchenko, St. Petersburg. Eng. Pat. 10,858, May 4, 1911.

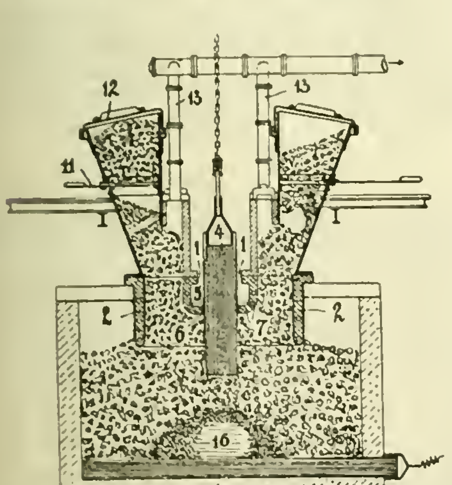
THE furnace is provided with a working chamber, and with a heat-proof electrically non-conductive or semi-conductive partition or partitions projecting into the chamber, so as to leave a narrow passage or passages for the charge in the path of the current. These passages are so proportioned relatively to the rest of the chamber, that practically the whole of the conversion of current energy into heat energy is confined to the passages, and the non-conductive or semi-conductive material, by reason of the heat, acquires such conductivity that it acts as a rheostat automatically controlling the concentration of heat. The furnace may have an inclined floor of heat-proof poorly-conductive material. Adjustable slides may be arranged for regulating the passages or apertures, and the walls or partitions may have renewable heat-proof edge portions adjacent to the passages. The wall or partition may be formed by a hopper for introducing the charge, and a channel may be arranged to lead from the narrow passage to an eduction gate, the latter being at such a level that the passage is continuously filled with charge during the working. Gases may be passed through the chamber and the passages during the working for the purpose of acting on the charge.—B. N.

Furnaces; Electric ——. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, New York. Eng. Pat. 17,060, July 25, 1911.

The electrode is provided with a fixed support, having movable supporting plates adjustable with respect to the fixed support, and having a surface configuration similar to that of the electrode. Connecting links are movably connected to the plates, but space the latter out of contact with one another, and means are provided for drawing the movable plates toward the fixed support, thereby contracting the space enclosed by them and exerting pressure upon the electrode.—B. N.

Furnace; Electric —— *with charging vessel surrounding the vertical electrode.* Bosnische Elektricitäts-A.-G. Fr. Pat. 436,578, Nov. 20, 1911. Under Int. Conv., Nov. 26, 1910.

The furnace is provided with a charging vessel, in the form of a shaft, made in two parts, of which one serves for the exhaustion of gas through the tubes, 13, and the other serves for charging with material through the double covers, 11 and 12. The lower part of the charging vessel, which surrounds the electrode, 4, is about the same width as the fusion hearth, 16. The internal part, 5, of the charging shaft is made funnel-shaped, so that the charge is kept clear of the electrode, and powdered material, similar to the charge, is placed in 5, so as to maintain a tight joint. The walls, 1 and 2, of the lower part of the charging vessel, are formed of sheets of iron lined with refractory material, and cooled by a flow of water, the walls being insulated from the walls of the furnace.—B. N.



Furnaces; Lining for electric ——. Soc. Générale des Nitrures. Fr. Pat. 436,596, Jan. 26. 1911.

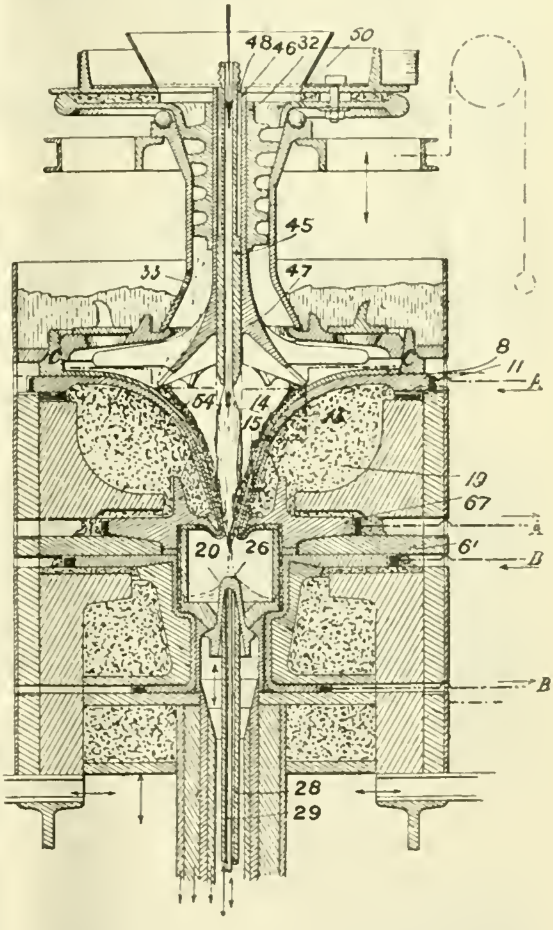
Blocks or bricks of aluminium nitride, agglomerated with sodium silicate, are employed for the refractory lining of electric furnaces.—B. N.

Furnaces; Production of gaseous reactions in electric ——. A. Helfenstein. Fr. Pat. 436,828, Nov. 25, 1911. Under Int. Conv., Nov. 26, 1910.

Between the vertical electrode, which may be suitably regulated, and the conducting sole of the furnace is interposed a molten bath, acting as a heating resistance into which the gases for the reaction are blown. The material in the bath may take part in the reaction, either as a contact substance or as one of the components of the reaction. Hard granular substances may be disposed so as to rest on the bath, and may also take part in the reaction either as contact material or as a component of the reaction, the gases being passed over the material after leaving the bath. The gases may be passed over the granular substances instead of being passed through the bath, and the latter will also serve to absorb the secondary products, such as slags, which may be formed in the chemical actions.
—B. N.

Furnace; Electric —— *for use in the manufacture of silicates, the ceramic art, and electro-metallurgy.* G. Méttler. Fr. Pat. 436,947, Nov. 29, 1911. Under Int. Conv., Nov. 30, 1910.

The charge is fed into the funnel, 50, from which it is delivered by a rotating screw, 32, on to a diaphragm, 47, and from the latter it descends to the cone, 8, upon which it gradually falls towards the zone of fusion near the apex of the cone. The furnace receives a preliminary heating by means of Dowson gas, or by an oxy-hydrogen flame supplied through the tube 45, fitting into the wider tube, 46, the necessary air entering through the opening, 33, and in this way the charge may be brought to incandescence.



Water may be circulated through the space, 48, for cooling purposes. The cones, 14 and 15, the latter of carbon, form the electric heating resistance through the circuit, A A, the copper terminals, 11, being attached to the pieces, 8, and 67. The space, 19, is filled with magnesia. The heating resistance has a lining, 54, of boric anhydride, or this substance mixed with zirconium oxide, these bodies, and the charge at the high temperature obtained by the preliminary heating becoming good conductors of the current. A refining chamber, 20, consisting of a hollow cylinder of calcined zirconium or thorium oxide, is arranged below the zone of fusion, this chamber being heated by a resistance included in the circuit, B B. The two electric circuits are separated by the magnesia block, 6¹. The chamber, 20, is closed by a valve, 26, manipulated either mechanically or by gas pressure through the rod, 29, or tube, 28, so that the fused material may be run off. The various parts of the furnace are surrounded by magnesia, and a special mixture is employed for obtaining gas-tight joints where necessary. An alternative form of heating resistance cone, at the point where it borders on the refining chamber, is described, consisting of two concentric cones, and an intermediate layer of metals, or oxides of metals of the chromium group, pure tungsten, titanium, or their carbides, either used together or separately, the mass being fritted or cemented with boric anhydride or ammonium sulphide.—B. N.

Rectifier; Electrolytic ——. W. Morrison, Des Moines, Iowa. U.S. Pats. 1,022,695 and 1,023,092, April 9, 1912.

(1) The anode of the rectifier consists of or contains bismuth, and the electrolyte such as a soluble chromate of an alkali metal, is capable of reacting with bismuth to give an "asymmetric film." (2) The anode of bismuth is alloyed with an element of the sulphur group in the periodic law, such as tellurium, having a higher atomic weight than sulphur.—B. N.

Electrolytic process. H. H. Bates and F. Adam, Joliet, Ill. U.S. Pat. 1,023,545, April 16, 1912.

A continuous stream of liquor is passed through a preheater and then through an electrolytic cell, from which it passes back to the preheater as the heating liquid, so that the outgoing liquor becomes cooled (to assist in the deposition of crystals) and, at the same time, raises the temperature of the incoming liquor just to the point desirable for entrance into the electrolytic cell, the voltage in the cell being just sufficient also to effect the electrolysis.—F. Sodn.

Secondary battery. P. Marino, London. U.S. Pat. 1,023,861, April 23, 1912.

See Eng. Pat. 2683 of 1909; this J., 1910, 97.—T. F. B.

Wood for use in secondary batteries; Process of treating ——. P. Marino, London. U.S. Pat. 1,023,948, April 23, 1912.

See Eng. Pat. 2641 of 1909; this J., 1910, 97.—T. F. B

Electric furnace. M. R. Conley, Assignor to J. E. Florence, New York. U.S. Pat. 1,023,996, April 23, 1912.

See Fr. Pat. 428,370 of 1911; this J., 1911, 1169.—T. F. B.

Electric furnaces; Apparatus for supplying the current to ——. Röchling'sche Eisen- und Stahlwerke Ges. m.b.H., and W. Rodenhauser. Fr. Pat. 437,516, Dec. 13, 1911. Under Int. Conv., Dec. 13, 1910.

See Eng. Pat. 10,231 of 1911; this J., 1912, 137.—T. F. B.

Heating gases to high temperatures for the production of endothermic reactions such as the oxidation of nitrogen. Eng. Pat. 14,528. *See* VII.

Purification of gases [containing sulphur dioxide]. U.S. Pat. 1,022,012. *See* VII.

Soldering electric conductors and the like. Eng. Pat. 11,841. *See* X.

XII.—FATS; OILS; WAXES.

Oils from plants belonging to the order Cruciferae. C. Grimme. Chem. Rev. Fett-Ind., 1912, 19, 102—105.

The oils in the following table were extracted by ether from the seeds of well-known plants, some of which are edible.

Oils.

Oil from	Yield.	Sp. gr.	Solidif. point.	Refractive index.	Acid value.	Saponif. value.	Iodine value (Wijs).	Hehner value.	Glycerol.	Unsaponifiable matter.
	per cent.	at 15°C.	°C.						per cent.	per cent.
Lepidium sativum L. (garden cress) ..	20·5	0·9238	-15 to -16	1·4718 (20° C.)	8·3	183·7	133·5	94·08	9·37	1·23
Nasturtium officinale R.Br. (water cress)	24·0	0·9205	-5 to -6	1·4704 (20° C.)	2·2	170·9	98·6	94·28	9·22	1·11
Barbarea praecox R.Br. (winter cress)	20·3	0·9214	-5 to -7	1·475 (20 C.)	11·7	180·0	137·3	94·42	9·20	0·98
Crambe maritima L. (sea kale)	47·0	0·9187	-8 to -10	1·4715 (20° C.)	10·1	179·5	92·7	93·15	9·26	2·22
Cochlearia officinalis L. (spoonwort) ..	22·5	0·9232	-7 to -8	1·1739 (20° C.)	10·8	173·4	143·3	94·52	8·86	1·05
Raphanus Raphanistrum L. (hedge mustard)........................	21·5	0·9186	-13 to -14	1·4722 (20° C.)	16·0	176·0	105·0	94·33	8·74	1·30
Camelina sativa Crantz. (cameline) ..	30·0	0·9224	-15 to -16	1·4761 (20° C.)	13·2	185·8	135·1	94·12	9·43	1·16
Isatis tinctoria L. (woad)	31·3	0·9251	-2 to -3	1·4751 (15° C.)	22·7	181·2	111·8	92·81	8·66	2·86

Fatty acids.

Oil from	M. pt.	Solidif. pt.	Refractive index.	Neutralisation value.	Iodine value (Wijs).	Mean molec. weight.
	° C.	° C.	25° C.			
Lepidium sativum L.	25—26	22—23	1·4659	191·1	138·1	293·2
Nasturtium officinale R.Br.	24—25	21—22	1·4621	174·0	102·5	322·7
Barbarea praecox R.Br.	23—24	21—22	1·4666	189·4	139·2	296·5
Crambe maritima L.	18—20	16—18	1·4673	181·5	99·3	309·4
Cochlearia officinalis L.	18—20	15—16	1·4670	179·1	139·2	313·6
Raphanus Raphanistrum L.	14—16	11—12	1·4658	179·5	109·1	312·8
Camelina sativa Crantz.	18—20	15—16	1·4680	189·6	138·5	296·3
Isatis tinctoria L.	24—25	21—22	1·4710	191·0	121·2	294·0

—J. A.

Animal fats ; Constituents of ——. *I. Lepus vulgaris* [*hare*]. J. Klimont. Monatsh. Chem., 1912, **33**, 441—446.

This sample of hare-fat was of a dirty yellow colour and soft, granular consistence. It had the following characters : sp. gr. (50° C.), 0·9134 ; acid value, 15·3 ; saponif. value 204·9 ; iodine value, 107·0 ; m. pt., 35° C. ; solidif. pt., 29° C. The solid portion of the fat, after repeated crystallisation from acetone, was proved to be essentially tripalmitin. The fatty acids from the liquid portion of the fat contain linolic acid but no linolenic acid.—J. A.

Datura stramonium ; Oil from seeds of ——. H. Meyer and R. Beer. Monatsh. Chem., 1912, **33**, 311—331. (See also this J., 1890, 1137 ; 1902, 1459 ; 1905, 447—448.)

As the result of a long series of fractional precipitations of the fatty acids with lithium, magnesium and barium acetates, and subsequent examination of the products, the authors conclude that the following is the composition of the oil obtained from the seeds of *Datura stramonium* : palmitic acid, 10 per cent. ; daturic acid (normal heptadecylic acid), 2·5 ; oleic acid, 62 ; linolic acid, 15 ; unsaponifiable, 1 ; and glycerol, 9·6 per cent. The oil also contains small quantities of acids of higher molecular weight than those mentioned but not stearic acid. On brominating the linolic acid, only the tetrabromostearic acid melting at 117° C. was obtained, but oxidation with potassium permanganate yielded two modifications of sativic acid, one melting at 162°—163° C. and the other at 173° C. On being reduced with zinc the tetrabromostearic acid gave only α-sativic acid and it is suggested that the two sativic acids (α and β) are stereoisomerides existing in the *cis* and *trans* forms. Daturic acid is more soluble in alcohol than palmitic acid, and the authors suggest that the substance obtained by Holde from this and other oils contained the latter acid as an impurity and that its quantity, even if it was present only in small amount at first, would become increasingly greater in the product of each recrystallisation, the daturic acid remaining in larger proportion in the mother liquors. The properties of the daturic acid obtained from the oil were satisfactorily compared with those of the pure acid obtained synthetically from methylheptyldecylketone.—J. A.

Crude fat of Beta vulgaris. A. Neville. Chem. Soc. Proc., 1912, **28**, 130.

The ethereal extract of the dry matter of the common mangel was examined and found to contain triglycerides, free fatty acids, and two neutral substances. The free and combined fatty acids consisted largely of palmitic, oleic, and erucic acids, whilst the two neutral substances were of phytosterol nature, and gave results on analysis corresponding with the empirical formulæ $C_{31}H_{58}O_2$ and $C_{29}H_{45}O_2$ respectively.

Candle nuts (*Aleurites triloba*) *from Mauritius.* Bull. Imp. Inst., 1912, **10**, 44—45.

The nuts were composed of approximately 64 per cent. of shell and 36 per cent. of kernel. The pale brownish-yellow oil (yield, 68·1 per cent. on the weight of the kernels) had the sp. gr. 0·927 at 15°/15° C. ; saponif. value, 193·7 ; iodine value, 151. It would be worth about £28 to £30 per ton in Europe.—A. S.

Lipases ; Syntheses by means of plant ——. S. Iwanow. Ber. deutsch. Botan. Ges., 1911, **29**, 595—602. Chem. Zentr., 1912, **1**, 587.

Glycerin extracts of unripe flax, poppy, and rape seeds were mixed with oleic acid and an antiseptic (thymol) and the acidity of the mixtures determined at intervals. The acidity was found to decrease, indicating a synthesis of olein. If, however, the glycerin extract was diluted with water, it was found to possess lipolytic properties, an increase of acidity being observed after addition of oil to the extract. Precipitates produced by adding alcohol to the glycerin extracts also possessed synthetic and lipolytic properties.—A. S.

Rate of evolution of hydrocyanic acid from linseed under digestive conditions. Collins. *See* XIXa.

Patents.

Oleaginous materials ; Process of treating ——. W. C. Merrill, Boston, Mass. U.S. Pat. 1,023,386, April 16, 1912.

The oleaginous material is cooked in a closed vessel under fluid pressure to separate it into its constituent parts, the fluid pressure is then cut off, and the constituent of lowest specific gravity is removed. The inorganic solids and the cooked mass are then removed separately from the vessel, and the cooked mass is further treated to separate the liquid constituents. Vapours arising from the material during the treatment are condensed and the condensed vapours are disinfected.—E. W. L.

Fats and unsaturated fatty acids ; Method for the reduction of ——. Verein. Chem. Werke A.-G., Charlottenburg, Germany. Eng. Pat. 20,329, Sept. 13, 1911. Under Int. Conv., Feb. 2, 1911.

See Fr. Pat. 434,927 of 1911 ; this J., 1912, 346.—T. F. B.

Fats and unsaturated fatty acids ; Process for the reduction of ——. C. Paal, Erlangen, Germany. Assignor to J. Crosfield and Sons, Ltd., Warrington. U.S. Pat. 1,023,753, April 16, 1912.

See Fr. Pat. 434,927 of 1911 ; this J., 1912, 346.—T. F. B.

XIII.—PAINTS ; PIGMENTS ; VARNISHES ; RESINS.

Ochres : Adsorption of colouring matters by ——. A. Bouchonnet. Rev. Gen. Mat. Col., 1912, **16**, 117—122.

From many experimental results the author concludes that the degree of adsorption of dyestuffs by an ochre depends on its fineness and on its composition. Generally speaking (though there are exceptions to the statement) the amount of adsorption is proportional to the iron and aluminium content of the ochre. It is stated that ochres coloured by adsorption of dyestuffs may be used instead of mineral pigments in paints, etc.—P. F. C.

Varnishes ; Examination of ——. H. Wolff. Farben-Zeit., 1912, **17**, 847—849. Chem. Zentr., 1912, **1**, 1402.

In the determination of volatile substances in varnishes, paint oils, and lacquers, it is frequently impossible to obtain the volatile oil quantitatively by steam distillation, even if this be prolonged for one day ; especially in presence of large quantities of resins, it is very difficult to distil off the higher-boiling portions of heavy petroleum spirit, rosin spirit, etc. It is better to heat the varnish or oil first to 110° C. and then distil with steam. Temperatures of over 115° C. must be avoided, or in presence of rosin, decomposition may ensue and small quantities of substances similar to rosin spirit distil over, which, whilst not appreciably affecting the amount of volatile oil, have a considerable effect on the properties, *e.g.*, the flash point, of the latter. For the determination of resins in varnishes containing copals, where saponification is essential, a combination of Fahrion's method (this J., 1911, 1266) with that of the author (Farben-Zeit., 1910, Nr. 7) is recommended. The following systematic method of examination is proposed. After determination of the specific gravity and refractive power, 10 grms. are dissolved in petroleum ether and the solution made up to 100 c.c. Twenty or 25 c.c. of the solution are treated with concentrated hydrochloric acid, and washed with water, and after expelling the petroleum ether, the acid and saponification values are determined. In another 20 or 25 c.c. of the solution the acid value is determined directly, and if the refraction at 15° C. is above 90—92, the resin acids are determined in 40 c.c. of the solution by Fahrion's method, or more rapidly by the author's method in the solution obtained in the determination of the saponification value. If the saponification value indicates the presence of unsaponifiable matter, a distillation with steam is carried out as described above, and when necessary, non-volatile unsaponifiable matter is determined by an extraction method. A practical drying test both with and without pigments is essential in all cases, and in this connection in order to shorten the time of the test, it is recommended that after the film has dried for 24 hours, it be warmed for 1—2 hours at 30°—35° C. and then examined as to stickiness.—A. S.

Patents.

White lead ; Manufacture of ——. H. Franzen. Ger. Pat. 244,509, March 10, 1911.

Lead oxide or other lead compound is boiled with an aqueous solution of an amino-acid or of mixtures of amino-acids such as are produced by the hydrolysis of proteins, and carbon dioxide is led into the resulting solution under atmospheric or increased pressure. After separating the precipitated white lead, the solution can be used again for dissolving a further quantity of lead oxide.—A. S.

Varnishes ; Manufacture of ——. T. G. Tye, Singapore. Eng. Pat. 29,122, Dec. 27, 1911.

A varnish which dries in about two hours, and which is said not to show marks or stains like oil varnishes when used, is prepared by dissolving a finely powdered mixture of old Chinese amber (1 oz.) and white dammar gum (½ oz.) in oil (20 oz.), distilled from *ptychotis ajowan* or *carum ajowan*, and clarifying if necessary.—E. W. L.

XIV.—INDIA-RUBBER ; GUTTA-PERCHA.

Rubber resources of Uganda. Bull. Imp. Inst., 1912, 10, 11—25.

The native plants from which rubber is obtained in Uganda are *Funtumia elastica*, Stapf, and the two vines, *Landolphia Dawei*, Stapf, and *Clitandra elastica*, K. Schum. In the past few years, however, planting has been undertaken, and it was estimated that in 1911, there were 3200 acres planted with cultivated rubber trees, viz., 2200 acres with Para trees, 900 acres with Ceara trees, and 100 acres with Funtumia and Castilloa trees. The results with the Para and Ceara trees have been very promising. The result of analyses of some Uganda rubbers are given in the following table :—

	1	2	3	4	5	6	7	8
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Loss on washing (moisture and impurities) ..	0·6	0·3	1·6	3·9	0·7	0·1	1·1	0·6
Composition of dry washed rubber :								
Caoutchouc	94·0	94·7	88·7	84·0	90·3	92·4	91·1	84·8
Resin	2·7	2·3	6·2	5·0	7·7	6·6	7·7	6·4
Protein	2·9	2·3	4·3	9·3	1·7	0·8	0·9	8·5
Ash	0·4	0·7	0·8	1·7	0·3	0·2	0·3	0·3
Value, per lb., with fine hard Para at 4s. 4½d. per lb..................	4s. 8d.	4s. 7d.	4s. 7d.	4s. 9d.	4s. 9d.	4s. 10d.	4s. 8d.	4s. 9d.

Nos. 1 and 2, Para crêpe and biscuits respectively, were somewhat deficient in strength, but the quality of the rubber should improve as the trees become older. Nos. 3 and 4, Ceara crêpe and biscuits respectively, possessed satisfactory physical properties. No. 5 was a sample of Funtumia sheet rubber of good quality. Nos. 6 and 7 were samples of *Landolphia Dawei* rubber in the form of sheets and biscuits respectively and of very good quality. No. 8 was a sample of sheet rubber of good quality from *Clitandra orientalis*.—A. S.

Para rubber ; A saccharine constituent of ——. Bull. Imp. Inst., 1912, 10, 25—27.

It is pointed out that in the analysis of rubber prepared by the Brazilian method (or by any method which leads to the inclusion in the rubber of all the solid constituents of the latex), the acetone extract may contain other substances besides resin. In a case cited previously (see this J., 1911, 374), the acetone extract of a sample of smoked Para rubber from Singapore contained a quantity of *l*-methylinositol equivalent to no less than 2·7 per cent. of the dry rubber.—A. S.

India rubber ; Colloidal nature of ——. F. Ahrens. Chem.-Zeit., 1912, **36**, 505—506.

The author refers to a previous communication (this J., 1910, 502), in which he concluded that the complete solution of rubber in benzol, and the hardening of vulcanised rubber were brought about by oxidation. Spence (this J., 1909, 374) brought forward the view that the thinning of rubber solutions and kindred phenomena might be due to an increase in the degree of dispersion of the colloidal particles through the action of light. The author experimented with emulsions of oil and water and found that the particles of oil, when brought into contact with oxygen, became covered with a surrounding skin, which protected them from further oxidation. The case of rubber may be considered analogous, the rubber itself constituting the "closed phase" in the latex emulsion, whereas the serum constitutes the "open phase." The minute particles of rubber combine with oxygen and surround themselves with a skin, which protects them from further oxidation, and accounts for the invariable presence of about 2 per cent. of oxygen in the rubber molecule. If the formation of this protective skin be prevented, as for instance by means of sulphuric acid, or if it be destroyed by excessive kneading between hot rollers, the resulting rubber becomes tacky owing to oxidation.—O. R.

Constituents of ozone. [*Ozonides of unsaturated organic compounds, including caoutchouc.*] Harries. *See* XX.

Patents.

India-rubber substitute ; Process for producing an ——. J. Stockhausen, Crefeld, Germany. Eng. Pat. 23,630, Oct. 25, 1911. Under Int. Conv., Dec. 22, 1910. Addition to Eng. Pat. 9264 of 1911, dated April 16, 1910.

The process described in the chief patent (see Fr. Pat. 428,468 ; this J., 1911, 1271) is modified by employing naphthalene or any suitable esters (such as esters of acetic, lactic or salicylic acid) as a substitute for the camphor therein mentioned. The following examples are given :—(1) 125 grms. of powdered gelatin or agar-agar are dissolved in 125 grms. of crude glycerin of 25° Bé., at about 70° C. To this mixture are added 15 grms. of tar and 25 grms. of naphthalene, and the product is finally hardened by the addition of 20 grms. of 4 per cent. formaldehyde. (2) Instead of naphthalene, 18 grms. of ethyl acetate along with the 15 grms. of tar, are added, and 15 grms. of 4 per cent. formaldehyde are used as before. After thorough mixing the product can be poured into moulds.—E. W. L.

Butadiene and its homologues; Preparation of ——. G. Austerweil. Ger. Pat. 245,180, Aug. 2, 1910.

A HALOGEN-SUBSTITUTED hydrocarbon containing the vinyl group ($CH_2:CH$), alone or mixed with another similar halogen-substituted hydrocarbon, is subjected to the action of magnesium. The butadiene or its derivatives obtained in this way can be converted into substances similar to caoutchouc by known methods.—A. S.

Compounds resembling rubber; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 10,914, May 5, 1911.

See Fr. Pat. 434,587 of 1911; this J., 1912, 349.—T.F.B.

Caoutchouc; Manufacture of synthetic ——. F. E. Matthews and E. H. Strange. Fr. Pat. 437,547, Oct. 24, 1911. Under Int. Conv., Oct. 25, 1910.

See Eng. Pat. 24,790 of 1910; this J., 1911, 1398.—T.F.B.

XV.—LEATHER; BONE; HORN; GLUE.

Tannin and the synthesis of similar substances. E. Fischer and K. Freudenberg. Ber., 1912, 45, 915—935.

CAREFULLY purified tannin (gallotannic acid) when hydrolysed with 5 per cent. sulphuric acid was found to yield over 90 per cent. of its weight of gallic acid and 7–8 per cent. of dextrose: the actual amount of dextrose produced was somewhat higher, for control experiments with mixtures of gallic acid and dextrose showed that losses of both compounds occur. The yield of dextrose is much too small for an ordinary glucoside of gallic or digallic acid, and the authors consider it probable that the sugar is in ester-like combination. A compound of 1 mol. of dextrose with 5 mols. of digallic acid, viz., pentadigalloyldextrose, $C_6H_7O_6[C_6H_2(OH)_3{\cdot}CO.O.C_6H_2(OH)_2.CO]_5$, would yield on hydrolysis 100 per cent. of its weight of gallic acid and 10·6 per cent. of dextrose. This constitution is in fair accord with published results on the optical activity, molecular weight, and weak acidity of tannin, and with the results obtained by the authors by the hydrolysis of tannin. Moreover, the authors have succeeded in synthesising from gallic acid and dextrose a compound, which while not identical with tannin possesses very similar properties. Dextrose was combined with tricarbomethoxygalloyl chloride (see this J., 1911, 1224) by shaking with a chloroform solution of the latter in presence of quinoline, and the penta-[tricarbomethoxygalloyl]-dextrose thus produced was hydrolysed by means of alkali. In this way an artificial tannin-substance, pentagalloyldextrose, $C_{41}H_{32}O_{26}$, was obtained. This is a pale yellow substance which softens above 150° C. and decomposes at 160° C. with slow evolution of gas. (Purified tannin shows a similar behaviour at a temperature about 70° C. higher.) It has a strongly astringent and bitter, but not sour taste. It is easily soluble in water, and its not too dilute solutions become turbid at 0° C. in a similar manner to those of purified tannin. It gives in aqueous solution a precipitate on addition of *N*/1 potassium hydroxide similar to that given by tannin. A 1 per cent. aqueous solution precipitates gelatin solution just about as strongly as tannin does at the same concentration. If a 20 per cent. alcoholic solution be treated with an equal volume of a 10 per cent. alcoholic solution of arsenic acid, the liquid sets to a stiff jelly in a few seconds: with tannin, according to Walden, the same phenomenon is observed in a solution of about half the concentration mentioned. Its solubility in organic solvents is similar to that of tannin, except that it is much more easily soluble than the latter in warm ether. It gives a colour reaction with ferric chloride and precipitates with pyridine, brucine, quinine acetate, and quinoline acetate. Its acidity appears to be somewhat greater than that of tannin. Analogous compounds have also been prepared with *p*-hydroxybenzoic acid in place of gallic acid and with α-methylglucoside and glycerol in place of dextrose. The work is being continued and the methods of synthesis described promise to be fruitful with respect to the constitution not only of gallotannic acid but also of other tannins. It is mentioned that the single crystalline tannin, chebulinic acid from myrobalans, also yields dextrose on hydrolysis with sulphuric acid.—A. S.

Quebracho wood; The percentage of moisture in ——. L. Allen. Collegium, 1912, 151—152.

SAMPLES were taken from six blocks of quebracho wood 70 cm. long, and the moisture determined with precautions to prevent loss between the sampling and determination. The following percentages were found: 17·9, 14·0, 18·0, 20·8, 14·6, 28·6. Samples taken from six logs of quebracho wood in the same factory gave percentages of water as follows: 19·2, 15·9, 14·7, 20·2, 11·5 15·8. The variation in moisture is thus extremely large, 11·5—28·6 per cent., and the wood is very hygroscopic.—D. J. L.

Vegetable tannins in leather and commercial extracts; Detection of ——. B. Kohnstein. Collegium, 1912, 153—158.

To 10 c.c. of a 4 per cent. tannin solution are added 5 c.c. of a 10 per cent. solution of "Alcutin" (Meyersberg, Vienna) or of a solution of "Peptonum siccum," Witte (a mixture of albumoses and peptones) saturated with certain salts (sodium chloride, ammonium sulphate, etc.), by which the tannin is precipitated. By observing the colour of the precipitate and of the filtrate after adding ammonia and boiling, the author proposes to differentiate between many tanning materials. The following are characteristic :—

Material.	Colour of precipitate.	Colour of filtrate on adding ammonia in the cold.	The same, boiled.
Quebracho	White	Reddish	Yellow
Mangrove	Rose red—flesh colour	Flesh colour to violet	Dark red
Sumac	White	Sulphur yellow	Orange
Knoppern	Grey white	Pale flesh colour	Yellow
Pine bark	Reddish white	Green	Yellow
Oak bark	Light yellow	Yellow	Light yellow
Oak wood	Brown yellow	Red brown	Lighter red brown
Chestnut wood	Brown yellow	Red brown	Lighter red brown
Myrobalans	Greenish white	Lemon yellow	Orange

The reaction of "Knoppern" extract is remarkable, the flesh-coloured filtrate obtained by adding ammonia in the cold becoming wine yellow on heating; this reaction differentiates the material from mangrove. The mixture of pine and mangrove tannins which has lately been used to imitate a hemlock sole-leather is also easily detected by this test. The dark red colour produced on adding alkali to the extract from the leather and due to the mangrove masks the green reaction. If "alcutin," however, is added to the extract and ammonia added to the filtrate, the colour produced by the pine reaction is very distinct and on heating, the green pine reaction vanishes and the characteristic rose-red colour of mangrove appears. The colour is probably due to a reaction similar to the biuret test as the filtrate contains albumoses which, with the inorganic substances present with the tanning materials (*e.g.* manganese and lithium salts) produce characteristic colours in alkaline solutions.—D. J. L.

Hides and skins; Restoration of dry —— *by the formic-mercury process.* A. Seymour-Jones. Leather World, 1912, 4, 344—345. (See also this J., 1912, 35.)

THE softening of dry hides by formic acid solution may be carried out in any kind of pit provided that the walls are made impervious to acid. This is said to be best done by coating with several coats of boiled oil or paint. The pit is filled with water and formic acid added to the extent of one-twentieth per cent. of 90 per cent. acid. The hides are left in 24 hours, drawn once, and again put back for 24 hours, when they should have become perfectly softened.

They are then salted by laying in a pit with salt or drumming with salt for 15 minutes. By immersion in the acid bath for 48 hours, about 25 per cent. of the acid is absorbed, which increases to 33 per cent. after 72 hours. The pit is made up to its original strength by adding more acid and when the liquor becomes too dirty it may be filtered by pumping through a cotton cloth sieve. If the water used is hard, the hardness is corrected by adding some cheap commercial acid or the water is softened. The cost of treatment of 100 heavy hides is as follows :—

	s.	d.
40 lb. of formic acid at 3d. per lb.	10	0
Less 75 per cent. of acid retained in pit	7	6
	2	6
Plus 100 lb. of salt	1	0
Total cost of restoring 100 heavy hides	3	6

—D. J. L.

Use of tannin materials and their analysis from the dyer's standpoint. Knowles. *See* VI.

Patents.

Leather ; Treatment of —— with lubricants for mechanical purposes. J. Williamson, Glasgow. Eng. Pat. 9320, Apr. 15, 1911.

Chrome-tanned hides when only partially dried—*i.e.*, containing about 25 per cent. of moisture—are placed in drums and heated to about 140° F. until they become soft and pliable. A mixture of graphite or talc, in the form of impalpable powder, and paraffin wax of m. p. about 125° F., in a molten condition, is run into the drum, which is then closed and rotated until the hides are thoroughly saturated. The quantities required are about 15 per cent. of graphite or talc and about 50 per cent. of wax calculated on the dry weight of hides to be treated. Leather prepared in this manner is said to be particularly suitable for hydraulic rings, valves, pump butts, etc.—E. W. L.

Glues, etc. ; Process for the manufacture of ——. J. M. Neil, Assignor to A. M. Hay, Toronto, Canada. U.S. Pat. 1,023,523, Apr. 16, 1912.

The process consists in preparing a glue liquor, precipitating from it first the chondrin by means of acid and then, after separating the chondrin, the glutin by means of alcohol. The chondrin and the glutin are then mixed, in the dry state, in such proportions as will produce a glue of the desired strength.—E. W. L.

Leather board ; Manufacture of waterproof ——. W. P. Thompson, Liverpool. From Hide-Ite Leather Co., Boston, U.S.A. Eng. Pat. 2498, Jan. 31, 1912.

See U.S. Pat. 1,021,660 of 1912 ; this J., 1912, 447.—T.F.B.

Chrome-leather ; Process for the preparation of ——. A. Wolff, Cologne, Germany. U.S. Pat. 1,023,451, April 16, 1912.

See Eng. Pat. 27,900 of 1911 ; this J., 1912, 292.—T. F. B.

XVI.—SOILS ; FERTILISERS.

Clay substances of the soil ; Flocculating power of some soluble salts on the ——. G. Masoni. Staz. sperim. agrar. ital., 1912, **45**, 113—159. Chem. Zentr., 1912, **1**, 1496.

From the results of a large number of experiments the author concludes that chlorides have a greater flocculating power than nitrates and sulphates. Calcium salts are more active than potassium and ammonium salts, and the latter are more active than sodium salts. There appears to be no simple relation between the quantity of a salt and its flocculating power, but the flocculating power (P_f) of the solution of a salt depends upon the ionic concentration (C_I) and the degree of dissociation (α). So long as C_I and α are equal, the value of P_f remains the same ; if C_I increases whilst α remains constant, the value of P_f rises in proportion ; if α increases whilst C_I remains constant, the value of P_f falls. The flocculating power is a function of the cation, the anion being without influence. The flocculating power depends upon the valency of the cation, but not upon its atomic weight. If the value of P_f for the sodium ion be taken as 1, then for the potassium or ammonium ion it is 2·4, and for the calcium ion, 5·7. The flocculating power of a salt on the clay substance of a soil is directly connected with the absorptive power of the soil for the salt, and may be regarded as due to an interchange of radicals between the salt and the soil.—A. S.

Phonolith ; Manurial value of the potassium silicate in ——. A. Felber. Z. angew. Chem., 1912, **25**. 765—766.

Commenting on Geldmacher's paper (this J., 1912, 243), the author denies that the potash in phonolith has any manurial value, because of its insolubility. Most soils already contain many times the amount of potassium compounds which would be added by any practicable dressing of phonolith, and in an equally available (or unavailable) condition. Potassium silicate may have a manurial value, on account possibly of the silica as well as the potash to be derived from it ; but potassium silicate as such is not contained in phonolith, which contains only complex silicates not decomposable by the weak acids which would attack potassium silicate. The application of the name " potassium silicate " to phonolith meal is not justifiable. There is no analogy between the case of phonolith and that of basic slag : the whole of the phosphoric acid in basic slag is soluble in acids, most of it in quite weak acids ; whilst at the best not more than 3 per cent. of potash can be dissolved out of phonolith by strong hydrochloric acid.—J. T. D.

Bone meal ; Method for distinguishing sterilised from unsterilised ——. E. Polenske. Arbb. Kais. Gesundheits-Amt, 1912, **38**, 559—561. Chem. Zentr., 1912, **1**, 1511—1512.

The presence of virulent anthrax organisms having been detected in some samples of unsterilised bone meal imported from India, the following test, depending upon the presence of uncoagulated albumin in the unsterilised bone meal, was devised for distinguishing the latter from sterilised bone meal. Ten grms. of the sample are mixed with 30 c.c. of cold water, shaken frequently during 24 hours, and then filtered. Ten c.c. of the clear filtrate, which should be neutral, are treated with 2 drops of acetic acid and heated for about ½ hour at 95° C. With unsterilised bone meal a characteristic flocculent precipitate is produced, whilst with the sterilised meal, at the most, a slight turbidity due to a fine granular precipitate is obtained. The flocculent precipitate is identified as albumin by Millon's reaction and the biuret test.—A. S.

Nutritive constituents of seeds ; Displacement of —— by water. G. André. Comptes rend., 1912, **154**, 1103—1105.

Seeds of wheat and of haricot beans were soaked for a period of 281 days in water rendered sterile by formaldehyde, and the amount of nitrogen, phosphoric acid and potash which diffused out was estimated. In wheat seeds this amounted to 3·56 per cent. of the total nitrogen, 79·57 per cent. of the total phosphoric acid and 99·22 per cent. of the total potassium oxide. After 27 days soaking roughly two-thirds of the potash, one-half of the phosphoric acid and two-thirds of the nitrogen had diffused out. With haricot beans 9·77 per cent. of the nitrogen, 83·4 per cent. of the phosphoric acid and 90·97 per cent. of the potassium oxide was eliminated in 281 days. After 27 days about two-thirds of the total potash and nitrogen and five-eighths of the phosphoric acid had passed out. Deductions are drawn as to the state of these constituents in the seeds : the behaviour of seeds closely resembles that of potato tubers.—E. F. A.

XVII.—SUGARS; STARCHES; GUMS.

Proskowetz soil filtration process. Changes in the non-sugars in the ——, [as applied to beet sugar factory waste waters]. V. Staněk. Z. Zuckerind. Böhm., 1912, **36**, 441—444.

A Bohemian beet factory, which in addition to manufacturing sugar in the ordinary way, also treats molasses by the Steffen desaccharification method, tried to purify its waste waters by the Proskowetz soil filtration process, but the experiment failed, the drainage waters having a very bad smell. On examining the waste waters, (*a*) before, and (*b*) after soil filtration, the following figures, expressing mgrms. per litre, were obtained: total solid matter, (*a*) 5270·5, (*b*) 3514·0; total mineral matter, (*a*) 1386·0, (*b*) 1515·0; total organic matter, (*a*) 3884·5, (*b*) 1999·0; reaction, (*a*) alkaline, =7·6 c.c. of *N*/1 acid, (*b*) acid, =5·5 c.c. of *N*/1 alkali; total nitrogen, (*a*) 166·6, (*b*) 89·3; nitrogen in ammonium compounds, (*a*) 9·8, (*b*) 12·8; nitrogen in amino-compounds, (*a*) traces, (*b*) 10·4; nitrogen in betaine (*a*) 73·1, (*b*) 32·8; betaine, (*a*) 705·5, (*b*) 316·2; volatile acids, as acetic acid, (*a*) 184·0, (*b*) 945·0; calcium oxide, (*a*) 310·0, (*b*) 624·0; magnesium oxide, (*a*) 28·8, (*b*) 58·6; potassium oxide, (*a*) 447·4, (*b*) 185·7; sodium oxide, (*a*) 108·8, (*b*) 65·8. It is thus seen that while the total solid matter, the organic matter, the total nitrogen, the betaine, and the alkalis had decreased, the total ash had appreciably increased, especially the calcium and magnesium salts, this being apparently due to the action of the organic acids on the soil. Likewise the volatile acids, originating from the decomposition of the carbohydrates, the amino-acids, and the betaine, had increased. As the water came from the filter beds it had a distinct odour of methylamine, the presence of which was chiefly due to the decomposition of betaine.—J. P. O.

Sucrose; The hydrolysis of —— by various acids in the presence of the sucrase of Aspergillus niger. G. Bertrand and Rosenblatt. Bull. Soc. Chim., 1912, **11**, 464-468.

A quantity of sucrase was prepared from *Aspergillus niger* and various acids were allowed to exert a hydrolysing action upon sucrose in the presence of this enzyme. The experiments were carried out in the same way as those tried with the invertase of yeast (see this J., 1912, 294). The general conclusions obtained from the experiments with invertase were confirmed when the sucrase of *Aspergillus niger* was used.—F. Shdn.

Patents.

Sugar; Apparatus for drying ——. W. H. Hannam and W. E. Murray, Assignors to Western Sugar Refining Co., San Francisco, Cal. U.S. Pat. 1,024,073. April 23, 1912.

The apparatus includes a series of endless travelling open-mesh conveyors, mechanism for imparting motion to the conveyors, and a feeder for delivering the material to be treated on to the receiving end of the first conveyor. A hopper, interposed between the discharge- and receiving-ends of adjacent conveyors, contains an inclined grizzly for transferring the material from one conveyor to the next. Each conveyor works over a receptacle provided with a cover which serves as a housing for the upper run of the conveyor. Means are provided for supplying hot air, under pressure, to each receptacle, the hot air escaping through an outlet in the cover.—L. E.

Starch conversion process. S. M. Lillie, Philadelphia, Pa. U.S. Pat. 1,023,257, April 16, 1912.

In the intermittent or batch process of converting starch, a suitable mixture of starch, water and acid is heated to the converting temperature under conditions to produce a liquor of only partial but practically uniform conversion; the heated liquor is delivered into a vessel, with as little admixture as possible of the consecutive portions of the liquor as they pass into the vessel; the flow into the vessel is stopped before the liquor which first entered the vessel shows the degree of conversion desired for the product; the charge is then allowed to remain until the first portion of liquid attains the desired degree of conversion, and finally the portions of liquor are withdrawn in the same order and at the same rate as they were introduced. The process of utilising the vapours produced in one conversion for heating the liquor for the next in consecutive or batch conversions is claimed, also the process of preparatory heating of the liquor by vapours of progressively increasing temperatures. Finally, the converted liquors are reduced to comparatively low temperatures by introducing them into vacuum chambers in which they are caused to produce vapours in the process of cooling.—J. F. B.

Starch from potatoes and the like; Process for obtaining ——. H. Tryller. Ger. Pat. 242,168, Sept. 21, 1910.

The potatoes or the like are grated, mixed with water, ground in a ball mill, and then projected against a sieve or screen, the pulp which does not pass through the screen being returned to the ball mill and the operations repeated. In the apparatus described, the ball mill consists of a drum constructed in segments which overlap so as to form a number of scoops. The drum rotates in a trough containing the grated potatoes and water, and by the action of the scoops, the pulp is partly forced through openings into the interior of the drum where it is ground by the balls, and partly projected against a screen, through which the starch milk flows.—A. S.

Obtaining tasteless and odourless vegetable albumin. Ger. Pat. 244,100. *See* XIXa.

XVIII.—FERMENTATION INDUSTRIES.

Yeast; Proteolysis of ——. A. J. J. Vandevelde. Bull. Soc. Chim. Belg., 1912, **26**, 107—112.

On digesting a mixture of 25 grms. of fresh yeast and 125 c.c. of physiological salt solution at a temperature of 37° C., the content of coagulable nitrogen was found to decrease from 0·342 to 0·297 grm. in 16 hours and to 0·174 grm. in 75 days (a solution of chloroform in acetone being added as antiseptic in the latter case); the products of proteolysis consisted almost entirely of peptones and amino-acids. In experiments made under the same conditions save that part of the physiological salt solution was replaced by an equal volume (5 or 25 c.c.) of *N*/1 hydrochloric acid, proteolysis was characterised by the formation of albumoses and their transformation into peptones; the proteolysis was not appreciably affected by the addition of pepsin to the mixture. On substituting sodium carbonate (5 c.c. of *N*/1 solution) for hydrochloric acid, the proteolysis was much greater in 75 days than when the yeast was treated with the physiological salt solution only, whilst in presence of sodium carbonate and trypsin, nearly the whole of the coagulable nitrogen was converted into peptones and amino-acids. During the proteolysis in presence of the antiseptic, the reproductive power of the yeast rapidly disappears, and the fermentative power becomes almost inappreciable.—L. E.

Tryptophol, a new fermentation-product formed by yeast from an amino-acid. F. Ehrlich. Ber., 1912, **45**, 883—889.

In accordance with the general reaction by which fermenting yeast transforms amino-acids into alcohols containing one carbon atom less in the molecule (see this J., 1905, 683; 1907, 28, 480; 1911, 231), tryptophane is converted into tryptophol or β-indolyl-ethyl alcohol. The preparation of the new alcohol from tryptophane by the action of yeast is described; the yield obtained is sometimes 80 per cent. of that calculated. Tryptophol crystallises in monoclinic plates melting sharply at 59° C. It is fairly soluble in hot water, readily soluble in most organic solvents but only sparingly in ligroin and petroleum ether. If an aqueous solution of tryptophol is treated with a few crystals of dimethylaminobenzaldehyde and just sufficient alcohol to dissolve the latter, and then a few drops of 25 per cent. hydrochloric acid are added, an intense violet-red colouration, perceptible at a dilution of 1 in 10,000, is formed slowly in the cold but rapidly on warming. This reaction, which distinguishes tryptophol from indole and skatole, appears suitable for the detection of the alcohol in fermented liquids.—J. H. L.

Yeasts, and mould fungi ; Transformation of amines into alcohols by ——. F. Ehrlich and P. Pistschimuka. Ber., 1912, **45**, 1006—1012.

YEASTS and moulds of different kinds are capable of transforming amines into the corresponding alcohols in presence of sugar, $R\cdot CH_2\cdot NH_2+H_2O=R\cdot CH_2\cdot OH+NH_3$. The ammonia formed is utilised by the organism in the synthesis of proteins, whilst the alcohol remains in the fermented liquid. In this way the authors obtained tyrosol from *p*-hydroxyphenylethylamine, and *iso*-amyl alcohol from *iso*-amylamine. Ordinary brewery and distillery yeasts possess this capacity to only a slight extent, for they do not grow well in presence of amines. On the other hand, wild yeasts, mycoderma-yeasts and similar film-forming races, such as *Willia anomala*, develop readily in sugar solutions containing amines and produce considerable quantities of the corresponding alcohols. The same is true of moulds such as *Oidium lactis* which are capable of transforming amino-acids into alcohols (see this J., 1911, 566). Those yeasts which decompose amines readily in presence of sugar do so also when the sugar is replaced either by glycerin or ethyl alcohol. In many putrefactive processes conversion of amino-acids to amines occurs, and such a transformation may perhaps be the first step in the formation of fusel oil in alcoholic fermentation, the amine then undergoing a further transformation into alcohol as described above (compare this J., 1907, 28, 480; 1911, 231).—J. H. L.

Enzymes ; Weakening of ——. L. Lichtwitz. Z. physiol. Chem., 1912, **78**, 128—149.

THE author has carried out a number of experiments from which the following conclusions are drawn :—The inverting activity of living yeast is less after cultivation in solutions containing invert sugar than after cultivation in sucrose solutions. The weakening of inverting power depends on the concentration of the invert sugar and it persists after the latter substance has been removed either by fermentation or by washing the yeast. When solutions containing both sucrose and invert sugar are brought to a state of vigorous fermentation by addition of actively fermenting yeast, the course of fermentation may be divided into two phases, during the first of which the invert sugar is fermented, and during the second the sucrose. If the production of carbon dioxide after various intervals is plotted on a time base, the curve exhibits a more or less sharp bend at or near the point corresponding to an amount of carbon dioxide equivalent to the invert sugar originally present. At this point the solution contains very little reducing sugar. The following phase of the fermentation, in which the sucrose is inverted and fermented, proceeds less rapidly than it would have done if the yeast had not already been affected by the invert sugar. It appears that the activity of invertase is diminished in presence of invert sugar, and after removal of the latter the invertase does not regain its full activity, at least for a time. It is possible that in general the products of enzymic action may exert a weakening influence on the enzymes which produce them.—J. H. L.

Sulphates ; Determination of —— *in solutions* [*wine*] *by the physico-chemical volumetric method.* A. Bruno and P. T. d'Auzay. Comptes rend., 1912, **154**, 984—986.

THE volumetric method of Dutoit and Duboux (this J., 1908, 871 and 912) depends on an end point which is fixed by a minimum electrical conductivity when baryta is gradually added to the solution. It is found that the results obtained in analysing wines differ considerably from those obtained gravimetrically, and the authors have therefore studied the effect of foreign materials on the end point. With pure potassium sulphate there is no minimum, but the end point is indicated by a change in the slope of the curve. With potassium hydrogen sulphate, the minimum corresponds to only half the total precipitation. With sulphuric acid alone or in presence of potassium hydrogen tartrate the minimum corresponds exactly with the true end point. With sulphuric acid in presence of tartaric or malic acid the minimum always occurs some way beyond complete precipitation. Finally with a solution of potassium sulphate or potassium hydrogen sulphate, in the presence of potassium hydrogen tartrate, tartaric acid or citric acid, the minimum will only by chance coincide with the true end point. These conclusions apply also to solutions containing a little alcohol, so that the method as applied to wines is rather uncertain.—W. H. P.

Methyl alcohol ; Simple method of detecting —— *in ethyl alcohol.* W. Sailer. Pharm. Zeit., 1912, **57**, 93.

HALF a grm. of sodium salicylate and 1 grm. of the alcohol are treated in a 100 c.c. Erlenmeyer flask with exactly 20 drops of strong sulphuric acid, added 5 drops at a time. An interval of a minute is allowed between each addition of acid, to avoid too rapid a rise of temperature. In 15 seconds after adding the last 5 drops of acid, a distinct odour of methyl salicylate will be perceptible in the presence of methyl alcohol. On then adding a mixture of 0·4 grm. of quicklime in 2 c.c. of caustic soda solution, an odour resembling that of methylphenylether will be apparent in one minute. The test should be applied side by side with a blank experiment, using pure ethyl alcohol. —J. O. B.

Hydrolysis of sucrose by acids in the presence of the sucrase of Aspergillus niger. Bertrand and Rosenblatt. *See* XVII.

New synthesis of hordenine. Voswinckel. *See* XX.

Fusel oil waste in Cuba. Oil, Paint and Drug Reporter, April 29, 1912. [T.R.]

IN response to inquiries that have been made regarding the production of fusel oil in Cuba a report has reached the Bureau of Manufactures from the Consul at Havana, which says that no attempt is made to save this by-product by the distilleries of Cuba, which run on the large supply of molasses coming from the sugar mills. One company is very anxious to secure technical advice and assistance with which to develop this feature of their industry. The price of molasses in Cuba averages at about 3½ cents per gallon. All the available supply finds a ready market. In 1910 the exportation of molasses from Cuba was in value $1,477,756, of which over 60 per cent. went to the United States and very nearly all the remainder to England. The distillation of alcohol of all grades in Cuba is about 1,000,000 gallons annually.

The foregoing report induced the officials of the Bureau of Manufactures to make a compilation of statistics regarding fusel oil, as follows :—

The chief use of fusel oil is in connection with the manufacture of explosives, and in making artificial fruit essences. The total output of this oil in the United States was 110,792 gallons during 1910. This figure was exceeded only in 1907, when 124,709 gallons were produced. As the production of spirits distilled from other materials than fruit increased from 163,893,960 gallons in the fiscal year ended June 30, 1910, to 175,402,396 gallons in the fiscal year 1911, it is probable that the 1911 output of fusel oil also showed a gain. The imports of fusel oil into the United States amounted to 4,953,952 lb., valued at $598,199, during the fiscal year 1910, and 5,231,252 lb., valued at $842,916, in 1911. European Russia ranked first as a source of supply, with Germany second, these countries supplying, respectively, 1,342,282 and 1,573,902 lb. in 1911. It is estimated that the maximum amount of fusel oil obtained on the distillation of proof spirits is about two-tenths of 1 per cent. During the fiscal year 1911 the production of spirits from molasses amounted to 21,634,257 gallons, produced from 41,014,190 gallons of molasses. There were 17 molasses distilleries in operation.

Patents.

Malt beverages; Manufacture [acidification] of fermented ——. R. Wahl, Chicago, Ill. U.S. Pat. 1,023,448, Apr. 16, 1912.

In the process of preparing fermented beverages by making a malt-mash, drawing off the wort, boiling with hops, cooling and fermenting, the step is claimed which consists in adding to the mash an extract of malt containing "lactic acid propagated therein." This auxiliary mash is prepared by mashing the materials at temperatures below 55° C., inoculating the mash with a portion of the above acidulated liquor and digesting at 45—55° C., until the desired degree of acidity is attained.—J. F. B.

Yeast; Process for kiln-drying —— in order to produce a characteristic flavour. Versuchs- und Lehranstalt für Brauerei. Ger. Pat. 244,285, Oct. 5, 1910.

In order to induce the production of a characteristic flavour, the drying of the yeast is carried out in a manner similar to that adopted in the kiln-drying of malt. For obtaining a strong flavour, the yeast is kept for some time at 100° C. and a water-content of 30 per cent., and then the drying is completed at 100° C. A stronger flavour still is obtained by keeping the yeast for some time at 60° C. and a water-content of 30 per cent., and then finishing the drying at 100° C. A very weak aroma is obtained if the kiln-drying is effected when the water-content of the yeast is 8 per cent.—A. S.

Fermenting processes. A. Lebbe, Ypres, Belgium. Eng. Pat. 12,723, May 26, 1911.

See Fr. Pat. 430,110 of 1911; this J., 1911, 1329.—T. F. B.

Starch conversion process. U.S. Pat. 1,023,257. *See* XVII.

Obtaining tasteless and odourless vegetable albumin. Ger. Pat. 244,100. *See* XIXa.

Yeast; Purification of ——. Erdmann and Schmuck. Eng. Pat. 11,424. *See* XIXa.

XIXa.—FOODS.

Milk; Behaviour of —— towards ammonium sulphate, and a new method for the determination of milk-sugar. E. Salkowski. Z. physiol. Chem., 1912, 78, 89—95.

According to Bang, if cows' milk is mixed with an equal volume of a saturated solution of ammonium sulphate, the casein is completely precipitated; the liquid obtained on filtering contains only very small, but somewhat variable, amounts of proteins. By saturating the milk completely with the salt, the whole of the protein is precipitated, and on this fact the author has based the following method for the polarimetric determination of milk-sugar:—Fifty c.c. of milk are shaken with 17·5 grms. of ammonium sulphate in a stoppered measuring cylinder. When all the salt has dissolved, the liquid is made up to 100 c.c. with saturated ammonium sulphate solution, mixed well, and filtered through a dry filter paper of about 16 cm. diam. The filtrate is read in a polarimeter and the reading multiplied by 2. As the specific rotatory powers of dextrose and hydrated lactose ($C_{12}H_{22}O_{11}+H_2O$) are practically the same—52·6° and 52·53°—a polarimeter graduated for dextrose solutions can be used without correction; but if anhydrous lactose is required, the readings must be multiplied by 0·94717.—J. H. L.

Linseed; Rate of evolution of hydrocyanic acid from —— under digestive conditions. S. H. Collins. Proc. Durham. Phil. Soc., 1912, 4, 99—106.

The amount of hydrocyanic acid yielded by linseed and the rate at which it is formed, depend upon the amount of cyanogenetic glucoside, on the amount of enzyme, on the temperature, and on the degree of acidity. To obtain, as far as possible, the natural conditions under which linseed would be digested, experiments were carried out in a cylinder placed in a sloping position in a water-bath and so fitted that a measured stream of hydrogen could be passed through it to sweep out the hydrocyanic acid as it was produced. The acid was finally absorbed by passing the gas through $N/30$ sodium hydroxide, its amount being subsequently estimated colourimetrically. A sample of Calcutta linseed, digested with water, yielded in this way 0·38 mgrm. of hydrocyanic acid per grm. of linseed, but when the water was replaced by acid of $N/20$ strength, to represent digestive conditions, no hydrocyanic acid was evolved and similar negative results followed the use of pepsin and rennet in acid solutions. Acids of $N/100$ strength destroy the activity of the enzyme and even $N/1000$ hydrochloric acid produces a slackening in the rate of evolution. In presence of lactic and butyric acids of $N/100$ strength, only small fractions of the hydrocyanic acid are evolved and the evolution is also greatly hindered by cellulose, hay or straw and to a less extent by sugar, treacle, chloroform and benzaldehyde. A mixture of linseed and Rangoon beans yields slightly more hydrocyanic acid than the same substances separately. Old samples of linseed contain acid and, in consequence, yield less hydrocyanic acid than they otherwise would. Since the acidity of the stomach contents and also that of fresh green grass is approximately $N/20$, linseed cannot, under normal circumstances, produce hydrocyanic acid when fed to carnivorous or herbivorous animals, but it is possible that abnormal conditions might reduce this acidity, and in consequence the production of hydrocyanic acid would set in.—J. A.

Displacement of nutritive constituents of seeds by water. André. *See* XVI.

Patents.

Yeast; Purification of ——. G. Erdmann, Berlin, and T. Schmuck, Schöneberg, Germany. Eng. Pat. 11,424, May 11, 1911.

The object of this process is to render beer yeast suitable for use in bakeries by freeing it from the bitter constituents of hops. The yeast is first aerated and then treated with warm water, preferably at a temperature not exceeding 30° C., aeration being continued during this treatment. The yeast, thus freed from bitter substances, is treated with a dilute solution of an organic acid, *e.g.*, tartaric acid, and is subjected, preferably whilst suspended in the acid solution, to an electric current of sufficient strength to destroy bacteria. Finally, the yeast is separated from the liquid, and an ester, *e.g.*, ethyl acetate, is added to it. —L. E.

Food; Method and apparatus for making infants' —— from cows' milk. J. P. Cramer, Bussum, Holland. Eng. Pat. 18,287, Aug. 12, 1911.

One litre of raw cows' milk is mixed with 3 litres of cold water in a cylindrical, 4-litre vessel, the height of which is twice its diameter. The whole is allowed to stand for 2 hours, the lower, nearly fat-free layer then being drawn off through a tap situated at about one-sixth of the height of the vessel from the bottom. To insure efficient separation, a hollow case with an opening at the bottom and curved on the side next the inner wall of the vessel, is provided; this case slides between guide strips, and when it is placed in its lowest position (*i.e.*, resting on the bottom of the vessel) the liquid ascends through it to an orifice which coincides with the tap-orifice. The residual upper layer, or cream (¾ litre), which contains the same proportions of fat and casein as human milk, but is deficient in lactose, albumin and salts, is treated with the requisite proportions of the latter substances.—L. E.

Pasteurising apparatus [for milk]. R. M. Cauffman, Centerville, Mich., U.S.A. Eng. Pat. 21,242, Sept. 26, 1911. Under Int. Conv., Oct. 19, 1910.

The apparatus includes an inner and an outer casing, and an intermediate perforated pipe connected by a branch pipe with an external steam supply. Steam passes from the space between the casings through an externally controlled valve, opening to perforated ducts arranged within and along the end and side walls of the inner casing. These ducts communicate with inlets for admission of air (to regulate the temperature) or water (for cooling when pasteurisation has been effected). Each inlet is fitted with a closure comprising a disc, a combined pivot and clamping screw extending through the disc and near its edge, a coupling member with a bore extending through the disc, and a screw-cap which is removed when it is desired to attach a hose to the coupling member. Overflow pipes are provided for controlling the height to which the water can rise within the inner casing.—L. E.

Concentration of solids in liquids [*milk*]. W. R. Whitney, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,022,523, April 9, 1912.

A container is divided into a number of chambers by diaphragms which are permeable to the liquid to be treated but not to the solids in the liquid. A flow of substantially pure water is maintained through the end chambers which are provided with electrodes, and the liquid to be treated, *e.g.*, milk, is passed through the other chambers, means being provided for cooling the liquid in the chambers. An electromotive force is impressed upon the liquid, whereby the solids are deposited on the diaphragms, and the same method is used for bringing a disinfectant into contact with the deposit and for removing it subsequently. The disinfectant is used to destroy bacteria present in the milk.—L. E.

Butter substitute and process of making the same. F. Kronenberger, Corona, N.Y., Assignor to The Alladin Manufacturing Co., Brooklyn, N.Y. U.S. Pat. 1,024,009, April 23, 1912.

Gelatin is dissolved in heated milk, a suitable fat (butter) is added to the hot mixture, and the whole is quickly cooled, with stirring.—L. E.

Albumin; Process for obtaining stable, decolourised, odourless and tasteless vegetable ——. Königswarter und Ebell. Ger. Pat. 244,100, Sept. 20, 1910.

The material containing albumin is neutralised and treated in the cold with neutral hydrogen peroxide, the mixture being kept in a neutral condition during the progress of the reaction by addition of a suitable reagent. It is stated that by this method a tasteless and odourless albumin suitable as a foodstuff and for technical purposes can be obtained from waste products from breweries, distilleries, sugar and starch factories, etc.—A. S.

Carbon dioxide; Process for impregnating liquids with —— *and apparatus therefor.* A. A. Pindstofte, Copenhagen. Eng. Pat. 22,826, Oct. 16, 1911.

The apparatus includes a tall chamber fitted with horizontal perforated partitions; near the bottom is a valved inlet-pipe for carbon dioxide, and extending from the top nearly to the bottom is a pipe for liquid which is supplied from one of a number of reservoirs situated above the chamber. The carbon dioxide and liquid ascend through the chamber and become thoroughly mixed, the impregnated liquid being bottled from a pipe near the top of the chamber. Such a quantity of carbon dioxide is introduced into the chamber, that the excess of it (together with the air expelled from the liquid) which is conveyed from the top of the chamber by a valved pipe to the top of the liquid reservoir, suffices to fill the space in the reservoir vacated by the liquid.—L. E.

Process for kiln-drying yeast in order to produce a characteristic flavour. Ger. Pat. 244,285. *See* XVIII.

XIXb.—WATER PURIFICATION; SANITATION.

Water supplies; Softening, purification and sterilisation of ——. A. C. Houston. Metropolitan Water Board. Eighth Research Report, 1912.

This report describes a new method of sterilising water by the addition of excess of lime, and in the case of a hard water of softening it at the same time. The bulk of the experiments were made with raw Thames water with the object of sterilising it and only incidentally of softening it. Commercial quicklime containing about 75 per cent. of calcium oxide was used, and the death of *B. coli* in 10 c.c. of the water was taken as indicating the destruction of disease germs. It was found that 1 part of quicklime to 5000 parts of water had little effect on the *B. coli* present in 1 hour, but after 5 hours nearly all the bacilli were killed, and in 24 hours they were completely killed in 42 out of 43 experiments. The excess of lime present over that required to combine with the free and semi-combined carbonic acid in the water varied from 0·005 to 0·01 per cent., average 0·007, and it is this quantity which produces the germicidal effect. With water to which was added 1 per cent. of sewage, a dose of lime of 1 in 5000 killed practically all the *B. coli* in 24 hours, but a weaker dose of 1 in 7500 was insufficient. It was found that the excess of lime present could be removed by adding to the treated water one-third or more of its volume of untreated water, the free and semi-combined carbonic acid in which neutralises the excess of lime. The effect on the hardness of the water was that using lime to the amount of 1 in 10,000, the total hardness was reduced from 22·36 to 11·03, and using 1·5 in 10,000 the reduction was from 23·82 to 8·42. In using the method on the London water supply, the untreated portion used for removing the excess of lime would be that which had by adequate storage been rendered bacteriologically safe, so that the result would be that the whole water would be bacteriologically safe, and at the same time it would have lost about 15 parts of its hardness. It would only remain to submit the water to rapid filtration to bring about chemical purification and to remove the precipitated calcium carbonate. When the method is applied to well water, the portion of the water used to effect neutralisation of the excess of lime would have to be sterilised previously by chlorine, ozone, or other suitable means. With soft waters, the whole bulk of the water would be treated with excess of lime, in this case about 1 in 50,000 was found to be sufficient, and the excess removed by suitable means, *e.g.*, carbon dioxide or aluminium sulphate.—J. H. J.

Galvanised iron pipes and zinc pipes; Use of —— *as substitutes for lead pipes in house water systems.* O. Kröhnke. J. Gasbeleucht., 1912, **55**, 421—429.

This paper gives the conclusions of previous work upon the solvent action of water upon galvanised iron pipes. Several microphotographs are given showing the irregular and blotchy character of the zinc coating produced by different methods as compared with the even character of the surface of a block zinc pipe. Experiments were made upon the amount of metal taken up by tap water from a block zinc pipe and the highest amount found after 18 hours standing was 3·5 mgrms. per litre. In simultaneous experiments with galvanised piping, it was found that after a few hours only traces in general were taken up from each kind of pipe, but after several days or weeks about twice as much zinc was taken up from the galvanised pipe as from the block pipe. It is concluded that galvanised pipe is a better pipe than lead pipe from a hygienic point of view, as the amount of zinc dissolved is below the limit of injuriousness. The amounts dissolved depend upon the nature of the water, temperature, and time of contact and upon the nature of the coating. Block zinc pipes are superior to galvanised pipes in that the surface is uniform in structure, and there is no question of the strength or adherence of the surface coating.—J. H. J.

Changes in the non-sugars in the Proskowetz soil filtration process [*as applied to beet sugar factory waste waters*]. Staněk. *See* XVII.

Patents.

Liquids, especially water; Process for the chemical treatment of ——. L. Linden, Brussels. Eng. Pat. 20,556, April 13, 1911.

Slaked lime is reduced to a fine powder, and slightly "carbonised" (carbonated) on the surface for the purpose of starting the precipitation in the settling tank. The iquid passes over this slaked lime, and has introduced into t a soluble permanganate and a ferric salt, and subsequently a hypochlorite.—G. W. McD.

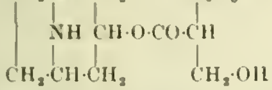
Water and other liquids ; Apparatus for the mechanical treatment of impure ——. L. Linden, Brussels. U.S. Pat. 1,024,451, April 23, 1912.

See Fr. Pat. 428,903 of 1911 ; this J., 1911, 1277.—T. F. B.

XX.—ORGANIC PRODUCTS ; MEDICINAL SUBSTANCES ; ESSENTIAL OILS.

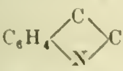
Nor-hyoscyamine and nor-atropine ; alkaloids occurring in various solanaceous plants. F. H. Carr and W. C. Reynolds. Chem. Soc. Proc., 1912, **28**, 124—125.

Nor-hyoscyamine—the secondary base corresponding with hyoscyamine—occurs in a number of different species of plants of the natural order Solanaceæ, namely, in *Scopolia japonica, Datura metel, Datura metcloides, Duboisia myoporoides*, and *Mondragora vernalis*, all of which also contain hyoscyamine. Its constitution is expressed as :—



which is supported by the evidence : (1) that the alkaloid contains no NCH_3 group ; (2) that it forms a nitrosoamine, and therefore contains an :NH group ; (3) that methyl iodide reacts with it, forming hyoscyamine ; and (4) that it yields by hydrolysis, tropic acid and nor-tropanol—a previously known base. Nor-hyoscyamine is lævorotatory, and is racemised by the action of dilute alkali. The racemic base, nor-atropine, gives atropine on methylation with methyl iodide. It therefore bears the same relation to atropine that nor-hyoscyamine does to hyoscyamine. Evidence was given to prove that the supposed isomeride of hyoscyamine, called ψ-hyoscyamine, described by Merck, is in reality nor-hyoscyamine. The best method of distinguishing nor-hyoscyamine and nor-atropine from each other and from the other mydriatic alkaloids, is by the melting points and crystalline form of various salts, particularly the oxalates, aurichlorides, and picrates. Nor hyoscyamine and nor-atropine produce contraction of the pupil of the eye, but the activity is about one-eighth that of the corresponding N-methyl derivative.

Physostigmine ; Researches on the constitution of ——. Part I. A. H. Salway. Chem. Soc. Proc., 1912, **28**, 125.

Physostigmine, when distilled with zinc dust yields a mixture of 1- and 2-methylindoles. The author concludes that physostigmine contains a benzene nucleus attached to nitrogen, whilst it is not improbable that the atomic grouping, , is also present in the alkaloid.

The hydrolytic product of physostigmine, namely, eseroline, $C_{13}H_{18}ON_2$, first prepared by Ehrenberg in 1893, has been found to be a monacidic tertiary base, containing one methyl group attached to nitrogen. Its *hydrochloride*, *picrate*, and *methiodide* were described. The oxidation products of physostigmine and eseroline have also been investigated. The so-called " eserine blue " has now been isolated in a pure condition. This base, $C_{17}H_{23}O_2N_3$, yields crystalline salts with two equivalents of an acid. It has an intensely blue colour, and in the presence of acids shows a brilliant carmine-red fluorescence. When physostigmine or eseroline is allowed to absorb two atoms of oxygen in the presence of alkalis, rubreserine, $C_{13}H_{16}O_2N_2$, is formed. This substance, previously isolated by Eber (Pharm. Zeit., 1888, **33**, 611), has been re-examined. It is a neutral substance, but yields salts both with acids and bases. Its *aurichloride*, *hydrochloride*, *picrate*, and *silver* salt were described.

Rhubarb ; Note on the constituents of ——. F. Tutin and H. W. B. Clewer. Chem. Soc. Proc., 1912, **28**, 96.

In a former communication (this J., 1911, 646) the authors described the isolation from rhubarb of a small amount of a substance (m.p. above 340° C.), which yielded an acetyl derivative melting at 335° C. It has since been ascertained that this substance is identical with the phenolic compound, jambulol, which has been quite recently described by Power and Callan (Pharm. J., 1912, [iv], **34** 416). Jambulol possesses the empirical formula, $C_{16}H_3O_4(OH)_5$.

Coca leaves from Ceylon and Federated Malay States. Bull. Imp. Inst., 1912, **10**, 37—42.

Three samples of coca leaves from Ceylon and one sample from the Federated Malay States were examined. All the samples appear to have been derived from *Erythroxylon Truxillense*, Rusby (Peruvian or Truxillo coca). The Ceylon samples contained respectively 1·2, 1·12, and 0·57 per cent. of total alkaloid, and the Malay sample 1·29—1·45 per cent. (referred to the dry material). In all cases cocaine was the principal alkaloidal constituent, so that the leaves would serve for the manufacture of medicinal preparations of coca as well as for the manufacture of cocaine. (See also this J , 1911, 445.)—A. S.

Kola nuts from British West Africa. Bull. Imp. Inst., 1912, **10**, 31—37.

The caffeine contents of samples of " genuine " kola nuts (*Cola acuminata*) and " false " kola nuts (*C. Johnsoni* and *C. verticillata*) from the Gold Coast in 1909 and 1910 respectively are shown in the following table. The 1909 samples were fresh moist nuts and the 1910 samples, hard dried nuts.

	Caffeine content referred to nuts dried at 100° C.	
	1909 samples.	1910 samples.
	Per cent.	Per cent.
C. acuminata	1·5	2·1
C. Johnsoni	1·3	0·8
C. verticillata	1·1	0·8

Samples of so-called " bitter kola seeds " from Northern and Southern Nigeria were found to contain no caffeine, and the plant yielding the seeds was identified as *Garcinia Conrauana*, Engl.—A. S.

Kola ; Valuation of [galenical] preparations of ——. G. Meillière. J. Pharm. Chim., 1912, **5**, 438—440.

Two and a half grms. of kola extract, or the evaporation residue from 20 grms. of the fluid extract, are dissolved, with heat, in about 25 c.c. of simple syrup. The syrup solution is transferred to a 250 c.c. separator, and treated with 2·5 grms. of potassium bicarbonate. The brisk effervescence which ensues is rapidly broken down on adding chloroform, of which from 10 to 20 times the volume of the mixture is used, in successive portions, to extract the caffeine. The chloroform extract is filtered, after standing for a short time, the solvent distilled off, and the residue transferred to a small tared capsule, dried and weighed. Saccharine preparations of kola, such as granules, are treated in a similar manner, without the addition of syrup, 25 grms. being dissolved in 10 c.c. of water. The syrup and bicarbonate are employed to prevent the formation of an obstinate persistent emulsion, such as occurs when aqueous solutions of kola preparations are shaken with chloroform in presence of a strong alkali.—J. O. B.

Hordenine ; New synthesis of ——. H. Voswinckel. Ber., 1912, **45**, 1004—1006.

Chlormethylanisylketone, $CH_3O{\cdot}C_6H_4{\cdot}CO{\cdot}CH_2Cl$, was converted by means of dimethylamine into the compound, $CH_3O{\cdot}C_6H_4{\cdot}CO{\cdot}CH_2N(CH_3)_2$, the methoxy group of which was then de-methylated by the action of hydriodic acid of sp. gr. 1·7. On reducing the product by heating it under pressure with hydriodic acid of sp. gr. 1·96, a substance, $HO{\cdot}C_6H_4{\cdot}CH_2{\cdot}CH_2N(CH_3)_2$, was obtained identical with the hordenine obtained from barley.—J. H. L.

Arbutin; Presence of —— in the leaves of Grevillea robusta. E. Bourquelot and A. Fichtenholz. Comptes rend., 1912, **154**, 1106—1108.

Arbutin, without methylarbutin, has been extracted from the leaves of *Grevillea robusta*.—E. F. A.

Hydrocyanic acid in plants; Presence of free ——. C. Ravenna and V. Babini. Atti R. Accad. dei Lincei, Roma, 1912, **21**, I., 540—544.

Ravenna and Tonegutti (this J., 1910, 1176) have pointed out previously that cherry-laurel leaves contain no free hydrocyanic acid (as indicated by the Prussian blue reaction), if care be taken to prevent hydrolysis of the glucoside present. Similar experiments have now been made with peach leaves, plants and seedlings of *Sorghum vulgare*, young flax plants, and medlar seedlings, and in all cases no free hydrocyanic acid could be detected by the Prussian blue reaction. With alkaline picrate test-paper (compare Chapman, this J., 1910, 1413) a slight but distinct reaction was obtained in every case, as also with cherry-laurel leaves, but this may be due to a very slight hydrolysis of the glucoside during the test, for when young cherry-laurel leaves were cut off while immersed in the boiling potassium hydroxide solution used to prevent enzymatic action, no hydrocyanic acid could be detected even with the alkaline picrate test-paper.—A. S.

Aromatic grass oils. Bull. Imp. Inst., 1911, **9**, 240—253, 333—340, **10**, 27—34.

In addition to work on citronella and lemon-grass oils (compare this J., 1911, 47), and on oils from three species of *Cymbopogon*, which have not previously been used as commercial sources of essential oil (see this J., 1910, 1079), the results of the examination of samples of vetiver or cuscus roots and oil from the Seychelles and Fiji are given.

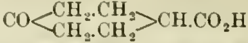
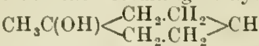
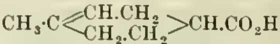
	Fiji vetiver oil.	Oil from Seychelles vetiver roots.
Sp. gr. at 15°/15° C.	1·0298	1·0282
Opt. rotation in 100 mm. tube at 20° C.	——	+27°
Acid value	——	55·9
Saponif. value	35·3	67·3
Solubility in alcohol	Clear solution with 2·5 vols. of 80 per cent. alcohol: cloudy on adding more alcohol.	Clear solution with 1 vol. of 80 per cent. alcohol, and not appreciably cloudy with 7—8 vols. of the alcohol.

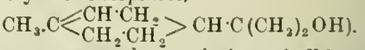
The Fiji oil is superior to Reunion vetiver oil and would find a ready market in Europe. The yield of oil from Seychelles vetiver roots (0·48 per cent.) is equal to that obtained in practice from Indian roots, and the oil is of excellent quality.—A. S.

Essential oil from the catkins of bog myrtle (Myrica Gale). C. J. Enklaar. Chem. Weekblad, 1912, **9**, 219—222. Chem. Zentr., 1912, **1**, 1459.

On distilling 5 kilos. of the catkins with steam, 20 grms. of a yellow oil of pleasant odour were obtained. The oil had the sp. gr. 0·899 at 15° C., $a_D = -5·36°$, and contained a pinene, phellandrene, cineol, and a sesquiterpene. (See also this J., 1911, 1279.)—A. S.

Terpineol; Resolution of dl-1-methyl-Δ¹-cyclohexene-4-carboxylic acid and synthesis of the optically active modifications of ——. K. Fisher and W. H. Perkin, jun. Chem. Soc. Trans., 1908, **93**, 1871—1876.

In a previous paper (Chem. Soc. Trans., 1904, **85**, 657), the synthesis of *dl*-terpineol, *dl*-limonene (dipentene) and terpin was described. The limonene was obtained by elimination of water from, and the terpin by hydration of, the terpineol (see Wallach, Annalen, 1885, 230, 258). (The method of synthesis of the terpineol was briefly as follows:—Ethyl-γ-cyanopentane-αγε-tricarboxylate, $(CO_2C_2H_5.CH_2.CH_2)_2C(CN).CO_2C_2H_5$, obtained by interaction of ethyl β-iodopropionate and ethyl sodiocyanoacetate, was hydrolysed with hydrochloric acid, yielding pentane-αγε-tricarboxylic acid, which when digested with acetic anhydride and distilled, yielded δ-ketohexahydrobenzoic acid,  $CO{<}\begin{matrix}CH_2.CH_2\\CH_2.CH_2\end{matrix}{>}CH.CO_2H$. The ethyl ester of this acid was treated with methyl-magnesium iodide in ethereal solution, the product hydrolysed, and the resulting δ-hydroxyhexahydro-*p*-toluic acid,  $CH_3C(OH){<}\begin{matrix}CH_2.CH_2\\CH_2.CH_2\end{matrix}{>}CH.CO_2H$, converted into its bromo-derivative, and then into Δ³-tetrahydro-*p*-toluic acid,  $CH_3{\cdot}C{\lessgtr}\begin{matrix}CH.CH_2\\CH_2.CH_2\end{matrix}{>}CH.CO_2H$, by means of weak alkalis or pyridine. The ester of the latter acid when treated with magnesium methyl iodide gave an almost quantitative yield of terpineol,



$$CH_3.C{\lessgtr}\begin{matrix}CH{\cdot}CH_2\\CH_2{\cdot}CH_2\end{matrix}{>}CH{\cdot}C(CH_3)_2OH).$$

In the present paper the resolution of *dl*-1-methyl-Δ¹-cyclohexene-4-carboxylic acid (Δ³-tetrahydro-*p*-toluic acid) into its optically active modifications by the aid of the different solubilities of the strychnine and brucine salts of the active acids is described. The ethyl esters of the active acids were then converted into the corresponding terpineols in the manner described above. *l*-Terpineol had an odour of lilac, melted at 35° C., and had $[\alpha]_D = -46·6°$. *d*-Terpineol melted at 33°—35° C., and had $[\alpha]_D = +44·2°$. It is pointed out that active terpineols of very varying rotations have been isolated from essential oils. For instance a *l*-terpineol from niaouli oil (Bertrand, Bull. Soc. Chim., 1893, **9**, 436) had $[\alpha]_D = -2°10'$, whilst a *d*-terpineol from cardamom oil (Schimmel's Report, 1897) had $[\alpha]_D = +83°31'$. A *l*-terpineol prepared from pinene by Ertschikowsky (Ber., 1896, **20**, 887) had $[\alpha]_D = -117·5°$.—A. S.

Sulphosalicylic acid; Reactions for ——. E. Barral. Bull. Soc. Chim., 1912, **11**, 447—450. (See also this J., 1912, 457.)

Bromine water gives no reaction with sulphosalicylic acid. Mandelin's reagent gives a bluish-indigo colouration. A solution of calcium hypochlorite produces no change at first, when added to a solution of the acid, but with excess of the reagent a brown colour forms, and chlorine is evolved. Millon's reagent produces a pink colouration; salicylic acid on the other hand gives a reddish-orange colouration. The odour of the methyl ester obtained by heating sulphosalicylic acid with methyl alcohol and sulphuric acid is pleasant, but different from that of methyl salicylate. Lead acetate solution gives no precipitate with a solution of the acid, whilst precipitation is caused by the basic acetate. Radiating clusters of monoclinic prisms are seen when a solution of sulphosalicylic acid in absolute alcohol is allowed to evaporate under a microscope.—F. Shdn.

Formaldehyde; Condensation of —— by ultraviolet light. R. Pribram and A. Franke. Monatsh. Chem., 1912, **33**, 415—439.

Coincidently with the formation of glycollic aldehyde when an aqueous solution of formaldehyde is exposed to the action of ultraviolet rays (this J., 1911, 711), formic acid is produced, along with a small amount of higher condensation products. The amount of acid formed is determined by the length of the exposure to the rays. Carbon dioxide and monoxide, hydrogen and methane are also produced in lesser degree. The oxygen necessary for the acid formation does not result from decomposition of the water present nor from ozone produced by the action of the rays upon air which may be present, since the formation is in no way hindered if air is excluded.—J. A.

Ozone; The constituents of ——. [Ozonides of unsaturated organic compounds, including caoutchouc]. C. Harries. Ber. 1912, **45**, 936—944.

Of the ordinary 11—14 per cent. ozone, produced by means of Berthelot tubes run in parallel, with a secondary tension of 8200 volts, and a frequency of 100 periods, about one-third consists of oxyozone, (O_4). This substance is destroyed by passing the mixture through caustic soda and concentrated sulphuric acid, a little ozone (O_3) underoing catalytic decomposition at the same time. In he light of these conclusions some of the anomalous results btained in the ozonisation of unsaturated hydrocarbons, tc., become explicable. Typically it is now shown that ymmetrical butylene, $CH_3{\cdot}CH:CH{\cdot}CH_3$ yields two "ozonides." The one obtained by the use of washed 6—8 per cent.) ozone, with its dimolecular polymeride, s a true ozonide—$CH_3{\cdot}\overbrace{CH \cdot CH}^{O_3}{\cdot}CH_3$. The second, which ccompanies the true ozonide when 14 per cent. ozone i.e. ozone which has not been washed with caustic soda nd sulphuric acid) is employed, is an oxyozonide $\overbrace{H_3{\cdot}CH{\cdot}CH}^{O_4}{\cdot}CH_3$. This is also accompanied by a imolecular polymeride. Both the simple ozonide and he simple oxyozonide are colourless liquids which can e distilled *in vacuo*. The polymerides are syrupy and annot be distilled. Definite ozonides were also obtained n the cases of tetrahydrobenzene, pinene, citronellol, nd terpineol, where hitherto the results have been more or less indefinite. The solid ozonides obtained re dimolecular, the simple ozonides are oily. In the case f cholesterol, with 6—8 per cent. ozone a product was obtained agreeing with the formula, $C_{27}H_{43}(OH){\cdot}O_3$, confirming Tschugaeff's conclusion that the cholesterol molecule contains only one double linkage. In the earliest experiments on caoutchouc ozonides, an apparatus yielding only 6 per cent. ozone was employed and figures agreeing accurately with the addition of $2O_3$ to the $C_{10}H_{16}$ molecule were obtained. These products gave on hydrolysis levulinic aldehyde and levulinic acid in the ratio 2 : 1. Later, more liquid ozonides were obtained, and the proportion of acid to aldehyde on hydrolysis of these products was found to be considerably higher. Repetition of this work shows that 6—8 per cent., washed ozone gives the true diozonide, $C_{10}H_{16}O_6$—a thick, viscous syrup—whereas 12—14 per cent. ozone gives the dioxyozonide, $C_{10}H_{16}O_8$, a less viscous and slightly more soluble substance. Quite different proportions of acid and aldehyde are obtained on hydrolysis of these two compounds as shown below :—

	$C_{10}H_{16}O_6$	$C_{10}H_{16}O_8$
Levulinic aldehyde	4·0	2·8
,, acid	3·0	4·0
Peroxide and resin	2·2	2·2

Synthetic caoutchouc was found to give similar results to natural caoutchouc.—E. W. L.

Detecting methyl alcohol in ethyl alcohol. Sailer. *See* XVIII.

Patents.

2-Phenylquinoline-4-carboxylic acid ; Process for preparing aryl esters of ——. Chem. Fabr. auf. Actien. vorm. E. Schering. Ger. Pat. 244,788, March 1, 1911.

When 2-phenylquinoline-4-carboxylic acid is esterified with a phenol or a naphthol in the usual manner, aryl esters are produced, which possess similar antirheumatic properties to those of the methyl and ethyl esters, but have the advantage of being tasteless.—T. F. B.

Salicylic acid menthol ester ; Process for preparing an acetyl derivative of ——. Kontor Chemischer Preparate Ernst Alexander. Ger. Pat. 244,787, Dec. 11, 1910.

Acetylsalicylic acid menthol ester is prepared by treating menthyl salicylate with an acetylating agent ; it possesses antirheumatic properties.—T. F. B.

Digitalis leaves ; Process for making a preparation of ——. Knoll und Co. Ger. Pat. 245,193, Aug. 21, 1910. Addition to Ger. Pat. 227,572, July 11, 1907 (see Eng. Pat. 6019 of 1908 ; this J., 1908, 832).

The alcoholic extract obtained from digitalis leaves as described in the principal patent, is not treated with ether as there directed, but with anhydrous ammonia or an alkali alcoholate in solutions free from water. By this means the inactive constituents of the leaves are almost completely separated, whereas when aqueous ammonia is used, they are only removed to a very limited extent. —T. F. B.

Dihalogen derivatives of paraffin hydrocarbons ; Manufacture of ——. W. H. Perkin, Manchester, and F. E Matthews and E. H. Strange, London. Eng. Pat. 9721, April 21, 1911.

See Fr. Pat. 429,225 of 1911 ; this J., 1911, 1268.—T.F.B

Chlorinated phenol esters ; Process for the manufacture of —— and of oxybenzyl alcohols, oxybenzaldehydes, and oxybenzoic acids. F. Raschig and M. Köbner, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,023,758, April 16, 1912.

See Fr. Pat. 401,845 of 1909 ; this J., 1909, 1167.—T. F. B.

Alkyl esters of diiodo fatty acids of high molecular weight. A. Baselli, Assignor to Soc. of Chem. Industry in Basle, Basle. U.S. Pat. 1,027,171, April 23, 1912.

See Eng. Pat. 19,350 of 1910 ; this J., 1911, 239.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Patents.

Toning photographic prints ; Process of ——. H. M. Ward, Leicester. Eng. Pat. 16,672, July 20, 1911.

The following process may be used to tone bromide prints to various shades of brown :—A bromide print or transparency, toned by the sulphide process or by hypo-alum in the usual manner, is further toned with gold ; it is then treated with a solution of a tin salt (*e.g.*, stannous chloride, nitrate, or acetate), darkened by exposure to light or treatment with alkali, washed, and dried. The stannous salt may be added to the gold toning bath. Suitable tin solutions may be obtained by dissolving from 1 to 3 grains of the stannous salt in each ounce of water. —T. F. B.

Colour photography. C. S. Forbes, London. Eng. Pat. 17,015, July 25, 1911.

In the imbibition process of colour photography, difficulty has been experienced in getting the various colours from the gelatin films to be absorbed by the already coloured print. To remedy this it is proposed to coat the gelatin print, after each colouring, with a thin layer of isinglass or similar substance to form an absorptive surface.—T. F. B.

XXII.—EXPLOSIVES ; MATCHES.

Explosion ; Circumstances attending an —— which occurred in the corning house of the gunpowder factory of Messrs. F. C. Dickson & Co., at Blackbeck, in the County of Lancaster, on the 14th December, 1911. Captain R. A. Thomas, H.M. Inspector of Explosives. [Cd. 6161.]

There was about half a ton of gunpowder in the corning house at the time when it exploded, and two men were killed. When the corning machine was dismantled it was found that the journal cap and shaft of one of the smooth rollers was rather badly scored. The oil-hole of the journal cap was blocked up, and the obstruction, which appeared to have been formed from the inside, had to be removed with a drift. It is considered that a shaft with any load upon it running in a dry state in a bearing in this condition, would inevitably generate heat, and the temperature could quite possibly rise to that necessary to ignite gunpowder which was in the form of dust. To obviate the possibility of accidents arising in future from such a cause, Captain Thomas suggests that in addition to the daily inspection of the machinery in the corning house, by the leading hand a thorough periodical inspection should take place at very short intervals, by a skilled mechanic, and in order to reduce the danger arising from obstructed oil-holes, some efficient means should be introduced to protect them from dust.—G. W. McD.

PATENT.

Explosives ; Envelopes for ——. C. G. Luis, Wimbledon Common. Eng. Pat. 14,682, June 21, 1911.

THE explosive is covered with one or more layers of foil made from aluminium or an aluminium alloy. This covering is said to prevent absorption of moisture, and also to increase the power of the explosive.—G. W. McD.

XXIII.—ANALYTICAL PROCESSES.

Phenolphthalein as an indicator ; Use of ——. The slow rate of neutralisation of carbonic acid. J. W. McBain. Chem. Soc. Proc., 1912, **28**, 106.

IT was shown that titrations with phenolphthalein as indicator require about ten minutes for the end-point to be attained, even in the absence of a gaseous space. This is not due to changes in the phenolphthalein, for these are not appreciable during many months in very low concentration of alkali (about $0{\cdot}7\times10^{-6}$ N-OH′). The phenomenon has been traced to the presence of carbon dioxide (carbonate), which is always intentionally or unintentionally present. It is uncertain which is the slow reaction, the rate of hydration of dissolved carbon dioxide or the rate of electrolytic dissociation of the carbonic acid. Carbon dioxide affects the amount of phenolphthalein necessary to produce maximum depth of colour, but it also affects enormously the amount of acid or alkali required to change the colour of the end-point by a definite amount. The very pale colour obtained at a concentration of $OH'=$ about $0{\cdot}7\times10^{-6}$ was shown to be the most sensitive colour for the end-point, and permanent colour standards were described which identify this region. It was recommended that in titrating, before either of the liquids to be titrated are placed in the titration vessel, the water in the latter should be coloured to the position of the final end-point with phenolphthalein and alkali.

Calcium and magnesium ; Separation of ——. O. Kallauner and I. Preller. Chem.-Zeit., 1912, **36**, 449—451, 462—464.

THE separation of calcium and magnesium by any of the modifications of the oxalate method is only satisfactory in dilute solutions, in the presence of a considerable quantity of ammonium salts, after rapid filtration in the case of single precipitation, or after prolonged standing in the case of double precipitation. When a large amount of magnesium has to be separated from a small amount (up to 3 per cent.) of calcium, the ordinary oxalate methods are unsatisfactory owing to the occlusion of magnesium oxalate. Single precipitation of calcium sulphate in alcoholic solutions does not yield accurate results ; on the other hand Stolberg's method of dissolving the precipitated calcium sulphate in hydrochloric acid, and precipitating repeatedly as oxalate, is satisfactory. The authors recommend the following modification of Stolberg's method for the separation of calcium sulphate : the mixture containing calcium and magnesium (chlorides) is evaporated to dryness, moistened with water, and taken up with a saturated solution of lithium sulphate in a mixture of 10 per cent. of ethyl and 90 per cent. of methyl alcohol.—O. R.

Use of tannin materials and their analysis from the dyer's standpoint. Knowles. *See* VI.

Application of the electrical conductivity method to the analysis of mixtures of sulphuric and nitric acids. Corvazier. *See* VII.

Carnot's reagent [for the detection of potassium] and preparation of the double thiosulphate of bismuth and sodium. Sanchez. *See* VII.

Preparation of iodic acid with a view to the determination of carbon monoxide. Nicloux. *See* VII.

Determining potassium iodate. Myers. *See* VII.

Determination of sulphur in insoluble sulphides. St. Warunis. *See* VII.

[Electrolytic] separation and determination of antimony in white bearing metals. Compagno. *See* X.

Determining tin in ores, alloys, etc. Banerjee. *See* X.

Examination of varnishes. Wolff. *See* XIII.

A saccharine constituent of Para rubber. *See* XIV.

Detection of the vegetable tannins in leather and commercial extracts. Kohnstein. *See* XV.

Method for distinguishing unsterilised from sterilised bone meal. Polenske. *See* XVI.

Determination of sulphates [in wine] by the physico-chemical volumetric method. Bruno and d'Auzay. *See* XVIII.

Detecting methyl alcohol in ethyl alcohol. Sailer. *See* XVIII.

Behaviour of milk towards ammonium sulphate, and a method of determining milk sugar. Salkowski. *See* XIXA.

Valuation of kola preparations. Meillère. *See* XX.

Reactions for sulphosalicylic acid. Barral. *See* XX.

PATENTS.

Carbon monoxide in gaseous mixtures ; Apparatus for automatically recording the percentage of ——. L. A. Levy, London. Eng. Pat., 12,841, May 29, 1911.

A PORTION of the gas to be analysed passes into a vessel where the amount of carbon dioxide is automatically registered. Another portion passes into a vessel containing an agent for oxidising carbon monoxide to carbon dioxide, the quantity of the latter gas being then automatically registered.—G. W. McD.

Flue-gases ; Means for analysing ——. H. H. Wilson, Altoona, Pa. U.S. Pat. 1,023,188, April 16, 1912.

THE apparatus consists of a cylinder in which is a piston that can be moved backwards and forwards. One end of the cylinder is provided with a passage, which can be closed by a valve, and into which the gas is introduced by the suction stroke of the piston. The two ends of the cylinder are connected by means of a passage, in which is included a vessel for containing an absorbent for a constituent of the gas, such as a column of liquid, through which the gas is forced by the piston from one end to the other of the cylinder. The other end of the cylinder is provided with a valved passage for the discharge of the gas, and is also connected with a tube containing a column of mercury for measuring the pressure of the gas, and thus determining the quantity of the constituent absorbed from the gas.—W. C. H.

Book Received.

GERMAN VARNISH-MAKING. By Professor MAX BOTTLER (Würzburg). Authorised Translation with Notes on American Varnish and Paint Manufacture. By ALVAH H. SABIN, M.S., Lecturer, New York University. John Wiley and Sons, New York. 1912. Price 15s. net. ($3.50 net.) Chapman and Hall, Ltd., London.

8vo volume, containing 360 pages of subject matter with 56 illustrations, and an alphabetical index. The subject matter is classified as follows :—Classification of lacquer and varnish. II. Raw materials. III. Preparation and Manufacture. IV. Oil-varnish and oleo-resinous varnishes. V. Turpentine and benzene varnishes. VI. Alcoholic and other volatile and non-volatile varnishes. VII. Colouring, bleaching, and filtering of lacquers and varnishes. VIII. Manufacture of printers'-ink, lithographic varnish, soap, resin and casein lacquers. IX. Notes on varnish making. X. Paint ; its constitution and nature. XI. (Appendix). Notes on analytical methods. XII. Crockett's varnish formulas.

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Canadian Section.

Meeting held at Toronto on Thursday, March 28th, 1912.

PROF. W. P. COHOE IN THE CHAIR.

SOME EXPERIMENTS ON THE HYDROLYSIS OF SAWDUST.

BY WALLACE P. COHOE.

The effect of acids upon cellulosic materials has engaged the attention of chemists since the time of Bracconet in 1819.

Simonsen was the first to attempt the manufacture of sugar from sawdust on any large scale. He used both sulphuric and hydrochloric acids of from 0·3 to 0·7 per cent. strength in quantity under a pressure of seven to eight atmospheres.

In Classen's process fairly dry sawdust was treated with 2½ to 3 per cent. of sulphurous acid, the amount of moisture present usually equalling the weight of dry sawdust. The digester was heated externally, and the excess of sulphurous acid was blown off and recovered. This process has been exploited, but cannot as yet be pronounced a commercial success. Though the yields of this method are very satisfactory, both in quantity and quality, yet the slowness of external heating seriously limits the output of a plant.

Reference should be made to the recent developments which have been made in Sweden in fermenting the sugars produced in the digestion of sulphite pulp. It is apparent that the hydrolysis of sawdust by sulphurous acid and acid sulphites, is making the production of alcohol possible on a commercial scale.

In Ewen and Tomlinson's method, which is being worked commercially in North America, sawdust is hydrolysed by sulphuric acid, the glucose produced being subsequently fermented. In this process conditions of moisture and percentage of acid approximate those of Classen, but the digester is heated internally by means of live steam.

Attracted by the fact that hydrochloric acid seemed to be more active than other acids in decomposing cellulosic materials, I was led to investigate the action of hydrochloric acid upon sawdusts under conditions where the reacting materials should be heated internally by live steam, and where the amount of water present should not exceed by more than 50 per cent. the weight of dry sawdust in the digester.

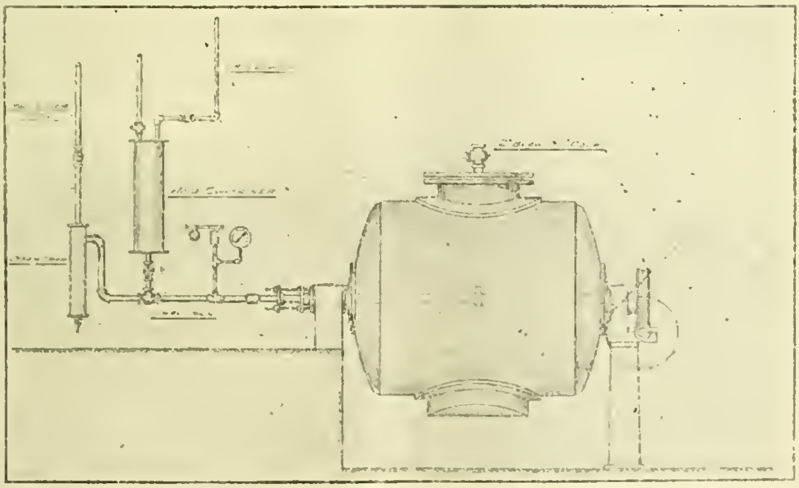
The investigations on a commercial scale of those methods not described in this paper, which I have already investigated on a laboratory scale, and which are outlined in U.S. Patent 985,726, will be described in a later paper.

Experimental part.

I.—Box factory sawdust of moderate fineness, and also sulphite pulp, was heated to 125 to 150° C. in sealed tubes in an oil bath, with hydrochloric acid in varying proportions from ½ per cent. to 3 per cent. real hydrochloric acid calculated on the weight of dry sawdust. In order that the circulation of the reacting acid might be complete, the conditions of Simonsen as to moisture were found to be necessary. Various yields were obtained, ranging from 25 to 29 per cent. of reducing sugars, calculated on the weight of dry wood originally present. It was found in a single reaction impossible to attain a much higher percentage of reducing sugars than 29 per cent., *i.e.*, this hydrolytic reaction runs to an equilibrium.

By emptying the tube, washing out the sugars already formed, and repeating the process, it is possible with hydrochloric acid to obtain a further yield of reducing sugars, smaller in quantity, however, than the first yield. Thus, if in the first operation 29 per cent. were obtained, in the second probably only 15 per cent. of reducing sugars, calculated as above, could be obtained. This repetition can be made time and again, with gradually decreasing production of sugars. This reaction has not been taken beyond a conversion of 60 per cent. of the weight of original dry sawdust present into reducing sugars, although if there were any economic possibilities no doubt nearly all the material could be so converted.

In this ability to convert material already acted upon, hydrochloric acid differs from sulphurous acid. Not only were we invariably unable to obtain as high a percentage of reducing sugars by using sulphurous acid, but we were also unable to obtain more than a 1 per cent. or 2 per cent. conversion on material already treated. When material already acted upon by sulphurous acid, was subjected to the action of hydrochloric acid, results comparable to those produced upon material correspondingly treated with hydrochloric acid were obtained.



II.—The next series of experiments was carried out on such a scale that a kilogram of dry sawdust could be used, and the conditions made to approximate those which were desired finally. A small digester 8 inches in diameter, and 10 inches long, was made out of steel pipe and cast iron fittings. The plates at either end were fitted with a shaft, and the whole apparatus rotated on bearings, in an iron oil bath which was externally heated by gas. Provision was made in one of the heads of the digester for the admission of steam, and for the blowing off of the digester. The two heads of the digester were covered with sheets of asbestos paper impregnated with Bakelite, and pressed on in a hydraulic press. The interior of the digester was coated with a mixture of Bakelite and asbestos, and baked on without pressing.

In the first series of experiments the amount of water present was decreased until it was practically equal to the amount of dry sawdust present. The acid was introduced, and the digester closed and heated externally in the oil bath for one hour. The average yield obtained from this method being 25 per cent. of reducing sugars calculated on the dry weight of sawdust introduced into the digester.

The first experiments were conducted with external heating. Next it was found that similar results could be obtained by the introduction of live steam into the interior of the digester, although unless the digester were also heated in the oil bath, considerable condensation took place, on account of the large area of radiating surface.

In view of the fact that the reducing sugars produced by this reaction did not all ferment, and also by the fact that the total amount of conversion was not by any means represented by reducing sugars, it occurred to the author that the presence of the hydrolysing agent during the heating stage might exert a harmful effect upon the final result. To overcome this the digester was filled and heated to the reacting temperatures, and then the reacting agent was introduced. This method is the one finally adopted.

III.—The apparatus next used, and shown in the figure, comprised a digester capable of holding 800 to 900 lb. of ordinary sawdust, consisting of a steel plate shell with rounded ends provided with trunnions for purposes of rotation. The digester is provided with a manhole, by means of which it may be filled and emptied. The longitudinal pipe, made of special bronze, provides means for the admission of live steam, and also for the admission of the reacting agent, which may be introduced from the acid container, being forced against the steam pressure by compressed air. The length of the digester was 4 feet on the straight side, and the diameter was also 4 feet.

The lining of the digester had to be capable of resisting the action of dilute hydrochloric acid at high temperatures. First the inside of the shell and ends was covered with a layer of asbestos paper which had been dipped in liquid Bakelite. Not having suitable acid-proof bricks, the interior lining was made of split fire-brick. A paste of liquid Bakelite and barium sulphate was spread upon the lining, and the brick was embedded in this paste. When the whole interior had been lined in this way, a charcoal stove was introduced through the manhole and the interior heated slowly to harden the cement. A few gallons of liquid Bakelite was then introduced into the digester, the manhole closed, the digester rotated, and compressed air introduced. In this way all the bricks were thoroughly impregnated with the liquid Bakelite. The excess of Bakelite was removed, and a slow fire, as previously described, started in the interior, care being taken not to heat so suddenly that blistering took place. The temperature was gradually increased, and the lining was thoroughly baked. It has been found from more than a year's experience of almost constant work, that not only was this lining able to resist the action of 3 per cent. hydrochloric acid solutions at a pressure of 150 lb., with a corresponding steam temperature, but that it also resisted sulphuric and sulphurous acids equally well and at the same time, as far as can be judged, is intact. This is especially remarkable in view of the fact that it has been the practice to blow off the digester from the pressure attained by the reaction to atmospheric pressure, within a period of five minutes.

In the experiments various qualities of soft wood sawdust have been used, including fine box factory sawdust, containing 12 to 15 per cent. of moisture; an ordinary fairly dry mill sawdust such as is obtained in Toronto; and mixed fine and coarse sawdust. For the most part the work was done with coarse sawdust containing from 40 to 60 per cent. of water, such as would be met with under ordinary working conditions on a large scale.

In making a run the following procedure was followed: The digester is rotated into such a position that the manhole, B, is on the top. The sawdust is introduced from above through a chute, the moisture content of the sawdust, of course, having been previously determined. The digester is then rotated, and at the same time live steam is blown in. The result is that in a short time, varying with the amount of moisture present in the sawdust, a pressure equal to the steam pressure used is attained. When this pressure is reached the digester may be blown off. In this way it is possible to recover any turpentine which may be present in the wood, any acetic acid which may be developed by the heat of the steam, any water in excess of that desired, and any volatile by-products which may be present. Among these latter it may be noted that a small percentage of furfurol is usually obtained in each digestion. In Canadian woods there is not enough turpentine present to be noticeable otherwise than by an oiliness on the top of the liquid condensed from the blow-off. After the blow-off the sawdust nearly always contains practically the same percentage of water, irrespective, within moderate limits, of the amount of water which was originally contained in the material.

After the pre-heating, the materials within the digester are in a condition most favourable for the hydrolysis. Steam is blown in, and then the reacting agent is introduced as rapidly as possible, and the digester rotated the necessary amount of time. The digester is then blown off as rapidly as possible, and the material dumped through the manhole, B.

The appearance of the material discharged from the digester varies with the percentage of acid used, the fineness of the sawdust, and the length of the digestion. Under the most favourable conditions where the best results are obtained, the material is a deep golden brown. The smell of furfurol is apparent in the blow-off vapours, also an odour suggestive of that accompanying the baking of cakes containing molasses.

For purposes of illustration a description of an early run may be interesting.

Run No. 6.—Previous to starting, the digester was heated by live steam, after which 800 lb. of sawdust containing 54 per cent. of water was run in.

3 p.m. Started rotation and turned on steam.
3.05 p.m. Steam gauge pressure 20 lb.
3.15 ,, ,, ,, ,, 40 lb.
3.22 ,, ,, ,, ,, 50 lb.
3.35 ,, ,, ,, ,, 90 lb.
3.36 ,, ,, ,, ,, 95 lb.
3.40 ,, Started to blow off.
4.10 ,, Blow off completed.
4.15 ,, Started rotation, turned on steam.
4.22 ,, Gauge pressure 50 lb.
Blew in 28 lb., 22° B. hydrochloric acid.
4.30 ,, Steam pressure at 65 lb.
5.25 ,, Stopped rotation, gauge pressure 52 lb. Blew off and dumped.
Percentage of sugar obtained, 16·62 per cent.

It will be seen from the above that in the early runs a very long time was taken, in fact, so long that no plant could afford to use such a process, as the output would be too small. Consequently progressive experiments were made to determine whether the process could be accelerated. The distributing tubes in the digester were modified so that instead of one central tube there were three, which distribute the acid and steam, not in the centre, but about six inches from the circumference of the digester. In this way it is much easier to heat up the digester and its contents. It was also found that there was no special advantage in lengthening the time of the pre-heating; in fact, it was advantageous to make it as rapid as possible, especially in view of the fact that prolonged heating seems to render the material less readily attacked by the acid.

Illustrations of how the practice varied may be shown by run No. 136, in which the length of the pre-heating was reduced to 14 minutes, and the length of the digestion to 5 minutes. In this run, the results of which are shown in the table below, the percentage of acid used was essentially the same as in run No. 8, described above. In run No. 139 the time of the pre-heating was 12 minutes, and the time of the digestion 4 minutes. In run No. 140 the time of the pre-heating was 12 minutes, and the time of the digestion 3 minutes.

Given proper preparation of the materials by the pre-heating, and a proper adjustment of phases in the digestion, all the time necessary for a successful reaction is that required by a proper mixing of materials. In other words, with proper preparation the reaction itself is practically instantaneous.

Throughout all runs the observation made of results on the laboratory scale, with regard to the fact that this reaction runs to an equilibrium, was confirmed. It has been found by repeated experiments that by a proper adjustment of the phases, the concentration at which the equilibrium occurs may be varied.

Analytical methods.—The constituents estimated in the converted sawdust by direct analysis were: Sugar, total water-soluble, unattacked or insoluble portion, chlorides and total acidity. The moisture was determined by difference.

Water-soluble solids.—100 grms. of wet product were extracted with 1500 to 2000 c.c. of boiling water. 100 c.c. of this extract was exactly neutralised with standard soda, and then evaporated to dryness. A correction was made for the soda added to neutralise the organic acids. The hydrochloric acid and other chlorides, present as impurities in the sawdust, were also deducted.

Reducing sugars.—100 c.c. of the extract was neutralised with whiting and filtered. The extract, which has a yellow or dark golden colour when acid, turns brown on neutralisation. Standing with bone charcoal over night clarifies the solution, but this treatment is not ordinarily deemed necessary. Fehling's solution was used in estimating the reducing sugar. The end point was found by filtering a portion of the solution and testing with acetic acid and ferrocyanide. The titration is not normal. In some cases the colour of the cuprous oxide is unnatural and the end point erratic. The blue colour of the solution generally becomes indistinguishable some considerable time before the end point is reached. Of course the reliability of the determination of reducing sugars by Fehling's solution depends upon uniformity of method. Insomuch as independent observers, who have checked my results, have invariably obtained a higher result for reducing sugars than we have, I feel safe in saying that my determinations are well on the safe side.

Non-sugars were obtained by substracting the amount of sugar from the amount of water soluble. Hydrochloric acid by titration. Acidity by titration. Unattacked residue by drying and weighting. Moisture by difference.

The results of all analyses are calculated to the weight of dry material used.

The following table furnishes data obtained from various trials made during our experiments. The percentages are all in terms of analytical results, excepting the last column, which furnishes the ratio which the sugars bear to the non-sugars in the water-soluble extract from the digested material. As many of the runs enumerated in the table below were made under varying conditions, the results obtained are not comparable one with the other.

No.	Un-attacked.	Sugars.	Non-sugars.	Organic acids. c.c. n/1	Sugar per cent. en water soluble.
	per cent.	per cent.	per cent.		
72	71·9	16·6	11·5	51·5	59·1
76	67·8	12·6	19·6	92·8	39·2
83	76·1	15·6	8·4	27·2	65·0
87	71·6	16·8	11·6	39·1	59·2
90	73·9	15·1	11·0	31·4	58·0
94	75·4	15·7	8·9	39·4	63·9
97	75·0	16·5	8·5	36·0	66·0
117	74·4	17·1	8·5	38·0	66·8
133	73·2	17·4	9·4	59·4	64·9
134	70·9	17·1	12·0	53·2	58·8
135	71·0	18·0	11·0	71·4	62·0
136	61·0	18·2	20·8	121·0	46·6
138	69·7	17·4	12·9	62·7	57·4
139	66·5	20·2	13·3	80·0	60·3

The value of the results obtained above, from a commercial standpoint, depends upon several factors.

A. *Extraction.*—If the sugars contained in the digested material are to be extracted for purposes of fermentation, or for the manufacture of refined glucose, the ease with which the soluble material may be extracted from the insoluble is a serious consideration. In such cases the coarse sawdust gives a much better result than the fine sawdust, as does also a conversion in the neighbourhood of 18 per cent., rather than those yielding higher results. The greater the attack of the sawdust by acid, so much finer does the material become, and consequently so much harder is the extraction process. Also, the shorter the time of the conversion process, by so much is the grinding action of the particles on each other in the rotating digester reduced, and consequently the process of extraction is rendered that much easier.

B. *Fermentation.*—Although most of the work has been done to determine what conditions promoted or hindered the conversion of sawdust into reducing sugars, yet the problem of determining how these reducing sugars can be converted into alcohol, has not been entirely neglected. In these experiments no particular attempt has been made to cultivate a yeast, either ordinary brewers' yeast or compressed yeast having been used in all cases. With a normal reaction, in which none of the phases are carried to an extreme, by the means mentioned above, it has been found possible to convert from 75—80 per cent. of the reducing sugars present into alcohol. This ratio, while it is satisfactory, can probably be very much improved by the cultivation of a yeast which would work to better advantage in the extracted material from converted sawdust.

Several conclusions have been reached with regard to the reaction described above, which may be summarised as follows:—

1. It is advantageous to have the sawdust heated to the reaction temperature before introducing the acid.
2. A prolonged pre-heating is not advantageous.
3. The recovery of valuable by-products, such as turpentine, is possible, using this method.
4. Coarse sawdust gives better result than fine.
5. By this method the time of conversion may be very much shortened over that consumed in existing methods, and consequently the output from a given plant may be very much increased.
6. Higher results have been obtained with hydrochloric acid than with other acids used by this method.
7. Commercial feasibility of the use of other acids.
8. Commercial advantage of double heating.

The problem of determining the identity of the reducing sugars and other water-soluble bodies produced by this conversion, is a most interesting one. Considerable time and attention has been devoted to it, but although certain conclusions have been reached, they have not been confirmed sufficiently to warrant a pronouncement on this subject as yet.

In conclusion I wish to express my indebtedness to those who have carried out the actual work in the laboratory and upon the larger scale. I wish to express my appreciation of the work of Dr. R. D. MacLaurin, Mr. Ewing Smith, Mr. H. E. Bunker, and Mr. H. H. Miller.

Any description of this process would not be complete without an adequate acknowledgment to Lt.-Col. J. B. Miller, not only for furnishing the sinews of war for what has been an expensive investigation, but also for his continued encouragement and his advice concerning wood waste conditions in this country.

Liverpool Section.

Meeting held at the University on Wednesday, March 13th, 1912.

MR. ARTHUR CAREY IN THE CHAIR.

THE TOXICITY OF PAINTS.

BY PROF. E. C. C. BALY, F.R.S.

Painters complain that white lead paints possess a characteristic smell different from that of any other paint.

This characteristic smell is said to be due to a volatile lead compound, and many cases of lead poisoning have been described amongst persons who have inhabited rooms freshly painted with white lead.

The matter was brought particularly under my notice during a discussion of the relative merits of the basic carbonate and basic sulphate of lead as pigments. Even without any previous experience I at once detected a most decided difference between the smell of the two substances when ground in linseed oil. It occurred to me that this matter could easily be put to a strict scientific test and in the present paper are contained the results of some experiments I have made in this direction. It may safely be said that any statements as to smell and even as to cases of poisoning are somewhat unsatisfactory unless there is forthcoming some proof of the exhalation of poisonous vapour by the paint in question.

It was to investigate whether or no any volatile and poisonous emanations truly occur that the present work was undertaken.

One of the most delicate methods of investigation we have at the present time in the case of vapours is that of spectroscopic absorption. The technique is exceedingly simple and at the same time extremely accurate, for the presence of even minute traces of substances having a power of absorbing light can at once be detected. The method of observation is as follows :—A source of light giving a spectrum of many lines is chosen, the rays from this arc focussed by means of a lens upon the slit of a spectrograph, and a photograph of the spectrum is taken. A vessel containing the gas or vapour to be examined is then placed between the light source and the slit and a second photograph of the spectrum taken. If any absorption of the light has occurred a comparison of the two photographs will at once show the nature and amount of the light absorbed. In the preliminary set of experiments three brass tubes were taken about one inch in diameter and 12 inches long and one of these was well coated on the inside with the commercial stiff paste of white lead containing 8 per cent. of linseed oil. The two remaining tubes were similarly coated with a paste of zinc white and of basic sulphate of lead* respectively ; care was taken in each case to allow a free passage of the light beam through the tube.

Each of these tubes in turn was set up in front of the spectrograph slit in the path of the light beam and a photograph of the spectrum of the transmitted light was taken. Each tube was gently heated in order to facilitate the escape of the volatile emanation if any were present. A comparison of each of the three photographs thus obtained with that of the spectrum of the light source showed undoubted evidence of absorption in the case of the white lead and none with the basic lead sulphate or zinc white.

This shows at once that there is some volatile emanation which possesses the power of absorbing light rays given off from white lead, and hence some more accurate experiments were undertaken with the view of putting the matter to a more rigid test.

A stout copper tube, 18 inches long and 2 inches in diameter, was wrapped with a single layer of asbestos cloth, and a long length of high resistance wire was carefully wound outside the asbestos there being altogether about 100 turns. By passing an electric current through this wire the tube could be raised to any desired temperature. A small branch tube carried a delicate thermometer and the whole was again covered with asbestos cloth so as to minimise the loss of heat as much as possible. The materials to be examined were smeared inside glass tubes about 1¾ inches diameter and 17 inches long, which were slipped into the copper tube. These glass tubes were closed with corks and each cork was bored with a large hole and a quartz plate cemented on to the corks so as to allow the passage of the whole spectrum, visible and ultra-violet. A diagram of the copper tube with one of the glass tubes in position is shown in Fig. 1 in sectional elevation, where AA is a glass tube fitted with the bored corks and quartz windows, and B is the side tube with a delicate thermometer.

This apparatus was set up in the path of the light rays and a series of glass tubes of the size specified above were prepared by coating them internally each with one of the materials to be investigated. The first substance examined in the above apparatus was zinc white. The glass tube AA was thickly coated with a stiff paste of zinc white and linseed oil and then closed at both ends with the corks and quartz windows. By means of a current of 1·8 amperes the temperature was very slowly raised and a photograph of the spectrum of the transmitted light was taken at 5 degree intervals from 30° C. to 120° C., nineteen photographs being thus obtained. As the source of light a powerful spark discharge between poles of cadmium was used, for it has been shown by Sir W. N. Hartley and others that the continuous spectrum given by this spark is exceedingly well adapted for the detection of absorption bands.

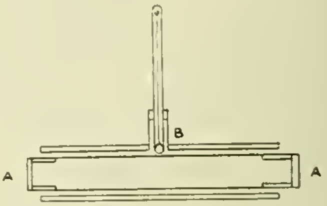


FIG. 1

When the photograph was developed it was found that a strongly marked absorption band was shown. No evidence of any absorption however was observed until the temperature reached 90° C. As at these higher temperatures it was clear that the linseed oil itself was volatilising, this absorption band was attributed to the vapour of the oil. The apparatus was then allowed to cool, and the zinc white tube was replaced by one containing a paste of linseed oil and basic sulphate of lead, and the process was repeated under exactly the same conditions, photographs being taken at the same temperatures as before. On development it was found that the record of absorption was identical with that given by the zinc white, that is to say no absorption was exhibited until the temperature reached 90° C. when a strong absorption band began to appear and in the same spectral region. A paste of white lead and linseed oil was then experimented with, the conditions being identical in every respect. In this case however it was found that the absorption began at a much lower temperature than in the two previous cases. Clear and definite evidence of the absorption band was noticed with the temperature at 65° C. These experiments have been repeated several times and exactly the same results were always obtained the only exception being that in one case the absorption with the white lead appeared at 60° C. instead of 65° C. These results afford clear proof that the white-lead-oil mixture does contain a volatile material which exerts an absorption of ultra-violet light and which may be driven off at a gentle heat (60°—65° C.). Some tests with dry white lead in the same apparatus gave entirely negative results.

In order to meet the criticism that these results do not necessarily concern the trade since the lower limit of 60° C. cannot be said to conform with painting conditions, some very much longer tubes were used, on the assumption that if the emanation be volatile it would be evolved at lower temperatures but more slowly. Wooden boxes were made 3 × 3 inches internal diameter and 6 feet long. Holes were bored in the ends and these were closed with quartz windows. Two of these boxes were used, one being coated with a cream of white lead and oil and the other with a cream of basic sulphate and oil. They were then securely closed and allowed to stand in a warm room for 12 hours. On photographing the spectrum of the cadmium spark after passage through each box in turn, distinct evidence of absorption was obtained in the case of the white lead box but none with the purex. This result in addition to confirming the previous experiments would also prove that the volatile compound is evolved in measurable quantities at ordinary temperatures under ordinary painting conditions.

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* As basic sulphate I employed the article known commercially as Purex, which approximates to $PbSO_4.PbO$.

It may be of some interest to record the fact that the smell of the glass tubes after they had been heated in the above experiments was singularly nauseating and in the case of the tubes containing the white lead the vapours produced certain specific symptoms such as lassitude and severe localized headache followed by diarrhoea.

As a natural consequence of the above results experiments were undertaken to determine whether the volatile substance was a compound of lead. A current of air was passed through a glass tube containing the pigment and oil, and gently heated in the resistance furnace. The air after the passage through the tube was passed into strong warm nitric acid and was tested for lead in the usual way. Comparative tests were made with white lead and basic sulphate and in the earlier experiments distinct evidence seemed to be obtained that there was produced a small quantity of a volatile lead compound in the case of the white lead. More recent experiments did not confirm these results and therefore it was concluded that the lead in the earlier experiments must have been mechanically carried over in the form of carbonate. In order to obtain more definite evidence as to the question of volatile lead compounds about 4 lb. of the stiff paste of white lead and linseed oil were heated in vacuo by an oil bath and the products condensed in a vessel cooled by liquid air. On allowing the temperature of the receiver to rise, a considerable quantity of gas was evolved leaving about 30 c.c. of liquid. This liquid contained a large quantity of water and was tested for lead but no definite evidence of the presence of this metal was obtained. It was found that the gaseous product possessed an indescribably nauseous odour and was undoubtedly poisonous, similar results being produced as those already described. This experiment was repeated with basic lead sulphate but little or no distillate was obtained.

In seeking an explanation of the nature and origin of the volatile emanation from the white lead-oil mixture it occurred to me that whereas basic lead sulphate and zinc white are anhydrous substances, white lead is a hydrated compound and that the emanation might be due to the influence of the combined water, because it may be assumed as a starting point that one of the first steps might be the hydrolysis of the linseed oil. The next series of experiments carried out were exactly similar to the absorption ones described above but substances other than pigments were used. In order, clearly to obtain a record of the absorption given by linseed oil a stiff paste was made by grinding up fine precipitated silica with raw linseed oil and this substance was examined exactly as detailed previously. No absorption was evidenced at all until the temperature reached 90° C. when the same absorption band began to make its appearance. This proves that the zinc white and basic lead sulphate pigments have no action on linseed oil as far as can be detected within the limits of accuracy of this method. The conclusion drawn previously as regards the absorption therefore seems justified.

With the view of testing the theory that the hydration of the lead carbonate molecule is one of the sources of the trouble, a mixture of lead hydroxide and raw linseed oil was next tried and the characteristic smell of white lead paint was developed very shortly after mixing the two substances together. On examination of this mixture by the absorption method in the resistance furnace it was found that the absorption began to be exhibited at 45° C. The mixture therefore evolves the emanation more readily than the white lead mixture itself. The importance of this result from the point of view of the hydration theory is manifest and moreover I noticed that the white mixture of lead hydroxide and oil after a short time turns yellow owing apparently to the oil depriving the hydroxide of its combined water with the formation of lead oxide.

Other substances mixed with oil were also tried as for example manganese dioxide, red lead, and lead peroxide. In each case the same volatile product was obtained also at very low temperatures (about 50° C.). Similarly also it was found that a litharge oil mixture gave the volatile compound though at not so low a temperature as the lead hydroxide-oil mixture. No special care was taken to dry these last four substances, but it would seem a reasonable conclusion that in order to guard against the formation of the poisonous volatile product it is advisable to use neither a pigment that is hydrated such as white lead nor one that is an oxidising agent such as red lead. For this reason it would also appear dangerous to employ driers that act by oxidation.

In connection with these conclusions one may mention the boiling of linseed oil with litharge. My friend, Mr. Young of the Great Northern Railway at Doncaster, was kind enough to give me some of the condensed fumes from the "boiling vessels" and I found that the vapour of this liquid exerted a powerful absorption of light. Moreover it was found that this substance did not contain any lead compound but it did contain considerable quantities of iron. This was no doubt due to the fact that it had been in contact with the metal. I do not necessarily accept the evidence as to the absence of lead as final for it might be argued that the metallic iron had decomposed the lead compound which had originally been present. Apart from this there is undoubtedly present in these condensed fumes very large quantities of the volatile poisonous substance. It is not easy at this stage to explain the action of the litharge unless it be looked upon as a catalytic oxidation process. In support of this I have found that glycerin when heated with litharge gives off not a little carbon dioxide, which would seem to indicate oxidation. More recently some experiments have been carried out with the view of determining the nature of the poisonous volatile compound and it has been found that there is present in the vapours some unsaturated compound of great reducing power, in all probability an aldehyde. Inasmuch as the substance reduces an alkaline ammoniacal silver nitrate solution there is little doubt that it is an aldehyde and its unsaturated character was shown by the readiness with which it was absorbed by bromine water which in the end was decolourised. In the first set of these experiments the same apparatus was used as for the absorption method previously described except that the corks carrying the quartz windows were replaced by corks fitted with short lengths of glass tubing, one of which was connected with an air blast and the other was drawn out to a thin capillary and passed into a test tube containing the silver solution. A slow stream of air was then passed over the various substances and then through the silver solution. The temperature was slowly raised until the silver began to be reduced. The following were tried all mixed with raw linseed oil, silica, zinc white, basic lead sulphate, white lead, lead hydroxide and manganese dioxide, and it was found that reduction of the silver solution was first observed at the same temperature as those at which the absorption had been noticed as detailed above. That is to say manganese dioxide, lead hydroxide, and white lead caused reduction when warmed to 50° C.—60° C., whilst basic lead sulphate, silica, and zinc white did not cause the reduction until 90° C. had been reached.

The effect of mixing the stiff pastes as previously used with more raw linseed oil until they had the consistency of thick cream, caused the reduction to make its appearance at lower temperatures but the same ratio between the various substances was still maintained.

The effect of mixing the paints with turpentine was then tried, the quantities of oil and turpentine being similar to those under ordinary painting conditions. A blank experiment was carried out in which air was passed over turpentine and then through the silver solution in order to determine whether any reducing action might arise from the turpentine itself but no reduction whatsoever occurred. When the same substances as before were mixed with raw oil and turpentine it was found that the volatile substance was even more easily produced than when the raw oil was used alone without turpentine; at the same time however the same ratio between the ease with which the various solids gave the product was preserved. As an instance of the readiness with which the product was obtained, a current of air passed through a one inch tube coated on the inside with white lead mixed with oil and turpentine gave at ordinary temperatures a marked reduction of silver in two hours (while no trace of reduction was obtained with basic lead sulphate under the same conditions). The relative ease with which the the four materials zinc white, basic lead sulphate, white lead, and lead hydroxide in oil and turpentine give the volatile compound may be perhaps expressed as follows:—

Zinc white or basic lead sulphate	10
White lead	150
Lead hydroxide	250

I cannot claim that the above experiments represent the last word upon the subject but I do feel that as far as they have gone they establish the fact that a poisonous volatile substance is given off paints made with white lead or red lead. It seems to me to be a necessary conclusion that we must recognise the existence of a source of poisoning in connection with painting that is to be differentiated from lead poisoning proper. The symptoms described in the earlier portion of this paper were experienced by me both with the vapours from white lead and also from the manganese dioxide and oil mixture so that it would seem impossible to attribute them to lead poisoning. These symptoms, my experiments show, are doubtless due to the evolution of unsaturated aldehydes and these are given off by any paint containing oxidising agents, white lead or red lead. The cases of poisoning which have been noted amongst people inhabiting rooms freshly painted with white lead would seem therefore to be due to these unsaturated aldehydes, and not to be true lead poisoning.

It is perfectly possible to minimise the amount of this poison by utilising either basic lead sulphate or zinc white and by using as little drier as possible; I say this with the more confidence because of the white paints, white lead was the only one that gave at ordinary temperatures a measureable amount of the aldehyde in my experiments. For this reason the conclusion must be drawn that danger attends the use of white lead paints.

The same must be said of red lead for it seems that the poisonous volatile compound is even more readily given off by this substance.

The experiments are being continued and I hope to be able shortly to communicate some further results to the Society.

Discussion.

The Chairman said that Professor Baly had emphasized the importance of the hydroxide group in these paints. The same toxic results were obtained with the unhydrated manganese dioxide; if the hydroxide group were so important, how was it that the same results were obtained in the absence of the hydroxide group.

Dr. A. Rule asked if the poisoning effect only occurred in the case of white lead, because other lead compounds were used as pigments—for instance, chrome yellow. Presumably this would have an oxidising action on oil, and be comparable with manganese dioxide. Had any other experiments been carried out, for example, treating higher alcohols with white lead in order to ascertain if an aldehyde were formed?

Professor R. Buchanan said that one point which had interested him very much, was that the emanations from paint produced diarrhœa, while the effects of lead itself were to produce colic and constipation so that he had felt that the first symptom must have been due to something other than lead. Might not lead palsy also be due to, or aggravated by, the inhalation of the aldehyde emanations, as is seen in the more profound action of alcohol and metallic poisons combined, in contrast to their assimilation alone?

Mr. W. R. Hardwick asked whether Professor Baly had done anything with oils other than linseed. Linseed oil stood pre-eminently as a drying oil, and he would like to know whether this tendency to dry had much to do with the toxicity, or whether the oils which did not so readily dry would have a similar effect.

Mr. Morris said, as regards the use of dryers, it was necessary for the paint to dry quickly. How could they get away from the commercial aspect of the case by using less dryers or none at all?

Professor Baly said in reply to Mr. Carey that he did not think that the manganese dioxide contained any water, but of course it might have been a little damp. Two reactions took place, viz., oxidation and hydrolysis, and it did not seem to him to matter much which took place first. If moisture and an oxidising agent were present it was to be expected that both the reactions would take place at the same time. In reply to Dr. Rule, he had not experimented with chrome yellow: in fact, a dealer had told him that lead chromate was not used nowadays. As regards the action of higher alcohols he had not made any experiments beyond the observations that lead oxide (litharge) and glycerin when heated together gave off carbon dioxide. He understood that a subcutaneous injection of the condensed emanation in an animal had not produced any result. He believed in some of the cases of poisoning traceable to these emanations certain kidney troubles had manifested themselves. No doubt lead poisoning presented a difficulty to medical men. It was well known that certain symptoms were developed in workmen who boiled linseed oil with litharge. Those symptoms had been described as 'lead poisoning," but a most careful investigation of some of the condensed fumes from the process showed that they contained no lead at all. In reply to Mr. Hardwick no experiments had been done with other oils. If it were required to reduce the aldehydes to a minimum white lead and dryers should not be used. Judging from his experiments the effect with basic lead sulphate or zinc white was so small as to be negligible; he had only investigated the problem from a scientific point of view.

London Section.

Meeting held at Burlington House on Monday, May 6th, 1912.

MR. E. GRANT HOOPER IN THE CHAIR.

INDIA RUBBER AS A PROTECTIVE COLLOID. THE FORMATION OF COLLOIDAL METALLIC SULPHIDES IN RUBBER SOLUTIONS.

BY EDWARD W. LEWIS, A.C.G.I., AND H. WAUMSLEY, A.C.G.I.

It was found, in the course of some manufacturing operations, that when certain solutions of technically pure rubber, in commercial 90 per cent. benzol, remained in contact with metallic lead, the colour of the solution began to darken, the darkening taking place first of all close to the surface of the lead, but afterwards slowly diffusing throughout the greater part of the solution. In cases where strips of lead were totally immersed in the solution the colouration did not spread upwards above the level of the metal, although horizontal diffusion appeared to be complete. Our experiments were directed mainly towards ascertaining the conditions under which this darkening occurred. It was found that when highly-purified benzol (free from carbon bisulphide) was employed as solvent, instead of the commercial article, no such change occurred, and it therefore became highly probable that the carbon bisulphide normally present in 90 per cent. benzol, was the active agent concerned. Subsequent experiments confirmed this view. The addition of small quantities of carbon bisulphide to solutions in pure benzol at once started the change, whilst when benzol was eliminated altogether and a strip of lead was immersed in a solution of rubber in carbon bisulphide, the production of colour was hastened.

It occurred to us that the deeply coloured solution obtained—which shows some opalescence by reflected light—might be a colloidal solution of lead sulphide formed under the protective influence of the colloid rubber, and we put this forward as a tentative explanation. Ultramicroscopic examination of a dilute solution confirmed this idea, the particles which presumably constituted the disperse phase being clearly visible; Brownian movement of the particles was not detected with absolute certainty, ut it was thought that a limited and sluggish motion could e discerned. This was to be expected on account of the elatively high viscosity of the solution.

Reactions of the solution.—Concentrated hydrochloric cid discharges the colour of the solution, the lead being resumably converted into chloride. Hydrogen sulphide s given off when the black rubber, obtained by evaporating he solution, is left in contact with concentrated hydrohloric acid at ordinary temperature.

The addition of iodine to the dark brown solution brought about a change of colour to yellow. A good deal of the lead iodide formed was coagulated and fell as a precipitate to the bottom of the tube, but some remained n solution forming a yellow, slightly opalescent liquid. Vulcanisation of a fairly concentrated solution, which had become very dark in colour, by means of a solution of sulphur chloride in carbon bisulphide, discharged the colour, a cream-coloured, opalescent jelly being produced. When a layer of ammonium sulphide solution was poured on top of this jelly, and the tube allowed to stand, the mass slowly became black from the top downwards.

When, by the addition of acetone or alcohol to a solution, the rubber was precipitated, the whole of the colour was carried down with it; on again dissolving the rubber in benzol a coloured solution was formed. It was thought that it might be possible to effect a precipitation of the lead sulphide, without at the same time precipitating the rubber, by exposing a solution to the *a*-rays from radium. Dr. Willows kindly undertook to investigate this point, but although an exposure of 24 hours was given, no precipitation took place.

The opportunity of studying these changes fully in a quantitative sense has not occurred, but the examination of the behaviour of six series, each consisting of three solutions containing respectively 2·0, 1·0, and 0·5 per cent. of rubber, in contact with metallic lead, has given results from which we have drawn the conclusions enumerated below.

In the course of our experiments the interesting fact was established that the addition of small quantities of alcohol to the benzol solutions containing carbon bisulphide hastened the production of colour, and, accordingly, certain of the solutions examined contained alcohol.

In three series the proportion of carbon bisulphide was kept constant at 1 per cent., in two series it was 1·0, 0·5, and 0·25 per cent. in the three solutions, and in one series it was the only other constituent of the solutions besides rubber. The alcohol was constant at 0·4 per cent. in one series, in two series it was 0·4, 0·2, and 0·1 per cent., and in the remaining three it was absent. Purified benzol constituted the bulk of the solvent in every series but one, viz., that in which only carbon bisulphide and rubber were present.

We do not propose to describe the result of each experiment, but, summarised broadly, the results went to show:—

1. That the production of colour is most marked in the case of the solutions containing 2 per cent. of rubber;

2. That the production of colour is more marked at the higher concentrations of carbon bisulphide than at the lower;

3. That the addition of alcohol in increasing quantity increasingly favours the production of colour;

4. That at concentrations of 0·5 per cent. of rubber the production of colour practically ceases.

In the absence of rubber no such production of colour takes place.

The question naturally arose as to whether a similar reaction was to be observed with metals other than lead. Only two other metals, viz., copper and mercury, have been found to exhibit a similar behaviour under like conditions. In the case of copper the production of colour is very much slower than in the case of lead, but the general features of the change are quite similar. In the case of mercury the colouration of the solution is only visible in the immediate neighbourhood of the metal, whilst a small amount of a black precipitate slowly forms on its surface; the whole change proceeds with extreme slowness.

Certain compounds of the metals, such as litharge, for example, also give highly coloured solutions under similar conditions.

The question of impurities in the carbon bisulphide has been considered, but, in experiments carried out with commercially pure bisulphide, further purified by distillation over metallic lead, mercury, and litharge (*c.f.* Esch and Balla, Chem.-Zeit., 1904, 28, 595; see this J., 1904, 761), the discolouration of the rubber solution took place with equal readiness.

It would appear that other colloids have also the property of bringing about a similar change, for when a strip of lead was immersed in an acetone solution of celluloid containing a little carbon bisulphide an exactly similar darkening of the solution occurred, although more slowly than in the case of a rubber solution.

In conclusion, we wish to thank Mr. Emil Hatschek for the interest he has shown in this work and for suggestions made by him from time to time.

Discussion.

Mr. E. **Hatschek** said this was the first case he knew of a colloidal lead sulphide solution in an organic solvent, and it was also the first case of rubber acting as a protective colloid: which meant that the metal went to a very slight extent only into colloidal solution in the absence of rubber, whereas it did so fairly rapidly in the presence of rubber. The fact that lead, copper, and, to a slight extent, mercury also showed the effect, was strangely paralleled by the behaviour of those three metals in contact with water: lead went directly into colloidal solution on contact with distilled water if air were excluded; but if air were admitted it was at once transformed into a hydroxide; copper did the same; and the parallel seemed to him to be striking. It was practically impossible to get the lead sulphide out of the benzol rubber solution. In an aqueous solution of those compounds, it was easy to precipitate it by the addition of an electrolyte; but it was impossible to dissolve an electrolyte in this solution, or, if it was done, it could not be dissociated. The method mentioned by the author of exposing it to the alpha rays might possibly be effective if prolonged. In any case, this represented about the most stable colloidal solution of which they had any knowledge—far more so than those protected with substances as unstable as gelatin. From the technical point of view, it showed how they might be lured into false security in using lead.

The **Chairman** asked whether the authors had tried to induce coagulation by heating the substance under a reflux condenser, so as to take it to as high a temperature as the solution permitted. It would be interesting to know if this sulphide coagulated in that way—as in many cases heat brought about the aggregation of a finely-divided insoluble suspended under conditions which approached those of colloidal solutions.

Mr. W. F. **Reid** said the phenomenon described was familiar to those who had to deal with linseed oil. As was well known, the usual driers added to the ordinary boiled oil were lead salts; but, if the oil were adulterated with another oil containing sulphur there was obtained, on boiling, a black solution similar to the samples shown by the authors. If allowed to stand, and if the oil were pretty thick, it would remain in that condition for months. If, on the other hand, the oil were not thick, there would be a precipitate of almost pure sulphide of lead. If the solution just as it was were used for a paint or a varnish practically no colour appeared in the paint or the varnish film which remained, only lead sulphate. As a rule, few people had the courage to use oil of that colour, nearly black, to mix with light coloured paint, but the only difference was that there was a small addition of sulphur, derived from the oils of the *Cruciferae*, such as mustard oils or rape oils, which darkened the oil at once. He had kept such oil four or five years enclosed in a bottle, and it did not clear at all. If the oil were thick, it did not even precipitate. This was a simple case of colloid, as in the case of indiarubber; and the greater effect in the case of indiarubber was probably due to the greater viscosity of that substance. A very small percentage of rubber in solution would make it so viscid that not only lead sulphide, but any other substance, remained in suspension for an almost indefinite period.

Mr. **Dreaper** said that when Mr. Hatschek referred to this as quite the most stable solution he had met with, he would like to draw attention to Faraday's solution of gold (gold sol.), which was still in existence in the Royal Institution, and apparently as good as ever it was.

Mr. E. W. **Lewis**, in reply, said the effect of heat on this reaction had been tried, without signs of coagulation. Using not only naphtha, but also nitrobenzene and pyridine, there were still no signs of coagulation. The case was not quite on all fours with the case of linseed oil quoted by Mr. Reid, because in one of the solutions shown one had carbon bisulphide and metallic lead in presence of a trace of rubber, and the conditions were exceedingly mild. The ease with which such solutions were formed was very striking. Some of the solutions shown were very dilute, and their viscosity was low compared with an oil like linseed oil.

Manchester Section.

Meeting held at the Grand Hotel on Friday, May 3rd, 1912.

DR. G. J. FOWLER IN THE CHAIR.

THE PRODUCTION OF BROMOIL PRINTS.

BY W. F. A. ERMEN, M.A.

In 1839, Mungo Ponton discovered that paper, impregnated with potassium bichromate, turns brown on exposure to light, and that the brown product is insoluble in water, whilst the bichromate is readily washed out of the unexposed portions. Becquerel in 1840 showed that the action was due to the presence of size in the paper, and not as Ponton had supposed, to a liberation of chromic acid. In 1853, Poitevin described a process in which a metal plate was coated with gelatin, impregnated with potassium bichromate, and after exposure to light behind a negative, the unexposed gelatin was washed away in warm water. The plate was then treated with an etching solution, the insoluble gelatin protecting the underlying portions, and thus producing an image in relief.

Poitevin also discovered that bichromated gelatin, if immersed in cold water after exposure to light behind a negative, would take up greasy ink only on the exposed portions, whereas the unexposed portions repelled the ink. E. J. Asser in 1859 produced photographic prints by applying printer's ink to the surface of paper coated with bichromated gelatin, which had been soaked in water after having been exposed to light behind a negative. The process did not find much favour, however, until it was revived by Rawlins in 1904, by the publication of an article in the Amateur Photographer. His description aroused great interest amongst pictorial photographers, and "Oil Printing" was taken up enthusiastically, particularly by Demachy and Puyo, the leaders of the French School of pictorialists, who have brought the technique to a high state of perfection. Since bichromated gelatin is comparatively insensitive to light, prints can only be made by this method by exposure to daylight. Consequently prints can only be made of the same size as the negative.

In 1898 Manly took out his "Ozotype" patent, which was subsequently developed into the Ozobrome process. This process is based on the discovery that gelatin becomes insoluble in the presence of bichromate, not only through exposure to light, but also if the bichromate is suitably reduced to the chromous state by purely chemical means. Paper, coated with a layer of pigmented gelatin, is impregnated with a solution consisting essentially of potassium bichromate, ferricyanide, and bromide, and then pressed into close contact with a bromide print, in which the image is composed of metallic silver. In about ten minutes the silver image has become oxidized, mainly to silver bromide, whilst the bichromate in the adjace layers of pigmented gelatin has been reduced, and h rendered the gelatin insoluble. The two sheets of pap are pulled apart, and the pigmented gelatin sheet is presse into contact with a sheet of prepared white paper. Th two sheets, still in contact, are immersed in hot wate when the paper originally carrying the pigmented lay floats off, together with all the gelatin which has n become insoluble, leaving behind a picture, the replica the original bromide print, in pigmented gelatin.

In 1907, Welborne Piper showed that the gelatin lay in which the silver image of the bromide print is imbedde can, by a modification of the Ozobrome treatment, itse be made locally insoluble, and that after this treatmen it will take up greasy inks in the same way as does bichromated gelatin print after exposure to light. Whe the bromide print is immersed in a solution containin potassium bichromate, ferricyanide, and bromide, wit the addition of a certain proportion of potash alum an citric acid, the black silver image is rapidly bleached to buff or brown tone; it is washed, and transferred to bath containing 50 c.c. of sulphuric acid per litre. Th colour of the image gradually changes to a sage green the precise depth and shade of this varying wit different brands of paper. After five minutes in the aci bath, the paper is well washed, and transferred to a 10 pe cent. solution of sodium thiosulphate, to which a littl sodium sulphite has been added, to prevent decompositio of the thiosulphate by any sulphuric acid still retaine by the paper. In the thiosulphate bath the colour of th residual image alters again, usually to a yellower tone and with some brands of paper almost disappears. Th paper is now ready for the application of the fatty ink, which is applied with a flat ended brush, to the surfac of the wet print, from which all drops of water have bee removed by blotting paper. The colour of the residua image is liable to interfere seriously with the tone of the ink applied above it; in fact, it often destroys all the beauty of the picture. In order to avoid this disturbing element, I tried to find a mode of procedure that would yield a satisfactory gelatin surface without leaving a coloured residual image. My investigations pointed to the fact that the ferricyanide was the cause of the trouble, and after many trials I have succeeded in finding a satisfactory substitute in the shape of cupric bromide.

The bromide print is immersed in a solution containing 50 grms. of cupric bromide and 1 grm. of potassium bichromate per litre. The image bleaches rapidly to a pale sage green. After rinsing in water, the paper is treated for three minutes with a 10 per cent. solution of sodium thiosulphate and well washed. The image at this stage is a pale greenish grey, and if this colour is not considered detrimental, pigmenting may be undertaken at once. If it is desirable to remove all trace of colour from the image, the print is well washed, and then immersed in a solution containing 50 c.c. of sulphuric acid and 2 grms. of thiourea per litre. After the acid has been washed out, the print is laid face upwards on several sheets of wet blotting paper, surface dried, and inked up in the usual manner.

THE ACTION OF OXALIC ACID ON CELLULOSE.

Cellulose oxalic acid ester.

BY J. F. BRIGGS.

The author had occasion to examine a number of bleached linen cloths on which a solution of oxalic acid had accidentally been spilled. The cloths had lain in warehouse for a considerable time, certainly over a year, before the accident was noticed, and when opened for sale were found to be badly damaged by the action of the acid. The fault took the form of a central patch or zone absolutely reduced to friable hydrocellulose, the damage extending not only in a horizontal direction, but also vertically through several folds of cloth with gradually decreasing intensity until the sound fabric was reached.

The tender portions of the cloth reduced Fehling's solution slightly, and gave a strong acid reaction with methyl orange. On extraction with water, oxalic acid was dissolved and readily identified. So far the conclusions to be drawn are simple and obvious:—Oxalic acid is capable of attacking cellulose profoundly, even at the ordinary temperature, given a sufficient length of time; this attack is similar to that of the mineral acids, with the production of hydrocellulose.

These observations would possess only a general interest were it not for the exceptional characters presented by one of the cloths of the same series. This particular cloth at first appeared like the others: the disintegration of the fibre was profound and the tender portions reacted strongly when touched with methyl orange. But on extraction with water no acid of any kind was obtained, the extract was quite neutral and free from oxalates, whilst the cellulose still showed an acid reaction with methyl orange. The cellulose had therefore become converted into an insoluble acid of very pronounced type, with properties such as might be expected in the case of the acid cellulose ester of a dibasic acid.

This assumption was proved to be correct. When portions of the tender fabric were boiled with 1 per cent. sodium hydroxide solution, the liquid became deeply coloured owing to the decomposition of the hydrocellulose, and when tested gave an appreciable precipitate of calcium oxalate.

In investigating the action of oxalic acid at the ordinary temperature on cellulose in presence of dextrin, Knecht (7th Internat. Cong. Appl. Chem., London, 1909) failed to obtain an oxalic ester of the cellulose. He found only evidence of a formic ester, and concluded that the oxalic acid had been decomposed in the fibre with production of formic acid. In Knecht's experiments the cloth was not tendered.

It seemed desirable, therefore, to ascertain under what conditions the acid oxalic ester could have been formed in the cloth in which it was discovered, and the result was readily reproduced by the action of a moderate heat.

Pure bleached cotton cloth was saturated with a solution of oxalic acid, squeezed and dried in the air: it was then heated in the dry state for several hours at various temperatures in a steam-jacketed oven. The conditions were similar to those prescribed by Girard for the preparation of hydrocellulose by the action of sulphuric acid.

Experiment I.—Three pieces of cloth were steeped in a 5 per cent. solution of crystallised oxalic acid, squeezed all together and then allowed to dry in the air. The air-dry weights were noted and one piece was titrated in presence of phenolphthalein to ascertain the proportion of oxalic acid in the cloth; the hygroscopic moisture was calculated by difference:

	No. 1.	No. 2.	No. 3.
	grms.	grms.	grms.
Dry cellulose	4·871	4·659	4·595
Oxalic acid as— $C_2H_2O_4.2H_2O$	0·233 (det.)	0·229 (calc.)	0·229 (calc.)
Hygroscopic moisture by difference	0·371	0·355	0·350
Total air dry weight ..	5·475	5·243	5·174

Cutting No. 2 was then heated for 30 hours at a temperature of 45°—50° C.; No. 3 was kept at the ordinary temperature as a control. The two cloths were each treated with 100 c.c. of water and 25 c.c. of the extract were drawn off for titration.

	No. 2.	No. 3.
	grms.	grms.
$C_2H_2O_4.2H_2O$ found in 100 c.c. ...	0·156	0·211

Difference = oxalic acid disappearing on heating = 0·055 grms.

Both cloths were next steeped in a dilute solution of sodium acetate, and thoroughly washed side by side in the same vessel with twelve changes of distilled water, squeezing at every change. After drying, the cloths were incinerated at a low temperature and the alkalinity of the ash was titrated:

	No. 2.	No. 3.
	c.c.	c.c.
Alkalinity of ash, c.c. $N/10$	5·0	1·2

Difference = 3·8 c.c. = combined Na. in No. 2.

Combined oxalic acid ($Na = C_2H_2O_4.2H_2O$) = 0·048 grm. = 1 per cent. on the cellulose.

Experiment II.—Two pieces of cotton cloth were steeped in a 10 per cent. solution of oxalic acid, squeezed and dried in the air. No. 1 was heated at 45°—50° C. for 36 hours. The oxalic acid disappearing during heating was calculated in the manner above indicated by comparison with the control.

	No. 1.	No. 2.
	grms.	grms.
Dry cellulose	7·094	7·561
$C_2H_2O_4.2H_2O$ present (calc.)	0·637	0·638
Ditto in 100 c.c. of extract ...	0·421	0·627

Difference = oxalic acid disappearing during heating = 0·206 grm.

These two cloths were then exhaustively washed together, this time without conversion into the sodium salt. The heated cloth showed a slight tendency to progressive hydrolysis of the ester during washing, which was corrected by performing the last three washes with 93 per cent. alcohol.

The cloths were dried in the air and then titrated in presence of phenolphthalein and a large excess of water:

	No. 1.	No. 2.
c.c. of $N/10$ alkali consumed in titration	14·3	0·1

Difference × 2 = combined oxalic acid = 14·2 × 2 × 0·0063 grm. = 0·180 grm. as $C_2H_2O_4.2H_2O$ = 2·3 per cent. on the cellulose

The heated cloth, now neutralised, was thoroughly washed and then heated on the water-bath with 5 times its weight of 1 per cent. sodium hydroxide solution for one hour. The oxalic acid in the extract was precipitated in presence of ammonia by means of calcium chloride; the oxalate was filtered off, redissolved to separate it from humus matter, and reprecipitated in presence of acetic acid: CaO found = 0·055 grm. = 0·123 grm. of $C_2H_2O_4.2H_2O$ = 1·6 per cent. on the cellulose.

This represents a loss as compared with the titration value, owing either to partial hydrolysis of the ester during titration or to incomplete saponification.

Experiment III.—A piece of cloth weighing 9·603 grms., dry, was saturated as in Experiment II., with a 10 per cent. solution of oxalic acid, squeezed, dried and then heated for 24 hours at 95° C. The oxalic acid disappearing during heating was 0·554 grm. The cloth was treated with sodium acetate and thoroughly washed. The combined oxalic acid was determined gravimetrically after saponification with 1 per cent. sodium hydroxide solution for 2 hours: CaO found = 0·160 grm. = 0·360 grm. of $C_2H_2O_4.2H_2O$ = 3·7 per cent. on the cellulose.

Experiment IV.—It was desirable to attempt to obtain a maximum fixation of oxalic acid by adopting extreme conditions. Twenty grms. of crystallised oxalic acid were moistened with 5 c.c. of water and fused in a dish over a flame. Strips of cotton cloth were dipped in the fused acid and withdrawn. These strips were quite hard and thoroughly coated with a deposit of the fused acid. The cloth was then heated at 95° C. for four days at the end of which time the hard crust of oxalic acid had almost entirely volatilised, whilst the cellulose was grey in colour and very tender. The heated strips were steeped in sodium acetate and thoroughly washed; by the time the washing was completed, the fabric had become very friable and disintegrated. The combined oxalic acid was determined after saponification as before. Weight of hydrocellulose sodium oxalate taken 3·473 grms. CaO found = 0·099 grm. = 0·223 grm. of $C_2H_2O_4.2H_2O$ = 6·4 per cent. of oxalic acid in the air-dry substance.

The above experiments show that oxalic acid, when heated in the dry state with cellulose, even at moderate temperatures, combines with it in small proportions and at the same time converts it into hydrocellulose. The cellulose oxalic acid ester, especially when appreciable proportions of oxalic acid are combined, shows a slight tendency to hydrolyse slowly during washing, but the sodium salt can be washed easily in the ordinary way. The product, even in the form of a sodium salt has a strong affinity for basic dyestuffs, the dye base being fixed on the fibre apparently in the form of a double oxalate.

The production of a cellulose formate under the conditions adopted appears improbable. In Experiment No. I. the actual loss of oxalic acid during heating is very small, whilst in Experiment III. at the higher temperature, it is probable that if a portion of the oxalic acid were decomposed into formic acid, the latter would be volatilised. In Experiment IV. the formation of a sublimate showed that under these conditions oxalic acid is largely volatile as such. It would be extremely difficult to estimate a small quantity of cellulose formate in presence of hydrocellulose and oxalic acid, since the hydrocellulose itself must be expected to yield formic acid when decomposed by sodium hydroxide, whilst the oxalic acid might yield it during distillation. This side of the question was therefore investigated indirectly, by generating formic acid on the fibre:—Cotton cloth was saturated with a 10 per cent. solution of oxalic acid in 30 per cent. aqueous glycerin, squeezed, dried and heated at 90° C. for 24 hours. At the end of this time the acid had almost disappeared; the cloth was only very slightly tendered, it showed no special affinity for basic dyestuffs, and did not reduce Fehling's solution perceptibly, whereas a cellulose formate might be expected to show strong reducing properties in virtue of its formyl residue.

The author has not been able to prepare the oxalic acid ester of cellulose without a proportional conversion into hydrocellulose, and this fact, in conjunction with the small proportion of acid entering into combination even under extreme conditions, suggests that the reaction may take place not with the ordinary alcoholic hydroxyls of the cellulose itself, but with a radical only made available by the hydrolysis of the cellulose complex. Such speculations, however, must be left over for future investigation. The product itself may be found to possess some scientific interest owing to its remarkable avidity for the absorption of bases from dilute solutions of their salts of the weaker acids.

Journal and Patent Literature.

Patent Specifications may be obtained by post by remitting as follows:—

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I.—GENERAL PLANT; MACHINERY.

Surface combustion and its industrial applications. Bone. *See* IIA.

Patents.

Raising and forcing liquids; Method and apparatus for ——. J. Koerver, Krefeld, Germany. Eng. Pat. 17,283, July 28, 1911.

The essential parts of the apparatus are shown in figures 1 and 2. Compressed air enters by the pipe, *a*, (Fig. 2) into the chamber, *b*, and, the slide-valve, *h*, being in the position shown, passes through the passage, *e*, through an external pipe (not shown) to the inlet, *p*, of the forcing vessel. The pressure of the air closes the flap valve, *m* (Fig. 1), and forces the liquid through the flap valve, *r*, and the rising main, *k*, to the upper reservoir. This continues until the level of the liquid has fallen sufficiently to cause the float, *n*, to sink low enough to bring the ball-valve, *o*, on to the seat, *p*. Until this takes place the pressure in the forcing vessels does not rise above that due to the head of liquid in the main, *k*. As soon, however, as the valve, *o*, is closed, the continued working of the compressor causes the pressure in the main above *o*, to increase until it is sufficient, when acting through the passage, *g*, on the upper side of the piston, *i*, to cause the latter to move downwards and alter the position of the slide-valve, *h*; this is assisted and hastened by the over-balance weight, *l*. When this change has taken place, the interior of the pressure vessel is in communication through *e'*, with the exhaust, *d*, which is connected with the suction of the compressor so that the pressure acting on *o*, is relieved and the valve, *r*, is closed by the weight of the column of liquid in *k*. The valve, *m*, opens and a fresh supply of liquid enters the forcing vessel. The valve, *o*, is prevented from rising too far and closing the air main by the check, *q*.—W. H. C.

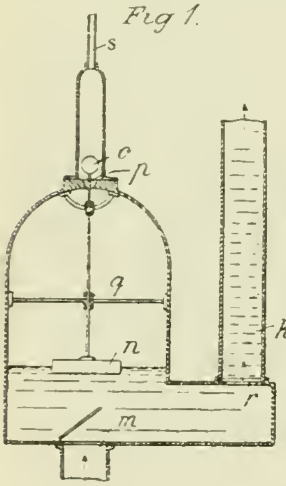


Fig 1.

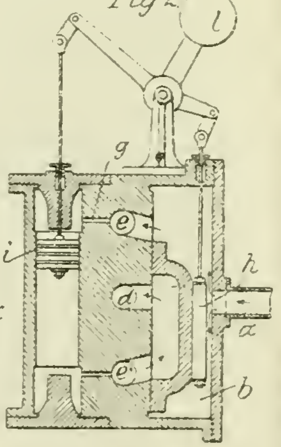


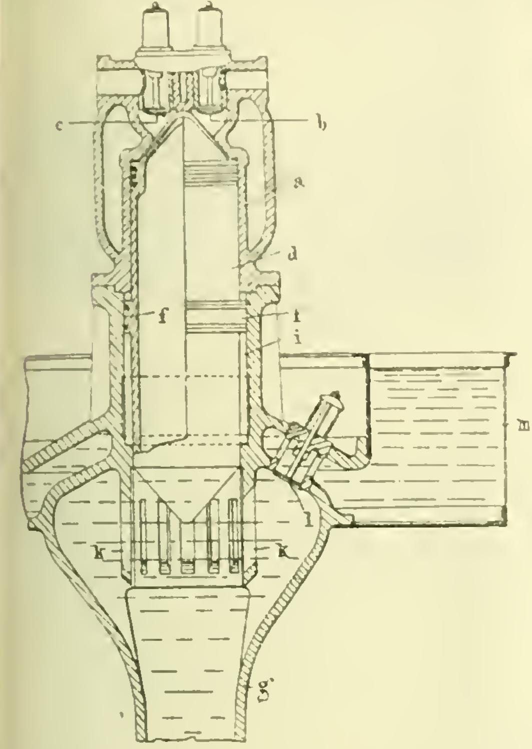
Fig 2.

Drying liquids and apparatus therefor. G. H. Kunick, London. Eng. Pat. 11,980, May 18, 1911.

In systems of drying liquids as a thin film on the surface of rotating, internally heated cylinders, the cylinders dip into shallow troughs into which the liquid to be evaporated is fed from a deep narrow reservoir placed below or behind them and connected by suitable pipes. Scrapers are provided so that not only the whole length but also part of the ends of each cylinder may be utilised.—W. H. C.

Raising and forcing of liquids. Akt.-Ges. Brown, Boveri und Co., Baden, Switzerland. Eng. Pat. 9937, April 24, 1911. Under Int. Conv., May 2, 1910.

The explosion of the mixture of gas and air which enters the explosion chamber, *a*, through the inlet valve, *b*, forces the piston, *d*, downwards and drives the water in *k*, along the delivery main, *g*. The travel of the piston, *d*, is limited by the collar, *f*, which, as the piston moves, compresses the air in the annular space, *i*, until it pulls up the piston. The momentum imparted to the column of water in *k*, *g*, causes it to continue its forward motion after *d* has stopped, and, creating a partial vacuum in the chamber, *k*, causes fresh water to enter from the cistern, *m*, through the spring-controlled valve, *l*. When the return movement of the column of water takes place, the piston is forced upwards and drives out the exhaust gases through the valve, c, at the same time compressing



the air in the annular space above the ring, f, until the motion of the piston is again checked. This air then begins to expand again, forcing the piston downwards, drawing in a fresh charge of explosive gas through the inlet valve, b, and imparting a second forward movement to the column of water in g. When this forward movement is reversed, the piston is forced upwards again by the returning column of water and the charge of gas is compressed ready for the next explosion.—W. H. C.

Evaporating apparatus. N. H. Hiller, Carbondale, Pa. U.S. Pat. 1,024,576, April 30, 1912.

The vapour given off in the primary evaporator is utilised in a power generator, the heated exhaust from which serves to evaporate a liquid of lower boiling point in a second evaporator. The vapour from the second evaporator is utilised in the generator of an absorption refrigerating apparatus. The primary evaporator is connected through reducing valves with the secondary evaporator and the generator of the refrigerating apparatus. The warm condensed liquids are passed through a heat exchanger where they are cooled, and the liquid for feeding the primary evaporator is heated. The cooled condensed liquids are then conveyed to a " re-boiler."—W. H. C.

Evaporating and drying apparatus. H. Kayser. Fr. Pat. 437,302, Oct. 30, 1911.

The apparatus comprises a closed casing containing a series of horizontal or inclined hollow plates heated by the passage through them of a solution of caustic soda and calcium chloride (Honigmann's solution). The substance to be dried, or solution to be evaporated, is placed on or allowed to flow over the hollow plates and the solid material or the residue of evaporation is stirred by means of scrapers. The steam which is formed within the casing passes by its own pressure through suitable inlet pipes into the interior of the hollow plates, and is condensed in the solution, which is at a higher temperature, thus helping to maintain the temperature In a modification, the steam if impure, is condensed in a separate apparatus, the heat serving to generate pure water vapour which is led into the heating solution in the hollow plates. The material to be dried may pass from one heating plate to a second plate beneath it, or it may be taken from the lower end of the plate by a screw conveyor to the discharge orifice. The apparatus may be used for evaporating brine, the plates being heated by steam under pressure. In order to obtain large crystals, the salt first deposited is drawn back by the scrapers into the current of boiling brine.—A. T. L.

Evaporator for liquids ; Continuous ——. F. de Larderel et Cie. Fr. Pat. 437,788, Dec. 18, 1911. Under Int Conv., Dec. 31, 1910.

The claim is for a tubular evaporator the tubes of which have continuous spiral flanges or gills. The spiral flange is attached to each tube at intervals only, so that the liquid flowing down is able to reach all parts of the vertical tubes.—W. H. C.

Vapourisation, heating or cooling of inspissable liquids ; Process for the ——. O. F. Brandt. Fr. Pat. 437,997. Dec. 22, 1911. Under Int. Conv., July 21 Dec. 5, 1911.

The claim is for the application of an apparatus similar to a water-tube boiler and consisting of an upper cylindrical casing covered at each end with an inclined tubular heater, to the vapourisation of liquids which tend to thicken on evaporation. The liquid is maintained level with the upper end of the inclined vessel and steam or other suitable heating medium is passed through the jacket. The heating causes the liquid to become specifically lighter and also causes the formation of bubbles of vapour which also tends to reduce the specific gravity. In this way a circulation is set up and the bubbles of froth rise up into the upper vessel where the bubbles break and the vapour passes away to the condenser, the concentrated liquid flowing back through the other connection to the lowest point of the tubes. A pocket, formed at this point, serves to retain any deposited solids.—W. H. C.

Evaporating apparatus. W. Kathol. Ger. Pat. 244,559, Jan. 29, 1911.

The evaporator has a main heating chamber with vertical tubes and below this a narrower tall auxiliary heating chamber also with vertical tubes. The central wide return tube of the main heating chamber is prolonged downwards, tapering at first and then forming the central return tube of the auxiliary heating chamber.—A. S.

Refrigerating machines ; Method of treating ——. W. A. Byerly, Bridgewater, Va., Assignor to Champion Ice Machine Co., Springfield, Ill. U.S. Pat. 1,025,561, May 7, 1912.

The treatment consists in introducing finely divided graphite into a refrigerating machine working with sulphur dioxide as the refrigerating agent, so as to produce a coating of graphite on the walls of the ducts traversed by the gas. —H. H.

Liquids and gases ; Apparatus for bringing —— into intimate contact. H. Lelarge. First Addition, dated Feb. 27, 1911, to Fr. Pat. 414,720, April 11, 1910 (this J., 1910, 1191).

The spiral bands wound round the tubes are made non-continuous in order to facilitate the formation of drops. The gas is discharged into a chamber placed above the washer proper, through coiled pipes in order to give it a rotary motion to facilitate the separation of the washing liquid.—W. H. C.

Rectifier for distilling. L. Mitréçé. Fr. Pat. 437,349, Nov. 23, 1911.

The apparatus comprises a spiral metal tube of flattened rectangular cross-section, forming an ascending conduit for the vapours, intertwined with a similar tube forming an ascending conduit for a current of cooling water. In this way the conduit for the vapour is in contact, both on its upper and lower surfaces, with the cooling conduit. The cross-section of the water conduit is about three times the height of that of the vapour conduit.—A. T. L.

Drying by jets of warm air of agglomerated, pulverulent or other materials carried on an endless band; Process and apparatus for the progressive ——. P. Meyer. Fr. Pat. 437,410, Dec. 9, 1911.

Heated compressed air is directed by numerous adjustable jets attached to a main which passes above the upper surface of a travelling band on which the material to be treated is conveyed through a long tunnel-like chamber provided with an inlet and outlet for the material and with a stack near the outlet. The amount of air is increased as the material passes towards the outlet.—W. H. C.

Filtration; Processes for —— and arrangements for carrying them out. Soc. des Etablissements Daubron. Fr. Pat. 437,614. Feb. 22. 1911.

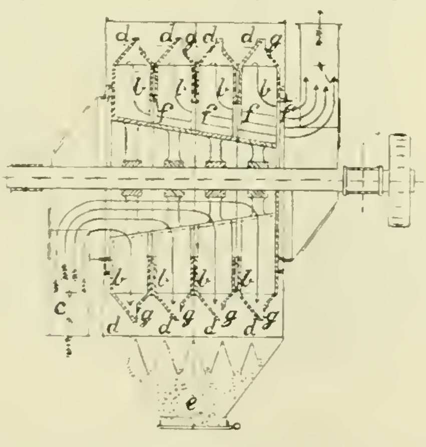
The filter is formed of sleeves or bags of filter cloth pleated or corrugated longitudinally and constricted at intervals at right angles to the corrugations so as to form a series of truncated double cones with radial corrugations. The sleeves are attached to projections from a pipe and are mounted in a chamber into which the liquid to be filtered is fed. The liquid portion passes through the filters and the solids are deposited on the sleeves. The latter are removed by reversing the flow of liquid and shaking or beating the sleeves by movable plates arranged within the casing.—W. H. C.

Filtering or concentrating liquids containing slime or sludge; Apparatus for ——. F. Abt and Brünn-Königsfelder Maschinenfabr. der Maschinen- und Waggonbau-Fabriks-A.-G. Simmering, vorm. H. D. Schmid. Ger. Pat. 244,878, Jan. 14, 1911.

The filter-element is provided on its surface with a layer of filtering material in the usual manner, through which the liquid is drawn by suction, the solids being subsequently removed from the filtering material by means of compressed air. In order to reduce the volume of the interior of the filter-element, and so increase the efficiency of the suction and pressure respectively, a closed tube or pipe extends downwards from the cover inside the filter element, so as to leave a narrow space at the sides and at the bottom. The pipes leading to the suction device and to the supply of compressed air pass through this pipe and open into the space at the bottom between it and the bottom of the filter-element.—A. S.

Gases; Centrifugal machine for the separation of solids or liquids from ——. Maschinenfabr. Buckau A.-G. zu Magdeburg. Ger. Pat. 244,319, April 8, 1911.

The gas enters the apparatus at *c*, and passes through the compartments, *b*, and out through the exits, *f*. The solid or liquid particles are projected by the centrifugal force, through the openings, *d*, into the collecting chamber, *e*. The openings, *d*, are closed by plates, *g*, connected by means of angle-pieces to the walls of the compartments, *b*. These plates are fixed perpendicularly to the axis of the machine, so as not to be affected by the centrifugal force, and are so thin that they offer no considerable resistance to the outward passage of the separated particles into the collecting chamber, but close the openings, *d*, in the event of a slight accumulation of pressure in the collecting chamber. The closing plates are preferably composed of a number of short overlapping pieces forming together an annular closure.—A. S.



Melting pot. E. Langguth. Ger. Pat. 244,535, March 23, 1911.

In a melting pot of the type in which a partition reaching nearly to the bottom divides the pot into a main melting chamber and an auxiliary chamber provided with an overflow for the discharge of the melted material, the claims are for giving the partition the same curvature and form as the remainder of the wall of the main melting chamber, and giving the outer wall of the auxiliary chamber such a form and curvature that it passes smoothly into the wall of the main chamber.—A. S.

Liquors from residues obtained in chemical processes, especially in the potash industry; Apparatus for separating ——. Gebr. Burgdorf. Ger. Pat. 244,537, May 20, 1911.

The apparatus consists of an annular pan or trough which is rotated continuously and is divided by a perforated partition into upper and lower chambers, the latter being subdivided into compartments. From the bottom of the trough tubes lead to a cock disposed in the axis around which the trough rotates. The passage way of the cock is divided into two chambers, one serving for the discharge of the liquor and the other for the washing liquid. The liquor is preferably withdrawn from the residue by means of suction. The rotation of the trough causes the residue, after removal of the liquor, to be automatically and continuously discharged by means of a fixed scoop projecting into the trough.—A. S.

Separating substances by elutriation. G. B. Schwerin, Frankfort on Maine, Germany. Eng. Pat. 27,920, Dec. 12, 1911. Under Int. Conv., Jan. 25, 1911. Addition to Eng. Pat. 2379 of 1911, dated Jan. 31, 1910.

See Ger. Pat. 241,177 of 1911; this J., 1912, 112.—T. F. B.

Separation; Process of centrifugal ——. J. E. Hatton and J. P. Sala, Habana, Cuba. U.S. Pat. 1,025,059, April 30, 1912.

See Fr. Pat. 427,090 of 1911; this J., 1911, 1101.—T. F. B.

Raising liquids by compressed air; Apparatus for ——. P. Kestner, Lille, France. U.S. Pat. 1,025,699, May 7, 1912.

See Eng. Pat. 21,737 of 1909; this J., 1910, 405.—T. F. B.

Storing inflammable liquids; Device for safely ——. C. Martini, Assignor to Martini und Hüneke Maschinenbau-A.-G., Berlin. U.S. Pat. 1,025,758, May 7, 1912.

See Eng. Pat. 1941 of 1912; this J., 1912, 422.—T. F. B.

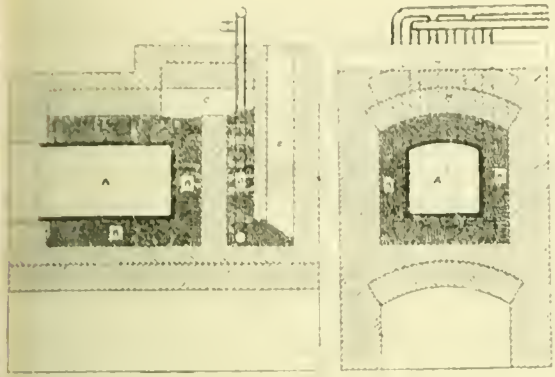
Desiccation of liquid substances; Apparatus for the ——. The Griscom-Spencer Co. Fr. Pat. 437,548, Oct. 25, 1911.

See U.S. Pat. 1,011,993 of 1911; this J., 1912, 62.—T. F. B.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Surface combustion and its industrial applications. W. A. Bone. J. Gas Lighting, 1912, 118, 432—434. (See also this J., 1911, 527, and 1912, 61.)

The application of surface combustion has been extended to the heating of muffle furnaces and domestic water-heaters. A new type of diaphragm has also been produced, for which it is not necessary to have compressed air, as it works on the injector principle with coal gas at a pressure of 2 lb. per square inch. With a crucible furnace on this system heated by ordinary coal gas and air, an alundum crucible containing a Seger cone No. 39 (1880° C.) was completely melted down in a few minutes, showing that a temperature of about 2000° C. is obtained. The great efficiency of the heating process for muffles is shown by the following table, referring to a muffle 9½ in. by 5¼ in. by 3¼ in. With the highest muffle temperatures there was no appearance of flame at the top of the furnace.



Temperature in middle of muffle.		Gas consumption to maintain temp. constant. cb. ft. per hour at 15° C.	Temperature of products.	
C.	Fahr.		C.	Fahr.
815°	1449°	21·0	540°	1004°
1004°	1840°	35·3	645°	1195°
1205°	2201°	58·0	870°	1598°
1424°	2596°	79·0	1085°	1985°

Mean net calorific value of gas = 540 B.T.U. per cb. ft. at 15° C.

In a similar test a muffle of the same size heated in the ordinary manner required 105 cb. ft. per hour to maintain it at 1055° C. (the highest temperature obtainable), whereas interpolation from the above figures gives about 43 cb. ft. for the surface combustion furnace. A system of regeneration may easily be applied (see fig.) in which the air is preheated to 500° or 600° C. The cold air is led in through a pipe, D, embedded in granular refractory material heated by the waste gases, it then passes up through the material and is supplied to the mixing chamber. In this way a saving of 20 to 25 per cent. in gas consumption is brought about, and the maximum temperature to be obtained from gases of low calorific power is greatly increased. A cylindrical domestic water heater gave the following figures when tested :—

Gas consumption	340 cb. ft. per hour.
Gas calorific value (net)	545 B.T.U. per cb. ft.
Water heated	2283 lb. from 44·4° to 128° Fahr.
Temperature of waste gases ..	147° Fahr.
B.T.U. utilised per cb. ft.	562.

$$\text{Ratio } \frac{562}{545} = 1{\cdot}03.$$

—W. H. P.

Pulverised coal; Burning —— in smelters and furnaces. L. S. Hughes. Min. and Eng. World, April 20, 1912.

The chief disadvantage in the use of pulverised coal being the damage caused by the formation of a vitreous coating or clinker (due to the combination of iron oxide with the silica in the coal ash) upon the grate bars, crown-sheet and walls of the firebox, this occurrence was prevented by the employment of limestone with the fuel. The amount of limestone used was approximately equal to the weight of the coal ash, the mixture being fed into the furnace by means of a simple air-blast injector.—W. E. F. P.

[*Coal.*] *Causes for variations in volatile matter determinations.* S. W. Parr. J. Ind. Eng. Chem., 1912, 4, 352–354.

The author discusses the causes of the varying results obtained in the determination of volatile matter in coal (compare also Lessing, this J., 1912, 165). It is recommended that the determination be carried out at a definite temperature not below 900° or 950° C. in a small platinum crucible, of given size and shape, closed by an inverted platinum capsule fitting inside the mouth of the crucible. The heating is preferably effected with a burner of the Méker type, and the charge is moistened with kerosene (see this J., 1912, 17).—A. S.

Petroleum oil; Action of catalytic agents on —. II. L. Ubbelohde and S. Woronin. Petroleum, 1912, 7, 331–339.

Further details are given of comparative results showing the influence of catalytic agents upon the distillation of petroleum oil (this J., 1911, 1242). These results showed a remarkable agreement with those obtained by Engler in his pressure experiments. Examination of the gases liberated showed that hydrogen greatly predominated, whilst methane only amounted to about one-half and ethane one-quarter of the quantity of hydrogen. Only at temperatures above 450° C. did the proportion of heavy hydrocarbons become appreciable. Up to 260° C. the amount of gas liberated was insignificant, but from that point rapidly increased. The evolution of gas at so low a temperature can only be attributed to the influence of the catalytic agent, since Spanier (Dissert., Karlsruhe, 1910) did not observe any liberation of gas at temperatures below 410° C. in the case of petroleum oils heated without catalytic agents. The ratio of hydrogen to other gases emitted remained fairly constant (52 to 62 per cent.) at temperatures of 280° C. to 500° C. Experiments also showed that both the gases and the liquid products of the decomposition of petroleum oil under pressure differed according to whether the gases escaped or whether they accumulated under pressure.—C. A. M.

Petroleum distillates; Solubility of metallic copper in different ——. C. I. Istrati and C. Teodorescu. Bul. Soc. de Stiinte din Bucuresti, 1912, 20, 615–620. Chem. Zentr., 1912, 1, 1596.

Different fractions obtained on distilling Moreni crude oil were mixed with powdered copper and exposed to sunlight in well-closed bottles. After a definite period, portions of the different samples were filtered and the dissolved copper and acidity determined. The acidity was found to increase regularly with the temperature at which the fraction was distilled. The amount of copper dissolved also increased with the temperature of distillation, but not regularly, for the fraction distilling at 250°—275° C. contained less dissolved copper than the next higher-boiling and lower-boiling fractions. The authors, in agreement with the hypothesis of Zaloziewscki, consider that in addition to naphthenic acids, the petroleum contains also lactone-alcohols, especially in the fraction distilling at 250°—275° C. These lactone-alcohols are hydrolysed by alkali and hence are determined with the acids, but they have no solvent action on copper. The copper salts of the naphthenic acids are insoluble in ether and petroleum spirit, but are easily soluble in concentrated ammonia solution, from which they are re-precipitated by addition of water.—A. S.

Paraffin: New method for the purification of —— and modification of the method of Marcusson and Meyerheim for characterising different paraffins by means of their iodine values. C. I. Istrati and M. A. Mihailescu. Bul. Soc. de Stiinte din Bucuresti, 1912, 20, 629—633. Chem. Zentr., 1912, 1, 1596—1597.

One hundred grms. of crude paraffin (ozokerite) or commercial paraffin are dissolved in 300 c.c. of chloroform by warming and treated with 300 c.c. of boiling alcohol, with continuous shaking. On cooling, the paraffin separates in tolerably large crystals. These are filtered off with the aid of the pump, and washed with a mixture of alcohol and chloroform and then with alcohol. The solution is distilled to recover the chloroform, and the residual paraffin is again subjected to the treatment, the process being repeated as often as desired. In this way the paraffin can be separated into fractions of very different melting points. The method can be applied advantageously in the determination of the iodine value as recommended by Marcusson and Meyerheim (this J., 1910, 806), chloroform being used instead of ether. The chloroform solution is shaken with boiling alcohol, allowed to cool slowly, the separated crystals washed with a mixture of equal parts of alcohol and chloroform, and finally with a little alcohol. The solution is distilled, the residue is dissolved again in 50 c.c. of chloroform, treated with 50 c.c. of alcohol, and the filtrate from this second treatment used for the determination of the iodine value. The values obtained are higher than when ether is used. In the case of ozokerite, the solutions must be decolourised with animal charcoal.—A. S.

PATENTS.

Peat; Treating —— for the production of fuel. J. Anderson, Zaarskoe Selo, and J. Hippius, St. Petersburg, Russia. Eng. Pat. 9657, April 20, 1911.

PEAT is heated with water in a closed vessel, in which the pressure is maintained by means of a pump, sufficiently high to prevent boiling, and the heated mass is withdrawn without relieving the pressure, so that the process is continuous. The discharging device may consist of any type of hydraulic piston motor, which is driven by the pressure of the heated mass and delivers the latter through a tubular regenerator which serves to heat the material which is being pumped into the autoclave. Eng. Pats. 10,834 and 20,420 of 1903 (this J., 1904, 14) are referred to.—A. T. L.

Coke oven. R. S. Moss, Chicago, Ill., Assignor to A. Roberts, Evanston, Ill., and E. Anderson, Chicago. U.S. Pat. 1,025,419, May 7, 1912.

A SERIES of vertical flues are arranged in the walls of a coking chamber in such a manner that at any cross-section of the coking chamber there will be on one side an outer air-heating flue leading at the top to a gas inlet and an inner heating flue, and on the other side two return flues, connected at the top, through which the burnt gases from the heating flue are led, and an outer air-heating flue. The heating flues and return flues are arranged alternately on opposite sides of the coking chamber so as to produce even heating. The effect of this arrangement is that a relatively thick wall is interposed between the heating and air flues, and a relatively thin wall between the return and air flues, so that the heat generated in the heating flues passes more readily into the coking chamber than into the air flues.—H. H.

Vertical retorts. S. Glover, St. Helens, and J. West, Southport, Lancs. Eng. Pat. 15,140, June 28, 1911.

IN order to provide the necessary condensing area for gas emerging from retorts arranged close together, for example, in two lines of four retorts each, the off-take main leads to a condensing main of oval cross-section containing an inner tube through which atmospheric air is free to circulate. The off-take main is fitted with valves to enable any of the retorts to be shut off.—H. H.

Furnaces; Process for increasing the temperature of combustion in gas-fired ——. H. L. Doherty, New York. U.S. Pat. 1,024,678, April 30, 1912.

IN a retort-oven heated by producer gas, the waste gases from the heating flues are sent through a regenerator for heating the producer gas, and then through a regenerator for heating the air for combustion, whilst another portion of the waste gases is introduced into the producer.
—A. T. L.

Gas producers; Process of operating ——. N. Latta, San Francisco, Cal. U.S. Pat. 1,018,832, Feb. 27, 1912.

IN order to loosen the fuel bed from time to time, particularly in producers of the down-draught type, an explosive mixture of air and gas is introduced through a suitable pipe into the fuel bed, and is ignited, preferably by the producer fire itself.—A. T. L.

Gas producer. E. A. W. Jefferies and G. H. Isley, Assignors to Morgan Construction Co., Worcester, Mass. U.S. Pat. 1,025,192, May 7, 1912.

IN a gas producer having a stationary gas-producing chamber with a rotating ash-pan spaced beneath it, the steam and air are admitted through radial arms carried by a central vertical pipe connected with the ash-pan, so that the lower portion of the contents of the chamber are rotated. The centrifugal or outward movement of the contents is prevented by a circular band connecting the ends of the radial arms.—H. H.

Gas producer. A. F. Matlack, Philadelphia, Pa. U.S. Pat. 1,025,198, May 7, 1912.

THE gas outlet ports of a gas producer are arranged in the lower portion of the body of the producer, and air and steam are admitted through a fixed central blast pipe at the top containing a rotating shaft connected with a conical stirrer beneath the blast pipe. The air and steam are led to the blast pipe through a heater box and passages formed in the walls of the producer. The hearth is rotated in the same direction as the stirrer.—H. H.

Gases produced by the carbonisation of coal; Purification of ——. W. Hiby, Wakefield, Yorks. Eng. Pat. 9632, April 20, 1911.

NAPHTHALENE is removed from coal gas, coke-oven gas, etc., by suddenly chilling the gases, at a point of the purifying or recovery system where the temperature is near the dew-point of naphthalene, by means of an agent, such as water or gas liquor, which is forcibly injected into the gases as a spray so as to remove the naphthalene separated from the gases by the chilling. The spray may fill the whole cross-section of the gas conduit for a considerable distance.—H. H.

Gases; Removal of carbon disulphide from ——. E. Knoevenagel, J. Reis, and F. Kuckuk, Heidelberg, Germany. Eng. Pat. 3043, Feb. 6, 1912. Under Int. Conv., Mar. 4, 1911.

THE gas is brought into contact with an alkali-cellulose, the carbon bisulphide being removed as cellulose xanthate. The alkali-cellulose may be mixed with lime. Carbon dioxide and hydrogen sulphide are preferably removed from the gas by preliminary treatment before subjecting it to the action of the alkali-cellulose.—H. H.

Gas; Purification of ——. Comp. pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. Fr. Pat. 437,613, Feb. 22, 1911.

A RECTANGULAR purifier is provided with rows of transverse horizontal bars of inverted V-section which serve to support the purifying material and to form free channels for the distribution of the gas. Each channel is open at one end only, the channels in one horizontal row opening into an inlet chamber, those in the next row above opening at the other end into an outlet chamber and so on. The inlet and outlet chambers are formed by vertical partitions adjacent to the opposite walls of the purifier.—A. T. L.

Mineral oils; Process for distilling —— with steam. H. Büchler. Ger. Pat. 245,545, June 17, 1911.

THE steam for the distillation of mineral oils is generated by the heat of the oil itself; this is effected by continuously adding small quantities of water to the oil, which is first heated to temperatures above 100° C. (*e.g.*, 200° C.).
—T. F. B.

Gases; Apparatus for washing and scrubbing ——. M. and J. H. White, Luton. U.S. Pat. 1,025,729, May 7, 1912.

SEE Eng. Pat. 10,357 of 1910; this J., 1911, 481.—T. F. B.

Gas purifying plant. H. Lane, Birmingham, Assignor to Internationale Wasserstoff A. G., Frankfort on Maine, Germany. U.S. Pat. 1,025,918, May 7, 1912.

See Eng. Pat. 11,878 of 1910; this J., 1911, 362.—T. F. B.

Apparatus for extracting nitrogen and carbonic acid from combustion gases. Eng. Pat. 22,531. *See* VII.

Apparatus for determining the consistence of bituminous road materials. Eng. Pat. 16,997. *See* IX.

Cleaning blast-furnace gases. Eng. Pat. 28,926. *See* X.

Apparatus for analysing gases. Eng. Pat. 1683. *See* XXIII.

Apparatus for determining the amount of poisonous or inflammable gases in the air. Fr. Pat. 437,585. *See* XXIV.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Incandescence gas light; Influence of flame-temperature on the brightness of ——. H. Strache. J. Gas Lighting, Aug. 8, 1911, 358: J. Gasbeleucht., 1912, **55**, 445—446. (Cf. this J., 1910, 1242.)

The candle-power of upright and inverted incandescence burners was measured with gas containing varying amounts of carbon dioxide. The gas used was coal-gas containing some carburetted water-gas. The gas for each series of tests was stored in a holder, and mixed with varying quantities of carbon dioxide, and the gross calorific value was determined. In every case, the burner was adjusted to give the best effect. With an upright burner, the number of calories required per candle-power-hour was 5·78 with gas free from carbon dioxide, 5·71 with gas containing 3·8 per cent., 7·46 with 11·2 per cent., and 9·85 with 21·0 per cent. of carbon dioxide. Similar results were obtained with an inverted burner and with gas enriched with petroleum spirit or acetylene so as to have the same calorific power after the addition of the carbon dioxide. The decrease in efficiency is due to the fact that the gas containing carbon dioxide burns with a larger flame which has a lower temperature.—A. T. L.

Patents.

Coal and similar substances: Apparatus for the distillation of ——. H. Clarke and J. A. Campbell. Fr. Pats. 438,019 and 438,027, Dec. 22, 1911. Under Int. Conv., May 31 and July 14, 1911.

(1) Vertical retorts of narrow rectangular cross-section are arranged in vertical rectangular heating chambers in two parallel rows, the shorter diameter of the retorts being in the direction of the length of the row. The heating chambers have outlets for the waste gases leading into a common flue separating the two rows, and the air for combustion is heated by passing through a flue adjacent to this central flue. The rectangular heating chambers are formed by pairs of perforated walls arranged between each pair of retorts, and the space between each such pair of walls serves as a combustion chamber. These walls are formed with projecting bricks to increase the heating surface and some of these bricks reach to the walls of the retorts and provide lateral support. Hot air from the main air flue, and gas from a main gas flue enter transverse flues arranged beneath the combustion chambers, and the gas issues through a series of burner orifices arranged at a lower level than the upwardly directed air inlets from the transverse air flues. The outside walls of the retort oven are formed with cavities which are packed with heat-insulating material. The retorts are built up of a number of short sections with socket and spigot joints, and the outer surface of the walls is corrugated. The lower end of each retort is closed by a plate which is removable laterally in guides by means of suitable gearing, the plate running up a slight incline when brought into position beneath the retort, so as to make a tight joint. The top of each retort is closed in by a metal cap having a flange, which fits over the upper edge of the retort walls. This cap has a lateral outlet connection for the gas, protected by a baffle against the entry of coal during the charging of the retort. The cap is also provided with a cover plate, held closed by a lever and cam. (2) The vertical retorts are built up of separate sections fitted one upon the other with tongue and groove joints. The sections are slightly tapered and the lower edge of each projects inwards slightly beyond the upper edge of the section below it. Each section is built up of a number of separate plates, the vertical joints between these plates being also tongued and grooved.—A. T. L.

Arc-light electrode. I. Ladoff, Cleveland, Ohio, Assignor to P. C. Peck, New York. U.S. Pat. 1,025,407, May 7, 1912.

The arc-light pencil has a hollow bore running through the centre which contains potassium fluoride or other salt of an alkali metal.—D. J. L.

Incandescent lamps; Process of making ——. W. R. Whitney, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,025,499, May 7, 1912.

The lamp bulb is heated, while open to the atmosphere, to a temperature at which the bulb begins to soften, *e.g.*, to about 400° C., a stream of dry inert gas such as hydrogen is passed through while the bulb is hot enough to prevent occlusion of gases or moisture, *e.g.* at about 300° C., and the bulb is then exhausted and sealed before air or moisture is again occluded.—H. H.

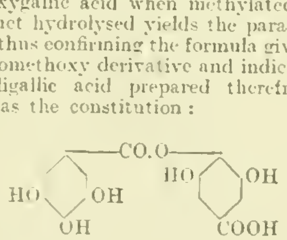
[*Electric*] *light: Means for producing* ——. C. P. Steinmetz, Schenectady, Assignor to General Electric Co., New York. U.S. Pat. 1,025,932, May 7, 1912.

See Eng. Pat. 14,121 of 1900; this J., 1901, 237.—T. F. B.

III.—TAR AND TAR PRODUCTS.

Carbomethoxy-derivatives of phenolcarboxylic acids and their use for syntheses. VI. Partial methylation of polyphenolcarboxylic acids. E. Fischer and O. Pfeffer. Annalen, 1912, **389**, 198—214.

The carbomethoxy-derivatives of phenolcarboxylic acids can be methylated by means of diazomethane in ethereal solution, the hydrogen atoms of the carboxyl groups and of any free phenolic hydroxy groups being replaced by methyl. This reaction affords a means of determining the position of the carbomethoxy groups. For example dicarbomethoxygallic acid when methylated in this way and the product hydrolysed yields the para methyl ether of gallic acid, thus confirming the formula given previously for the dicarbomethoxy derivative and indicating that the crystallised digallic acid prepared therefrom (this J., 1911, 1224) has the constitution:



The reaction is also useful for the preparation of methyl ethers of phenolcarboxylic acids which cannot readily be obtained by other methods. The authors describe the preparation of the monomethyl ethers of gentisinic and β-resorcylic acids in which the methyl group is in the ortho position to the carboxyl group, and the *o,o*-dimethyl ether of phloroglucinolcarboxylic acid. These three compounds differ from the previously known isomeric methyl ethers by their higher melting points and by giving either no reaction or only a very faint colouration with ferric chloride.—A. S.

Amidosulphonic acid. Hofmann and Biesalski. *See* VII.

PATENTS.

Anthracene derivatives; Manufacture of [*amino*] ——. A. G. Bloxam, London. From Chem. Fabr. Griesheim Elektron, Frankfort on Maine, Germany. Eng. Pat. 3513, Feb. 12, 1912.

β-AMINOANTHRAQUINONE and those of its derivatives which do not contain sulphonic groups, as well as the reduction products of these compounds which are soluble in alkali (*e.g.*, β-aminoanthrol), can be converted into β-anthramine and its derivatives by reduction with zinc in presence of an alkali, the reaction being continued until practically none of the reduction product soluble in alkali remains. *Example.* Fifty parts of β-aminoanthraquinone are heated in a reflux apparatus with 500 parts of ammonia solution of sp. gr. 0·91 and 100 parts of zinc dust, for ten hours. A brown-red solution is formed, from which the β-anthramine is precipitated as yellow crystals which are recrystallised from alcohol. —T. F. B.

Meta-cresol and process of making the same. F. Elger, Basle, Assignor to Hoffmann-La Roche Chemical Works, New York. U.S. Pat. 1,025,616, May 7, 1912.

COMMERCIAL *m*-cresol, containing 80 to 92 per cent. of *m*-cresol, or other mixtures rich in *m*-cresol, are treated with a "selective agent" which will separate only the *m*-cresol in the form of a crystalline substance; this may be effected by cooling the mixture to a temperature of about 0° C., and allowing the cooled mixture to stand for some time, when the pure *m*-cresol may be separated in the form of long crystals by inoculating the mixture with a crystal of previously formed pure *m*-cresol. The colourless crystals thus obtained have a m. pt. of about 11° C., and melt to a colourless liquid which turns yellow after prolonged exposure to light.—T. F. B.

Phenylglycine, its homologues and derivatives; Process for preparing ——. Chem. Fabr. vorm. Weiler-ter Meer. Ger. Pat. 244,825, Dec. 2, 1908.

THE aniline salt of phenylglycine is obtained by the action of one mol. of chloro-acetic acid on two mols. of aniline, preferably at temperatures below 100° C., an aqueous solution of an alkali hydroxide or carbonate, or of sodium borate or phosphate, or other alkaline substance, being gradually added to the mixture in such quantity that on the completion of the reaction the mixture is not alkaline or only slightly so. By this means the aniline salt of phenylglycine, which is quite insoluble, separates in a condition of purity. The formation of phenylglycine anilide is avoided by keeping the temperature below 100° C., whilst if the chloro-acetic acid be added to the aniline, formation of phenylimino-diacetic acid does not occur. If desired the chloro-acetic acid and the alkali can be added simultaneously to the aniline.—T. F. B.

Azoxy- and azobenzene from nitrobenzene; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 245,081, Feb. 18, 1910.

THE iron mud, obtained as a waste product in the reduction of organic nitro compounds by means of iron, consists essentially of triferric tetroxide with a trace of free iron. This may be utilised for the reduction of nitrobenzene to azoxy- and azobenzene, the nitrobenzene being heated with the iron-mud and concentrated alkali hydroxide solutions to high temperatures, pressure being applied where necessary. A diluent, such as solvent naphtha, may also be added. The composition of the reduced mixture is determined by the conditions of the reaction. —T. F. B.

Acidylarylaminonaphtholsulphonic acids, Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 245,608, Dec. 12, 1909.

WHEN salts of arylaminonaphtholsulphonic acids are heated with formic acid, formylarylaminonaphtholsulphonic acids are obtained: they differ from the non-acidylated acids in their greater solubility, in their behaviour towards oxidising agents and diazo compounds, and in that they do not form nitrosamines. They are stated to be valuable azo dyestuff components.—T. F. B.

Meta- and para-cresols; Process of separating ——. F. Elger, Basle, Switzerland, Assignor to Hoffmann-La Roche Chemical Works, New York. U.S. Pat. 1,025,615, May 7, 1912.

SEE Fr. Pat. 434,534 of 1911; this J., 1912, 277.—T. F. B.

Chlor-aralkylsulphonic acids and process of making such compounds. O. Schmidt, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,025,652, May 7, 1912.

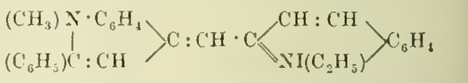
SEE Eng. Pat. 29,720 of 1910; this J., 1911, 1245.—T. F. B.

Apparatus for determining the consistence of bituminous road materials. Eng. Pat. 16,997. *See* IX.

IV.—COLOURING MATTERS AND DYES.

Cyanines; Constitution, synthesis and degradation of the ——. A. Kaufmann and E. Vonderwahl. Ber., 1912, 45, 1404—1419.

THE authors find that not only does quinaldine itself condense to *iso*cyanine but generally 2-substituted quinoline derivatives, for example, 2-phenylquinoline methiodide and quinaldine alkylhalogenides, form *iso*cyanines. On the other hand 4-phenylquinaldine ethiodide does not act in this manner. Quinoline derivatives containing a mobile group in the 4-position condense with quinaldine alkyliodides to furnish *iso*cyanines. Thus 4-chloroquinoline ethiodide and quinaldine ethiodide yield Ethyl Red and 4-chloro-2-phenylquinoline methiodide gives with quinaldine ethiodide the same dyestuff as is produced from 2-phenylquinoline itself. These facts, taken together with the observation of the products of degradation of the dyestuff from quinaldine ethiodide and 2-phenylquinoline methiodide indicate its constitution as—



The *iso*cyanines are therefore to be regarded as quinolylene-quinaldines and the cyanines as quinolylene-lepidines. The lepidine dyestuffs contain a double linking more than the *iso*cyanines and consequently this may explain the fact that the former are blue whilst the latter are red. In the preparation of Ethyl Red by the above-mentioned process some diethylerythroapocyanine is also formed. Ethyl Red forms additive compounds with alcohols: it is unattacked by a small amount of alkali but is decomposed on boiling with a large excess of this agent. Ethyl Red forms, in addition to monacid salts, diacid salts and not triacid as has been stated. The cyanine dyestuff prepared from quinaldine ethiodide alone melts at 183° C., and is about four times as soluble in water as Ethyl Red. The dyestuff from quinaldine ethiodide and 2-phenylquinoline methiodide forms green needles which are eight times as soluble in water as Ethyl Red.—J. C. C.

Dyestuffs derived from phenoxyaniline; New ——. A. Mailhe. Comptes rend., 1912, 154, 1240—1242.

NITRATION of phenyl ether gives rise to the *p*-nitro-derivative which on reduction with iron and acetic acid furnishes the corresponding amino-compound, m.pt. 82° C. This amine is readily diazotised and the diazo-compound gives azo-compounds with the usual components. Amongst those described the azo-compound from dimethylaniline dyes silk and wool from an acid bath in golden yellow shades, that from phenol, after sulphonation, dyes silk and wool in dull brown shades and those from the naphtholsulphonic acids dye the above materials in carmine red shades. The introduction of the phenoxygroup into aniline has the effect of brightening the colours produced on diazotisation and combination: an effect similar to that produced by the methoxy-group.—J. C. C.

Patents.

Vat dyestuff ; Manufacture of a ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 14,899, June 19, 1911.

An orange yellow vat dyestuff is obtained by heating β-aminoanthraquinone (20 parts) in nitrobenzene (150 parts) with a solution of thiophosgene (5·2 parts) in nitrobenzene (10 parts) until a test sample of the dyestuff which separates dissolves in alkalis with a blue colour. The dyestuff gives a yellowish red vat from which cotton, after being exposed to air, rinsed and soaped, is dyed a brilliant orange colour.—J. C. C.

Dyestuffs capable of being diazotised and combined on the fibre ; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 22,529, Oct. 12, 1911.

The new azo-dyestuffs are obtained by saponifying the acylaminoazo-colouring matters prepared from diazotised monoacyl-*m*-phenylenediamines and *m*-phenylene- or *m*-tolylene-diaminesulphonic acid, tetrazotising the products so obtained and combining with two mols. of *m*-phenylene- or *m*-tolylene-diamine. Example: 13·6 parts of *m*-aminoformylanilide are diazotised and combined with 21 parts of *m*-phenylenediaminesulphonic acid in sodium carbonate solution. After the formyl group has been eliminated in the usual manner, the product is tetrazotised and combined with 22 parts of *m*-phenylenediamine in sodium carbonate solution. The dyestuff is salted out, pressed and dried. When dyestuffs obtained by this method are dyed on cotton and diazotised and developed on the fibre with β-naphthol or *m*-phenylenediamine, pure brown shades are produced.—J. C. C.

Triphenylmethane series ; Production of chrome dyestuffs of the ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 437,667, Dec. 14, 1911. Under Int. Conv., Jan. 12, and April 21, 1911.

The dyestuffs are obtained by condensing substituted *m*-hydroxybenzaldehydes in which the hydroxylic hydrogen atom is replaced by hydroxycarboxylic acids or by mixtures of such acids, and oxidising the leuco-compounds thus produced. Example: A mixture of 23·1 parts of *p*-chloro-o-nitrophenyl-3-oxy-2:6-dichlorobenzaldehyde, and 21 parts of o-cresotic acid is stirred with 320 parts of sulphuric acid until the aldehyde has disappeared. The mass is cooled, thrown on ice and the leuco-compound collected. Oxidation is effected by means of nitrosylsulphuric acid. The dyestuff produces blue shades on wool after being chromed on the fibre.—J. C. C.

Leucoquinizarin ; Production of ——. Farbenfabr. vorm. F. Bayer und Co., Fr. Pat. 437,970, Dec. 21, 1911. Under Int. Conv., Jan. 12, 1911.

Leucoquinizarin is obtained by reducing purpurin (20 kilos.) dissolved in sulphuric acid (300 kilos.) with the addition of boric acid (7 kilos.) by means of aluminium powder (5 kilos.) at 20°—30° C. Other reducing agents, such as zinc or iron, may also be employed.—J. C. C.

Monoazo-colouring matters and pigments derived therefrom ; Manufacture of new ——. Actien-Ges. für Anilin-Fabrikation, Treptow, Germany. Eng. Pat. 2425, Jan. 30, 1912. Under Int. Conv., Feb. 11, 1911.

2-Methoxy-5-nitro-4-aminotoluene, prepared by the action of sodium methoxide on 2-chloro-5-nitro-4-aminotoluene and melting at 153° C. is diazotised and combined with β-naphthol or 1-phenyl-3-methyl-5-pyrazolone or a substitution product of the latter not containing a sulphonic or carboxylic group. The dyestuff obtained by the use of the former component is red and that from the latter is orange. When converted into lakes in the usual way, the resulting pigments are very suitable for printing wall-papers, for lithography, or for oil-colours. —J. C. C.

Azo dyestuffs ; Manufacture of ——. H. Levinstein and M. Wyler, Assignors to Levinstein, Ltd., Blackley. U.S. Pat. 1,024,791, April 30, 1912.

The dyestuffs are obtained by combining a diazo compound with the urethane of 2.5-aminonaphthol-7-sulphonic acid.—T. F. B.

Dianthraquinonyl sulphides ; Process for making ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 437,632, Dec. 12, 1911. Under Int. Conv., Nov. 18, 1911.

Dianthraquinonyl sulphides of the general formula, A.S.A′, where A and A′ represent anthraquinonyl radicals, are obtained by treating about two mols. of halogen-anthraquinones with one mol. of an alkali sulphide. Thus, by heating β-chloroanthraquinone with sodium sulphide and aqueous alcohol to 120°—130° C., $\beta\beta$-dianthraquinonyl sulphide is obtained as a yellow substance, sparingly soluble in organic solvents, and insoluble in alkalis and dilute acids; when treated with alkaline reducing agents it gives a vat from which cotton or wool is dyed fast, intense yellow shades.—T. F. B.

Vat dyestuffs of the anthraquinone series ; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 245,768, Nov. 24, 1910. Addition to Ger. Pat. 224,500, March 26, 1909 (see this J., 1910, 1297).

Vat dyestuffs which may differ in shade from those described in the principal patent, and which produce faster dyeings, are obtained by heating α- or β-aminoanthraquinone with sulphur chloride, with or without the addition of a solvent, to temperatures above the boiling point of nitrobenzene.—T. F. B.

Condensation products of the anthraquinone series ; Preparation of nitrogenous ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 246,085, Sept. 30, 1910.

When β-diazoanthraquinone reacts with a primary aliphatic diamine, nitrogen is evolved, and products are formed which may be used as dyestuffs or for the preparation of dyestuffs. For example, the product obtained from β-anthraquinonyl diazonium sulphate and ethylenediamine dyes cotton fast orange-yellow shades from the vat.—T. F. B.

Leuco-derivatives ; Manufacture of ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 437,809, Nov. 21, 1911. Under Int. Conv., Dec. 12, 1910.

The vat dyestuffs described in Ger. Pats. 222,640, 224,590 and 224,591 do not undergo transformation into the leuco-compounds very easily when being prepared for dyeing, and it is found advantageous to prepare the leuco-compounds during the manufacturing process, reduction being effected by hydrosulphite, zinc powder, bisulphite, etc. The leuco-compounds are compressed with glucose, glycerin, etc., for purposes of transport, and can be converted into vats by adding alkali. The latter are obtained direct if the alkali salts of the dyestuffs are used. The same effect may be produced by evaporating the dyestuffs with glucose and alkali to dryness in a vacuum.—J. C. C.

Wool [azo] dyestuff suitable for the single-bath chrome process ; Preparation of a blue ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 246,084, March 9, 1911. Addition to Ger. Pat. 245,280, Dec. 24, 1910 (see this J., 1912, 483).

Diazotised 4·6-dichloro-2-aminophenol is combined with a monoalkyl ether of 1·8-dihydroxynaphthalene-4- or -5-sulphonic acid.—T. F. B.

Acid dyestuffs of the anthracene series ; Process for preparing brown ——. R. Wedekind und Co. Ger. Pat. 245,232, July 9, 1911. Addition to Ger. Pat. 237,946, Sept. 14, 1909 (see U.S. Pat. 996,487 ; this J., 1911, 947).

THE products obtained by sulphonating and nitrating dichloroanthraflavic acid or the chloroanthraflavic acids containing less chlorine, are condensed with aromatic amines either without a condensing agent, or with the addition of caustic soda, sodium carbonate, borax, the hydrochlorides of aromatic amines, or sodium acetate. The dyestuffs thus prepared are faster than those obtained according to the principal patent.—T. F. B.

Sulphide dyestuffs ; Manufacture of blue ——. Chemikalienwerk Griesheim, G. m. b. H. Fr. Pat. 437,701, Dec. 15, 1911.

THE condensation products of nitrosophenols and aromatic amines with a free para-position are converted into leuco-compounds by digestion with aqueous solutions of the alkali salts of resorcinol. The products give blue sulphide dyestuffs when fused with polysulphides. Example 1 : A 25 per cent. paste of the indophenol (=165 kilos. of 100 per cent.) obtained from nitrosophenol and diphenylamine is stirred with a solution of 66 kilos. of resorcinol in about 900 litres of water and 75 kilos. of sodium hydroxide (40° Bé.) at a temperature of 10°—20° C. When the solution of the indophenol is complete, the leuco-compound is precipitated by adding acids. Example 2 : 40 kilos. of the above leuco-compound are added to a mixture of 100 kilos. of crystallised sodium sulphide and 50 kilos. of sulphur. The mass is evaporated until the temperature becomes 128°—130° C., and then heated for 24 hours under a reflux condenser. The dyestuff obtained produces greenish indigo-blue shades on cotton which are very fast.—J. C. C.

Wool dyestuffs of the anthracene series ; Process for preparing brownish- to bluish-black ——. R. Wedekind und Co. Ger. Pat. 245,233, July 9, 1911. Addition to Ger. Pat. 237,946, Sept. 14, 1909.

THE condensation described in Ger. Pat. 245,232 (preceding) is effected at a higher temperature, or the temperature is maintained for a sufficient time to produce a brownish-black or bluish-black product. Under these conditions the fastness of the dyestuffs is considerably enhanced.—T. F. B.

Vat dyestuff ; Process for preparing a violet-blue ——. Kalle und Co. Ger. Pat. 245,544, Oct. 9, 1910. Addition to Ger. Pat. 241,910, March 20, 1907.

A DYESTUFF which dyes violet-blue shades from the vat is obtained by treating with chlorosulphonic acid the thioglycollic acid of the constitution :—

$$C_6H_2[S.CH_2.COOH(1) : CH_3(3) : hal.(4) : OR(6)].$$

—T. F. B.

Triarylmethane dyestuffs ; Process for preparing chrome ——. Anilinfarben- und Extract-Fabr. vorm. J. R. Geigy. Ger. Pat. 245,769, July 16, 1910.

THE unsymmetrical diphenylmethane derivatives, obtained by the action of *p*-chloromethyl-*o*-cresotinic acid, or their anhydro compounds, on mono- or dialkylated aromatic amines or their substitution products containing a free *para*-position, are oxidised by means of nitrosylsulphuric acid to the corresponding hydrols, which are condensed with aromatic hydroxycarboxylic acids or naphtholsulphonic acids, and the resulting leuco-compounds are oxidised to the dyestuffs. The products dye wool from acid baths red to violet shades which are converted by chroming into fast shades varying from reddish violet to greenish-blue.—T. F. B.

Vat [anthracene] dyestuff ; Process for preparing a ——. Badische Anilin und Soda Fabrik. Ger. Pat. 246,086, Feb. 23, 1911.

THE product of the action of thiophosgene on *β*-amino-anthraquinone possesses no tinctorial properties, but can be converted into an orange-red vat dyestuff when trea
with a basic substance and then heated either alone o
presence of a diluent. The constitution of the prim
product has not been determined, but it has been fo
not to consist of dianthraquinonyl-thiourea.—T. F. B.

*Mordant dyestuffs of the triarylmethane series ; Ma
facture of* ——. P. A. Newton, London. From Farb
fabr. vorm. F. Bayer und Co., Elberfeld. Germa
Eng. Pat. 10,905, May 5, 1911.

SEE Ger. Pat. 238,487 of 1910 ; this J., 1911, 1306.—T.F

Wool [azo] dye ; Blue ——. C. Heidenreich, Leverkus
Assignor to Farbenfabr. vorm. F. Bayer und Co., Elb
feld, Germany. U.S. Pat. 1,025,267, May 7, 1912.

SEE Eng. Pat. 14,901 of 1911 ; this J., 1912, 184.—T. F.

*Substantive [azo] dyestuffs fast to acids ; Manufact
of* ——. Farbwerke vorm. Meister, Lucius, u
Brüning, Höchst on Maine, Germany. Eng. P
25,162, Nov. 11, 1911. Under Int. Conv., Nov. 22, 19

SEE Fr. Pat. 435,932 of 1911 ; this J., 1912, 327.—T. F.

Vat [thioindigo] dyestuffs ; Violet-blue ——. E. Ho
Assignor to Farbwerke vorm. Meister, Lucius, u
Brüning, Höchst on Maine, Germany. U.S. P
1,025,138, May 7, 1912.

SEE Eng. Pat. 21,569 of 1910 ; this J., 1911, 1305.—T. F.

Vat dyestuff and process of making same. R. Maag, Sir
lingen. Assignor to Farbwerke vorm. Meister, Luci
und Brüning, Höchst on Maine, Germany. U.S. P.
1,025,147, May 7, 1912.

SEE Eng. Pat. 9257 of 1911 ; this J., 1911, 1110.—T. F.

Vat dyestuff ; Blue —— *and process of making sa*
R. Welde, Höchst, and B. Homolka, Frankfort, Assign
to Farbwerke vorm. Meister, Lucius, und Brüni
Höchst on Maine, Germany. U.S. Pat. 1,025,1
May 7, 1912.

SEE Fr. Pat. 424,036 of 1910 ; this J., 1911, 738.—T. F.

Vat [anthracene] dyestuff ; Salmon-coloured —— *and p
cess of making same.* G. Kränzlein, Assignor to Far
werke vorm. Meister, Lucius, und Brüning, Höchst
Maine, Germany. U.S. Pat. 1,025,195, May 7, 19

SEE Eng. Pat. 15,523 of 1910 ; this J., 1910, 1297.—T. F.

Preparing a pure claret-coloured azo colour lake. Ger. P
245,747. *See* XIII.

V.—FIBRES ; TEXTILES ; CELLULOSE ; PAPER.

Cellulose ; Testing the purity of ——. E. Richte
Wochenbl. Papierfab. 1912, **43**, 1631—1634.

FOR testing the degree of purity of wood cellulose, *i.*
estimating residual lignin, the author has investigated t
following methods : treatment with chlorine gas a
titration of the hydrochloric acid formed, the absorpti
of iodine from a standard solution, and the Hempel-Seid
method. The chlorine method is influenced by lig
and it is difficult to remove the last traces of chlorine ; t
results of the iodine method are influenced by the hardne
or softness of the pulp ; on the other hand, the Seid
method gives concordant results and is considered
be the best. It consists in digesting the cellulose wi
nitric acid (13°$_0$ HNO$_3$) at 98°—100° C., collecting a
titrating the nitrous gases produced in the oxidation
the lignin. The following modifications of the origin
Seidel procedure were found to be desirable : 5 grm
of the sample should be treated with 100 c.c. of the aci
instead of with 50 c.c. ; the time taken for heating u
to 100° C. should always be the same, viz., 15 minute
and the water-bath should be maintained at the boili

temperature for 60 minutes. Owing to the formation of a mist of acid when the temperature reaches about 70° C., the author has slightly modified the apparatus :—A long-necked distillation flask with the side tube high up is used and a suitable condenser is inserted down the neck and fixed there with rubber or pulp; the condenser should occupy as much space as possible in the neck of the flask and a glass tube should pass through the centre of it for the introduction of air. The samples to be tested must first be freed from resin by extraction with ether, then with alcohol, and lastly with water. With extracted spruce-wood raspings the best result was obtained by treating about 3 grms. of the wood with 100 c.c. of the acid. The yield of nitrous acid was 1·076 grm. calculated as N_2O_3, per 10 grms. of dry and ash-free wood, and this value is taken as a standard, equivalent to 28 per cent. of lignin. From this standard the percentage of lignin may be calculated from the nitrous acid formed by the treatment of any sample of wood-cellulose; typical samples showed from 2·0 to 3·5 per cent. of lignin, the results being complementary to the yields of cellulose by chlorination; 20·1 per cent. of lignin was found in jute. The method is quite satisfactory for technical purposes, whereas Klason's colourimetric method with sulphuric acid often gives contradictory results with samples of different type and manufacture. Seidel's method has also been used for the determination of mechanical wood-pulp in papers.—J. F. B.

Cellulose; The hydrolysis of —— by ferments. H. Pringsheim. Z. physiol. Chem., 1912, **78**, 266—291.

Hitherto the resolution of cellulose by organisms has only been observed under the action of bacteria of fungi; as a structural component of tissues, cellulose naturally resists the action of plant enzymes, whilst in the case of herbivorous animals which consume cellulose, the preliminary stages of digestion are performed by the bacteria of the digestive tract. In the study of the decomposition of cellulose by bacteria, consumption follows digestion so closely that, hitherto, no intermediate stage has been recognised between the cellulose and its final products of metabolism. The author has now for the first time succeeded in showing that hydrolysis under the action of secreted enzymes, with formation of soluble sugars, is indeed an antecedent stage in the assimilatory processes of the cellulose bacteria. Similar results have been obtained with all types of these micro-organisms: the denitrifying bacteria, the methane- and hydrogen-forming and the thermophilic types of bacteria. The last named are by far the most active, and therefore form the best material for experimental study. The difficulties are enhanced by the fact that the cellulose bacteria cannot be isolated from the solid substratum and their cell-juices cannot be obtained by pressing. The separation of the functions of digestion and assimilation may, however, be effected by inducing a vigorous fermentation of cellulose under favourable conditions and then suddenly paralysing the vital activity of the bacteria by the addition of a suitable antiseptic. Toluene answers the purpose with many of the species, but it is not sufficiently powerful to kill the thermophilic bacteria, and a 1 per cent. solution of iodoform in acetone is employed for these. When the vital functions of the organisms are paralysed, the digestive action of the secreted enzymes proceeds until the latter are themselves destroyed by proteolysis. In the case of the slow-acting bacteria, a period of 2—8 days is required for the production of appreciable quantities of reducing sugars, but with the vigorous thermophilic species, sugars are formed within 24 hours. The first soluble product which can be detected is the dissaccharide cellobiose, this being subsequently converted by a separate enzyme, cellobiase, into dextrose. The primary cytolytic enzyme, cellulase, is active between the temperature limits of 20° and 70° C., and since the thermophilic bacteria can only be cultivated at a temperature of about 55° C., the separate nature of their vital and digestive functions may be demonstrated by simply cooling the culture from 55° to 20° C.: reducing sugars, mainly dextrose, then accumulate. Alternatively, if the antiseptic be added and the culture heated to 67° C., the action of the cellulase persists, whilst that of the cellobiase is inhibited, so that the disaccharide accumulates. It appears probable that the entire molecule of cellulose is built up of cellobiose residues, since by repeated fermentations of the residue it is possible to hydrolyse the whole of the cellulose in this manner; the case is considered to be analogous to the hydrolysis of starch to maltose. All types of cellulose bacteria secrete the same kind of cellulase. This ferment appears to be an endocellular enzyme; its activity is only manifested when the secreting organism is in direct contact with the cellulose, owing probably to some stimulus imparted from the substratum to the cell.
—J. F. B.

Cellulose; Studies on ——. III. The Xyloidins. H. Jentgen. Z. angew. Chem., 1912, **25**, 941—947.

The xyloidins are parchmentised or structureless low nitrates of cellulose produced by the action of diluted nitric acid. The governing conditions are the physical state of the cellulose (preferably loose cotton wool), the concentration of the acid and the temperature. Higher temperatures afford wider limits of the concentration of the nitric acid; at about 18° C., nitric acid ranging from 1·469 to 1·479 sp. gr. is recommended; to obtain homogeneous products the cellulose should dissolve practically completely in the acid. A convenient method for the preparation of xyloidin consists in moistening 10 grms. of loose cotton with twice its weight of water and steeping it in 300 c.c. of nitric acid of sp. gr. 1·5 until dissolved, care being taken, by cooling, to avoid excessive rise of temperature; the viscous solution is poured into water. The viscosity of the acid solution rapidly decreases and after 24 hours becomes equal to that of water; the percentage of nitrogen in the product does not, however, alter appreciably. The nitrogen in xyloidin preparations ranges from 6·2 to 8·8 per cent. according to the concentration of the acid. Their solubility likewise varies with the concentration of the acid and other conditions of preparation. Products with 6—7 per cent. of nitrogen are insoluble in all the ordinary solvents of nitrocellulose; those with higher percentages are soluble in glacial acetic acid and are gelatinised or partially soluble in other media. The hygroscopic moisture of the xyloidins is less than that of cotton (2·5—4 per cent.): they ignite at a temperature of 196°—197° C. If the solution of cellulose in nitric acid be exposed to the air for several days, the xyloidin gradually separates as a pasty precipitate; if a fresh solution be kept at a temperature below 10° C., the xyloidin solidifies to a jelly. The xyloidins are rapidly attacked and dissolved by concentrated hydrochloric acid, with evolution of nitric oxide and formation of "acid-cellulose," soluble in strong hydrochloric acid and in 10 per cent. sodium hydroxide. An acid-cellulose containing 4 per cent. of nitrogen may also be prepared by treating cotton with a mixture of equal volumes of glacial acetic acid and nitric acid of 1·5 sp. gr. for several days until dissolved. The acid-celluloses obtained by the denitration of the xyloidins appear to contain definite acidyl groups; they form lactones on drying, they decolourise red phenolphthalein solution, and after treatment with sodium hydroxide they retain an appreciable quantity (about 3·2 per cent.) of mineral constituents after exhaustive washing. J. F. B.

Aluminium sulphate; Function of —— in the sizing of sulphite wood-pulp. C. G. Schwalbe and H. Robsahm. Wochenbl. Papierfab., 1912, 43, 1454—1457.

When 3 per cent. of aluminium sulphate was added to a mixture of unbleached sulphite wood pulp with about 40 times its weight of distilled water, the whole of the aluminium was precipitated on the fibre in the form of hydroxide. The sulphuric acid remained in the water, partly in combination with calcium derived from the wood pulp, but partly also in combination with organic matter in a neutral form not yet investigated. When the same experiment was repeated, using hard town's water instead of distilled water, the precipitation of the aluminium hydroxide was not quite complete: about 3·2 per cent. of the alumina added remained in solution. Moreover, it was found that the hard water alone, without the cellulose, was capable of precipitating about 84 per cent. of the alumina in the aluminium sulphate added.

Rosin size had an effect similar to that of the hard water, 3·4 per cent. of the alumina remaining unprecipitated, whilst the sulphuric acid combined partly with the sodium and partly with organic matter. When 6 per cent of aluminium sulphate on the cellulose was added to the pulp with the rosin size, 53·7 per cent. of the aluminium sulphate remained in solution, showing that the precipitating power of the cellulose is at a maximum with about 3 per cent. of aluminium sulphate, and is slightly diminished by an excess of that salt. If the sized pulp be extracted with ether, the quantity of resin remaining insoluble in ether is only slightly greater in the pulp treated with 3 per cent. of aluminium sulphate than in that treated with 6 per cent. Hence the authors conclude that only a small proportion of the alumina added is precipitated in the form of aluminium resinate, the major portion being precipitated as hydroxide by the action of the cellulose. No basic aluminium sulphate is precipitated since the percentage of sulphuric acid in the sized cellulose is smaller than in the original pulp.—J. F. B.

Patents.

Wood; Process of converting —— into paper-making stock and by-products. B. F. Williamson, Gainesville, Fla. U.S. Pat. 1,025,356, May 7, 1912.

Resinous wood in a comminuted condition is placed in a closed vessel from which practically all the air is exhausted, a caustic soda solution of less than 15° Bé. is then admitted, whilst excluding free oxygen, and the charge is boiled with steam practically devoid of free oxygen, the volatile products, together with any oxygen set free, being withdrawn as fast as they are formed, so that the wood is reduced to pulp substantially without any oxidation of the cellulose. The strength of the caustic soda solution is selected such that, when combined with the resins and heavier oleaginous materials of the wood, it forms a mildly alkaline soapy solution under the action of which the digestion of the wood is effected.—J. F. B.

Vegetable fibre; Process of extracting ——. C. L. Weiberg, Detroit, Mich. U.S. Pat. 1,025,435, May 7, 1912.

The stalks, stems, etc., of plants are boiled in a solution of an alkali peroxide in the presence of a protecting, unsaponifiable, heavy oil: this preliminary treatment is followed by a further boiling with " corrosive " alkalis, the fibre being finally washed.—J. F. B.

Fibrous, mineral, and other substances, especially paper; Process for impregnating —— with sulphur. G. and O. Leuchs. Ger. Pat. 244,818, Dec. 10, 1910.

The fibrous material is impregnated with milk of sulphur, and is then dried, heated, and pressed. The mass to be impregnated may be mixed with a sulphur compound, preferably in solution, from which the sulphur is subsequently separated by chemical means. The products may be further treated with an oil, and a filler may in some cases be added. A variety of uses may be made of the products, notably as electric insulating materials or for other purposes for which rubber is used.—T. F. B.

Celluloid and similar materials; Composition and method of manufacture of a plastic material to replace ——. M. H. de La Ramée. Fr. Pat. 437,751, Dec. 16, 1911. Under Int. Conv., Dec. 16, 1910.

30 kilos. of gelatin are soaked in an equal weight of cold water for 48 hours, then dissolved by heating, cooled to 45° C., and 1 kilo. of gallotannic acid mixed with it. 30 kilos. of casein are moistened with 25 per cent. of ammoniacal water for 5—6 hours, boiled for an hour and a solution containing 10 parts of caoutchouc, 20 parts of carbon bisulphide and 2 parts of sulphur added and mixed with glycerin according to the suppleness required in the finished article. 40 kilos. of powdered colophony are dissolved in an equal weight of ammoniacal water. The three solutions thus obtained are mixed and heated on the water bath until a homogeneous mass is obtained. The cakes are then well dried and soaked in a 20 per cent. formaldehyde solution for 15 minutes for each millimetre of thickness and when dried again are ready for use. The product may be coloured by adding basic aniline dyes during the process of manufacture.—D. J. L.

Cellulose solutions; Process for preparing ——. W. Traube. Ger. Pat. 245,575, Jan. 10, 1911.

Cellulose, cellulose hydrate, oxycellulose, and similar compounds may be dissolved in solutions of aliphatic diamines in which cupric hydroxide has been dissolved; solutions containing as little as two to eight per cent. of ethylenediamine are effective. The cellulose is precipitated from such solutions by addition of small quantities of acid. (See also this J., 1911, 1449.)—T. F. B.

Soda-cellulose manufacture; Process for obtaining acetic and formic acids from the waste lyes of ——. E. L. Rinman. Ger. Pat. 244,816, Feb. 10, 1911.

After the waste lyes have been freed from humus substances and soda (as bicarbonate), they are treated with an acid which is stronger than carbonic acid, such as oxalic acid, hydrochloric acid, or phosphoric acid, and the formic and acetic acids are separated by distillation. (See following abstract). By fractional acidification of the lyes the acids can be obtained separately. The residue from the distillation may be subjected to dry distillation, or to distillation with steam, when lactic acid and other products may be obtained.—T. F. B.

Black lyes from soda-cellulose manufacture; Process for obtaining the sodium salts in the form of bicarbonate from ——. E. L. Rinman. Ger. Pat. 244,941, Feb. 11, 1911.

The black lyes are freed from organic compounds which can be precipitated by carbon dioxide, and are then treated at increased temperatures with ammonia and carbon dioxide; sodium bicarbonate is thus produced, and the ammonia is recovered by means of lime, with formation of the calcium salts of formic, acetic, and other acids. It is stated that a larger quantity of sodium bicarbonate is formed by treating the black lyes than when carbon dioxide and ammonia are passed into a solution of sodium chloride alone.—T. F. B.

Paper, pasteboard, and like material having an artistic surface. H. C. Heide, London. From Knowlton Bros., Inc., Watertown, N.Y., U.S.A. Eng. Pat. 10,564, May 1, 1911.

See Fr. Pat. 429,256 of 1911; this J., 1911, 1207.—T. F. B.

Enzymes which attack mannans, galactans, and celluloses. Bierry and Giaja. *See* XXIV.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Sizing properties of flour; Effect of fermentation on the ——. H. B. Stocks. J. Soc. Dyers and Col., 1912, 28, 148—151.

The author discusses the changes which take place when a mixture of equal parts of flour and water is fermented by the yeast and bacteria in the flour and in the air. A series of sizing experiments carried out with (*a*) ordinary unfermented flour: (*b*) the same flour mixed with an equal weight of water and fermented eight weeks; (*c*) the same flour fermented twelve weeks, proved, firstly, that fermented flour is a better " binding " or " carrying " agent than unfermented flour; secondly, that the fermented flour produces a stronger yarn and causes a smaller loss of elasticity. The weight of insoluble matter contained in the flour decreases with fermentation, but its volume becomes much greater. Both these factors increase the viscosity of the prepared size. Moreover lactic acid and glycerin, being liquid, non-volatile and deliquescent, act as softeners and impart elasticity to the sized yarn. —P. F. C

Patents.

Bleaching textile materials. A. Rousseau. Fr. Pat. 437,502, Feb. 20, 1911.

This process, which is specially applicable to linen, consists in exposing the material to the action of an intense artificial light and ozone.—P. F. C.

Dyeing and bleaching yarns, rovings and the like; Apparatus for ——. A. Wilson and The British Cotton and Wool Dyers Assoc., Ltd., Bradford. Eng. Pat. 16,924, July 24, 1911.

A series of open-ended perforated tubes on which are mounted the "cheeses," project from and through one of the walls of a dyeing chamber, and a rod provided at its end with a flange disc fits loosely into the free end of each tube. When the chamber is closed, one of the walls presses down on the disc which in turn longitudinally compresses the cheese. By this means dye-liquor which is pumped into the tubes from outside the dyeing chamber is forced to travel radially through the yarn.—P. F. C.

Bleaching and dyeing machine. T. Frusher, New York. U.S. Pat. 1,024,003, April 23, 1912.

This machine comprises two closed tanks, one being used as a chamber for mixing and heating the dye-liquor, whilst the other is a container for the hanks which are hung over a frame arranged inside it. Above and below the yarn are fitted perforated pipes, the upper ones being in communication with the mixing chamber, whilst the lower ones are connected with a pump. By this means dye-liquor can be forced from the mixing chamber into the upper series of perforated pipes and sprayed on to the hanks, to be subsequently withdrawn through the lower perforated pipes and returned to the mixing chamber. —P. F. C.

Dyeing fibrous materials; Method of ——. W. R. Smith, Assignor to Buffalo Leather Co., Buffalo, N.Y. U.S. Pat. 1,025,323, May 7, 1912.

The material is loosely confined to prevent lateral and vertical movement, which would cause entanglement, but not so closely as to prevent access of the liquid to all parts. The material treated in this way is immersed in the dye-bath and the dye-liquor circulated laterally through it. Circulation is improved by forcing air through the liquor and material.—D. J. L.

Piece-dyeing; Apparatus for ——. J. A. Aubrée and P. Chardon. First Addition, dated Feb. 7, 1911, to Fr. Pat. 413,031, May 15, 1909 (this J., 1910, 1103).

The claims of the principal patent are extended to the scouring, bleaching, dyeing, or impregnation of all textile fabrics and to the finishing of woollen or mixed fabrics. —P. F. C.

Dyeing indigo from a hydrosulphite vat; Process of and machine for ——. C. Rachou and E. Chaumat. First Addition, dated Feb. 8, 1911, to Fr. Pat. 422,414, Jan. 18, 1910 (this J., 1911, 534).

The process and machine described in the principal patent may be employed for all vat dyestuffs.—P. F. C.

Finishing or filling and colouring, or filling only of textile fabrics. J. A. Sackville, Swinton, Lancs. Eng. Pat. 9073, April 12, 1911.

Beaten wood or paper pulp, rendered adhesive by the addition of starch, rosin soap or some other suitable agent is applied to the fabric by a "tommy dod" mangle. For book-cloths, casein, gelatin, shellac or albumin is substituted for the starch and fixed by the addition of formaldehyde or by steaming. If desired, a colouring matter may be fixed on the fabric by mixing it with a solution of a fixing agent such as gelatin, which is then made insoluble by the ordinary methods. For dark shades, oxide of iron either alone or mixed with other pigment colours may be used.—P. F. C.

Dyeings on the fibre [by means of triphenylmethane dyestuffs]; Process for producing fast ——. Act.-Ges. f. Anilinfabr., Treptow, Germany. Eng. Pat. 3134, Feb. 7, 1912. Under Int. Conv., March 2, 1911. Addition to Eng. Pat. 25,007, Jan. 12, 1910.

See Addition of Oct. 17, 1911, to Fr. Pat. 421,564 of 1910; this J., 1912, 383.—T. F. B.

Colour effects on textile fabrics; Production of peculiar ——. M. Becke, Assignor to Farbwerke vorm. Meister, Lucius, und Bruning, Höchst on Maine, Germany. U.S. Pat. 1,024,668, April 30, 1912.

See Eng. Pat. 6872 of 1909; this J., 1909, 1032.—T. F. B.

Linen or other textile articles; Process for waterproofing —— *and giving them a permanent glazed washable surface.* A. A. A. Zimmer, London. U.S. Pat. 1,025,731, May 7, 1912.

See Eng. Pat. 24,006 of 1909; this J., 1911, 21.—T. F. B.

Preparing solutions containing the reduction products [hydrosulphites] of the sulphites or bisulphites of organic bases. Ger. Pat. 245,043. *See* XX.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Amidosulphonic acid. K. A. Hofmann and E. Biesalski. Ber., 1912, **45**, 1391—1398.

The authors recommend amidosulphonic acid, $NH_2.SO_3H$, which can be easily obtained in a pure condition in large quantities by the interaction of hydroxylamine hydrochloride and sulphurous acid (see Raschig, Annalen, **241**, 161; Divers and Haga, Chem. News, **74**, 277), as a standard substance in acidimetry and alkalimetry. Although when heated with water, it undergoes hydrolysis fairly rapidly, at 40° C. or below the hydrolysis proceeds very slowly, and as the ammonium hydrogen sulphate produced ($NH_2.SO_3H + H_2O = NH_4.O.SO_3H$) also acts as a monobasic acid, in most cases no appreciable effect on the titrations is caused by the hydrolysis. Methyl orange, cochineal, rosolic acid, or litmus should be used as indicator. Amidosulphonic acid also offers advantages over pyrosulphate or sulphuric acid for the preparation of arylsulphuric acids and phenolsulphonic acids, the crystalline ammonium salts being in many cases obtained directly. A mixture of equal quantities of phenol and amidosulphonic acid heated to 150°—160° C. gives ammonium phenol-*p*-sulphonate. A mixture of 15 grms. of phenol and 10 grms. of amidosulphonic acid, heated on the water-bath, gives the ammonium salt of phenylsulphuric acid. Anisol, the cresols, the 1·2·4- and 1·3·4-xylenols are also sulphonated when heated to 150° C. with amidosulphonic acid. β-Naphthol gives 2-naphthol-6-sulphonic acid (Schaeffer's acid).—A. S.

Silicic acid and the silicates; Thermochemistry of ——. O. Mulert. Z. anorg. Chem., 1912, **75**, 198—240.

The heats of formation of various silicates, from the corresponding metallic oxides and silica, have been determined by measuring the heat of solution, in hydrofluoric acid, of the oxides and silicates concerned. The results obtained are shown in the following table, the heats of formation of the aluminium silicates being regarded as approximate only.

	Heat of formation.	Heat of crystallisation.
	Cals. per grm.-mol.	
Sodium silicate	+97·85	——
Manganese metasilicate	——	+8·52
Zinc orthosilicate	—23·74	+9·04
Zinc metasilicate	+ 2·49	——
Leucite	+101·6	——
Microcline	+104·2	——
Adularia	−131·2	+55·72
Analcime	+85·22	——
Natrolite	+95·76	——
Heulandite	+59·44	——

Aluminium hydroxide, with an excess of hydrofluoric acid, gives an aluminofluorhydric acid, and, with an excess of aluminium hydroxide the latter acid slowly reacts forming a sparingly soluble compound. Contrary to the assertion of J. Thomsen, silicic acid reacts with an excess of hydrogen fluoride to give hydrofluosilicic acid. Determination of the specific heat of hydrogen fluoride solutions has, especially in the more concentrated solutions, given considerably higher values than those obtained with equivalent solutions of hydrochloric, nitric, and sulphuric acids.—F. Sodn.

Felspar; Extraction of potash and alumina from ——. H. W. Foote and S. R. Scholes. J. Ind. Eng. Chem., 1912, 4, 377.

Laboratory experiments in sealed glass tubes showed that finely ground felspar can be almost completely decomposed by heating with aqueous sulphuric acid in presence of a small quantity of hydrofluoric acid. The glass was attacked slightly but not sufficiently to affect the general results. The amount of decomposition was ascertained by determining the aluminium in the resulting solution. The best results were obtained under the following conditions: A mixture of 10 grms. of felspar, 10 grms. of sulphuric acid, 10 grms. of water, and 1 grm. of calcium fluoride was heated for 20 hours at 140°—150° C. The amount of decomposition was 88·9 per cent. (See also this J., 1908, 560).—A. S.

Perborates; The constitution of ——. E. Bosshard and K. Zwicky. Z. angew. Chem., 1912, **25**, 993—995.

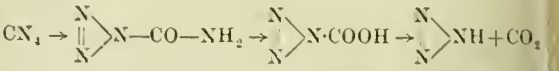
Solutions of perborates give all the reactions of hydrogen peroxide and have therefore been considered as metaborates combined with hydrogen peroxide. On this assumption the structure of perborates could be indicated either as NBO_2,H_2O_2, or as $(NO_2)(OH)_2.B_2O_3$. Attempts to separate hydrogen peroxide from solutions of perborates were however unsuccessful, and Constam and Bennet have shown that perboric acid is monobasic. Both these hypothetical structures are therefore incorrect. From an investigation of the relative rates of decomposition of hydrogen peroxide and sodium perborate solutions in presence of colloidal platinum, the authors conclude that perboric acid first breaks down into metaboric acid with formation of hydrogen peroxide. Perboric acid therefore is analogous to persulphuric acid and its constitution is represented by the formula, $HO.BO_2.(H_2O.)$.—T. St.

Hydrogen peroxide; Action of —— *on lactic acid and dextrose.* J. Effront. Comptes rend., 1912, **154**, 1296—1298.

Hydrogen peroxide decomposes albuminoid substances and amino-acids in acid or alkaline solutions, with formation of ammonia and hydroxy-acids. It decomposes hydroxy-acids more readily than their salts. If a solution of lactic acid is distilled and the volume of liquid in the distilling flask is maintained constant by running in hydrogen peroxide, practically the whole of the lactic acid is ultimately converted into acetic acid which passes into the distillate together with small quantities of alcohol. If a solution of dextrose is distilled in the same way, formic and acetic acids and small quantities of alcohol are produced. The volatile acids amount to about 60 per cent. of the weight of dextrose decomposed. Oxalic acid is formed in considerable quantities during the process, but none remains by the time all the sugar has been destroyed.—J. H. L.

Carbon pernitride. G. Darzens. Comptes rend., 1912, **154**, 1232—1234.

By treating an aqueous solution of sodium trinitride (the sodium salt of hydrazoic acid) with cyanogen bromide and extracting with ether, the substance, CN_4, carbon pernitride or cyanogen trinitride, can be prepared as a crystalline colourless substance melting at 35·5°—36° C. It is soluble in water and in most organic solvents, and can be sublimed *in vacuo* at low temperatures. At 70° C. it begins to decompose, and at 170° to 180° C. it explodes with great violence. It is also very sensitive to shocks and must be manipulated with great care. In the presence of traces of bromine it is converted into a polymeride insoluble in ether, which is much more stable and does not detonate. In aqueous solution the pernitride undergoes hydrolysis, in stages represented by the following formulæ,



$$CN_4 \rightarrow \begin{matrix}N\\ \|\\ N\end{matrix}\!\!>N{-}CO{-}NH_2 \rightarrow \begin{matrix}N\\ \\ N\end{matrix}\!\!>N{\cdot}COOH \rightarrow \begin{matrix}N\\ \\ N\end{matrix}\!\!>NH + CO_2$$

Determination of the heat of combustion in the Berthelot bomb was accompanied by violent explosion and considerable damage to the platinum capsule. In spite of this the value −92·6 cals. was obtained for the heat of formation of the solid substance. The pernitride is therefore the most endothermic substance known. The heat of polymerisation is 10·4 cals.—W. H. P.

Patents.

Sulphuric acid; Manufacture of ——. F. Perry, Tipton, Staffs. Eng. Pat. 20,063, Sept. 9, 1911.

Gases containing hydrogen sulphide are made to react with a solution of copper sulphate, so as to give sulphuric acid and a precipitate of copper sulphide, and the latter is reconverted into sulphate by calcination, followed by treatment with sufficient sulphuric acid to react with any oxide formed. The invention is intended to apply specially in the preparation of the dilute sulphuric acid required for the recovery of ammonia in the manufacture of Mond or other producer gas, the gas being at the same time rendered free from hydrogen sulphide.—F. Sodn.

Copper compounds or solutions thereof; Manufacture of ——. S. J. Ralph, Stockton-on-Tees, and Sulphates, Ltd., Peterborough. Eng. Pat. 10,338, April 28, 1911.

Iron is removed as oxide from copper liquors by adding barium oxide, hydroxide, or carbonate (preferably the last) and treating the mixture with an oxidising agent such as air, the barium compound being added in amount equivalent to that of the iron present, and sufficient sulphuric acid or sulphate being also present to convert the barium into sulphate. Free acid is preferably neutralised by means of copper oxide before adding the barium compound.—F. Sodn.

Zincate solutions; Preparation of ——. C. Ranson, Paris, France. U.S. Pat. 1,023,964, April 23, 1912.

Concentrated solutions of alkali zincates, such as sodium zincate, are prepared from ores containing zinc oxide by treating the ore with ammonia solution, and mixing the resulting liquid with an alkali, such as caustic soda. The ammonia and steam are distilled off from the mixture, and condensed so as to produce ammonia solution, thus making the process a continuous cycle.—B. N.

Oxide or sulphide of zinc; Process of manufacture of —— *with simultaneous obtainment of by-products.* J. Braunschild and B. Chapiro. Fr. Pat. 437,501, Feb. 20, 1911.

Zinc is treated with a warm solution of alkali hydroxide, in the presence of finely divided or porous iron or of iron which is alloyed or coupled with a less oxidisable metal or carbon, and the solution of zincate obtained, after a preliminary purification by known methods, is mixed with boiling water, and further boiled if necessary, so as to precipitate the zinc as oxide, after which the separated liquor is concentrated and used again in the process; or, the zincate is converted into zinc sulphide by passing a current of hydrogen sulphide into the hot solution or by boiling the solution with one of sodium, potassium, or barium sulphide, the zinc sulphide being precipitated in a form which is readily washed. Suitable apparatus, of a continuous type, consists of a reaction vessel with non-conducting wall, having a perforated false bottom, on which the zinc rests, and a couple, consisting of carbon and iron plates, suspended so as to be in contact with the zinc, appropriate openings being provided for the introduction of the hot alkali solution and for the discharge of hydrogen and also the zincate solution and impurities, which collect below the false bottom. The process may be modified by adding a solution of sodium or potassium itrate to the reacting mixture and heating to about 0 C. (preferably with agitation), when ammonia is volved in place of hydrogen.—F. Sodn.

Zinc oxide; Process of manufacture of pure —— by direct extraction of minerals or salts of zinc. P. Ferrere. Fr. Pat. 437,889, Dec. 19, 1911. Under Int. Conv., April 27, 1911.

A solution containing zinc (for example, as sulphate, obtained by roasting a sulphide mineral and subsequently lixiviating and eliminating sulphates of copper, etc., from the solution) is treated (preferably at the boiling temperature or under pressure) with a normal sulphite of an alkali or alkaline-earth metal or of magnesium or aluminium (but preferably with a solution of potassium or sodium sulphite), and the precipitated zinc sulphite is calcined at a high temperature (600—800 C.). When zinc sulphate is treated, part of the residual liquor may be employed for lixiviating fresh portions of the roasted mineral, and part may be treated with an equivalent quantity of calcium carbonate and with the sulphur dioxide obtained by calcination, so as to regenerate sodium sulphite, with the precipitation of calcium sulphate. A bisulphite may also be employed, in place of a normal sulphite, if desired, in which case the zinc bisulphite is converted into the normal salt by heating or by a reduction of pressure —F. Sodn.

Hydrogen peroxide solution; Stable ——. O. Liebknecht, Frankfort-on-the-Maine, Germany, Assignor to Roessler and Hasslacher Chemical Co., New York. U.S. Pat. 1,025,948, May 7, 1912.

Claim is made for a solution of hydrogen peroxide containing sulphanilic acid.—W. E. F. P.

Nitrogen and carbonic acid gas from combustion gases; Apparatus for extracting ——. H. Braun, Berlin. Eng. Pat. 22,531, Oct. 12, 1911.

The apparatus, which is intended for carrying out the process described in Eng. Pat. 20,631 of 1909 (see Fr. Pat. 414,690 of 1909; this J., 1910, 212), consists of a furnace, a water-irrigated washer through which the combustion gases are drawn, retorts containing copper oxide, in which the gases mix with combustible gases (previously rendered free from sulphur in suitable purifying apparatus), a cooling apparatus for condensing steam from the mixed gases from the retorts, towers or chambers in which potash or other alkaline solution is circulated for absorbing the carbon dioxide from these gases, a boiler for heating the saturated potash solution to recover the carbon dioxide and regenerate the absorbing liquid, and vessels for storing the separated gases. The rates of flow of the gases are so regulated that approximately perfect combustion takes place, the two currents preferably entering the retorts in a tangential direction, and being oppositely directed. The copper oxide acts as a contact substance and effects the combustion at a temperature varying between 400° and 600° C.—F. Sodn.

Nitrogen compounds; Process of manufacturing —— by means of red [ferruginous] bauxite. N. Lecesne. Fr. Pat. 437,397, Dec. 9, 1911.

Gypsum is calcined with coal to form calcium sulphide, and the latter is treated with steam and carbon dioxide with the formation of powdered calcium carbonate and evolution of hydrogen sulphide; the latter is passed through a series of rotating drums containing ground bauxite, which is rich in iron and titanium and poor in silica, the bauxite being thereby turned black owing to the formation of ferrous sulphide. The resulting porous, "black bauxite," when mixed with lime and calcium carbonate, has the property of fixing atmospheric nitrogen, when a current of air is passed over it for prolonged periods; if steam be mixed with the air, nitrates are formed; in the absence of steam chiefly nitrides are obtained, and if the bauxite be used in the form of grains, prepared as described in Fr. Pat. 424,514 of 1910 (this J., 1911, 747) the resulting product contains amides.—O. R.

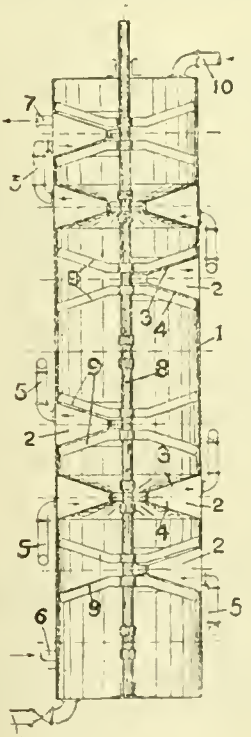
Nitrides; Process of manufacture of —— in the electric furnace. G. Coutagne. Fr. Pat. 437,501, Feb. 20, 1911.

A mixture of carbon with oxygen compounds (simple or mixed) of silicon, calcium, barium, magnesium, aluminium, boron, titanium, or analogous elements, to which sawdust (say 5 per cent.) and sodium chloride may be added, is submitted, in an electric furnace (which may be open or provided with a movable cover) to the heat developed by a current in a core of carbon which is surrounded by the mixture, and nitrogen (or a gaseous mixture containing nitrogen) is injected, under a sufficient pressure to cause the gas to slowly pass through the whole mass.—F. Sodn.

Fluorescent substances [basic zinc silicate, etc.]; Process for the manufacture of ——. G. Rupprecht. Fr. Pat. 437,746, Dec. 16, 1911. Under Int. Conv., Dec. 17, 1910 and Nov. 11, 1911.

Basic zinc silicate is claimed to be superior to platinocyanides for the manufacture of fluorescent Röntgen ray screens. It may be prepared by fusing one molecular part by weight of silica with more than one molecular part by weight of zinc oxide, and small quantities of certain foreign bodies, such as compounds of platinum or gold, iron, manganese, chromium, or the like, may be added to intensify or modify the fluorescence. The zinc may be wholly or partially replaced by cadmium, and the silica by the oxides of titanium, tungsten, molybdenum, vanadium, or phosphorus.—O. R.

Cooling apparatus for the preparation of granular salts from —— hot saturated solutions. K. Koelichen. Ger. Pat. 245,649, Oct. 6, 1909.



In a vertical chamber, 1, a series of closed cooling elements, 2, are arranged after the fashion of the steps of a spiral staircase. These cooling elements are connected with one another by the pipes, 5. The cooling liquid enters at 6 and leaves at 7. The rotating shaft, 8, carries arms, 9, which move over the cooling surfaces 3, 4, and keep the solution which is being cooled in motion. The hot saturated solution enters at 10 and is discharged at 11. The apparatus is intended especially for solutions obtained in the manufacture of potassium salts.—A. S.

Chlorates and perchlorates; Process of neutrolisation of the alkali in the electrolytic manufacture of ——. M. Couleru. Fr. Pat. 437,831, Feb. 27, 1911.

The accumulation of free alkali during the electrolytic preparation of chlorates and perchlorates is prevented by adding suitable chlorates (such as lead chlorate) or perchlorates to the electrolyte.—F. Sodn.

Crystallisation of salts; Apparatus for the continuous ——. F. Krupp A.-G. Ger. Pat. 244,361, May 3, 1911.

THE apparatus consists of a trough divided into a number of compartments, which are quite separate one from the other except for the openings for the passage of the solution from one compartment to the next. Each compartment is provided with a separate device for removal of the separated crystals, and means are provided whereby one compartment can be cut out of the series for the purpose of emptying it, without interrupting the working of the others.—A. S.

Hydrogen; Process and apparatus for the preparation of —— in closed vessels by autocombustion. G. F. Jaubert. Fr. Pat. 438,021, Mar. 4, 1911.

THE oxidising agents specified in Fr. Pat. 427,191 of 1910 (this J., 1911, 1058) are omitted, it being found that certain iron alloys, especially ferrosilicon containing 75 per cent. of silicon, when heated to a very high temperature, are capable of decomposing steam with sufficient evolution of heat to carry on the reaction. $3\ FeSi_6+40\ H_2O=Fe_3O_4+18\ SiO_2+40\ H_2$. The reaction may be regulated by the addition of lime, which has the further advantage of forming an easily workable slag. The apparatus comprises a refractory chamber surrounded by a steam coil, the delivery end of which terminates in a series of injectors, which admit steam into the chamber; a feeding hopper is provided at the top of the chamber and a door for the withdrawal of the slag at the bottom. —O. R.

Metallic salts; Deposition of —— from solutions containing them. H. L. Sulman, and The Metals Extraction Corporation, Ltd., London. Eng. Pat. 10,052, April 25, 1911.

SEE Fr. Pat. 433,477 of 1911; this J., 1912, 230.—T. F. B.

Hydrogen; Process and apparatus for manufacturing ——. G. F. Jaubert, Paris. Eng. Pat. 17,589, Aug. 2, 1911. Under Int. Conv., Aug. 6, 1910.

SEE Fr. Pat. 430,302 of 1910; this J., 1911, 1313.—T. F. B.

Oxygen; Cartridge for the preparation of ——. G. F. Jaubert, Paris. U.S. Pat. 1,025,191, May 7, 1912.

SEE Eng. Pat. 22,034 of 1909; this J., 1910, 25.—T. F. B.

Oxygen; Process for the production of ——. D. Helbig. Fr. Pat. 437,685, Dec. 15, 1911. Under Int. Conv., Dec. 17, 1910.

SEE Ger. Pat. 244,839 of 1910; this J., 1912, 490.—T. F. B.

Evaporating and drying apparatus. Fr. Pat. 437,202. *See* I.

Apparatus for separating liquors from residues obtained in chemical processes, especially in the potash industry. Ger. Pat. 244,537. *See* I.

Obtaining acetic and formic acids from the waste lyes of soda-cellulose manufacture. Ger. Pat. 244,816. *See* V.

Obtaining the sodium salts in the form of bicarbonate from black lyes from soda-cellulose manufacture. Ger. Pat. 244,941. *See* V.

Electric furnace for the manufacture of nitrides. Addition to Fr. Pat. 436,789. *See* XI.

VIII.—GLASS; CERAMICS.

Insulators; High-tension porcelain line ——. J. Lustgarten. Inst. Electr. Engineers, 1912. [Adv. proof.]

INSULATORS are in England composed of kaolin, ball clay, flint, Cornish stone and felspar. The ball clay is in preponderating amount; it makes the mixture easier to work and renders the finished insulator less brittle. Brittleness is the chief defect of insulators and can only be minimised by proper design. On the Continent the body contains kaolin, felspar and quartz; the resulting porcelain is whiter, more brittle, but probably superior in electric strength. In English practice the body is thrown and turned, fired at 1250°—1300° C., when it suffers 16 per cent. linear shrinkage, and then glazed and fired at a lower temperature. In Germany and America the ware is moulded, biscuited at 800°—900°, glazed and re-fired at 1400°—1500°, whereby the body is vitrefied and the glaze matured. The shrinkage is slightly less for moulded goods than for those turned on the lathe. The density is 2·3—2·4. English insulators, whether glazed or unglazed, will not absorb water. Heat conductivity (silver 100 per cent.) is 0·045 per cent., and specific heat 0·17. Specific electric resistance depends on the surface conditions; surface leakage is more serious than actual leakage through the material. A clean glazed piece at normal temperature and humidity had a specific resistance of 2×10^{12} megohms. Porcelain becomes conducting when raised to a red heat. The dielectric constant obtained with direct current is about 5·3. With alternating current the value for a frequency of 50 is about 10 per cent. less, diminishing a further 3 per cent. for a frequency of 100. The greatest mechanical strength of porcelain is in compression, being about 30 tons per square inch, only 30 per cent. less than cast iron. Tensile strength averages 10 tons and tensile bending strength 3 tons per sq. inch. Weather-resistance depends on the hardness, which is so great that the surface can be penetrated by a diamond point only under great load. The long spans which have come into use subject the insulator to great stresses, the most important being the horizontal pull of the wire, especially when the wire breaks, and also at corners and dead-ends. Other stresses are wind pressure and extreme cold, and the weight of snow and ice on the wire, especially with aluminium conductors which require a large diameter. As an insulator withstands compression best, in the pin type the pin is threaded up into the head of the insulator, so that the porcelain is only in compression and not in shear. The insulator can thereby be designed to withstand 3—4 tons, the pin bending before the porcelain fractures. After devoting several pages, with photographic illustrations, to a discussion of electric discharge and the types and designs of insulators best calculated to afford protection against arc and similar effects, the author proceeds to the testing of insulators. Testing laboratories should be equipped to carry out two kinds of tests. The one consists of investigating characteristics of new designs subjected to practice; the other comprises guarantee tests on representative samples selected by the purchaser, and puncture tests on duplicates. The most general tests are the measurement of voltage and the puncture test. There are three methods of measuring pressure: by transformer ratio, by the Kelvin electrostatic voltmeter, and by a spark-gap. The spark-gap gives uncertain values and may not confirm its own results on successive days, but it is preferable where the regulation is effected by a resistance in the primary circuit which is apt to cause distortion of wave-form. Puncture tests are done on each shell and on the completed multi-piece insulator. There is no uniformity in the duration of the tests, which vary at different works from one minute to two hours; but 30 minutes is recommended as ample. The flash-over voltage should also be studied under rain either by an artificial apparatus which regulates precipitation and direction (apparatus described), or under natural weather conditions, as it is difficult to imitate snow and frost. Water in the frozen state is a fair non-conductor, but driven snow falling at a temperature above freezing-point forms a thawing mass which constitutes the severest conditions with which an insulator meets. Soot on a damp day will attract moisture and thereby tend to lower insulation resistance. The leakage loss of clean insulators is half that of insulators soiled by smoke and dust. A sea-coast with its salt fogs is more trying to an insulator than dry mountainous regions. Near chemical works the suspension type is preferable to the pin type, as the former is better cleansed by wind and rain.—H. H. S.

Stoneware; Enamel decoration on ——. A. Berge. Sprechsaal, 1912, 45, 306—307.

The word enamel is used in this paper in its widest sense of a coloured glaze with or without an opacifier. Several types of stoneware glaze are given, as follows:—

	SiO_2	B_2O_3	Al_2O_3	PbO	CaO	K_2O	Na_2O	BaO	CaO	MgO	SrO	Temperature.
I	2·2	0·55	0·4	0·6	0·1	0·15	0·15	—	—	—	—	950° C.
II	2·4	0·2	0·4	—	—	0·2	0·2	0·3	0·3	—	—	1000° C.
III.	1·8	0·8	0·2	—	—	0·2	—	—	—	0·26	0·54	950° C.
IV.	0·5—1·2	0—0·7	0—0·3	0·7—1·0	—	0—0·3	0—0·3	—	—	—	—	800° C.
V	2·5	2·0	0·3	0·5—1·0	—	—	0—0·5	—	—	—	—	800° C.

A palette of twelve colours is also supplied, and for ornament the Japanese wares of Satsuma, Awata, and Kioto are recommended as models. They are stonewares which ring well; the glaze has a dull surface, is strongly crackled and often decorated with much gold-line.—H. H. S.

Method of joining platinum and quartz. Berlemont. *See* XXIII.

Antiquities; Disintegration and preservation of ——. Rathgen. Verh. des Vereins zur Beförd. des Gewerbfleisses, 1912, Heft 4.

The disintegration of stone objects and pottery can almost invariably be traced to the presence of soluble salts, and the most effective way of preventing disintegration is to remove the salts by lixiviation. In the case of the smaller, more valuable articles, distilled water is used, but for large objects, especially limestone blocks, pure tap water, spring water, or rain water may be employed. Occasionally articles are encountered which will not withstand lixiviation with water, and a preliminary test should be made in all cases. The water is changed frequently at first, and later at intervals of eight days. Illustrations of the manner in which the lixiviation, both of small and of large objects, is carried out in the laboratory of the Berlin Museum are given. After lixiviation and drying, the surface of limestone objects is hardened by a treatment with "Fluat," whilst the enamelled side of enamelled bricks is coated with molten paraffin, the excess of which is afterwards removed by rotating brushes. Cracked articles are bandaged before lixiviation, and are afterwards immersed in molten paraffin and then allowed to cool before removing the bandages. In the case of coloured objects, the colour can frequently be fixed by treatment with "Fluat." Superficial deposits of calcium carbonate on acid-resisting objects are removed by lixiviation with very dilute hydrochloric acid, followed by thorough washing; in other cases such deposits are removed by mechanical means. Articles of burnt clay or pottery having superficial deposits are heated slowly to 120° C. in a drying oven, and then introduced into a gas-heated muffle-furnace and heated slowly to about 600° C. After slowly cooling, the articles are freed from the superficial deposits by a blast of air, by a soft brush, or by prolonged immersion in water. Metal objects are usually cleaned and renovated most efficiently by an electrolytic reduction process, the metal object being either used as, or connected with the cathode, and a weak electric current passed. The liberated hydrogen loosens the coating of rust or the like, which can subsequently be removed by mechanical means, after which the object is thoroughly washed in water. Iron objects are then immersed directly in molten paraffin at 120° C., whereby the water is evaporated and the object becomes coated with paraffin, the excess of which is subsequently removed. Bronze articles after cleansing are preferably lacquered, and lead articles are coated with wax. Iron objects frequently contain chlorine compounds, which may lead eventually to their entire disintegration. Such objects are lixiviated with water to remove the chlorine compounds, and then immersed in molten paraffin as described above. Tin objects must be kept at a temperature not below 18° C., in order to prevent the so-called "tin pest" (see this J., 1908, 1155). The author describes two forms of air-tight cases in which objects can be preserved in an atmosphere free from moisture and carbon dioxide. In the case of wooden objects it is recommended that they be coated with paraffin immediately after excavation, the fused paraffin being sprinkled or poured on to the object. The excess of paraffin is subsequently removed by the application of a small gas flame 1 cm. long by 1 mm. diameter. —A. S.

Patents.

Glass furnace; The melting pot of a ——. R. H. Thompson, Birmingham. Eng. Pat. 16,877, July 24, 1911.

The pot is of the covered or hooded type, and is adapted to take the full charge of material to be melted at one filling, so that the charge substantially fills the pot to the top and only sinks to the level of the skimming lip when the fusion is complete. For this purpose the pot is provided with an auxiliary mouth above the ordinary, or glass-drawing mouth, the latter being closed with a suitable stopper during the filling and fusing, or the pot is provided with a single mouth which can be closed with suitable stoppers, one above the other. The capacity of the pot, both for the unfused and fused material, is increased by tapering the walls outwards, at the sides and back of the pot.—W. C. H.

Clay; Process of treatment of moist —— *for dry pressing.* W. Eckardt and E. Hotop, G. m. b. H. Fr. Pat. 437,543, Oct. 13, 1911.

A body suitable for dry pressing is prepared by thoroughly mixing moist clay materials with pulverised caustic lime, and adding sand, if necessary. The sand should be graded into coarse and fine, and the latter finely ground, so that the proper quantities of the two grades can be added to the mixture of clay and lime to secure satisfactory results both on pressing and on vitrefying the mass.—W. C. H.

Hollow bodies from arenaceous quartz and other not easily fusible materials; Method and apparatus for electrically producing ——. A. Voelker, Beuel, and N. Meurer, Cologne, Germany. Eng. Pat. 19,643, Sept. 4, 1911.

See Fr. Pat. 435,037 of 1911; this J., 1912, 336.—T. F. B.

IX.—BUILDING MATERIALS.

Lime for sand-lime bricks; Hydraulic ——. B. Krieger. Tonind.-Zeit., 1912, 36, 773—775.

The author draws attention to Hardenbroek's statements that hydraulic lime should not be used for the manufacture of sand-lime bricks, and that the pressed raw bricks should not be allowed to dry out before being introduced into the autoclave. Mention is made of the report of the Dutch Commission for the investigation of Dutch bricks and sand-lime bricks, with special reference to the work of Leduc and de la Roche (Tonind.-Zeit., 1909, 291). It was found that bricks made from hydraulic lime were more readily destroyed by frost than ordinary sand-lime bricks, and that the surfaces of the former began to harden in the raw state before the bricks were brought into the autoclave, the resulting products in consequence lacking uniformity. The lime used in a large number of sand-lime brickworks was analysed, and the value,

$$\frac{\text{aluminium oxide}+\text{ferric oxide}+\text{soluble silica}}{\text{calcium oxide}}$$

was termed the hydraulic coefficient. An attempt was made to correlate decreasing strengths and increasing damage by frost in various bricks with increase of the hydraulic coefficient; no such general relationship was found to hold good, though in the products of one factory, where two classes of lime were used, not one of the bricks made with lime having the unusually high hydraulic coefficient of 0·143 withstood the freezing test, whereas all the bricks made with lime of a lower hydraulic coefficient remained undamaged.—O. R.

Portland cement; Free lime in ——. H. E. Kieler. J. Ind. Eng. Chem., 1912, 4, 358—362.

RESULTS of tests are described which show that the presence of free lime (anhydrous) cannot be the sole cause of the failure of certain samples of cement to pass the boiling test. Le Chatelier has stated that the addition of 1 per cent. of freshly calcined lime to a sound cement will render it unsound, but in the author's experiments, finely ground lime was added in relatively large quantities (in one case up to 25 per cent.) to samples of cement without rendering them unsound. In all the cases tried, the quality of the cement was improved by finer grinding or by removing the coarser particles by sifting. In other experiments in which unsound cements were exposed to moist air at 150° F. (65·5° C.), the absorption of from 0·1 to 0·27 per cent of moisture sufficed to render the cements sound. It was found that when cement is allowed to stand, either in a sealed jar or exposed to the air, the coarser particles become progressively finer, and it is considered probable that the seasoning of unsound cement consists in the disintegration of the coarser portion (in which free lime may be present encased in glassy particles), caused or accelerated by heat and moisture, and that the moisture need not be in sufficient quantities to hydrate the free lime, but merely to render the coarser particles sufficiently fine to permit hydration before the cement has set.—A. S.

Disintegration and preservation of antiquities. Rathgen. *See* VIII.

PATENTS.

Artificial stone: Manufacture of ——. C. W. Julians, Ponders End, Middlesex, and The British Stone and Marble Co., Ltd., London. Eng. Pat. 9272, Apr. 13, 1911.

IN the manufacture of artificial stone from a mixture of crushed stone or slag with slaked lime by pressing into blocks and then carbonating the latter, a portion of the finely powdered stone is mixed with the burnt lime before the latter is slaked, the remainder being added when the slaking is complete. The charge is then rapidly mixed, being pressed as soon as it attains the consistence of cream. It is stated that blocks so produced (without subsequent treatment with steam) may be easily and safely handled immediately after being pressed.—W. E. F. P.

Stones; Process for the manufacture of artificial ——. M. Hartung. Fr. Pat. 437,662, Dec. 14, 1911.

THE main constituents of the stones, *e.g.*, plaster or cement, are mixed with a large quantity of water, the excess of which is removed by pressure, or centrifugal force before the blocks are moulded. The excess of water may also be removed by pressing the mass in porous bags. Imitation marble can be obtained by preparing coloured, dehydrated blocks in this way, which are then broken up and mixed and sprinkled with dry colours before being moulded. —W. C. H.

Bituminous road materials; Apparatus for determining the consistency of ——. J. Hutchinson, London. From W. W. Crosby, Baltimore, Md., U.S.A. Eng. Pat. 16,997, July 25, 1911.

THE consistency of materials, such as pitch, asphalt, coal tar, and the like, is determined at temperatures from 0° to 100° C. (or lower or higher), by measuring the distance travelled through the substance that is being tested, by plungers under the known loads, in a fixed period of time, for instance, 5 seconds. The apparatus may also be used to measure the period of time required for the plungers, under known loads, to travel a fixed distance through the substance to be tested, which is contained in a box of fixed dimensions and is maintained at a known temperature. In this case the time required by the plunger to travel the fixed distance is taken as the measure of the consistency. The apparatus consists essentially of an accurately balanced wheel, around the circumference of which a thread passes, which is attached at one point to prevent slipping. The plungers are attached to one end of the thread, and a pan for counterpoising weights to the other, and means are provided for accurately measuring the arc through which the wheel turns. The specification contains details of the dimensions of the plungers, etc.—W. C. H.

Fireproof compound. A. Gutensohn, London. Eng. Pat. 18,820, Aug. 21, 1911.

A MIXTURE of 3 parts of ordinary fireclay, 1 part of pipeclay, and about 1/20 of a part of manganese peroxide is made into a paste with sodium silicate and water; the paste is then dried and powdered again, and used either in that condition or else mixed with a dry mixture of the first three ingredients. The resulting product is mixed with water to the required consistence and employed as a fireproof compound with or without the addition of some highly refractory material.—W. C. H.

Cements and the like; Compositions for hastening the setting of ——, and for waterproofing them. J. H. Schallenberg, Cologne, Germany. Eng. Pat. 20,076, Sept. 9, 1911.

THE composition is made by mixing 90 parts of sodium bicarbonate, 10 parts of potassium bicarbonate and 2 parts of barium chloride, and is added in the proportion of from 3 to 10 per cent. of the mortar. Gypsum, soda, water glass and potash may also be added to the composition.—W. C. H.

Cement; Process of manufacture of a fully combined ——, and of improvement of ordinary cements. N. Lecesne. Fr. Pat. 437,860, Dec. 18, 1911.

A QUICK-SETTING, highly resistant cement, in which the constituents are present in the proportions required for complete chemical combination, is obtained by the incorporation of bauxite with the cement. Cements in general are improved by the addition of bauxite, as the complementary quantity of alumina modifies their composition and allows the time of setting and the resistance to be regulated according to the uses to which the cements are to be put; the alumina also combines with, and stabilises the lime in slag cements. The increase of hydraulicity of limes in general is also claimed, whereby qualities similar to those of limes and cements are imparted to plaster. The fully combined cement and improved ordinary and slag cements, limes and plasters are claimed as new technical products, independently of processes of manufacture.—W. C. H.

Rocks; Process of utilisation of volcanic ——. F. Ribbe. First Addition, dated Dec. 11, 1911, to Fr. Pat. 418,624, July 27, 1910 (this J., 1911, 88).

A CUPOLA is used in carrying out the process described in the original patent, and products of different densities are obtained by arranging one or more rows of tuyères on the cupola, and by varying their height above the base of the furnace. A well is arranged at the bottom of the cupola, and the tapping holes are worked at different heights. The product is devitrefied by running it into moulds with thick walls, heated to about 700° C.—W. C. H.

Bricks or light stones; Process for the manufacture of —— by means of blast-furnace slag. C. H. Schol. Fr. Pat. 437,595, Nov. 25, 1911.

THE loose, bulky pieces of slag, produced during the granulation, are separated by sifting and are used as filling material, whilst the smaller portions of the granulated slag are finely ground and used as binding material, with or ithout the addition of lime. The lumps employed as lling material are covered with a coating of mortar, and ft long enough, if necessary for several days, for this o harden, and are then mixed with the binding agent. alcium chloride, or some other substance capable of roducing a similar effect, either in the form of a dry owder or as a solution in water of about 10° Bé., may e used as the mortar or as the binding agent for the filling naterial. In order to obtain as high a percentage as ossible of loose and voluminous pieces of slag, the granuation of the latter is effected by the simultaneous action f water and compressed air.—W. C. H.

Wood; Impregnation of ——. J. Polifka and B. Hacker, Assignors to "Impragnator" Impregnating Co., Ltd., Budapest. U.S. Pat. 1,024,864, April 30, 1912.

See Fr. Pat. 392,554 of 1908; this J., 1908, 1205.—T.F.B.

Compound for waterproofing cement and the like. U.S. Pat. 1,023,926. *See* XIII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Steel; The structural composition and physical properties of ——. A. Sauveur. J. Franklin Inst., 1912, **173**, 499—508.

The structure of a slowly cooled, almost pure iron-carbon steel consists entirely of pearlite if the total carbon content is close to 0·85 per cent., of free ferrite and pearlite if the carbon is below this amount, and of free cementite and pearlite if the carbon is higher. Knowing the percentage of carbon in cementite, it is therefore easy to calculate the relative proportions of ferrite and pearlite, or cementite and pearlite, in such a steel when the total carbon is known. Also, knowing the mechanical properties of each of these structural constituents, and assuming that each constituent would impart to the steel its own properties in proportion to its amount, it should be possible to foretell the properties of the steel from its carbon content. The author shows that this reasoning gives results closely in agreement with those found by direct test.—T. St.

Steels; Crystallisation and structure of slowly cooled ——. N. T. Belaiew. Rev. Mét., 1912, **9**, 321—342.

The author has studied the structure and crystallisation under slow cooling of steels containing less than 2 per cent. of carbon. The samples were kept in the melted condition for 2 hours and then allowed to cool in the furnace, the time taken for the temperature to drop from 1500° C. to 300° C. being about 60 hours. Solidification of the melted steel takes place with the formation of a dendritic structure. This change is called the "primary crystallisation." Evidence of the dendritic structure is apparent to the naked eye under favourable conditions in the surface appearance of the steel. The crystallographic form is the octahedron. A consideration of the formation of the dendritic structure leads to the conclusion that the resulting solid solution is non-homogeneous. As the steel cools through the solid solution state, polygonal grains, each consisting of aggregations of elementary octahedra, are formed. When the temperature falls below the Ar_1 point, ferrite or cementite separates and the pearlitic structure is developed. This change is designated the "secondary crystallisation." If the secondary crystallisation is made to take place quickly, the structural elements separate in planes parallel to the octahedral surfaces, giving rise to the so-called Widmanstatten figures in the interior of each grain. The "structure of large crystals" is developed when the axes of the dendrites coincide with those of the separated ferrite and cementite.—T. St.

Tool steels; Influence of heat on hardened ——. E. G. Herbert. Iron and Steel Inst., May, 1912. [Advance proof.]

The durability of tool steel as measured by the author's "tool steel testing machine" (Iron and Steel Inst., 1910, I. 206) seems to depend jointly upon the hardness and toughness. The product of hardness and toughness in every case increases in value as the temperature rises above 100° C., and to this is attributable the increased durability at high temperatures, or at high speeds or heavy cuts, which raise the temperature of the cutting edge. In some cases the curves of durability show two maxima as the temperature rises, a circumstance not yet clearly explainable, but perhaps due to change in the relative importance at different temperatures of the hardness and toughness factors. Lowering of durability at very high speeds is no doubt caused by actual softening of the edge by the consequent high temperature. In cutting with water, the temperature is lowered, and hence the maximum durability is reached at a higher speed than with the dry tool—in many instances at double the speed, though no general ratio can be stated. High-speed steel attains its maximum durability at about the same temperature as carbon-steel, but has then a much higher durability than carbon steel; and at much higher temperatures, though its durability falls off absolutely, yet its superiority over that of carbon steel is increased.—J. T. D.

Iron-carbon and iron-silicon alloys; Magnetic properties of ——. E. Gumlich. Faraday Society, April 23, 1912. [Advance proof.]

Carbon in these alloys behaves (as to magnetisation up to saturation, coercive force, remanence, and electric resistance) very differently according to the heat treatment of the alloy; both the physical properties and the structure show this. The carbon dissolved in the iron exerts the strongest influence, increasing the coercive force and lessening the remanence as its amount increases. It decreases the permeability and increases the loss by hysteresis: important considerations for dynamo steel and transformer iron, which should be magnetically soft. Added silicon tends to lessen these disturbing effects of carbon, though apparently its influence is not a direct one, for it decreases the saturation value just as a non-magnetic addition would; possibly it aids in transforming the dissolved carbon into cementite or into "temper-carbon."—J. T. D.

Iron-nickel, iron-cobalt, and nickel-cobalt alloys; Magnetic properties of ——. P. Weiss. Faraday Society, April 23, 1912. [Advance proof.]

On the author's kinetic theory of ferro-magnetism, metals appear to be homogeneous solid solutions. The saturation intensity of magnetism is the resultant of the molecular moments, and at absolute zero gives the true moment of the molecule. Atoms rigidly connected form a molecule; but atoms may also be articulated, *i.e.*, magnetically free to assume any orientation. In oxygen and metallic salts (solid or dissolved) the coefficient of magnetisation is inversely proportional to the absolute temperature; and multiplied by the absolute temperature, it gives the Curie constant. From this constant the molecular moment can be deduced. At varied temperatures the magnetic moment of the nickel atom is represented by multiples of a common factor 1123·5, called the "magneton": at absolute zero it is 3 × 1123·5, at temperatures above the Curie point 8 magnetons, and in salts 16 magnetons. The magnetic moments of atoms of cobalt, manganese, chromium, vanadium, copper, and uranium all contain the same common factor. The idea of magnetons has been of use in investigating the alloys giving the title to the paper. The existence of the compound Fe_2Ni is indicated, and conclusions are drawn as to β-, γ-, and δ- iron, probably Fe_3, Fe_2, Fe respectively. The results can be interpreted in the case of the nickel-cobalt and reversible iron-nickel alloys, but are not clearly interpretable in the iron-cobalt and irreversible iron-nickel alloys. The compound, Fe_2Co, is more magnetic than iron. Nickel, in its

reversible alloys with iron, is in a state which the pure metal assumes only at a higher temperature ; cobalt does not affect nickel in this way, but does so affect iron.
—J. T. D.

Platinum group of metals. Volatility of the ——. Sir W. Crookes. Roy. Soc. Proc., 1912, A86, 461—476.

In an electric resistance furnace, formed of a close helix of platinum strip around a porcelain tube, it was found that the strip thinned and ultimately melted, and on the porcelain tube at the point of rupture a deposit always occurred, which was found to consist of microscopic hexagonal crystals of platinum. The author was thus led to investigate the volatility of platinum and its congeners at temperatures below their melting points. The metals—crucibles in the cases of platinum and iridium, polished plates in those of palladium, rhodium, and ruthenium, were heated in the electric furnace to 1300° C. for successive periods of two hours. The loss of weight was found to be approximately proportional to the time of heating, and amounted in 30 hours, with platinum, to 0·245 per cent. of the weight of the metal, with palladium to 0·745 in 22 hours, with iridium to 7·297, and in 30 hours with rhodium to 0·131, whilst ruthenium lost 25 per cent. of its weight in 8 hours. With iridium, the amount of loss for equal periods of heating, at temperatures between 1100° and 1400° C., increased proportionally with the rise of temperature. After these exposures at 1300° C., the platinum had not sensibly changed in appearance, the palladium gradually lost its smoothness and became crystalline and *moiré*, the iridium showed the same change in a higher degree, the rhodium slightly darkened but did not become crystalline, and the ruthenium became dull black, and was coated with oxide. On repeating the experiments at 900° C. by means of a Méker burner, neither platinum nor rhodium showed any change in weight or appearance, palladium lost in 22 hours 0·1827 of its weight, and showed practically the same appearance as after the heating at 1300° C., and iridium lost in 22 hours 0·092 per cent., but showed no change in appearance beyond a slight darkening. In the case of ruthenium, there is no doubt that the volatility is due to the formation of oxide ; and this is probably so in the case of iridium, for a quantity heated to 1300° C. for 30 hours in a quartz tube *in vacuo* lost only 0·069 per cent. Platinum and rhodium, however, appear to volatilise as metal.—J. T. D.

Gold-baths ; The composition of ferrocyanide ——. E. Beutel. Z. angew. Chem., 1912, **25**, 995—998.

THE author has previously shown that the complete interaction of the double chloride of gold and hydrogen with potassium ferrocyanide is represented by the equation :—

$$28HAuCl_4+35K_4FeCy_6+10\,O=$$
$$28KAuCy_4+112KCl+8HCy+5Fe_7Cy_{18}+10H_2O.$$

In the presence of alkali, the action may be :—

$$14HAuCl_4+10K_4FeCy_6+15K_2CO_3+5O+10H_2O=$$
$$14KAuCy_4+56KCl+4HCy+15CO_2+10Fe(OH)_3.$$

This reaction was tested by boiling a solution of the gold, ferrocyanide and potassium carbonate in the molecular proportions required by the equation, for 10 hours in an Erlenmeyer flask fitted with a reflux condenser. The operation was carried out in presence of sunlight, and from time to time a brisk stream of oxygen was passed through the liquid. The amount of ferric hydroxide precipitated was found to be exactly as indicated by the equation, and none of the original substances (nor ferricyanides) could be detected in the solution. A solution of potassium ferrocyanide and sodium carbonate, under the same treatment, gave no ferric hydroxide. In baths containing an excess of ferrocyanide over the amount shown in the above equation, the reaction is as follows :—

$$14HAuCl_4+14K_4FeCy_6+13K_2CO_3+7O+10H_2O=$$
$$14KAuCy_4+56KCl+4HCy+13CO_2+10Fe(OH)_3+4K_3FeCy_6.$$

The formation of potassium auricyanide takes place very slowly, even on boiling, the aurocyanide most probably being first formed. This no doubt is the basis of empirical practical rule of boiling down the bath be use, and the reason that an old bath works better th one freshly prepared.—T. St.

[*Zinc.*] *Blende concentrates ; Plant for the enrichm of pyritic* ——. E. C. Hugon. Inst. Min. and M May, 1912. [Advance proof.]

An account is given of the means adopted at Pierrefitte Mines, Htes. Pyrénées, for the enrichm of concentrates containing 33—35 per cent. of zinc a 18—20 of iron and consisting of low-grade, ferrugin blende associated with one or more of the minerals pyrit pyrrhotite, magnetite and chalybite. Preliminary te showed that magnetic separation preceded by roasti was more advantageous than direct treatment by w magnetic processes. The plant employed comprises t roasting furnaces (supplied with hot gases from a comm fore-hearth): an inclined, rotary cooler consisting 16 parallel water-jacketed tubes arranged in a circ about a hollow axle ; a shaking screen ; and the magne separator. The furnaces, having a combined capaci of 50 tons per 24 hours, are of the type in which the char is propelled from the highest to the lowest of a series superposed chambers by means of rabbles attached to central rotatory shaft ; the furnace gases are draw through dust-chambers by means of an exhaust fa before being allowed to escape to the stack. The capaci of the cooler is from 40 to 50 tons per 24 hours (accordi to the fineness of the material under treatment), that the magnetic separator being 70 tons per 24 hours. the treatment of the same class of material as used in th preliminary experiments, the zinc content of the conce trates is increased by 12 per cent., the total recove of zinc being 94 per cent. ; while concentrates containin only 27 per cent. of zinc are enriched to 42 per cent the total recovery of the metal being 91—92 per cen The working costs for the plant are approximately 3 f per ton of material treated.—W. E. F. P.

Blende ; Principles of the roasting of —— in muffle furnaces W. Hommel. Metallurgie, 1912, **9**, 281—296.

THE author describes experiments he has made in roasting blende, and discusses the factors which come into play. Size of hearth, taken alone, is only a measure of the capacity when furnaces of the same type are under consideration. Temperature, amount of stirring and the air-supply are also important factors. The author summarises the conditions of satisfactory blende-roasting, and discusses various types of hand and mechanical furnaces, giving a table showing comparative costs, dimensions and output of several special furnaces. Drawings with dimensions are given of the Hommel, Saeger-Brown, and Merton furnaces.—T. St.

Blue powder ; Reduction of —— in zinc smelting. W. F. Blecker. Min. and Eng. World, May 4, 1912.

An account is given of the conversion of blue powder into metallic zinc by an electrolytic process in which the material was fed into a bath of molten zinc chloride. The operation was conducted in a small iron pot, forming the cathode and adapted to be heated by gas ; the anode was composed of Acheson graphite. To ensure a rapid commencement of the electrolysis (the bath being already liquid), the current was started at 15 volts ; this was subsequently reduced to, and maintained at, about 5 volts at from 100 to 200 amp., the current being kept low enough to permit of the pot being heated by gas at intervals of 5 or 10 minutes. The blue powder was added in quantities of 1 lb. at a time at intervals of about 2 minutes, each charge being stirred into the bath to prevent ignition at the surface. The greatest amount treated in a single run was 25 lb., the recovery of metal being over 100 per cent. in all cases, owing to the electrolysis of the zinc chloride. The power consumption during several runs averaged one-tenth kilowatt-hour per lb. of metal recovered, the loss of zinc chloride being about 1 lb. per 25 lb. of metal produced. The quality of the metal obtained was found to correspond to that of the raw aterial employed, the process not being one of refining. he author is of opinion that, in the production of metal f equal grade, the process is far more efficient than duction by carbon.—W. E. F. P.

onel metal. R. H. Gaines. J. Ind. Eng. Chem., 1912, 4, 354—358. (See also this J., 1909, 91 313; 1911, 287, 427.)

nalyses of a number of samples of cast, rolled, and rged Monel metal made during the latter half of 1911 howed that the methods of reduction have been so mproved that the composition of the alloy is now controlled within relatively narrow limits. The composition f the alloy in the three conditions mentioned varied ithin the following limits in the samples analysed:—

	Cast metal.*	Rolled metal.†	Forged metal.‡
	per cent.	per cent.	per cent.
opper ...	26·59—27·53	24·76—26·09	26·69—26·83
ickel	68·10—68·50	68·48—69·83	69·45—69·54
ron	2·16— 3·33	2·07— 2·44	2·13— 2·19
arbon ...	0·25— 0·43	0·28— 0·44	0·17— 0·19
ilicon	1·08— 1·41	0·12— 0·37	—
anganese	0·11— 0·49	1·26— 1·82	1·38— 1·50
obalt	trace	trace	—

*8 samples. † 6 samples. ‡ 3 different portions of a billet.

It is stated that the strength and other physical properties of the alloy are affected chiefly by the heat treatment, the variations in the proportions of the constituents within the limits in which they occur having comparatively little influence. It is stated further that an alloy of similar composition prepared by melting together the constituent metals has not the same physical properties as Monel metal obtained direct from copper-nickel matte. Monel metal is usually referred to as a non-corrodible alloy: according to the author's experiments it possesses about the same resistance to corrosion as the better-known bronzes. Test-pieces of metal were embedded in "rich" earth, which was moistened by periodical additions of very dilute solutions of corrosive salts during six months. The loss in weight was as follows:—Phosphor bronze, 0·09 per cent.; Tobin bronze, 0·11; Monel metal, 0·12; Parsons' manganese bronze, 0·12; Muntz metal, 0·33; and steel, 1·04 per cent. The Monel metal showed the least change in appearance as a result of corrosion. Considerable difficulty is sometimes encountered in obtaining sound castings of Monel metal, chiefly owing to dissolved oxides and gases. An addition of 2 oz. of magnesium per 100 lb. of alloy before pouring has proved of service. The most satisfactory results are obtained by adoption of the methods used for making fine steel castings. It is recommended that rigid physical specifications should be enforced for Monel metal, but that the limits as to chemical composition should not be too narrow.—A. S.

Cobalt-carbon system: The ——. G. Boecker. Metallurgie, 1912, 9, 296—303.

By heating cobalt with sugar-charcoal at a temperature of 1700° C. for about half an hour, the author was able to prepare an alloy containing 3·9 per cent. of carbon. This was the highest percentage of carbon obtained, a higher temperature and longer heating both resulting in a lower carbon content. By melting this alloy with varying amounts of cobalt, a series of alloys was prepared with carbon ranging from 0 to 3·9 per cent. The samples were examined thermally and microscopically. The melting point of pure cobalt was found to be 1488° C., that of the eutectic 1300° C., and the percentage of carbon in the eutectic to be 2·9. Under slow cooling, the carbon in all the alloys almost entirely separated as graphite, in general, not more than 0·1 per cent. of carbon being left combined. The combined carbon at the eutectic temperature was ascertained in several alloys by quenching the alloys in water after they had been kept at the eutectic temperature for 20 minutes. It was found to have a value of 0·82 per cent. The solubility line of carbon in cobalt was determined between 1300° C. and 1000° C. by keeping samples of the alloys at a given temperature for 20 minutes, quenching in water at the room temperature, and determining the combined carbon in the quenched samples. The total carbon in the alloys was determined by the chromic acid method, 1 grm. of the sample, 35 to 40 c.c. of chromic acid solution (1 grm. of anhydride per c.c.), and 200 c.c. of sulphuric acid (1 : 1) being taken for each determination. The graphite was determined by the usual method for pig irons, and the combined carbon was taken by difference. The microstructure of the alloys was evident without etching, and confirmed the thermal analysis. Alloys with small carbon content had a silver-white to bright grey fracture, and were harder to work than those with higher carbon content. The latter gave a dark grey fracture. Alloys with from 0·6 to about 1 per cent. of carbon were very hard and tough, and those with 2·6 per cent. or more of carbon were hard but very brittle.
—T. St.

Palladium with antimony: Alloys of ——. W. Sander. Z. anorg. Chem., 1912, 75, 97—106.

A thermal and microscopical investigation of the alloys of palladium and antimony, of which the equilibrium diagram is given, has shown the existence of the compounds, $PdSb_2$, $PdSb$, Pd_5Sb_3, and Pd_3Sb, and series of mixed crystals between the concentrations, 57·5 and 61·5, 68·5 and 72·5, and 85 and 100 per cent. of palladium; transformations in the solid state occur at about 525° C. and 950° C., with alloys containing 47—68·5 and 68·5—85 per cent. of palladium respectively. Up to a content of 72 per cent. of palladium, the alloys are very brittle: unlike pure palladium, they have no magnetic influence.—F. Sodn.

Surface combustion and its industrial applications. Bone. *See* IIa.

Burning pulverised coal in smelters and furnaces. Hughes. *See* IIa.

Solubility of copper in different petroleum distillates. Istrati and Teodorescu. *See* IIa.

Disintegration and preservation of antiquities. Rathgen. *See* VIII.

Patents.

[*Iron.*] *Oxides; Process for the economic reduction of ——, by carbon and carbon monoxide.* Soc. Electrométallurgique Française. First Addition, dated Feb. 20, 1911, to Fr. Pat. 432,721, Oct. 10, 1910 (this J., 1912, 135).

Claim is made for the use of blast-furnace and similar gases instead of carbon monoxide; and for the actual process of reduction in the inclined, rotatory furnace independently of the subsequent treatment in the electric furnace.—W. E. F. P.

Pig iron; Production of a fine-grained ——, low in sulphur and carbon, direct from the blast-furnace. K. Schmidt. Ger. Pat. 244,921, Nov. 10, 1910.

As the molten iron flows through the trough leading to the ladle or moulds, it is subjected to the action of a blast of air directed on to it.—A. S.

[*Iron.*] *Alloy.* J. W. Donnell, Evanston, Ill. U.S. Pat. 1,025,131, May 7, 1912.

Claim is made for an alloy containing about 80 per cent. of cast iron, 20 of copper, and 0·8 of platinum.—W. E. F. P.

Ferro-tungsten; Process for the manufacture of ——, from wolfram ore, utilising the furnaces and crucibles employed in steel melting. Jaboulay et Cie. Fr. Pat. 437,949, Dec. 16, 1911.

The ore is reduced by carbon in the presence of metallic iron and suitable materials for fluxing the manganese oxide. The charge employed for the preparation of ferro-tungsten, containing about 50 per cent. of the latter metal, from

wolfram containing 67 per cent. of tungstic anhydride, 18 of ferrous oxide, 12 of manganous oxide and 3 of silica, consists of 100 parts by weight of ore, 6½ of limestone, 9 of silica, 12 of wood charcoal, and 39 of metallic iron.
—W. E. F. P.

Iron and steel: Process for refining ——, by means of chromium employed as ferro-chrome. J. Buchel. Fr. Pat. 438,052. Dec. 23, 1911.

Ferro-chrome practically free from carbon is employed, the presence of aluminium in the alloy—which is prepared by the aluminothermic process—not being detrimental.
—W. E. F. P.

Castings in steel, brass phosphor bronze and other materials; Process of and apparatus for making ——. J. Vaughan-Sherrin, Ruckinge, Kent. Eng. Pat. 4387. Sept. 21, 1911.

The formation of blowholes in the castings is prevented, it is claimed, by the provision in the moulding sand of a system of minute passages (too small to allow the molten metal to escape) communicating with a large vacuum chamber by means of which the withdrawal of the air and gases from the mould is effected during the casting operation. The mould is suitably enclosed, the molten metal being introduced from an ingate vessel rotatably mounted upon it: and the vacuum chamber is provided with a trap for preventing the ignition of explosive gases which may be withdrawn from the mould.—W. E. F. P.

Copper; Treatment of oxidised ores or products containing ——. W. Dewar, London. Eng. Pats. 10,143. April 26, and 15,995. July 10, 1911.

In the presence of an excess of solid or gaseous fuel the material, contained in a suitable vessel not externally heated, is subjected to the action of a hot or cold air-blast with the object of producing globules of metallic copper within the mass. The latter is subsequently crushed and washed for the separation of the shots of metal, the tailings being treated with a solution of ammonia or ammonium carbonate to effect the recovery of the remaining copper as oxide or basic carbonate respectively.
—W. E. F. P.

Copper; Apparatus for precipitating ——. A. Ramen, Helsingborg, Sweden. Eng. Pat. 24,163, Oct. 31, 1911.

With the object of causing the copper solution (containing cupric chloride) to circulate in such a manner as to prevent the formation of cuprous chloride (by the action of the precipitated metal upon the solution), the precipitating vessel is provided with vertical perforated partitions so as to form an inner chamber for the scrap iron and two outer chambers, the latter communicating with each other at the top by a horizontal channel through which the solution is propelled by means of a revolving paddle.
—W. E. F. P.

[*Copper*]. *Electroplating process.* F. J. McElhone, Jersey City, N.J. U.S. Pat. 1,025,760, May 7, 1912.

In the manufacture of electroplates a conducting deposit is first produced upon the face of the wax case by means of a liquid containing finely divided graphite in suspension: the case is then rinsed and plated in a bath containing 23 oz. 205 gr. of copper sulphate and 6 fl. oz. of sulphuric acid per gallon of water.—W. E. F. P.

[*Copper*]. *Metals; Process for the extraction of —— from ores.* H. S. Mackay. Fr. Pats. 437,481 and 437,841, Dec. 12, 1911.

Claim is made for the extraction of copper from ores by means of the chloridised liquid obtained by the electrolysis of a solution of cupric chloride; for the extraction of metals from ores by means of the chloridised liquid produced in the anode compartments of an electrolytic vat in which sea-water and ferruginous mine-water are caused to circulate in the cathodic and anodic compartments respectively; and for the chlorination of mineral or other solutions by the preceding method, a solution of sodium chloride being circulated in the cathodic compartments. Ores containing sulphur are either roasted for the production of sulphates or calcined for the remova of sulphur by sublimation, the material being then leached with a solution of sodium chloride or with a one per cent. solution of ferric chloride which is subsequently electrolysed and used for the treatment of a further quantity of the ore.—W. E. F. P.

[*Copper-lead alloy.*] *Matter; Composition of ——.* J. J. Davoren, Denver, Colo. U.S. Pat. 1,024,561, April 30, 1912.

An alloy of copper and lead in equal proportions, and phosphorus, is claimed. A suitable composition is copper 50 lb., lead 50 lb., and phosphorus 1 oz.—T. St.

Furnaces; Muffle ——. J. R. C. August, Sowerby Bridge. Eng. Pat. 13,016, May 30, 1911.

A coke-fired muffle furnace built up in such a manner that a uniform heat is maintained even during and just after the addition of fresh fuel. The furnace is made of fireclay slabs enclosed in a metal casing. The fireplace is deeper at the back than at the front, and projects forward in front of the muffle, forming a throat lined with fireclay, through which the fuel is fed. Air and fuel thus become heated before they reach the furnace proper. The products of combustion rise around the sides and back of the muffle and then by means of fireclay slabs are conducted by a zigzag course to the flue. By this arrangement a constant top heat is provided above the muffle. The upper portion of the furnace is arranged with a hinge, to allow of ready access to the zigzag flue for cleaning purposes.—T. St.

Blast furnace. M. McMurray, Cleveland, Ohio. U.S. Pat. 1,024,801, April 30, 1912.

The blast-furnace consists of an outer shell carrying the superstructure of the furnace top and an independent inner shell which is capable of vertical movement relatively to the outer shell. Between the two shells is an intervening free space in which are situated water pipes attached to the outer shell and arranged to allow of the distribution of water upon the inner shell.—T. St.

Gases; Method of cleaning blast-furnace ——. F. Werndl, Breslau, Germany. Eng. Pat. 28,926, Dec. 22, 1911.

The blast-furnace gases are led over a cylindrical rotating electro-magnet which is set in rotation and fed with current from an electro-motor arranged outside the pipe carrying the gases. A scraper attached to the inner wall of the pipe causes the metallic particles which have been attracted to the magnet to drop into a collector. A baffle-plate situated between the magnet and the escape-branch of the pipe helps to bring the gases into contact with the magnet.—T. St.

Zinc; Metallurgy of ——. C. V. Thierry, Paris. Eng. Pat. 19,973, Sept. 7, 1911.

Commercially pure zinc oxide is mixed with carbon in the proportions to satisfy the equation $ZnO+C=Zn+CO$, and the mixture is heated in an electric furnace of any type. A furnace of the resistance type only has so far been employed. The advantages are that the heat is thus conveyed directly to the charge, and that the problem of condensing the zinc vapours is reduced to its simplest form as these are mixed with a minimum quantity of entrained gases. Moreover, so little residue is left in the furnace that the action may be made continuous over a very long period.—T. St.

Zinc or zinc dust; Process for obtaining metallic —— from materials containing zinc sulphide. K. Friedrich. Ger. Pat. 244,893, July 24, 1910.

Zinc blende or other material containing zinc sulphide, is heated in presence of hydrogen or gases containing hydrogen or hydrogen compounds, and the hydrogen sulphide or other volatile sulphur compound, or free sulphur, roduced, is removed from the gases before these are allowed o cool, in order to prevent the re-formation of zinc sulphide. f necessary the ore or other product containing zinc ulphide may be ignited before heating in presence of ydrogen. The hydrogen sulphide, etc., may be separated rom the gases by means of lime, or lime and carbon charcoal, coke, or the like).—A. S.

Zinc; Electrolytic separation of ——. J. Matuschek. Ger. Pat. 244,930, April 22, 1911.

An aqueous solution of zinc fluoride, alone or with other inc salts such as the sulphate, and preferably with addition of ammonium fluoride, is used as electrolyte. Special laim is made for an electrolyte composed of 500 c.c. of pure water, 750 c.c. of a solution containing 500 grms. of zinc fluoride, and 1500 c.c. of a solution containing 873 grms. of zinc sulphate.—A. S.

Zinc; Process for obtaining metallic —— from its ores. G. Gallo. Ger. Pat. 245,365, Jan. 26, 1911.

The dried or roasted ore is treated with hydrofluoric acid or hydrofluosilicic acid, and after drying, the resulting zinc fluoride or silicofluoride is mixed with zinc oxide and a suitable flux, preferably sodium chloride, and smelted in an electric furnace.—A. S.

Zinc; Process for obtaining —— by distillation. H. Speeketer. Ger. Pat. 245,681, July 27, 1909.

The principle of the process consists in heating a suitable heat-accumulating material to a temperature (1400° C.) above that required for the reduction and volatilisation of the zinc, and then bringing into intimate contact with this heated material the zinc ore or mixture of zinc ore and charcoal. Preferably the charcoal used for the reduction of the zinc ore is used also as the material for accumulating heat, and the zinc ore is pre-heated to a temperature below that at which reduction takes place. —A. S.

Ores and metals; Process for reducing ——. W. H. Kelly, Los Angeles, Cal. U.S. Pat. 1,024,136, Apr. 23, 1912.

The reduction is effected by the mixture of oxygen and hydrogen resulting from the dissociation of steam at a high temperature, the gases, "while still in a nascent condition," being introduced into the reduction chamber through an upper and a lower set of tuyères.—W. E. F. P.

Titanium and silver; Article composed essentially of ——, and method of producing the same. A. J. Rossi, Niagara Falls, Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,024,476, Apr 23, 1912.

A mixture of titanium oxide and carbon with molten silver, or with silver oxide, is subjected to a temperature sufficient to ensure the reduction of the titanium oxide.—W. E. F. P.

Titanium and silver: Article composed essentially of ——, and method of producing the same. A. J. Rossi, Niagara Falls, Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,025,426, May 7, 1912.

A mixture of titanium oxide with molten silver and molten aluminium, or with silver oxide and aluminium powder, is subjected to a temperature sufficient to ensure the production of metallic titanium.—W. E. F. P.

Lead and zinc; Process for the separation of ——. J. Babé. First Addition, dated Feb. 24, 1911, to Fr. Pat. 428,707, June 28, 1910 (this J., 1911, 1167).

As a source of hydrogen sulphide for use in the process described in the chief patent, claim is made for blocks prepared by saturating powdered charcoal with a solution of an alkali (or alkaline-earth) sulphide, treating the resulting pulp with sulphuric acid, and solidifying the mixture by the addition of plaster.—W. E. F. P.

Furnace; Electrometallurgical —— with electrodes. J. Westly. First Addition, dated Dec. 14, 1911, to Fr. Pat. 435,941, Nov. 4, 1911 (this J., 1912, 395).

The base of the furnace is inclined towards a well or receptacle, and one of the electrodes is placed immediately over the highest part of the base.—B. N.

Furnaces for roasting ore in stages, Process for working ——, and means for the application of the same. R. Scherfenberg. Fr. Pat. 437,565, Nov. 15, 1911.

In a furnace of the kind comprising a series of superposed chambers, provision is made for the direct conveyance of the sulphurous gases from each compartment to the uppermost chamber, and for the introduction of fresh air (preheated by passing through the central hollow shaft by which the rabbles are actuated) into those compartments directly communicating with this chamber. By this arrangement, it is claimed, the output of the furnace is considerably increased, since overheating of the ore is prevented during the earlier stages of the roasting.—W. E. F. P.

Metals; Manufacture of porous ——. H. I. Hannover. Fr. Pat. 437,816, Nov. 27, 1911.

In a process for the production, by mechanical means, of porous metals for accumulator-plates, bearings, etc., a suitable alloy (of antimony and lead, for example) is heated to a temperature sufficient to initiate the liquation of the more fusible constituents, the fluid portion being then removed from the still solid skeleton by blowing, suction, centrifugal action, vibration, or similar means. In order that the finished product may retain the shape of the original metallic body, the latter is partly enclosed by means of metal bands, or certain portions of it are composed of metal of higher melting point than that of the mass.—W. E. F. P.

Annealing metal articles in a non-oxidising atmosphere; Apparatus for ——. A. Kreidler. Ger. Pat. 245,355, July 21, 1911.

The apparatus is of the type in which the articles are carried through the annealing furnace by an endless conveying device (chain, band, or waggons on rails). Within the furnace the conveying device takes a curved path and then returns in the opposite direction. Fixed gas-tight to the entrance end of the furnace is an exit pipe or conduit for the annealed articles, in which the entering and outgoing articles travel in opposite directions adjacent to one another, so that there is an exchange of heat; this exit conduit may be divided into two compartments by a thin partition. If the exit conduit be of sufficient length, the annealed articles become cooled therein to such a degree that there is no danger of oxidation by the air, and hence the end of the exit conduit may be left completely open, thus allowing of easy loading and unloading of the conveying device. If the non-oxidising gases in the annealing furnace be lighter than air, the whole system is disposed in an inclined position, sloping upwards from the open end of the exit conduit. —A. S.

Roasting and agglomeration of finely-divided substances. A. Roth. Ger. Pat. 245,627, Sept. 16, 1910.

In the process of roasting and agglomerating fine ores, flue dust, etc., by means of a burning stream of gas, the claim is for the introduction of the material into the air used for combustion before the latter mixes with the gas.—A. S.

Tin; Electrolytic recovery of —— from alloys, plated ware, scrap, etc. W. Reinders. Ger. Pat. 245,682, July 12, 1910.

In order to obtain a coherent deposit, the separation of the tin is effected in a bath without a diaphragm in the usual manner, whilst in order to maintain the requisite concentration of the electrolyte, it is circulated through the anode chamber of a separate cell provided with a diaphragm. In this cell tin is dissolved from the scrap, etc., in the anode chamber, and hydrogen is evolved at the cathode.—A. S.

Iron ores; Method of treating ——. B. F. Halvorsen, Christiania. U.S. Pat. 1,024,629, April 30, 1912.

See Fr. Pat. 403,623 of 1909; this J., 1910, 96.—T. F. B.

Steel ; Manufacture of ——. T. D. Mackie, Bowes Park, and G. F. Forwood, Limpsfield. U.S. Pat. 1,024,999, April 30, 1912.

See Eng. Pats. 22,569 of 1910 and 8498 of 1911 ; this J., 1911, 1391.—T. F. B.

Metals and mechanical parts of iron, steel, and the like ; Process for preserving —— from rust [by electroplating with zinc]. A. A. Lemètre, Paris. Eng. Pat. 11,432, May 11, 1911.

See U.S. Pat. 1,012,665 of 1911 ; this J., 1912, 137.—T.F.B.

Antimony and arsenic ores ; Method of treating ——. A. Trifonoff and D. Gardner, St. Petersburg. Eng. Pat. 10,328, April 28, 1911.

See Fr. Pat. 429,411 of 1911 ; this J., 1911, 1220.—T. F. B.

Ore-roasting furnaces. E. Bracq, Lens, France. Eng. Pat. 10,642, May 2, 1911.

See Addition of April 21, 1911, to Fr. Pat. 426,789 of 1910 ; this J., 1911, 1220.—T. F. B.

Metals ; Production of films or thin sheets of ——. W. G. Wagner, London. U.S. Pat. 1,025,848, May 7, 1912.

See Eng. Pat. 17,115 of 1910 ; this J., 1911, 1020.—T.F.B.

Manufacture of bricks or light stones from blast-furnace slag. Fr. Pat. 437,595. *See* IX.

XI.—ELECTRO-CHEMISTRY.

High-tension porcelain line insulars. Lustgarten. *See* VIII.

Patents.

Electrode ; Carbon —— for galvanic batteries, in which the electrolytic fluid or the depolarising gas or the mixture thereof is conveyed through the pores of the negative electrode. S. Benkö, Budapest, Hungary. Eng. Pat. 9649, April 20, 1911.

The electrode is provided with a metal frame, as described in Eng. Pat. 12,677 of 1909 (this J., 1910, 703), and impregnated with metal so as to form metallic nodal points or principal metallic veins. From these nodes or veins the metal is distributed through the electrode in a network of fine veins. A sufficient degree of porosity is maintained to allow of the passage of the depolariser, and an electrode of great conductive capacity is obtained. —B. N.

Lead oxides for accumulators ; Manufacture of ——. C. H. Jacob. Fr. Pat. 437,726, Feb. 24, 1911.

Litharge is obtained by means of a soluble salt of lead and an alkali, and lead peroxide from a soluble lead salt and hypochlorite of calcium, sodium or potassium, both reactions being carried out under definite conditions of concentration and temperature.—B. N.

Electric arcs for the treatment of gases ; Production of long stable ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 16,636, July 19, 1911.

The gas is passed in with a tangential motion around the arc, and the latter is at the same time subjected to the action of a magnetic field. Eng. Pat. 14,955 of 1905 (this J., 1906, 890) is referred to.—B. N.

Fullers' earth and analogous materials ; Method of [electrolytically] separating and purifying ——. C. C. Ruprecht, Blakely, Ala. U.S. Pat. 1,024,104, April 23, 1912.

The fullers' earth is mixed with water, and the mixture decanted from sand and similar impurities in suitable tanks. Chemicals are added to render the liquid conductive to the electric current, and the liquid is electrolysed by passing it rapidly through an electrolytic cell. The organic impurities are thus destroyed, the earth is precipitated and the water decanted, the deposited earth being afterwards dried.—B. N.

Cell ; Electrolytic ——. O. H. and A. F. Pieper, Rochester, N.Y. U.S. Pat. 1,024,597, April 30, 1912.

The cell comprises a hollow electrode chamber and radiating chambers with passage-ways connecting the latter at the tops and bottoms, and also connecting them with the electrode chamber. The bottom of the latter is lower than the other chambers, so as to form a pocket for collecting sediment. The chambers and passage-ways are formed in an integral casting, with apertures in alignment with the passage-ways, and with cleaning plugs fitted into the apertures.—B. N.

[Electrolytic] Protective device. A. G. Jones, San Francisco, Cal., Assignor to General Electric Co., New York. U.S. Pat. 1,024,857, April 30, 1912.

The electrolytic cell is provided with electrodes mounted with their surfaces substantially parallel, and having electrolyte between them, the electrodes being of such a shape, or having obstructions in the spaces between them, as to hinder the radial flow of electrolyte from between the electrodes. Thus, the electrodes may be provided with wavy portions on the circumference so as to form baffles, or the electrodes may be "crimped," or each electrode may be "creased near the edge to form a circumferential trough in one surface and a projection on the other surface of said electrode, said projections and troughs being in registry to form baffles for radially-flowing electrolyte."—B. N.

Nitrides ; Electric furnace for the manufacture of ——. G. Coutagne. First Addition, dated Feb. 25, 1911, to Fr. Pat. 436,789, Feb. 1, 1911 (this J., 1912, 432).

The heating of the furnace described in the principal patent is effected partly by means of electric arcs, for which purpose one or several of the elements are fitted with movable electrodes, running, for example, in grooves cut in the large electrodes. The height of the furnace may be thus reduced.—F. Sodn.

Electrolysing aqueous solutions of metallic salts ; Means for causing mercury to circulate while ——. R. Carl, Schmargendorf, Assignor to Siemens und Halske A.-G., Berlin. U.S. Pat. 1,025,509, May 7, 1912.

See Fr. Pat. 435,890 of 1911 ; this J., 1912, 396.—T. F. B.

Impregnating fibrous, mineral, and other substances, especially paper. Ger. Pat. 244,818. *See* V.

Manufacture of nitrides in the electric furnace. Fr. Pat. 437,504. *See* VII.

Neutralisation of alkali in the electrolytic manufacture of chlorates and perchlorates. Fr. Pat. 437,831. *See* VII.

XII.—FATS ; OILS ; WAXES.

Funtumia elastica ; Composition of seeds of —— from the Ivory Coast. A. Hébert. Caoutch. et Gutta-Percha, 1912, 9, 6232—6234.

The bruised seeds lost 6·6 per cent. of their weight at 110° C. and on being extracted with ether yielded 20 per cent. of a clear, dark yellow, semi-drying oil which did not solidify at −10° C. It had the following characters :—sp. gr. (at 15° C.), 0·929 ; acid value, 1·8 ; saponif. value, 167·6 ; Hehner value, 94·0 ; Reichert value, 12·1 ; iodine value, 139·0. Examined by the lead salt-ether method the oil was found to contain 60 per cent. of liquid acids and 40 per cent. of solid acids. The residue left after extracting the oil had the following composition : ash, 1 per cent.; proteins (nitrogen, 3·4 per cent.), 21·25; igestible carbohydrates, 41·93; and woody fibre, 32·72 er cent.—J. A.

allflower seeds; The fatty oil of ——. H. Matthes and W. Boltze. Arch. Pharm., 1912, **250**, 211—230.

HE oil obtained by extracting wallflower seeds (*Cheiranthus heiri*, L.) with ether has a green colour changing to brown o long keeping. By distilling with steam, 0·027 per cent. f an essential oil was obtained. The fatty oil obtained y extraction with light petroleum (b. p. 40°—60° C.), and reed from essential oil, had the following characters: p. gr. at 15° C., 0·9240; n_D = 1·4690 at 40° C.; acid alue, 11·5; saponification value, 180·3; iodine value Hübl), 124·53; Hehner value, 95·66; Reichert-Meissl alue, 0·33; Polenske value, 1·4. The oil can be classed rith the drying oils. A new solid unsaturated acid, *heiranthic acid*, $C_{18}H_{34}O_2$, was isolated. This crystallises rom alcohol in white silky needles, melts at 30° C., and oils at 240° C. at 18 mm. Of the total fatty acids, 65 per ent. is cheiranthic acid, 30 per cent. is linolic acid, and the emainder linolenic acid. The oil contains 0·47 per cent. f unsaponifiable and crystallisable material, melting at 36° C., and giving reactions characteristic of a phytosterol. See this J., 1909, 1164.)—F. SHDN.

Plukenetia conophora oil. Tropenpflanzer, 1912, **16**, 265. (See this J., 1909, 892.)

A SAMPLE of oil from the fruit of the liana *P. conophora* was examined at the Kgl. Materialprüfungsamt. The fruit contained 59 per cent. of oil, having the sp. gr. (15° C.), 0·936; index of refraction (15° C.), 1·4835; saponification value, 190; iodine value (Hübl-Waller), 195; iodine value (Wijs), 204. One drop of the oil completely dried (non-tacky) after 4 days at room temperature, after 18 hrs. at 50° C. A varnish made by the addition of 3 per cent. of lead-manganese siccative (2 : 1), and heating to about 180° C., completely dried at room temperature after 18 hours. The oil would be suitable as a substitute for linseed oil.—H. E. P.

Fats; The progressive hydrolysis of —— *by means of sulphuric acid. A correction.* A. Grün and O. Corelli. Z. angew. Chem., 1912, **25**, 947.

IN the original paper (see this J., 1912, 442) the calculations were based on an arithmetical error, according to which the ester value of tripalmitin was taken as 238·3. Thus the analysis of one of the products, showing an ester value of 209·0, was interpreted as indicating 70 per cent. of dipalmitin and 30 per cent. of tripalmitin, whereas this value really represents that of practically pure tripalmitin. Further in a second product the erroneous calculation showed 75 per cent. of dipalmitin and 25 per cent. of tripalmitin, whereas really only 15 per cent. of dipalmitin is indicated by the analytical figures. The essential results of the investigation are not modified by these erroneous calculations, but the authors consider it desirable to repeat and correct their previous experiments particularly on the analytical side.—J. F. B.

Detergents containing perborates; Stability of ——. E. Bosshard and K. Zwicky. Seifensieder-Zeit., 1912, **39**, 290—292, 337—338. Chem. Zentr., 1912, **1**, 1595—1596.

MIXTURES of perborates with soap powder and other substances (sodium carbonate and bicarbonate, water glass, pyrophosphate, etc.) are less stable than pure perborates. The more stable mixtures are those containing soap free from excess of akali and from compounds of heavy metals. In small quantities sodium carbonate, pyrophosphate, silicofluoride and other loading agents are without appreciable influence. An addition of silicic acid to a perborate prevents rapid decomposition if the acid is in such a fine state of division as partly to envelop the perborate. The decomposition of the perborate is accelerated by moisture, by substances containing water of crystallisation, and by catalysts such as ferric oxide, manganese peroxide, etc. For the analysis of soap preparations containing perborates, the powdered sample is mixed with manganese dioxide and treated with sulphuric acid in the flask described previously (this J., 1910, 889) until the mixture becomes heated to boiling and the liberated fatty acids float to the surface. Caustic soda solution (1 : 2) is used as sealing liquid for the gas-measuring tube, for even with preparations free from sodium carbonate, small quantities of carbon dioxide are evolved, possibly owing to oxidation of the fatty acids. —A. S.

Detection of adulteration of butter. Robin. *See* XIXA.

Relation between the Kirschner and Polenske values for margarines containing coconut oil or palm-kernel oil. Bolton and others. *See* XIXA.

PATENTS.

Grease and oils; Apparatus for extracting ——. C. Egerton, Philadelphia, Pa. U.S. Pat. 1,024,838, April 30, 1912.

THE material is extracted in a horizontal rotatory drum provided with manholes in the sides and a hollow trunnion at one or both ends, through which pass valved pipes for the introduction of steam and solvent into the longitudinal perforated pipes within the drum near its side walls.—C. A. M.

Fats, oils, and waxes; Process for dissociating [*hydrolysing*] ——. Verein. Chemische Werke Akt.-Ges., Charlottenburg, Germany. Eng. Pat. 749, Jan. 10, 1912. Under Int. Conv., Feb. 2, 1911.

IN the Twitchell process for the hydrolysis of fats, oils, and waxes by means of sulphonated fats or fatty acids, it is proposed to subject such fats or fatty acids, before sulphonation, to a process of reduction. It is stated that the fatty acids obtained by hydrolysis in this manner are very light in colour, and that the hydrolysis is considerably accelerated owing to its being possible to use a larger proportion of the hydrolysing agent without increasing the colour of the product. The reduction may be effected electrolytically or by means of hydrogen in presence of a catalytic agent. The following example is given:—The product obtained by hydrogenating 100 parts of castor oil by Paal's process (see Fr. Pat. 425,729 of 1911; this J., 1911, 1022) is mixed with 100 parts of naphthalene and gradually added to 400 parts of sulphuric acid of 66° B., the temperature not being allowed to exceed 20° C. Stirring is continued until a uniform solution is obtained, when the mass is poured into 800 parts of water: the upper layer which separates is filtered and constitutes the hydrolysing agent. The hydrolysis is effected, for example, by introducing dry steam for 6 or 8 hours into a mixture of 1000 parts of palm-kernel oil, 300 parts of water, and two parts of the above hydrolysing agent. When the product has separated, the lower (glycerin) layer is concentrated as usual, whilst the upper layer consists of the fatty acids.—T. F. B.

Fats and fatty oils; Separation of —— *into glycerin and fatty acids.* G. Petroff. Fr. Pat. 437,336, Nov. 23, 1911.

THE glyceride is mixed with the necessary quantity of sulpho-acids, or with other derivatives soluble in water, obtained by the treatment of petroleum oils with sulphuric acid, and the reaction is carried out in the presence of water and a small quantity of acid, with continuous agitation with either steam or air.—B. N.

Washing compounds or detergents. W. P. Thompson, Liverpool. From A. Groeben, Brussels. Eng. Pat. 4111, Feb. 18, 1911.

MIXTURES of sodium carbonate with sodium silicate or other detergent substances are obtained in a form that does not cake into a hard mass by mixing any commercial neutral (normal) sodium carbonate and water in the proportions of about $Na_2CO_3 + 5$ to $7H_2O$ with the other ingredients at a temperature of about 34° C. Above this temperature no formations of the monohydrated, decahydrated or anhydrous sodium carbonate takes place, and the resulting mixture of the carbonate, Na_2CO_3+5 to $7H_2O$, and the silicate, etc., remains pulverulent.—C. A. M.

Vegetable albumen; Processes for the treatment of —— to enable it to be employed in the manufacture of soap. F. A. V. Klopper, Dresden-Leubnitz, Germany. Eng. Pat. 2191, Jan. 27, 1912.

Vegetable albumin is gradually heated with glycerin to 120° C., with continual stirring, until it is transformed into a gelatinous paste-like mass, which may be incorporated with soap without visible separation of albuminous particles.—C. A. M.

Soaps insoluble in water; Quantitative removal of glycerin from —— by the aid of the filter-press. F. Vogt. Fr. Pat. 437,414, Dec. 9, 1911.

The calcium soap is reduced to a fine powder and made into a paste with hot water, or with water containing a small quantity of glycerin from a previous lixiviation. The mass is transferred to a filter-press, and whilst under pressure is washed with water, the weak wash liquor containing glycerin being used again until a sufficient degree of concentration of glycerin is obtained.—B. N.

Fats, oils, and fish oils; Process for converting —— into like bodies of higher melting-point. M. Wilbuschewitsch, Nischninovgorod, Russia. U.S. Pat. 1,024,758, April 30, 1912.

See Fr. Pat. 426,343 of 1910; this J., 1911, 966.—T. F. B.

Preparing edible fats. Fr. Pat. 437,665. *See* XIXa.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Resin (semi-hard copal); A fossil —— from Guiana. J. C. Essner. Ann. Chim. analyt., 1912, 17, 166—167.

The resin occurs in bulky masses, with a vitreous fracture, covered externally with a whitish coating, and earthy patches. The interior, after removing the outer portion, is either perfectly clear and colourless, or tinted yellowish or reddish in places. The odour is pleasant, but faint. The resin is easily scratched with a knife, and may be powdered without cohering. It then has a distinct odour of turpentine. It softens at about 175° C., melts at about 190° C., decomposing above 230° C., forming a yellow oil, which solidifies on cooling. It is partly soluble in cold alcohol, more soluble in hot alcohol, the solution depositing as it cools. Amyl alcohol is the best solvent. In ether, chloroform, acetone, benzene, carbon tetrachloride and carbon bisulphide, it swells and softens, but very little dissolves. Xylene dissolves it but slightly and renders it opaque. When heated to about 250° C. and treated with linseed oil, it dissolves like other copals, and it behaves in a similarly characteristic manner with oil of turpentine. It has the sp. gr. 1·089. The colourless and coloured portions, examined separately, showed the following characters in the order given:—Solubility, in absolute alcohol, 75·2 per cent. and 80 per cent.; in amyl alcohol, about 80 per cent., and 80 to 85 per cent.; acid value, 118, and 125; saponification value, 127, and 151; iodine value 84·3, and 81·5.—J. O. B.

Patents.

Foil or leaf-like material; Manufacture of ——. J. Hamilton, New York. Eng. Pat. 9473, Apr. 18, 1911.

Resin or the like used as the basis material is freed from natural grease, *e.g.*, by treatment with a suitable solvent, and then incorporated with an oil and a pigment and poured over a non-adherent surface, such as an acid solution. By this means formation of oily spots and weak places in the finished leaves is prevented.—C. A. M.

Cement; Compound for waterproofing —— and the lik and process of making same. G. P. Dieckmann, Assigno to H. B. Hasbrouck, Mason City, Iowa. U.S. Pat 1,023,926, Apr. 23, 1912.

To the product obtained by the saponification of 100 part of fish oil with 10 parts of sodium hydroxide dissolved i 50 of water, 40 parts of alum dissolved in 150 of water ar added during agitation: the water is finally expelled fron the mixture after the addition of a suitable quantity o powdered calcium oxide.—W. E. F. P.

Azo colour lake; Process for preparing a pure claret coloured ——. Farbwerke vorm. Meister, Lucius, un Brüning. Ger. Pat. 245,747, March 19, 1908.

If a solution of diazotised 2·1-naphthylaminesulphoni acid is added to a hot solution of β-naphthol containin a calcium compound, lakes of a deep claret colour ar produced. The combination is preferably effected i presence of a suitable substratum, and it is advantageou to add to the β-naphthol solution, Turkey-red oil, soap, or a similar substance possessing colloidal properties. —T. F. B.

[Paint] Oils and compounds thereof. W. E. Lake, London. From W. N. Blakeman, jun., New York. Eng. Pat. 9027, April 11, 1911.

See U.S. Pat. 989,226 of 1911; this J., 1911, 756.—T. F. B.

Plastic phenolic condensation product. J. W. Aylsworth, East Orange, N.J., U.S.A. Eng. Pat. 9559, April 19, 1911.

See Fr. Pat. 429,292 of 1911; this J., 1911, 1267.—T. F. B.

Lac; Process of treating ——. J. Johannes, Calcutta. U.S. Pat. 1,024,783, April 30, 1912.

See Fr. Pat. 424,261 of 1910; this J., 1911, 756.—T. F. B.

Manufacture of monoazo-colouring matters and pigments therefrom. Eng. Pat. 2425. *See* IV.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Manihot rubber in German E. Africa. E. Marckwald. Tropenpflanzer, 1912, 16, 225—236.

The author has visited German E. Africa to study the conditions necessary to produce a first-class rubber from *Manihot glaziovii*, which he states is the only tree which can be successfully grown throughout. First-class selected seed should be used: planting should take place in the season of little rain, at a distance of not less than 5 × 5 m. (5½ × 5½ yds.). The trees should not be allowed to branch out; this view is confirmed by Zimmermann. Tapping should not be effected before the third or fourth year: it is better to tap in such a way that coagulation is not effected on the tree. Acetic acid is not recommended for the coagulant, as tending to form acetates and promote protein decomposition. Calcium chloride solution (2 per cent.) has been suggested and appears at least as good as acetic acid. "Purub" (hydrofluoric acid) seems to be used less than formerly on account of the cost. Washing requires the greatest care and is of the utmost importance in obtaining a good and well-keeping product. The present cost of production is about M. 5.80 to M. 6 per kilo. (2s. 8d. to 2s. 9d. per lb.). This must be diminished by attention to detail, recovery of oil from seed, etc. It is urgently necessary to plant in the next favourable season and to exercise great care in producing a standard quality. Some rubbers from German E. Africa have, in the past, looked well but turned out badly. With proper care the author considers this rubber should equal if not surpass fine Para.—H. E. P.

Apocynum or Indian hemp rubber. C. P. Fox. J. Ind. Eng. Chem., 1912, 4, 387—388.

The fresh latex of Indian hemp yields about 2·36 per cent. of rubber, which after washing and drying is of good

quality, being firm, not tacky, odourless and strong, but of a black colour. The latex is not coagulated by acids or alkalis, but is readily coagulated by one-tenth of its volume of acetone, and less readily by formaldehyde.
—A. S.

Rubber: Value of mechanical tests of ——. R. Ditmar. Z. Chem. Ind. Kolloide, 1912, **10**, 238—242.

The author discusses the properties of rubber from the colloid-chemical standpoint and shows how numerous are the factors which have an influence on the quality of the finished rubber. Rubber is a typical colloid and must be investigated as such if useful results are to be obtained. The author considers the suggestion that standards for the mechanical properties of rubber should be published to be useless, for the properties of a colloid such as rubber are not constant but continually changing, and the results obtained one day would not hold good for a subsequent day.—A. S.

Gutta-percha; Results obtained with different kinds of ——, *with special reference to Tjipetir gutta-percha.* R. Ditmar. Z. Chem. Ind. Kolloide, 1912, **10**, 233—238.

At the Government plantation at Tjipetir near the south coast of Java there are about 2500 morgen (1580 acres) planted with *Palaquium Gutta*, *Pal. oblongifolium*, and *Pal. borneense.* The Tjipetir gutta-percha is stated to be so pure that the ordinary washing process in the rubber or cable works is not required; its price is about M. 9·5 per kilo. The author gives in three tables the results of the examination of seven samples of different kinds of commercial gutta-percha. For the determination of the resin, ethyl acetate is preferable to acetone as a solvent. For the determination of the softening point, a strip of the material, 7 cm. long by 5 mm. cross-section is fastened in a horizontal position in a clamp at one end, and to the other free end a weight is fixed by means of a set screw. The softening point is taken as the temperature at which the strip gives way under the load. Viscosity determinations are considered to be of no practical service. The analytical results show that in general the trade price corresponds fairly closely with the content of pure gutta hydrocarbon. Contrary to the statement of Tschirch (see this J., 1903, 1250; 1905, 627), no evidence could be obtained that fluavil (the constituent soluble in cold alcohol) diminishes the value of the gutta-percha: a white gutta-percha of very good quality contained 39·36 per cent. of fluavil. Tschirch's statement that albane (soluble in hot alcohol) does not affect prejudicially the quality of the gutta-percha also could not be confirmed. On the contrary a high content of albane and albanane usually indicates a poor quality.—A. S.

Composition of seeds of Funtumia elastica from the Ivory Coast. Hébert. *See* XII.

Patents.

Caoutchouc-like bodies and intermediate products: Synthetic manufacture of ——. W. H. Perkin and C. Weizmann, Manchester, and F. E. Matthews and E. H. Strange, London. Eng. Pat. 9722, April 21, 1911.

When straight-chain amylenes, or other olefinic hydrocarbons containing the structure, $:C:C\cdot CH\cdot CH:$, or a mixture of such hydrocarbons, is heated, two atoms of hydrogen may be removed from each molecule, a portion of the hydrocarbon being converted into a hydrocarbon having conjugate double linkages, $:C:C\cdot C:C:$. This portion is capable of being converted by polymerisation into a caoutchouc-like substance. The dehydrogenation is facilitated by the use of a catalyst such as finely-divided copper. When it is impracticable to separate by distillation the dehydrogenated from the original hydrocarbon, the separation may be effected by polymerising the dehydrogenated hydrocarbon *in situ*, when the unaltered hydrocarbons can be removed by distillation or by precipitating the caoutchouc substance by adding a liquid in which it is insoluble, but which mixes with the unpolymerised hydrocarbons. *Example:* 100 grms. of 1.2-butylene $CH_3\cdot CH_2\cdot CH:CH_2$, is passed during one hour through a tube, 3 ft. long, containing copper heated to redness: the mixture of butadiene and unchanged butylene is polymerised, after condensation, by means of metallic sodium, and the butylene is separated by heating (compare Fr. Pat. 429,225; this J., 1911, 1268).—T. F. B.

Caoutchouc; Process for the production of a substance similar to ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 2313, Jan. 29, 1912. Under Int. Conv., Aug. 7, 1911.

The product obtained by Kondakow (J. prakt. Chem., 1901, **64**, 109) by autopolymerisation of βγ-dimethylerythrene differs entirely from that produced by heating the dimethylerythrene according to Fr. Pat. 422,955 of 1910 (this J., 1911, 637); it is a white crumbly mass which resinifies rapidly in air. It can, however, be converted into a stable product, which can be utilised as a substitute for caoutchouc by treatment with basic substances, such as ammonia, caustic soda, aniline, dimethylamine, or diethylamine.
—T. F. B.

Gums; Treating palo-amarillo and similar ——. G. B. Bradshaw, Brooklyn, N.Y. U.S. Pat. 1,021,178, April 23, 1912.

Resin is extracted from rubber or rubber gums by coagulating the latex of the gum, thus removing about 90 per cent. or at least 80 per cent. of the water, the gum being then treated with a solvent for both the rubber and the resin. The rubber is precipitated, the solvent drawn off, and the rubber washed free from solvent in the presence of water. Ingredients, such as calcined magnesia, are added to the rubber to change its texture and convert it into a commercial article.—B. N.

Rubber waste; Apparatus and process for reclaiming vulcanised ——. C. S. Heller, Assignor to Moore Architectural and Engineering Co., Akron, Ohio. U.S. Pats. 1,024,936 and 1,024,937, April 30, 1912.

See Fr. Pat. 434,841 of 1911: this J., 1912, 399. The reclaiming solution contains caustic alkali and ferric hydroxide.—T. F. B.

Latex; Process and apparatus for converting —— *into sheets of crude rubber.* H. H. Markley and F. E. Mellinger, Lumija, Mexico. Eng. Pat. 19,788, Sept. 5, 1911.

See U.S. Pat. 1,008,607 of 1911; this J., 1911, 1462.
—T. F. B.

Hydrocarbons having two ethylenic linkages (conjugate double linking); Manufacture of —— *and of caoutchouc-like bodies therefrom.* W. H. Perkin, Manchester, and F. E. Matthews and E. H. Strange, London. Eng. Pat. 6903 of 1912, date of Appl., April 21, 1911.

See Fr. Pat. 429,225 of 1911; this J., 1911, 1268.—T. F. B.

Process for producing erythrene. Fr. Pat. 437,387. *See* XX.

XV. LEATHER; BONE; HORN; GLUE.

Tan liquors; Acids in ——. H. R. Procter. J. Amer. Leather Chem. Assoc., 1912, 7, 249—252. (See also this J., 1912, 242.)

Acids are important in tan liquors to neutralise lime carried in by the hides, and in sole leather tanning to produce "acid plumping." Acidity is also essential to enable the vegetable tanning process to proceed, because alkaline liquors will not tan although they may colour. Tannin and gelatin free from acid or salts, will not mutually precipitate. Gelatin and hide fibre are amphoteric substances, *i.e.*, they are capable of acting both as weak acids and weak bases. In presence of weak acids they form compounds which will precipitate tannin. They are also capable of decomposing salts and appropriating their acid. Of practical as well as of theoretical importance is the effect of the salts of chemically weak acids in rendering these acids still weaker (*e.g.*, sodium acetate and acetic acid), without diminishing their power of combining with bases, as in neutralising lime, or of changing the colour of indicators such as phenolphthalein which are sensitive to weak acids. The presence of neutral salts in tan liquors will therefore alter the titration figures when using indicators such as methyl-orange. The mere titration of total acidity with a single indicator gives no useful information. A more practical method is to take advantage of the sensitiveness of different indicators to different degrees of real acidity. Congo-red changes colour approximately at the lowest acid strength which will perceptibly plump hides, and may be adopted as the indicator for plumping acids. The Procter lime-water method is useful as giving a direct value of the lime-neutralising acids. Phenolphthalein and, preferably, hematin are suitable for determining total acid. The external method of spotting on test-paper is better than previous detannisation with gelatin and an internal indicator. Hematin paper can be made by dipping blotting paper in the solution, and can be preserved dry in the yellow state. Oxidation of the alkaline tan liquors can be prevented by titrating in a flask with addition of a drop or two of gasoline.—J. R. B.

Jellies ; Deformation of —— by freezing. R. E. Liesegang. Z. Chem. Ind. Kolloide, 1912, 10, 225—232.

The author's experiments were carried out mainly with jellies to which Indian ink or other non-diffusible pigments had been added, in order that the effects might be more closely observed. He considers that the force exerted by the ice in crystallisation as a factor in the deformation of the jelly has hitherto been over-estimated, and that the more important factor is the force exerted by the drying gelatin. The ice crystals sometimes localise the dehydration at different places, and in this way strains are produced which may lead to cracks and to the formation of relatively large pores. Incidentally results were obtained indicating the feasibility of a technical method of drying sheets of gelatin by freezing and of preparing gelatin-coated filters intermediate between ordinary paper filters and so-called ultra-filters. If a thin layer of gelatin spread upon glass be subjected to a temperature of —1° C., the greater portion of the water forms a crust of ice which can be removed, or if the mass be allowed to thaw, most of the water flows off, leaving behind a sheet of gelatin of low-water-content. The gelatin filtering layer is obtained when freezing is effected under such conditions that needles of ice penetrate the film of gelatin in a more or less vertical direction ; on subsequently drying the gelatin, at a low temperature, a film permeated by minute pores or channels is obtained.—A. S.

Carbomethoxy-derivatives of phenolcarboxylic acids and their use for syntheses. VI. Partial methylation of polyphenolcarboxylic acids. Fischer and Pfeffer. *See* III.

Resistance of gelatin to the disintegrating action of alkalis. Lumière and Seyewetz. *See* XXI.

Patents.

Leather ; Method of treating —— and product thereof. W. R. Smith, Assignor to Buffalo Leather Co., Buffalo, N.Y. U.S. Pat. 1,025,324, May 7, 1912.

Leather is rendered stiff and given waterproof and non-slipping qualities by immersing in a heated fluid mixture containing a solid bitumen possessing at normal and somewhat higher temperatures a degree of elasticity comparable with that of elaterite and a fusible bitumen possessing high penetrative qualities.—D. J. L.

Curing hides ; Process of ——. F. P. James, Nashville, Tenn., Assignor to The Electric Meat Curing Co., Cleveland, Ohio. U.S. Pat. 1,025,401, May 7, 1912.

Hides are given a preliminary preserving treatment before tanning by washing to remove surface accumulations, immersing in a solution of sodium chloride, and passing an electric current through the solution and hides.—D. J. L.

Tannin from vegetable materials ; Batteries for extracting and concentrating —— by boiling. C. Bourdon. Second Addition, dated Nov. 20, 1911, to Fr. Pat. 407,504, Oct. 1, 1909 (this J., 1910, 504 ; 1911, 39).

A copper boiler is used to heat the water used for the extraction of vegetable tanning materials, thereby lessening the harmful effect of impurities in the water, especially that of ferruginous matter. The concentrating boiler is connected with a condenser in communication with an air pump by means of which the liquor is evaporated and concentrated rapidly at a relatively low temperature and with the production of a purer and more concentrated extract.—D. J. L.

Tortoise shell and the like ; Treatment of horn or claw scrap for the production of artificial ——. R. Rausch, Vienna. Eng. Pat. 6378, March 14, 1912.

The horn or claw chips, freed from fat in a potash lye, are mechanically cleaned by means of brushes, then washed and dyed. The material is then pressed into plates at a temperature of 100° to 150° C., at a pressure of 150 to 200 atmos., and afterwards placed in a solution of tartaric acid, then into glycerin, and again pressed at a temperature of 40° to 50° C.—B. N.

Manufacture of nitrogenous fertilisers from leather clippings, etc. Fr. Pat. 437,628. *See* XVI.

XVI.—SOILS ; FERTILISERS.

Nitrification ; Influence of molasses on —— in cane soils. S. S. Peck. Report of Work of Expt. Station ; Hawaiian Sugar Planters' Assoc. Bull. No. 39, 1912. (*Cf.* also this J., 1911, 1176 ; and 1912, 1463.)

Previously (this J., 1910, 1647), the author found that molasses applied to sugar cane land lying fallow, or applied to land some weeks before planting, may produce beneficial results by stimulating the nitrogen-fixing bacteria of the soil ; but that if it be applied at intervals to land on which cane is growing it acts harmfully by increasing the action of the denitrifying bacteria. He has since studied the amount of nitric nitrogen produced in the soil from sodium nitrate, ammonium sulphate, and tankage under the influence of (*a*) a large application of molasses, (*b*) the same amount of molasses applied in small amount at regular intervals, and (*c*) of the mineral matter of the molasses. The experiments were carried out in metal vessels, termed lysimeters, from which the drainage waters can be collected and analysed. It was found that whether sodium nitrate, ammonium sulphate, or tankage, or a mixture of all three, be used as fertilizer, molasses acts harmfully by causing a part of the nitrogen applied as nitrate to revert to unavailable or less available forms of nitrogen, by checking the nitrification of ammonium sulphate, and by retarding the ammonification and nitrification of organic fertilisers. These effects are not due to the mineral matters of the molasses, but to the sugars, and cannot be corrected by dressing with calcium carbonate.—J. P. O.

Surface tension and wetting power of insecticides and fungicides. Increasing the wetting power of copper preparations and insecticides. Vermorel and Dantony. *See* XIXb.

Patents.

Calcium cyanamide or nitrolim ; Treatment of ——. F. W. MacMahon, Warlingham, Surrey. Eng. Pat. 9412, April 20, 1912.

Calcium cyanamide is treated with sufficient water (at a temperature below that at which ammonia might be formed) to produce a more or less crumbly mass, which is then granulated (*e.g.*, by forcing through a sieve) and dried. The product contains little or no dust, free carbide, or quicklime.—F. Sodn.

Phosphoric acid compounds ; Process of manufacturing ——. F. Giese, Zoppot, and W. Wolters, Ildehausen. Germany. U.S. Pat. 1,025,619, May 7, 1912.

Readily soluble phosphates are produced by melting natural phosphates in the presence of substances adapted to interact with the formation of silicates, the resulting mass being subdivided by the action of a blast of commingled steam and air.—W. E. F. P.

Fertilisers ; Artificial —— *and process for manufacturing the same.* L. R. Coates. Fr. Pat. 437,411, Dec. 9, 1911.

Apatite, coprolites, or other phosphates are ground, intimately mixed with powdered limestone, and calcined at 800—900° C. The mixture is slaked and neutralised with sulphuric acid, powdered, and screened, yielding a dry, impalpable powder containing an easily assimilable phosphate and calcium sulphate.—O. R.

Fertilisers ; Process for the manufacture of nitrogenous —— *from leather clippings, old boots, or other leather articles.* Q. Feldmann. Fr. Pat. 437,628, Dec. 11, 1911.

Waste leather is treated with steam at 4 to 5 atmospheres pressure for about an hour, whereby it is reduced to a paste ; the latter is dried, preferably with the assistance of quicklime, and reduced to a fragmentary or powdered state, in which it contains about 9 per cent. of nitrogen and is suitable for fertilising sandy soils. The materials, originally used for tanning the leather, are extracted by the steam and may be recovered.—O. R.

Fertiliser and process of producing the same. L. R. Coates, Baltimore. U.S. Pat. 1,024,880, April 30, 1912.

See Fr. Pat. 437,411 of 1911 ; preceding.—T. F. B.

XVII.—SUGARS ; STARCHES ; GUMS.

Soaked beet seed ; Experiments with ——. G. Köck. Österr.-Ungar. Zeits. Zuckerind., 1912, **41**, 13—15.

Stormer has stated that if the beet seed be soaked in fresh water for about 20 hours previous to sowing, not only is there rapid and continuous growth, but sound resistant plants of good weight are obtained. As the experiments demonstrating this assertion were conducted only in the laboratory, the author has carried out investigations on the large scale in two different districts. He found in the early stages that although the soaked seed germinated and grew more rapidly than the untreated seed, there was no other noticeable difference between the two. In the later period of growth likewise, both plots appeared to be the same, but the yield from the treated seed was 242·8, whilst that from the untreated seed was 215·8 quintals per hectare (193½ cwt. and 172 cwt. respectively per acre). By soaking beet seed for 20 hours in fresh water, it was found that the increase in weight was about 200 per cent. and the author thinks that the advantage of providing the seed with a sufficiency of water for germination in this way may be largely dependent upon the weather conditions obtaining immediately after sowing, and that the value of the treatment requires to be established by further experiments under varying conditions.—J. P. O.

Sugar beet ; Influence of different amounts of water on the yield and quality of the ——. A. Herke. Österr.-Ungar. Zeits. Zuckerind., 1912, **41**, 1—7.

Experiments carried out in concrete and metal vessels showed that while within certain limits the total weight of the plant increases with an increasing amount of water, the foliage increases in greater proportion than the root. Although the percentage of dry substance and sugar contained in the root decreases with an increase of water, the absolute amount of sugar in the root slightly increases. For the production of 1 kilo. of beetroot, the amount of water required was found to vary from 340·6—604·4 litres, according to the soil. As to the nitrogen content, this is decreased to a marked extent with an increase of water, and this is so not only for the total, but also for the objectionable nitrogen. (Cf. also this J., 1905, 808 ; 1906, 673 ; and 1911, 701.)—J. P. O.

Quotient of purity ; Dilution method of determining the —— *[of beet sugar factory products].* O. Wohryzek. Österr.-Ungar. Zeits. Zuckerind., 1912, **41**, 46—60.

In determining the quotient of purity of beet sugar factory products according to the ordinary, the Austro-Hungarian customs, or the Curin methods, an error is introduced owing to the difference of contraction on dilution between pure and impure solutions, this error increasing with the dilution and the impurity of the product. Nevertheless, one or other of these methods is generally used on account of the rapidity with which it may be carried out, as compared with the more correct but tedious procedure of determining the density of the undiluted product by the pycnometer or Westphal balance and the polarisation in the ordinary way. A correction table has now been drawn up, by means of which the figures obtained by the dilution method may be converted to the actual apparent quotient of purity. In using this table, the details of working are as follows : Twice the normal sugar weight of the product is washed with warm water into a 200 c.c. flask, cooled, and made up to the mark. The density of this solution is taken by the pycnometer, and the density of the product examined obtained from Lipski's table ; or the Koydl spindle is used, and the original density thus read directly. Preferably using the Cron automatic pipette, 50 c.c. of the solution are transferred to a 100 c.c. flask, defecated with a little basic lead acetate, made up to the mark, filtered, polarised, and the reading multiplied by two. Having the density and the polarisation, the quotient is calculated, and the figure thus obtained is corrected by means of the table given. This method requires only one weighing, whereas with those generally used two or three are necessary ; in taking the spindle reading, no de-aeration is required ; it is well suited for ordinary routine work ; and it gives results that corroborate those found by determining the density and polarisation of the undiluted product separately. It is pointed out that this table may not give accurate results when abnormal roots are being sliced, or when manufacture is irregular, since then the nature of the non-sugars, and consequently the contraction of their solutions on dilution, will not be the same. For ordinary work in the beet sugar factory, it is stated to give reliable results, and that this is so is borne out by a series of comparative determinations made with all classes of factory and refinery products.—J. P. O.

Refractometer ; Use of the —— *in beet sugar factory routine control.* O. Fallada and A. Kulp. Österr.-Ungar. Zeits. Zuckerind., 1912, **41**, 29—39.

Numerous investigations have been carried out on the use of the refractometer for the rapid determination of dry substance in the sugar house (this J., 1906, 200, 1161 ; 1908, 698, 1168 ; 1909, 253 ; 1910, 775), and the authors have now conducted a series of comparative experiments with beet sugar factory products from diffusion juices to final molasses. Whereas previously it has been found that the values given by the pycnometer are highest, those by the refractometer intermediate, and those by desiccation are lowest, a number of determinations now show that this is not always so. In the case of diffusion juices, it was observed that the values found by the refractometer were highest, those found by the pycnometer were intermediate, and those found by desiccation were lowest, the average figures being 20·90, 20·40, and 19·95 per cent. respectively. Although the differences between the dry substance contents indicated by the refractometer and the pycnometer were fairly constant in each of the samples examined, no fixed relationship could be observed between the so-called " true " dry substance and the dry substance found by the other two methods. In explanation of this, attention is called to the observation of Pellet that during the desiccation of diffusion juice, decomposition of those non-sugars that are removable by defecation and carbonatation occurs, and also to the work of Andrlik and Stanek (this J., 1911, 299) showing that when determining the dry substance of diffusion juices by desiccation.

varying results are obtained with the same sample according to the type of drying oven used. With (*a*) saturated juices and (*b*) thick-juices the order between the refractometric, pycnometric and true dry substance values was the same, being (*a*) 22·72, 22·31, 22·16, and (*b*) 12·69, 12·30, and 12·03 per cent. respectively, but here the differences between each dry substance value in the several samples were quite regular. When, however, (*a*) after-product centrifugal syrups, (*b*) after-product massecuites, and (*c*) final molasses were used, the order was not the same, although the differences between each value were always very regular, the average figures for the refractometric, pycnometric, and desiccation values then being: (*a*) 82·53, 80·40, 82·30; (*b*) 91·38, 89·07, 90·83; and (*c*) 81·53, 79·75, 81·20 respectively. It is pointed out that with these impure products the pycnometric figures are lowest owing to the error arising from the contraction of the non-sugars on dilution in the Curin method (see preceding abstract). In discussing these results, the authors express the opinion that since the difference between the true and refractometric dry substance values are reasonably constant for all beet sugar factory products with the exception of diffusion juices, the suggestion of Pellet to establish a table of factors for converting the refractometric or pycnometric to the true values should be adopted. Summarising these results, and those of other investigators, it has been shown that the relationship between the refractometric, the pycnometric, and the desiccation dry substance values varies according to the campaign and the district. It has also been proved that throughout the same campaign and in the same factory there is such a constant difference between the three values that factors should be determined by means of which the refractometric and the pycnometric values can be converted to the true dry substance.—J. P. O.

[*Sugar.*] *Carbonatation scums: Methods employed for controlling the exhaustion of* ——. L. Lindet and Charpentier. Bull. Assoc. Chim. Sucr., 1912, **29**, 676—680.

For the determination of the sucrose and lime of carbonatation press scums in one operation, the author previously recommended the use of phenol (this J., 1911, 702), the advantage claimed being that, contrary to ammonium nitrate, this reagent liberates all the sucrose that may be combined as insoluble tribasic calcium saccharate. Further experiments with the process now show that, whereas the polarisation of the liquid extracted with acetic acid represents the true value, when phenol, ammonium nitrate, and water are used, the amounts of sucrose found are only 78, 76, and 67 per cent. respectively. These figures indicate that the greater part of the sucrose contained in beet sugar factory press scums is in the free state, but that the remainder is present as tribasic calcium saccharate, completely decomposable by acetic acid, but only partially affected by phenol or ammonium nitrate. Experiments are also described showing that the lime liberated by acetic acid, phenol, or ammonium nitrate is originally present, not only as tribasic calcium saccharate, but also as insoluble pectin and protein compounds.—J. P. O.

Exhausted beet slices; Determination of sucrose in —— S. Leviteki. Centr. Zuckerind., 1912, **20**, 1128—1129.

In determining the sugar content of exhausted beet slice the polarisation of the expressed juice is sometimes highe and sometimes lower than the polarisation of the liqui obtained by the hot aqueous digestion method. In ord to investigate the cause of this irregularity, a well mixe finely divided sample of exhausted slices was prepared a portion of this was examined by the hot aqueous digestio method, while the remainder was divided into four part and the juice expressed from each with gradually increasin pressures. Accepting the figures obtained by the ho aqueous digestion method as correct, the results obtaine show that the polarisation of the juice expressed with lo pressures is too high, and that expressed at high pressure is too low. In the opinion of the author, provided onl moderate pressures be always applied, the polarisatio of the expressed juice may be employed as a rapid routin method for controlling the work of diffusion; but whe determining the amount of sugar left in the slices for th purpose of ascertaining the losses of manufacture, th hot aqueous digestion method must always be used —J. P. O.

Available sugar, available crystal sugar, and the crysta content of cane sugars of different composition; Tables for the calculation of ——. H. C. Prinsen Geerligs. Archief. Suikerind. Nederl.-Indië, 1911, **19**, 1469—1472. Intern. Sugar J., 1912, **14**, 274—278.

From the sucrose present in the raw juice of a cane factory, and the quotient of purity of this raw juice, the maximum amount of available sugar may be calculated. Moreover, a value for the quantity of standard muscovado may be found, and this compared with the actual amount, to see if satisfactory yields are being obtained. It is assumed that the standard muscovado sugar has a polarisation of 96·5, a crystal content of 95·1, and that the purity of the molasses is 33⅓, from which it follows that the water-content of the standard muscovado is 0·7 per cent., and its purity is 97·2. It is further supposed that the ratio of sugar to non-sugar in the press-scums is 1 : 2, so that the highest value for the available standard muscovado is as follows:—

$$\frac{P - 33\frac{1}{3}}{97{\cdot}2 - 33\frac{1}{3}} \times \frac{100}{P} \times \frac{100}{99{\cdot}3},$$

P being the observed quotient of purity. Thus, for each degree of purity of the raw juice a factor can be calculated by which the percentage of sugar in the juice must be multiplied to give the figure for the available standard muscovado, and in Table I. these factors for purity values between 77 and 93 are summarised. In order to obtain the amount of available crystal, the above figures are simply multiplied by 0·951. Finally, the crystal content for any polarisation of first sugar, and for any water content, can be found in Table II. In calculating it, the purity is taken at 33⅓, indicating that to every 2 parts of water-free non-sugar, one part of sugar goes to the molasses, which amount is subtracted from the polarisation, giving the crystal figure.

Table I.

	0·0	0·1	0·2	0·3	0·4	0·5	0·6	0·7	0·8	0·9
77	0·8942	0·8951	0·8960	0·8968	0·8976	0·9885	0·9894	0·9003	0·9012	0·9021
78	0·9030	0·9038	0·9047	0·9055	0·9964	0·9072	0·9981	0·9089	0·9098	0·9107
79	0·9115	0·9123	0·9131	0·9140	0·9148	0·9156	0·9165	0·9173	0·9182	0·9190
80	0·9198	0·9206	0·9214	0·9222	0·9231	0·9239	0·9247	0·9255	0·9263	0·9271
81	0·9279	0·9287	0·9295	0·9303	0·9311	0·9318	0·9326	0·9334	0·9342	0·9350
82	0·9358	0·9366	0·9374	0·9381	0·9389	0·9397	0·9405	0·9412	0·0420	0·9428
83	0·9435	0·9443	0·9450	0·9458	0·9465	0·9473	0·9481	0·9488	0·9496	0·9503
84	0·9511	0·9518	0·9526	0·9533	0·9540	0·9548	0·9555	0·9563	0·9570	0·9577
85	0·9584	0·9591	0·9598	0·9605	0·9613	0·9620	0·9627	0·9634	0·9641	0·9648
86	0·9655	0·9663	0·9670	0·9677	0·9684	0·9691	0·9699	0·9706	0·9713	0·9720
87	0·9727	0·9733	0·9740	0·9747	0·9754	0·9761	0·9767	0·9774	0·9781	0·9788
88	0·9795	0·9802	0·9808	0·9815	0·9822	0·9829	0·9835	0·9842	0·9849	0·9856
89	0·9862	0·9869	0·9875	0·9882	0·9888	0·9895	0·9902	0·9908	0·9915	0·9921
90	0·9928	0·9934	0·9941	0·9947	0·9953	0·9960	0·9966	0·9973	0·9979	0·9986
91	0·9992	0·9998	1·0005	1·0021	1·0027	1·0034	1·0040	1·0047	1·0053	1·0069
92	1·0055	1·0061	1·0067	1·0073	1·0080	1·0086	1·0092	1·0098	1·0104	1·0110
93	1·0116	1·0122	1·0128	1·0134	1·0140	1·0146	1·0152	1·0458	1·0164	1·0170

Table II.

Water Content.

Polarisation.	0·0	0·1	0·2	0·3	0·4	0·5	0·6	0·7	0·8	0·9	1·0	1·1	1·2	1·3	1·4	1·5	1·6	1·7	1·8	1·9	2·0
99·9	99·85	99·90	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
99·8	99·70	99·75	99·80	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
99·7	99·55	99·60	99·65	99·70	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
99·6	99·40	99·45	99·50	99·55	99·60	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
99·5	99·25	99·30	99·35	99·40	99·45	99·50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
99·4	99·10	99·15	99·20	99·25	99·30	99·35	99·40	—	—	—	—	—	—	—	—	—	—	—	—	—	—
99·3	98·95	99·00	98·05	99·10	99·15	99·20	99·25	99·30	—	—	—	—	—	—	—	—	—	—	—	—	—
99·2	98·80	98·85	98·90	98·95	99·00	99·05	99·10	99·15	99·20	—	—	—	—	—	—	—	—	—	—	—	—
99·1	98·65	98·70	98·75	98·80	98·85	98·90	98·95	99·00	99·05	99·10	—	—	—	—	—	—	—	—	—	—	—
99·0	98·50	98·55	98·60	98·65	98·70	98·75	98·80	98·85	98·90	98·95	99·00	—	—	—	—	—	—	—	—	—	—
98·9	98·35	98·40	98·45	98·50	98·55	98·60	98·65	98·70	98·75	98·80	98·85	98·90	—	—	—	—	—	—	—	—	—
98·8	98·20	98·25	98·30	98·35	98·40	98·45	98·50	98·55	98·60	98·65	98·70	98·75	98·80	—	—	—	—	—	—	—	—
98·7	98·05	98·10	98·15	98·20	98·25	98·30	98·35	98·40	98·45	98·50	98·55	98·60	98·65	98·70	—	—	—	—	—	—	—
98·6	97·90	97·95	98·00	98·05	98·10	98·15	98·20	98·25	98·30	98·35	98·40	98·45	98·50	98·55	98·60	—	—	—	—	—	—
98·5	97·75	97·80	97·85	97·90	97·95	98·00	98·05	98·10	98·15	98·20	98·25	98·30	98·35	98·40	98·45	98·50	—	—	—	—	—
98·4	97·60	97·65	97·70	97·75	97·80	97·85	97·90	97·95	98·00	98·05	98·10	98·15	98·20	98·25	98·30	98·35	98·40	—	—	—	—
98·3	97·45	97·50	97·55	97·60	97·65	97·70	97·75	97·80	97·85	97·90	97·95	98·00	98·05	98·10	98·15	98·20	98·25	98·30	—	—	—
98·2	97·30	97·35	97·40	97·45	97·50	97·55	97·60	97·65	97·70	97·75	97·80	97·85	97·90	97·95	98·00	98·05	98·10	98·15	98·20	—	—
98·1	97·15	97·20	97·25	97·30	97·35	97·40	97·45	97·50	97·55	97·60	97·65	97·70	97·75	97·80	97·85	97·90	97·95	98·00	98·05	98·10	—
98·0	97·00	97·05	97·10	97·15	97·20	97·25	97·30	97·35	97·40	97·45	97·50	97·55	97·60	97·65	97·70	97·75	97·80	97·85	97·90	97·95	98·00
97·9	96·85	96·90	96·95	97·00	97·05	97·10	97·15	97·20	97·25	97·30	97·35	97·40	97·45	97·50	97·55	97·60	97·65	97·70	97·75	97·80	97·85
97·8	96·70	96·75	96·80	96·85	96·90	96·95	97·00	97·05	97·10	97·15	97·20	97·25	97·30	97·35	97·40	97·45	97·50	97·55	97·60	97·65	97·70
97·7	96·85	96·60	96·65	96·70	96·75	96·80	96·85	96·90	96·95	97·00	97·05	97·10	97·15	97·20	97·25	97·30	97·35	97·40	97·45	97·50	97·55
97·6	96·40	96·45	96·50	96·55	96·60	96·65	96·70	96·75	96·80	96·85	96·90	96·95	97·00	97·05	97·10	97·15	97·20	97·25	97·30	97·35	97·40
97·5	96·25	96·30	96·35	96·40	96·45	96·50	96·55	96·60	96·65	96·70	96·75	96·80	96·85	96·90	96·95	97·00	97·05	97·16	97·15	97·20	97·25
97·4	96·10	96·15	96·20	96·25	96·30	96·35	96·40	96·45	96·50	96·55	96·60	96·65	96·70	96·75	96·80	96·85	96·90	96·95	97·00	97·05	97·10
97·3	95·95	96·00	96·05	96·10	96·15	96·20	96·25	96·30	96·35	96·40	96·45	96·50	96·55	96·60	96·65	96·70	96·75	96·80	96·85	96·90	96·95
97·2	95·80	95·85	95·90	95·95	96·00	96·05	96·10	96·15	96·20	96·25	96·50	96·35	96·40	96·45	96·50	96·55	96·60	96·65	96·70	96·75	96·80
97·1	95·65	95·70	95·75	95·80	95·85	95·90	95·95	96·00	96·05	96·10	96·15	96·20	96·25	96·30	96·35	96·40	96·45	96·50	96·55	96·60	96·65
97·0	95·50	95·55	95·60	95·65	95·70	95·75	95·80	95·83	97·00	95·95	96·00	96·05	96·10	96·15	96·20	96·25	96·30	96·35	96·40	96·45	96·50
96·9	95·35	95·40	95·45	95·50	95·55	95·60	95·65	95·70	95·75	95·80	95·85	95·90	95·95	96·00	96·05	96·10	96·15	96·20	96·25	96·30	96·35
96·8	95·20	95·25	95·30	95·35	95·40	95·45	95·50	95·55	95·60	95·65	95·70	95·75	95·80	95·85	95·90	95·95	96·00	96·05	96·10	96·15	96·20
96·7	95·05	95·10	95·15	95·20	95·25	95·30	95·35	95·40	95·45	95·50	95·55	95·60	95·65	95·70	95·75	95·80	95·85	95·90	95·95	96·00	96·05
96·6	—	—	95·00	95·05	95·10	95·15	95·20	95·25	95·30	95·35	95·40	95·45	95·50	95·55	95·60	95·65	95·70	95·75	95·80	95·85	95·90
96·5	—	—	—	—	—	95·00	95·05	95·10	95·15	95·20	95·25	95·30	95·35	95·40	95·45	95·50	95·55	95·60	95·65	95·70	95·75
96·4	—	—	—	—	—	94·85	94·90	94·95	95·00	95·05	95·10	95·15	95·20	95·25	95·30	95·35	95·40	95·45	95·50	95·55	95·60
96·3	—	—	—	—	—	94·70	94·75	94·80	94·85	94·90	94·95	95·00	95·05	95·10	95·15	95·20	95·25	95·30	95·35	95·40	95·45
96·2	—	—	—	—	—	94·55	94·60	94·65	94·70	94·75	94·80	94·85	94·90	94·95	95·00	95·05	95·10	95·15	95·20	95·25	95·30
96·1	—	—	—	—	—	94·40	94·45	94·50	94·55	91·60	94·65	94·70	94·75	94·80	94·85	94·90	94·95	95·00	95·05	95·10	95·15

—J. P. O.

Disaccharides; Detection of small quantities of ——. C. Neuberg and S. Saneyoshi. Z. Ver. deut. Zuckerind., 1912, 559—569.

Whilst the recognition of sucrose and of raffinose (see Neuberg and Marx, this J., 1907, 478) presents little difficulty, the case is very different as regards the reducing disaccharides, maltose, isomaltose, lactose and melibiose, when these occur in small quantities and mixed together. By boiling dilute solutions of the osazones of these sugars with sulphuric acid of 1·5—2 per cent. concentration for 2 hours, they undergo decomposition into equimolecular proportions of glucosazone and free hexose. In this way dextrose is formed from maltose and isomaltose, and galactose from lactose and melibiose. No formation of osones occurs. In order to identify the dextrose or galactose produced, the acid liquid is carefully neutralised with barium carbonate, repeatedly extracted with ether until the latter no longer becomes yellow, and then boiled for a few minutes with bone charcoal and filtered. In the colourless filtrate, after concentration, dextrose is easily distinguished from galactose by its ready fermentability. The authors found, for example, that whilst a 0·6 per cent. solution of dextrose was completely fermented by yeast within 12 hours, producing 8 c.c. of carbon dioxide, a similar solution of galactose produced only 0·25 c.c. of gas in the same time. The decomposition of osazones of disaccharides by this acid treatment is almost quantitative; from 0·2 grm. of lactosazone, 0·06 grm. of galactose was obtained. On the osazones of dextrose and galactose the treatment is without effect, no appreciable quantity of reducing products being formed. The method does not discriminate between the osazones of lactose and melibiose, both of which give galactose; but these disaccharides would rarely occur together, one being of animal and the other of vegetable origin. Maltose differs from isomaltose, lactose and melibiose, in that its osazone is decomposed (into glucosazone and dextrose) by yeast maltase. If therefore a mixture of osazones of disaccharides produces reducing sugar on contact with the enzymes of pure top-fermentation yeast (bottom yeast contains an enzyme which decomposes melibiose), the presence of maltose is certain. For this test pure culture top-fermentation yeast, zymin, or maceration juice prepared by Lebedeff's method, may be employed, but in all cases it must be ascertained by a blank test that no reducing sugars are produced by the autolytic action of the ferment itself. The test can be successfully carried out with 0·1 grm. of maltosazone. This quantity, dissolved in 12 c.c. of water and treated with 0·5 grm. of zymin or 1 grm. of pure culture top yeast, and then with 1 c.c. of toluene and a drop of chloroform, is decomposed more or less completely within 48 hours at 40° C. Before testing for dextrose all osazones must be removed, for maltosazone has slight reducing properties. This may be done, after filtering from the yeast, (1) by making the filtrate slightly acid with acetic acid and heating with bone charcoal, (2) by extracting with amyl alcohol at 60° C., or (3) by precipitating, first with a concentrated solution of phosphotungstic acid free from mineral acid, and then, after filtration, with lead acetate solution to remove excess of the former, and finally removing excess of lead by hydrogen sulphide. The colourless liquid thus obtained reduces Fehling's solution readily.—J. H. L.

Gum tragacanth; Volatile acidity of —— compared with that of Indian gum. W. O. Emery. J. Ind. Eng. Chem., 1912, 4, 374—376. (See also this J., 1912, 452.)

The amounts of volatile acid produced on treating known weights of gum tragacanth and of Indian gum (*Sterculia urens*) respectively with a mineral acid are fairly constant and differ from one another so greatly that, in conjunction with other well-known tests, they are of considerable value in determining the purity of gum tragacanth or the amount of Indian gum admixed therewith. One grm. of the sample is treated for several hours in the cold with 100 c.c. of water and 5 c.c. of syrupy phosphoric acid in a 700 c.c. round-bottomed flask with a long neck. When the gum is fully swollen, the liquid is boiled gently for two hours under a reflux condenser, and the volatile acid is then distilled over by a vigorous current of steam until 600 c.c. of distillate are obtained and the acid residue has a volume of about 20 c.c. The distillate is titrated with $N/10$ potassium hydroxide and phenolphthalein until a faint pink colour persists on boiling. A control determination without gum is also made. Under these conditions 35 samples of gum tragacanth gave an average of 2·15 per cent. of volatile acids (reckoned as acetic acid) and 21 other samples gave an average of 2·20 per cent. Nine samples of *Sterculia urens* gum gave an average of 15·91 per cent. of volatile acid, and 14 other samples gave an average of 15·79 per cent. According to Robinson (this J., 1906, 1164), *Cochlospermum gossypium* gum, which is also sold as Indian gum, yields 14·4 per cent. of acetic acid.—A. S.

Action of hydrogen peroxide on lactic acid and dextrose. Effront. *See* VII.

Influence of molasses on nitrification in cane soils. Peck. *See* XVI.

Patents.

Sugar; Process for manufacturing crystallised —— in slabs or loaves. J. F. P. Kestner. Fr. Pat. 437,633, Dec. 9, 1911. Under Int. Conv., Dec. 17, 1910.

Sugar syrup is concentrated in a partially exhausted evaporating apparatus and is thus heated to a higher temperature than that attained when a higher vacuum is employed. When a very small proportion of the sugar has crystallised, the syrup is run directly into moulds and cooled artificially. Owing to the higher temperature of evaporation, a more concentrated syrup of sufficient mobility is obtained, and the yield of crystallised sugar is thus increased. The process may be modified in that the syrup is concentrated at a lower pressure, and crystallisation is allowed to proceed further, before the syrup is run into moulds.—L. E.

Sugar; Process for the manufacture of refined —— directly from the beetroot and cane, and of white sugar directly from residual syrups. M. de Wierusz-Kowalski. Fr. Pat. 437,891, Dec. 19, 1911. Under Int. Conv., Dec. 12, 1910.

This process depends on the fact that the interior portion of sugar crystals (that have separated from impure solutions) is of higher purity than the exterior portion. In the concentration of the syrup or of residual syrup, crystallisation is arrested when the crystals are of sufficient size. The crystals, which are of high purity, are separated from the syrup, washed and dried, and are used as refined sugar, whilst the syrup is further concentrated. This process also renders unnecessary the addition of inferior syrup to syrup of high purity in order to reduce the latter to that degree of purity (90—91 per cent.) which is generally considered best for obtaining the maximum yield of first product sugar.—L. E.

XVIII.—FERMENTATION INDUSTRIES.

Hops; Economy in the use of ——. C. Bleisch. Z. ges. Brauw., 1912, 35, 229—234.

It has been claimed that by employing special machines for shredding hops before use, the utilisation of the flavouring principles is rendered much more complete, and the quantity of hops employed can be reduced, in some cases by 20 per cent. The author has carried out experiments on a large scale with two such machines, in one of which the leaves of the hop cones are simply torn apart to expose the lupulin, whilst in the other the hops are reduced to fragments so small as in some cases to escape the strainer.

The relation between the bitter substance-content of the hops before and after use was taken as a measure of the utilisation of their flavouring principles. The second kind of machine mentioned above gave the best results as regards the extraction of the hops, but in no case did the possible saving of hops calculated on the basis of these experiments exceed 6 per cent. Another process is described applicable only to the decoction method of mashing. Instead of boiling the hops with the wort, they are extracted with the several mash liquors and sparge liquors, in a specially constructed strainer.—J. H. L.

Alcoholic fermentation ; Mechanism of ——. A. Harden and W. J. Young. Biochem. Zeits., 1912, **40**, 458—478.

Experiments carried out with active yeast juice prepared by Lebedeff's maceration method (this J., 1911, 147) have confirmed the results previously obtained by the authors with pressed yeast juice and zymin (this J., 1906, 490 ; 1908, 821). On addition of sodium phosphate to a fermenting mixture of maceration juice and sugar, there is an increased production of carbon dioxide corresponding to the quantity of phosphate added ; but as soon as all this phosphate has been converted into hexosephosphate, the rate of production of carbon dioxide falls again to its original value. The production of carbon dioxide is therefore a concomitant of the formation, not of the decomposition, of hexosephosphate (cp. Iwanoff, this J., 1910, 37 ; Lebedeff, this J., 1911, 973). Hexosephosphate alone undergoes fermentation less rapidly than when admixed with sugar ; this fact is in accordance with the authors' theory (*loc. cit.*) but not with Lebedeff's. The velocity of fermentation of dihydroxyacetone by pressed yeast juice or maceration juice is much less than that of sugars, although addition of the former substance to a fermenting mixture of yeast juice and sugar does not diminish the rate of fermentation. Dihydroxyacetone, therefore, cannot be an intermediate product in the fermentation of sugar (cp. Slator, this J., 1912, 198). Possibly the reverse is the case, for the facts known concerning the fermentability of dihydroxyacetone—(1) that it ferments less rapidly than sugar, (2) that addition of phosphate does not accelerate its fermentation as in the case of hexoses, (3) that the fermentation products are alcohol and carbon dioxide, and (4) that during its fermentation some free phosphate is converted into hexosephosphate (Lebedeff, this J., 1911, 973)—are all in accordance with the view that dihydroxyacetone is slowly converted into sugar and fermented as such.—J. H. L.

Alcoholic fermentation ; Formation of acetaldehyde in ——. S. Kostytschew. Ber., 1912, **45**, 1289—1293.

Sugar solutions containing small quantities of zinc chloride were fermented by the yeast preparation, "hefanol," in presence of toluene, for 3—4 days. Small quantities of acetaldehyde were obtained on distilling the fermented liquids. It is suggested that acetaldehyde is an intermediate product of fermentation, and that in presence of zinc chloride a portion of it becomes polymerised and so escapes further transformation. The fermented liquids appeared also to contain formic acid, and the equation : $CH_3.CHO + H.COOH = CH_3.CH_2OH + CO_2$ is suggested to represent the final step in alcoholic fermentation (cp. Schade, this J., 1906, 1112).—J. H. L.

Dihydroxyacetone ; Alleged formation of —— during alcoholic fermentation, and the action of animal charcoal and of methylphenylhydrazine on ——. F. Chick. Biochem. Zeits., 1912, **40**, 479—485.

The author is unable to confirm the statements of Boysen-Jensen (see this J., 1909, 494) (1) that dihydroxyacetone may be detected in dextrose (Kahlbaum's preparation), (2) that if dextrose is fermented by yeast in presence of sodium sulphate or hydroxylamine hydrochloride, dihydroxyacetone may be detected in the product, (3) that solutions of dihydroxyacetone undergo decomposition into alcohol and carbon dioxide in presence of animal charcoal. The methylphenylosazone of dihydroxyacetone described by Neuberg (this J., 1902, 506) as melting at 127°—130° C. is formed only in solutions above a certain concentration. Thus, from solutions of 1 grm. of dihydroxyacetone and 4 grms. of methylphenylhydrazine in 100 c.c. of 9·6 per cent. acetic acid, Neuberg's compound separates. If the solution is diluted to more than 500 c.c. with acid of the same strength, yellow or green needles separate, which melt at 146—147° C. At intermediate concentrations mixtures of the two substances are obtained.
—J. H. L.

Aspergillus niger ; Mode of fixation of calcium by ——. Mlle. Robert. Comptes rend., 1912, **154**, 1308—1310.

Aspergillus niger is capable of absorbing relatively large quantities of calcium from liquid culture media rich in salts of this metal (see this J., 1912, 39). The calcium so absorbed is present in the mycelium in combination with oxalic acid, which is a normal secretion product of the organism, but which under ordinary conditions passes almost completely into the liquid medium.—J. H. L.

Hydrolysis of cellulose by ferments. Pringsheim. *See* V.

Enzymes which attack mannans, galactans, and celluloses. Bierry and Giaja. *See* XXIV.

XIXa.—FOODS.

Butter ; Detection of adulteration of ——. L. Robin. Ann. Falsif., 1912, **5**, 180—187.

The methods described previously (this J., 1906, 1055 ; 1907, 720, 975) may be carried out as follows, the modifications introduced rendering the operations more simple :—Five grms. of the fat are boiled in a 150 c.c. flask for 5 minutes under a reflux condenser with 25 c.c. of standardised alcoholic potassium hydroxide solution ; after cooling, 17 c.c. of water and 2 drops of phenolphthalein solution are added, and the solution is titrated with $N/2$ hydrochloric acid containing 56·5 per cent. of alcohol. From the quantity of alkali required for the saponification, the saponification value is calculated. Just sufficient of the alcoholic hydrochloric acid is then added to liberate the fatty acids, the mixture is agitated in a bath of cold water for 2 minutes, diluted with 56·5 per cent. alcohol to the mark, and filtered at 15° C. Fifty c.c. of the filtrate are now titrated with $N/10$ potassium hydroxide solution, the number of c.c. required being multiplied by 0·6 to obtain the value for the acids soluble in alcohol. A further quantity of 60 c.c. of the filtrate is next placed in a graduated tube of 120 c.c. capacity, a teaspoonful of powdered talc is added, the mixture is diluted to 120 c.c. with cold water and well mixed. After filtering, 100 c.c. of the filtrate are titrated with $N/10$ potassium hydroxide and the quantity of the latter required is multiplied by 0·6 to obtain the value for the fatty acids soluble in water. The fatty acids insoluble in water are obtained by difference. The limits and ratios given previously (*loc. cit.*) are retained.—W. P. S.

Margarines containing cocoanut oil or palm-kernel oil ; Relation between the Kirschner and Polenske values for ——. E. R. Bolton, H. D. Richmond, and C. Revis. Analyst, 1912, **37**, 183—188.

In a previous paper (see this J., 1911, 975) it was pointed out that a determination of the Kirschner value would enable the presence of small quantities of butter fat to be determined in the presence of cocoanut oil and that it furnished a reliable figure for the percentage of cocoanut oil in the absence of butter fat. As certain of the results leading to these conclusions were obtained with a butter of low Reichert-Meissl value, the authors have redetermined these results, using a butter having a higher Reichert-Meissl value, and are now able to make the following deductions : For the Kirschner values of both cocoanut oil and palm-kernel oil (with or without admixture with butter fat up to 10 per cent.) a straight line can be plotted which will represent, very closely, the values obtained experimentally. Further, for any percentage of cocoanut or palm-kernel oils the difference in the Kirschner values for "no butter-fat" and for any percentage of butter-fat (up to 10 per cent.) will be proportional within very small limits to the percentage of butter-fat. (2) The Polenske value is practically independent of the amount of butter-fat present (up to 10 per cent.) and is dependent on the presence of cocoanut oil or palm-kernel oil only. A table is given showing the Reichert-Meissl, Polenske, and Kirschner values for mixtures containing from 0 to 100 per cent. of cocoanut oil and from 0 to 10 per cent. of butter-fat. On account of the similarity of the results obtained for cocoanut oil and palm-kernel oil, the following formula will give the percentage of butter-fat present with either fat for the Kirschner and Polenske values found experimentally: Butter fat $= \frac{K-(0{\cdot}262P^{0{\cdot}63}+0{\cdot}09)}{0{\cdot}242}$, or nearly as exactly by the more simple formula: Butter-fat $= \frac{K-(0{\cdot}1P+0{\cdot}24)}{0{\cdot}244}$. The following formulæ connect the Kirschner value and the percentage of butter-fat when neither cocoanut oil or palm-kernel oil is present: $K=0{\cdot}236B+0{\cdot}33$ or, with a small increase in the probable error, $K=0{\cdot}244B+0{\cdot}28$. As the Kirschner value is almost entirely due to the amount of butyric acid present, it is evident that the relation between the Polenske value and the Kirschner value will be more sensitive than the relation between the Reichert-Meissl and Polenske values, and the following table is given tentatively as showing this relation:—

Kirschner value.	Polenske value.
20	1·60
22	2·10
24	2·65
26	3·20

—W. P. S.

Precipitant for amino-acids. Neuberg and Kerb. *See* XXIII.

Patents.

Flour; Treatment of ——. J. S. Remington, Grange-over-Sands, Lancs. Eng. Pats. 14,415, June 17, 1911, and 18,455, Aug. 15, 1911.

A meal prepared from malted grain is mixed with "liquid" phosphoric acid, so that the resulting mixture shall contain from 18 to 30 per cent. of phosphoric acid. This mixture is then added to flour in any desired proportion, the most suitable quantity for improving the baking qualities of the flour being 1·5 lb. to every 280 lb. of flour.—W. P. S.

Baking powder, self-raising flour, or like products. J. S. Remington, Grange-over-Sands, Lancs. Eng. Pat. 18,716, Aug. 19, 1911.

A baking powder is produced by mixing solid phosphoric acid, 34 parts, dry starch, 46 parts, and sodium bicarbonate, 20 parts. One part of this powder may be mixed with 14 parts of flour.—W. P. S.

Baking powders; Manufacture of ——. G. B. Ellis, London. From Chem. Werke vorm. Dr. H. Byk, Charlottenburg, Germany. Eng. Pat. 26,952, Dec. 1, 1911.

Carbonates or bicarbonates are mixed with anhydro-oxy-acids or their salts, or the inner esters, or acid derivates of oxy-acids (*e.g.* glycolide, polyglycolide and lactide) to obtain mixtures which are practically stable in the cold but yield an abundant evolution of carbon dioxide when the temperature is raised.—C. A. M.

Butter and cream; Processes and plants for manufacturing sterile ——. E. W. Kuhn, Brussels. Eng. Pat. 19,298, Aug. 29, 1911.

Milk is saturated with oxygen at a pressure of about 5 atmospheres in a rotating vessel; the oxygen is then exhausted from the vessel, the milk is sterilised at a temperature of 110° C. under a pressure of about 10 atmospheres, and the sterilised milk is conducted through a pipe to a separator. The cream is then inoculated with a pure lactic acid culture, allowed to mature in an atmosphere of filtered air, and churned. All the parts of the apparatus are sterilised before use, and the room in which the maturing and churning operations are carried out is provided with means for sterilising and filtering the air which is admitted. The butter obtained, or the cream, is packed in closed sterilised receptacles.—W. P. S.

Fats; Process for preparing edible ——. P. A. Schmitt. Fr. Pat. 437,665, Dec. 14, 1911. Under Int. Conv., Jan. 16, 1911.

The egg-yolk used to emulsify fat in milk or water in the preparation of edible fats, is never quite sterile; according to the present invention, a substitute, which may be prepared in a perfectly sterile state, is used. To prepare margarine, an animal fat or oil is emulsified in milk by adding to the mixture 1 per cent. by weight of an aqueous solution containing: casein, 10: sodium benzoate, 10: sodium bicarbonate, 0·1; potassium bicarbonate, 0·6, and lactose, 30 per cent. by weight; or again, a vegetable fat or oil is emulsified in milk by adding to the mixture about 4 per cent. by weight of an aqueous solution containing: casein, 5: sodium benzoate, 4: sodium bicarbonate, 0·1; potassium bicarbonate, 6, and glucose, 35 per cent. by weight.—L. E.

Milk; Process of manufacturing artificially soured —. J. Willmann, Assignor to Dairy Machinery and Construction Co., Inc., Derby, Con. U.S. Pat. 1,025,772, May 7, 1912.

Milk, whilst contained in one receptacle to keep it free from external contamination, is first pasteurised and then cooled to a temperature favourable to the growth of cultures. The milk is kept at the temperature for a sufficient time to produce the desired degree of acidity. —G. W. McD.

XIXb.—WATER PURIFICATION ; SANITATION.

Lead poisoning from domestic utensils; Risk of ——. F. M. Litterscheid. Z. Unters. Nahr. Genussm., 1912, **23**, 440—445.

The author has examined the tin coating on the interior of certain large copper boilers which are used for obtaining a supply of hot water for household purposes, and finds that this coating sometimes contains a large quantity of lead. Solder is also employed in making the joints in the vessels. Further experiments showed that lead is dissolved in appreciable quantity when water is heated in such vessels; a part of the lead remains in solution whilst some is contained in the sediment of calcium salts which separate from the water on boiling. The formation of scale in the vessels may after a time diminish the quantity of lead dissolved from the coating, but a possible source of lead poisoning may arise from the use of such utensils.—W. P. S.

Carbonic acid; Determination of free —— *in water by the Trillich method.* H. Noll. Z. angew. Chem., 1912, **25**, 998—1005.

The author has investigated the effect of using phenolphthalein solution of different strengths as the indicator in the titration of (1) free carbonic acid in water with sodium carbonate, and (2) sodium carbonate with sulphuric acid. The results show that with waters containing no bicarbonates and not much free carbonic acid, reliable results are obtainable with any strength, but that in presence of bicarbonates, unless the phenolphthalein solution is of the right strength for the particular case, the results will be incorrect. If the indicator is too strong the results will be low, and *vice versa*. For waters with a temporary hardness up to about 14 degrees (German), the strength of the phenolphthalein solution should be from 1 : 2000 to 1 : 1000, and 0·5 c.c. should be taken r 200 c.c. of the sample. Where the temporary hardness much greater, the correct strength of indicator to use ust be ascertained for the particular class of water. imilarly, in the titration of alkali monocarbonates, if the olution of phenolphthalein is too weak, the results btained will be low. The addition of sodium chloride the solution does not rectify the error.—T. St.

ardness of water; Determination of — by potassium palmitate. C. Blacher. Chem.-Zeit., 1912, **36**, 511.

HEN determining the hardness due to bicarbonates by itration with hydrochloric acid, the carbon dioxide is xpelling by blowing air through the solution, and the quid titrated with an alcoholic solution of potassium almitate until it is faintly alkaline to phenolphthalein. he palmitic acid used for preparing the potassium almitate is freed from stearic acid, as far as possible, by crystallisation. It is stated that unlike the usual itration with ordinary soap solution, the method is pplicable even in presence of humic acids, only a small orrection being needed even in extreme cases.—A. S.

nsecticides and fungicides; Surface tension and wetting power of ——. Means for increasing the wetting power of copper preparations and insecticides. V. Vermorel and E. Dantony. Comptes rend., 1912, **154**, 1300—1302. (See also this J., 1911, 1325.)

NSECTICIDE preparations, whether acid, neutral or lkaline, can be rendered capable of wetting vine leaves nd young grapes very satisfactorily, by adding, per ectolitre, 10—50 grms. of gelatin previously dissolved n a little hot water. For this purpose gelatin is much ore effective than saponins and soaps.—J. H. L.

etermination of the concentration of colloidal solutions by means of the interferometer. Marc. *See* XXIII.

Patents.

efuse; Method of and plant for destroying —— and recovering the useful constituents thereof. E. Box and O. Sunderland, Bexley Heath, Kent. Eng. Pat. 14,983, June 27, 1911.

The refuse is mixed with lime and coal-dust and subjected to destructive distillation; the gases evolved are purified by passing them through chambers containing residues from the retorts mixed with lime, iron oxide, or other substances, and may be used, either alone or mixed with ordinary coal-gas, for lighting and heating purposes. —W. P. S.

Fenchone; Process for the manufacture of [disinfectant] solutions or emulsions of ——, and the products produced thereby. K. Rulke, Berlin. Eng. Pat. 26,691, Nov. 29, 1911. Under Int. Conv., Dec. 15, 1910.

See U.S. Pat. 1,020,621 of 1912; this J., 1912, 406.—T. F. B.

ewage-sludge; Treatment of ——. J. Grossmann, Manchester. U.S. Pat. 1,025,622, May 7, 1912.

See Eng. Pat. 16,397 of 1908; this J., 1909, 1000.—T. F. B.

pparatus for determining the amount of poisonous or inflammable gases in the air. Fr. Pat. 437,585. *See* XXIII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

pium; New method for the assay of ——. P. Carles. Ann. Chim. analyt., 1912, **17**, 171—174.

Seven and a half grms. of the opium, previously dried at 60° C., and powdered, are intimately mixed with 3 grms. of freshly slaked lime, then stirred with 25 c.c. of distilled water to form a homogeneous mixture. To this, two further portions of water, each of 50 c.c., are added; the mixture is transferred to a flask, and allowed to stand for 2 hours, well corked, with occasional stirring. It is then filtered; 52 c.c. of the filtrate, exactly measured off, are treated with 8 c.c. of cold saturated oxalic acid solution. After 15 minutes the precipitated calcium oxalate is filtered off, the first runnings being returned to the filter, if not perfectly clear. When all the oxalate has been collected, it is washed, on the filter, with 6 c.c. of cold distilled water. The filtrate is then transferred to a shallow flat dish (the lid of a Petri dish, or a saucer with greased edges will answer), treated with 2·8 c.c. of cold-saturated solution of pure sodium carbonate, added 1 c.c. at a time, and the mixture is set aside for 48 hours, being gently stirred, on the second day, with a glass rod. The crystalline alkaloids are then collected on a counterpoised twin filter paper, and washed with morphine-saturated water until the washings give no precipitate with lime water. The crystals are then further washed with 2 c.c. of 85 to 90 per cent. alcohol, delivered on them drop by drop, from a pipette; afterwards with 4 c.c. of a mixture of equal weights of ether and 90 per cent. alcohol, finally 15 times in succession with 2 c.c. of ether of sp. gr. 0·720. The morphine is then dried on the counterpoised filters, at 100° C., and weighed. The weight obtained, representing the morphine from 5 grms. of opium, should not be less than 0·5 grm. This method gives results 0·5 to 0·75 per cent. lower than the official process of the French Codex.—J. O. B.

Morphine in opiates, particularly in Pantopon "Roche"; Determination of ——. E. Anneler. Arch. Pharm., 1912, **250**, 186—198.

A comparison of several methods for the determination of morphine in Pantopon "Roche" has been made. The latter substance is a pure preparation of the hydrochlorides of the total alkaloids of opium. Two crystallisation methods were tried, that of the German Pharmacopœia, 5th Ed., and the lime and ammonium chloride method of the French Codex and British Pharmacopœia as modified by Debourdeaux (see this J., 1911, 1029). The first of these gave results from 4 to 5 per cent. too low. The loss of morphine by the second method was found to be constant, and necessitated the addition of 30 mgrms. of morphine for each 50 c.c. of mother-liquor. The two remaining methods that were tried depended upon extraction and not crystallisation. 0·8 to 1·0 grm. of "Pantopon" was dissolved in about 30 c.c. of water and transferred to a 150 c.c. separating funnel. A concentrated aqueous solution of 1 grm. of sodium bicarbonate was mixed with the contents of the funnel, which were then extracted with 10 c.c. of chloroform saturated with morphine. The latter must have been freshly filtered from excess of morphine. The shaking must be only gentle to avoid the formation of an emulsion. The chloroform is drawn off and filtered through a small filter wetted with chloroform. The extraction is repeated with two more portions of 10 c.c. of chloroform. 60 c.c. of a mixture of equal volumes of isobutyl alcohol and chloroform are then poured through the filter into the separating funnel, and the whole shaken for 10 minutes. The extract is drawn off into another separating funnel, and the extraction repeated twice with 20—10 c.c. of the same mixture. The united extracts are washed with 10 c.c. of water, and filtered through a filter wetted with chloroform into a dry separating funnel. The extract is treated with excess of standard hydrochloric acid which is washed out and the free acid titrated with standard alkali using iodeosin and ether as indicator. The results were found to be 1·5 per cent. too high. In the last method that was tried, 1·2 grms. of "Pantopon" were dissolved in water to make 56 grms. and 4 grms. of 15—20 per cent. sodium hydroxide solution added. The whole was well mixed and 50 grms. filtered off. This was extracted thrice with 10 c.c. of chloroform. The chloroform was washed once with water and the water returned to the original aqueous solution. This was acidified with 8 c.c. of 10 per cent. hydrochloric acid, 70 c.c. of a mixture of isobutyl alcohol and chloroform added and the whole made alkaline with sodium carbonate solution. After shaking, the organic solvent was removed and the morphine determined as in the first of the extraction methods described above, the results being however somewhat higher.—F. Shdn.

Isonarcotine; Constitution of —— and the synthesis of derivatives of narcotine of large molecular proportions. M. Freund and K. Fleischer. Ber., 1912, **45**, 1171—1182.

After standing for some time at a temperature of about 0° C. in 70 per cent. sulphuric acid, narcotine and opianic acid condense to form two isomeric bases. α-Opian(lact)yl-narcotine, $C_{32}H_{31}NO_{11}$, is insoluble in water and soluble with difficulty in alcohol. It melts with decomposition at 199° C., and has $[\alpha]_D = -94{\cdot}73°$ at 12° C. in chloroform. The corresponding β-base is also insoluble in water, but is soluble in warm alcohol. It melts at 173°—175° C. and has $[\alpha]_D = -103{\cdot}6°$ at 12·5° C. in chloroform. The α-base was converted into the methiodide, which was decomposed by means of silver oxide. The ammonium base was subsequently heated with potassium hydroxide and the aqueous solution of the reaction product treated with hydrochloric acid, with the formation of α-(5)-opian(lact)yl-narceine hydrochloride, $C_{33}H_{37}NO_{13},HCl$, which decomposed at 193° C. Narcotine can be made to condense with formaldehyde by a reaction similar to that used for condensing it with opianic acid. Methylene-di-narcotine $C_{45}H_{46}O_{14}N_2$, can be crystallised from alcohol and chloroform, and melts at 215°—216° C., it has $[\alpha]_D = -93{\cdot}4°$ in chloroform. Oxidation with nitric acid converts it into methylene-di-cotarnine. The hydrobromide, $C_{25}H_{28}O_6N_2Br_2$, of this base melts at about 240° C. with decomposition. Bromo-hydrocotarnine will not condense with either opianic acid or formaldehyde. Consequently isonarcotine is regarded as (5)-opian(lact)-yl-hydrocotarnine.—F. Shdn.

Methylene-di-hydrocotarnine. M. Freund and A. Daube. Ber., 1912, **45**, 1183—1186.

When hydrocotarnine is treated with 82 per cent. sulphuric acid, methylene-di hydrocotarnine, $C_{25}H_{30}N_2O_6$, is produced. A quantitative yield is obtained if the acid is previously mixed with concentrated formaldehyde solution. The hydrobromide of the base melts at 240°—244° C.—F. Shdn.

Quinine in the presence of pyramidone [dimethylamino-antipyrine]; Recognition of ——. C. Mannich and L. Schwedes. Apoth.-Zeit., 1912, **27**, 343.

When ammonia is applied in the thalleioquin test, a characteristic green colour is produced starting from quinine alone. If pyramidone be present, the reaction is prevented and a red colour appears. Pyramidone can be separated from quinine by shaking out the bases from an alkaline solution, and washing the extract thoroughly with water. Pyramidone being the more soluble in water is thereby removed. The herepathite reaction is prevented by pyramidone, and when this is present, the precipitate takes longer to appear and it is necessary to add more iodine solution than usual.—F. Shdn.

Amygdonitrile (l-mandelonitrile) glucoside in Photinia serrulata. H. Herissey. Comptes rend., 1912, **154**, 1249—1251.

The author has extracted the l-mandelonitrile glucoside from the fresh leaves of *P. serrulata* in practically the same way as he isolated it from *Cerasus padus* (this J., 1907, 1027). It has also been obtained from the bark of *Prunus serotina* by Power and Moore (this J., 1909, 258).—W. H. P.

Ephedrine and pseudo-ephedrine. E. Schmidt and F. W. Calliess. Arch. Pharm., 1912, **250**, 154—170.

Further attempts have been made to render natural ephedrine and pseudoephedrine optically inactive (see this J., 1910, 1329). Ephedrine suffers no change after heating with baryta-water to 180° C., or with concentrated alcoholic potassium hydroxide solution to 110° C. When pseudo-ephedrine is heated in the same way with baryta-water, it is converted into ephedrine. Ephedri is converted into pseudo-ephedrine by warming on t water-bath with concentrated sulphuric acid. Both bas yielded the same derivative, acetyl-pseudo-ephedrir after acetylation, as shown by the properties of the acety compounds and their derivatives, as well as by the fa that both yield pseudo-ephedrine on hydrolysis. Tl hydrochlorides of both bases were treated with sodiu nitrite. Nitroso-ephedrine melted at 78° C., and nitros pseudo-ephedrine at 80° C. Both compounds ga pseudo-ephedrine on hydrolysis.—F. Shdn.

Essential oils; Constituents of ——. Pseudocedrol. Son sesquiterpene alcohols. Tetrahydrocaryophyllene. F. W Semmler and E. W. Mayer. Ber., 1912, **45**, 1384—1394.

After further fractionation and removal of the cedre and cedrenol (this J., 1912, 254 and 407), cedar wood o has been found to contain a liquid saturated tertiar alcohol, pseudocedrol, $C_{15}H_{26}O$. It boils between 14 and 152° C. at 9 mm., has the sp. gr. 0·9964 at 20° C $\alpha_D = +21{\cdot}5°$ at 20° C., and $n_D = 1{\cdot}5131$ at 20° C. Whe reduced with zinc dust at 225°—235° C., cedrene an dihydrocedrene, $C_{15}H_{26}$, are formed. The latter distil for the most part between 109° and 112° C. at 10 mm. I has the sp. gr. 0·9070 at 20° C., $\alpha_D = +37°$ and $n_D = 1{\cdot}4882$ Cedrene can be reduced by means of platinum and hydroge with the formation of dihydrocedrene. Prepared in thi way, the characters are:—b. pt. 122°—123° C. at 10 mm. sp. gr. 0·9204 at 20° C., $\alpha_D = +2°$ at 20° C., $n_D = 1{\cdot}4929$ a 20° C. Pseudocedrol after treatment with concentrate formic acid yields cedrene, identical with the natura hydrocarbon. After determining the refraction constants guaiol appears to be a bicyclic alcohol with one doubl linkage. When oxidised by adding solid permanganat to the substance dissolved in acetone, a glycerol, $C_{15}H_{28}O_3$ is produced, which melts at 210°—211° C. Guaiol wa oxidised by means of ozone with the production of a oxide and a keto lactone. The oxide boils at 138°—144° C at 7 mm., has the sp. gr. 0·9972 at 20° C., $\alpha_D = +96°$ a 20° C., and $n_D = 1{\cdot}5276$. The characters of the keto lactone are: b. pt. 200°—208° C. at 8 mm., sp. gr. 1·06 at 20° C., $n_D = 1{\cdot}5005$ at 20° C. The high-boiling portio of oil of cloves contains a new sesquiterpene alcohol, $C_{15}H_{26}O$, which is bicyclic and contains one double linkage The characters are: b. pt. 138°—148° C. at 8 mm., sp. gr. 0·9681 at 20° C., $\alpha_D = -17°$, $n_D = 1{\cdot}5010$. Natural caryophyllene was reduced by means of platinum black and hydrogen, tetrahydrocaryophyllene being thereby produced. This boiled at 122°—123° C. at 12 mm., and had the sp. gr. 0·8712 at 20° C., $n_D = 1{\cdot}4700$, $\alpha_D = +3°$ at 20° C. The substance is identical with that obtained by the reduction of the caryophyllene regenerated from caryophyllene bihydrochloride.—F. Shdn.

Terpenes and essential oils. 109th and 110th communications. O. Wallach. Annalen, 1912, **389**, 169—198.

The 109th communication comprises sections on compounds derived from cyclohexylhexanone and on some bi- and tri-cyclic C_5-ring systems. The 110th communication deals with (1) the direct conversion of nitrosopinene into pinocamphonoxime by treatment in methyl alcohol solution with hydrogen in presence of colloidal palladium; (2), the transformations of the nitrosochlorides of some unsaturated semicyclic hydrocarbons; and (3), the fission of menthonoxime by potassium hydroxide.—A. S.

Glycerin; Decomposition of —— by ultra-violet radiation. V. Henri and A. Ranc. Comptes rend., 1912, **154**, 1261—1263. (See also this J., 1911, 386.)

By subjecting a 10 per cent. aqueous solution of glycerin for six hours to the action of ultraviolet radiation from a 500-volt quartz mercury lamp, the authors have shown that the glycerol molecule is decomposed with the formation of formaldehyde and acids as well as other aldehydic substances. The decomposition is considerably increased by the presence of hydrogen peroxide, the activation being proportional to the quantity of peroxide added.—W. H. P.

Patents.

Morphine; Manufacture of alkyl derivatives of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 22,611, Oct. 13, 1911.

Morphine may be alkylated by treating it, with or without a solvent, with a quaternary ammonium base or with a mixture capable of forming such a base. For example, a solution of 171 parts of phenyltrimethylammonium chloride in methyl alcohol is added to a solution of 56 parts of potassium hydroxide in methyl alcohol; the potassium chloride is filtered off and the solution is heated with 303 parts of morphine for 10 hours at 140° C. The methyl alcohol and dimethylaniline are removed by distillation, and the codeine is separated from the small quantity of unaltered morphine by treatment with caustic soda and benzene in the usual manner.—T. F. B.

Compounds of hydrogen peroxide with organic substances; Process for making stable the ——. V. Staněk, Prague, Austria. Eng. Pat. 26,960, Dec. 1, 1911. Under Int. Conv., Jan. 23, 1911.

The compounds of hydrogen peroxide with organic substances such as urea, succinamide, asparagine, betaine, erythritol, etc., may be rendered stable by the addition of small quantities of an organic acid or an acid salt of such acid. For example, the compound of hydrogen peroxide and urea may be rendered stable for six months by addition of about 0·1 per cent. of citric acid (compare Eng. Pat. 14,502 of 1911; this J., 1911, 1409).—T. F. B.

Chloral derivatives containing the radical of a fatty acid. N. Sulzberger, New York. U.S. Pat. 1,025,889, May 7, 1912.

The patent covers the compounds of chloral with amides of fatty acids containing more than twelve carbon atoms, of the formula, $CCl_3.CH(OH).NXY$, where X is the radical of the fatty acid and Y an alkyl group. The compound of chloral with palmitic acid amide is a white crystalline powder "of fatty feel," m.pt. about 110° C., not volatile without decomposition insoluble in water, and soluble in alcohol.—T. F. B.

Aldehydes; Process for making ——. G. Lumbroso and J. Broders. Fr. Pat. 437,286, Feb. 13, 1911.

When ozone acts on organic compounds containing an ethylenic linkage in an anhydrous medium, ozonides are at first formed; further action of ozone converts these into more or less peroxidised products which, when treated with water or salts in solution, are converted into acid products, and not into aldehydes. The formation of these peroxidised compounds may be avoided by the use of dry oxygen or ozonised air, in presence of an anhydrous diluent such as a non-oxidisable hydrocarbon of high mol. wt.; the amount of the ozonides is not allowed to rise beyond two or three per cent. of that of the unsaturated hydrocarbon used, and they are removed from the reaction product as rapidly as possible by conversion into aldehydes. This process is stated to be especially applicable to the preparation of acyclic aldehydes containing eight or more carbon atoms, and of cyclic aldehydes.—T. F. B.

Monochlorhydrin from glycerin and hydrochloric acid; Process for obtaining ——. Sprengstoffwerke Dr. R. Nahnsen und Co. Fr. Pat. 437,315, Nov. 15, 1911. Under Int. Conv., Feb. 11, 1911.

Hydrochloric acid gas is passed into an evacuated vessel containing glycerin at a temperature of about 150°–160° C., at which not only the aqueous hydrochloric acid, but also the monochlorhydrin will distil. The process can be made a continuous one by spraying glycerin into an evacuated vessel, and at the same time introducing the hydrochloric acid, the reaction products being continuously removed and separated by fractional cooling. The yields are stated to be about 90 per cent. of the amount of glycerin used.—T. F. B.

Erythrene; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 437,387, Dec. 8, 1911. Under Int. Conv., Jan. 10, 1911.

This process consists in decomposing petroleum or its fractions or residues by means of hot contact bodies or heated surfaces, and separating the erythrene from the resulting gaseous mixture. *Example.* A fraction of b.pt. 70–100° C. obtained from Caucasian petroleum, is passed in a state of vapour over a coil of platinum wire heated electrically to dull redness. The unaltered petroleum is returned to the container, whilst the gases produced are freed from low-boiling hydrocarbons by cooling, and the erythrene is isolated either by strong compression and cooling and fractionation, or by a chemical process, such as by converting it into its tetrabromide.—T. F. B.

Flowers; Process for extracting the natural essences from ——. L. Manescau. Fr. Pat. 437,582, Nov. 16, 1911.

Flowers are digested or macerated (or both) with ether, and the extract is evaporated and the residue dissolved in alcohol for use in perfumery.—T. F. B.

Sulphites or bisulphites of organic bases; Process for preparing solutions containing the reduction products [hydrosulphites] of the ——. Kinzlberger und Co. Ger. Pat. 245,043, Aug. 6, 1910.

Alcoholic solutions of the above-mentioned reduction products are obtained (1) by reducing alcoholic solutions of the sulphites or bisulphites of methylamine, pyridine, piperidine, etc., with zinc, iron, or other suitable metal; (2) by reducing sulphurous acid with zinc in presence of alcohol and adding the desired organic base; (3) by treating with alcohol the product obtained by the interaction of sulphurous acid, the organic base, and zinc in presence of water. In order to obtain solutions of the organic hydrosulphites free from zinc or iron, their alcoholic solutions may be treated with water. The preparation of the compounds may be carried out by reducing with zinc or iron the concentrated aqueous solution of the sulphite or bisulphite, precipitating the zinc or iron by addition of an organic base, and adding to the filtered solution sufficient alcohol to produce high percentage alcoholic solutions. The products may be obtained in the solid form, almost free from water, by the action of sodium on solutions of sulphites or bisulphites of organic bases in alcohol.—T. F. B.

Formic acid; Process for preparing —— *from formates and sulphuric acid.* H. Schröder. Ger. Pat. 245,168, Jan. 22, 1909.

The decomposition of the formate by sulphuric acid is effected in presence of a substance which will absorb the heat of the reaction, this substance consisting of a hydrocarbon more volatile than formic acid, and not able to mix with it. For example, the formate may be suspended in petroleum spirit, and concentrated sulphuric acid added to the mixture: the heat of the reaction is absorbed in volatilising the petroleum spirit, and no decomposition of the formic acid results. External cooling may also be resorted to if desired.—T. F. B.

a-Glucoheptonic acid; Process of preparing ——. A. Liebrecht. Ger. Pat. 245,267, April 25, 1911.

When the addition product of dextrose and hydrocyanic acid is boiled with barium hydroxide, and the precipitate treated with sulphuric acid, *a*-glucoheptonic acid is produced. In this process it is not necessary to use hydrocyanic acid, a mixture of potassium cyanide and acid sufficing.—T. F. B.

Aluminium glycollate; Process for preparing ——. Chem. Werke vorm. Dr. H. Byk. Ger. Pat. 245,490, Nov. 9 1910.

Aluminium glycollate may be obtained in a crystalline form, readily soluble in water, by the action of one mol. of aluminium hydroxide or one of its salts on two mols. of glycollic acid or a salt thereof. Its solutions are stable, and when heated it does not melt, but undergoes decomposition. Its composition is represented by the formula, $Al(O.CO.CH_2.OH)_2.OH$ It possesses a rather pleasant, fruity taste.—T. F. B.

Mercurous salt of diiodophenol-p-sulphonic acid ; Process for preparing a ——. H. Trommsdorff. Ger. Pat. 245,534. Dec. 19, 1909.

A SOLUTION of one mol. of a mercurous salt is added to an aqueous solution of one mol. of diiodophenol-*p*-sulphonic acid or one of its salts. The resulting compound differs from the corresponding mercuric salt in that it is neutral, stable, and contains a higher percentage of mercury (48·56 against 32·08 per cent.). It is of value in therapeutics.—T. F. B.

Mercury derivatives of carboxylic acid esters and their saponification products ; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 245,571, Feb. 2, 1911.

ESTERS of unsaturated cyclic carboxylic acids are treated with mercury salts, and the complex mercuri-carboxylic esters are saponified. Many of the products thus produced (*e.g.*, those from chaulmoogra oil) possess valuable therapeutic properties; they differ from similar products obtained from aliphatic esters inasmuch as the mercury is readily removed from the molecule, and therefore in a highly active condition.—T. F. B.

Nitrohydroxyorylarsinic acids ; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 245,536, Feb. 23, 1911. Addition to Ger. Pat. 235,141, May 25, 1910.

THE nitro-aminoarylarsinic acids used in the principal patent (see Eng. Pat. 5595 of 1911 ; this J., 1911, 768) may be replaced by nitrohalogenarylarsinic acids, which are heated with alkali hydroxide solutions.—T. F. B.

Methylene-dicotarnine ; Process for preparing ——. M. Freund. Ger. Pat. 245,622, June 3. 1911.

NARCOTINE is condensed with formaldehyde, preferably in presence of a mineral acid as condensing agent, and the product thus formed, $CH_2:(C_{22}H_{22}O_7N)_2$, is oxidised to methylene-dicotarnine, $CH_2:(C_{22}H_{14}O_4N)_2$. The new compound may be applied in medicine as a hæmostatic agent.—T. F. B.

Pharmaceutical product [from urea and hydrogen peroxide] ; Manufacture of a ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 1555, Jan. 20, 1911.

SEE Fr. Pat. 436,095 of 1911 ; this J., 1912, 409.—T. F. B.

Oils containing colloidal mercury ; Process for the manufacture of ——. A. Dering, Mannheim, Germany. Eng. Pat. 1219, Jan. 16, 1912. Under Int. Conv., Feb. 11, 1911.

SEE Ger. Pat. 239,681 of 1911 ; this J., 1911, 1409.—T.F.B.

Iron albuminates of organomineral acids ; Method of producing ——. P. Hoering, Berlin, and O. Kippe, Osnabrück, Germany. U.S. Pat. 1,025,466, May 7, 1912.

SEE Fr. Pat. 379,693 of 1907 ; this J., 1907, 1254.—T.F.B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Gelatin ; The resistance of —— *to the disintegrating action of alkalis.* A. and L. Lumière and A. Seyewetz. Bull. Soc. Franç. Phot., 1912, 3, 159—163.

SOLUTIONS of potassium, sodium, and lithium hydroxides, even at considerable dilutions, completely disintegrate gelatin and dissolve it after a time depending on the concentration and temperature of the solution: thus, *N*/1 solutions of the alkali hydroxides dissolve gelatin in 25 minutes at 15°—17° C., in 15 minutes at 20° C., and in 10 minutes at 25°—27° C. Concentrated or dilute aqueous solutions of ammonia do not disintegrate gelatin in the cold, even after prolonged contact, but they cause it to swell considerably, especially in dilute solutions: in hot solutions the gelatin melts, but at the same temperature as in water alone. The alkali carbonates and trisodium phosphate in dilute or concentrated solutions not only do not attack gelatin, but they also prevent its solution both when hot and when cold: concentrated solutions are more effective than dilute ones in this respect, in fact, at suitably high concentrations gelatin may be treated with such solutions at 100° C. without alteration.—T. F. B.

PATENT.

Paper, fabric, etc. ; Process for rendering —— *permeable to light.* E. Rousseau. First Addition, dated Feb. 15, 1911, to Fr. Pat. 436,100, Jan. 13, 1911 (see this J., 1912, 410).

THE paper or fabric, carrying the design to be reproduced, is immersed in the liquid organic chloro-compound at a temperature of 40°—70° C., allowed to drain for a few minutes, and placed, whilst still wet, in a transparent, impermeable envelope composed of any suitable material. By this means a number of copies of the original can be made without the solvent evaporating and affecting the copying paper used.—T. F. B.

XXII.—EXPLOSIVES ; MATCHES.

PATENTS.

Nitrocellulose ; Removal of acids from —— *and centrifugal machine therefor.* F. I. du Pont, Assignor to the E. I. du Pont de Nemours Powder Co. Wilmington, Del. U.S. Pat. 1,024,624, Apr. 30, 1912.

THE acid is removed from the nitrocellulose by centrifugal action within a perforated horizontal cylinder rotating at a high speed within a closed chamber. The material is introduced into the cylinder by means of a conveying shaft, which revolves at a speed slightly slower than that of the cylinder.—C. A. M.

Signal-fusee ; Time burning railway ——. L. S. Ross, Newtonville, Mass. U.S. Pats. 1,025,205 and 1,025,883, May 7, 1912.

(1) THE composition consists of barium nitrate, barium chlorate, sulphur, a carbohydrate and an ingredient, in less proportion than the sulphur, but insufficient to retard combustion, which will neutralise any acid developed during storage. (2) The composition consists of a metallic nitrate, carbonaceous material, sulphur, and potassium perchlorate. The composition, in a short portion of the fusee, has potassium perchlorate in excess to increase the rate of burning, whilst the remainder has its ingredients in the normal proportions, so as to burn with less rapidity.—G. W. McD.

Propellant ; Process for the manufacture of a progressively burning ——. W. Eberlein. Fr. Pat. 437,714, Dec. 15, 1911. Under Int. Conv., Dec. 27, 1910, Feb. 2 and Oct. 21, 1911.

THE powder, in the form of rods or tubes, has a decreasing density from the exterior to the interior, so as to increase the rate of combustion. This is attained by placing the partially dried explosive in a liquid (*e.g.*, water) which, penetrating the explosive, counteracts the action of the solvent and produces in the interior of the rod or tube an explosive of lesser density than the exterior.—G. W. McD.

XXIII.—ANALYTICAL PROCESSES.

Platinum and quartz ; Method of joining ——. G. Berlemont. Comptes rend., 1912, **154**, 1217—1218.

The author has made strong joints between a platinum-iridium alloy and quartz.—W. H. P.

Carbon, hydrogen and sulphur in organic compounds ; Electrical method of Morse and Gray for the simultaneous determination of ——. E. E. Reid. Amer. Chem. J., 1912, **47**, 416—429.

Certain modifications are suggested in the method (see this J., 1905, 753 and 1906, 563) particularly with regard to the determination of sulphur. It is suggested that the combustion tube itself and the tube carrying the heating wire should be made of quartz. The use of asbestos plugs is found in some cases to lead to low results for sulphur, owing to retention of the sulphur oxides, so it is suggested that quartz wool be used. As a substitute for the electrical heater which was devised to keep the tube for absorbing oxides of nitrogen at 175 C., the author finds it convenient to use a brass block, 50 × 50 × 360 mm., with a hole through its largest axis, heated by a Bunsen burner. It is probably best in most cases, to make two separate combustions, one for carbon and hydrogen, the other for sulphur. In the first case special attention must be paid to completeness of combustion, and in the second to slowness of the current of gas, so that the oxides of sulphur may be completely absorbed. It is found that all the sulphur may be satisfactorily burned and absorbed while some carbon is still left unburnt.—W. H. P.

Phenolphthalein ; Simultaneous influence of alcohol and neutral salts on the delicacy of ——. E. Lenk and J. Mondschein. Chem.-Zeit., 1912, **36**, 534—535.

The experimental figures deal with the effect of ammonium chloride, alcohol, and water in varying quantities on the neutrality of phenolphthalein. The ammonium chloride was quite neutral to litmus, and the same amount of indicator was present in each case. The results are given in tables and curves. 10 c.c. of $2N$- ammonium chloride solution alone required 2·4 c.c. of $N/10$ potassium hydroxide to attain neutrality to phenolphthalein ; when diluted with 40 c.c. of water, it required 4·1 c.c., with 20 c.c. of alcohol, it required 41·2 c.c., and with 40 c.c. of water and 20 c.c. of alcohol, it required 33·4 c.c. of $N/10$ potassium hydroxide. Similar anomalies are observed in the presence of other salts such as ammonium sulphate and magnesium sulphate, while non-hydrolysed salts such as sodium chloride have no effect.—W. H. P.

Colloidal solutions ; Determination of the concentration of —— *by means of the new liquid interferometer.* R. Marc. Chem.-Zeit., 1912, **36**, 537—540.

A modified form of the interferometer (compare this J., 1911, 770) has proved of great service in determining the concentration of colloidal solutions in adsorption experiments and similar cases. A single chamber is used containing water which serves as the standard liquid and for maintaining a constant temperature. The chamber is fitted with a cover having a depression of suitable size and shape which projects downwards into the water and serves as container for the solution to be examined. Results are cited showing the ease and accuracy with which differences of concentration of colloidal solutions can be determined with the instrument, and it is pointed out that the refraction of colloidal solutions as indicated by the interferometer does not alter appreciably as other properties of such solutions do when the solutions are kept for relatively short periods (3—8 days). The sole difficulty in the use of the instrument with colloidal solutions consists in the difficulty of correctly adjusting the interference bands, but the author shows how this can be overcome. This method of examination promises to be of value in the examination of potable waters and in judging the efficacy of filters for such waters.—A. S.

Copper associated with cadmium, arsenic, iron, or lead ; The oxalate permanganate process for the determination of ——. H. L. Ward. Amer. J. Science, 1912, **33**, 423—432.

The method previously described (this J., 1912, 411) is most accurately applied to the determination of copper, in presence of cadmium, by precipitating the boiling solution with oxalic acid (3·5—4 grms. of the solid acid per 100 c.c. of solution), in the presence of a large excess of free acetic acid and small amounts of free nitric acid ; it may be applied similarly to the separation of copper from arsenic (in the quinquevalent condition). Copper is best separated from iron by adding a large excess of oxalic acid to the boiling solution (faintly acid with acetic acid) and then, after cooling, two volumes of acetic acid. When lead is present, this is precipitated with sulphuric acid, in a solution containing a large amount of free acetic acid, and (with or without filtering) the copper is then precipitated by oxalic acid. Ammonium salts should not be present when precipitating copper as oxalate, and it is recommended that the precipitate be left overnight before filtering.—F. Sodn.

Iron and titanium ; Separation of ——. F. Bourion. Comptes rend., 1912, **154**, 1229—1232.

The mixture of ferric oxide and titanium dioxide is heated to 700°—750° C. in a current of hydrogen chloride containing a little sulphur chloride. The iron is thus converted into volatile ferric chloride, the titanium being unattacked. It is necessary to take special precautions that the current of hydrogen chloride shall not be too rapid, and that it shall be quite dry. It is also necessary that the quantity of sulphur chloride shall not be too great. This is accomplished by passing the hydrogen chloride into a large bulb surrounded by ice, containing a little sulphur chloride. The delivery tube reaches to within a few mm. of the surface of the sulphur chloride. The quantity of the mixed oxides required varies from 0·3 to 0·5 grm., and the time required is from 2½ to 4 hours.—W. H. P.

Ferric iron ; Determination of —— *in the presence of certain organic substances.* J. T. Hewitt and G. R. Mann. Analyst, 1912, **37**, 179—182.

The authors found that the addition of thiosulphate and the immediate titration of the excess of the latter yielded the best results. Generally 20 c.c. of approximately $N/10$ solution of a ferric salt were mixed with the solution of the organic substance, then 3 c.c. of a 1 per cent. solution of copper sulphate and 1 c.c. of a 1 per cent. solution of ammonium thiocyanate, and the mixture was titrated with $N/10$ thiosulphate until the colour of the ferric thiocyanate disappeared ; the excess of thiosulphate was next titrated with a standardised solution of iodine. The standard solution of the ferric salt should contain 75 c.c. of $N/1$ sulphuric acid per litre. The results obtained were fairly satisfactory. Acetates do not affect the results if mineral acid be also added, acetic acid itself having but slight influence. The deep colour produced by salicylic acid interferes seriously, and the quantity of mineral acid which must be added to inhibit this is too great to allow of the subsequent titration with thiosulphate. The titration is practically unaffected by the presence of sugars and not greatly by tartaric acid or by citric acid. Unless present in large amount, ammonium sulphate does not render the method useless.—W. P. S.

Amino-acids ; Precipitant for ——. C. Neuberg and J. Kerb. Biochem. Zeits., 1912, 40, 498—512.

Amino-acids can be almost completely precipitated from solution by the following means :—The solution, rendered weakly alkaline with sodium carbonate, is treated alternately with small quantities of a 25 per cent. solution of mercuric acetate and a strong solution of sodium carbonate with frequent stirring, so long as a white precipitate continues to be formed and until it assumes a reddish yellow colour (due to mercuric carbonate) which persists after stirring. The liquid is then treated with 5—8 times its volume of alcohol and filtered, and the precipitate washed with 80 per cent. alcohol. The filtrate should be neutral or weakly alkaline. Usually 95 per cent. or more of the amino-acids originally present is contained in the precipitate, and can be recovered without loss, and in a pure state, by decomposing the precipitate with hydrogen sulphide, filtering, and evaporating the filtrate. This reaction appears to be generally applicable to amino-acids. The precipitate formed consists probably of basic mercury salts of carbamic acids (see Siegfried, this J., 1905, 451) derived from the amino-acids.—J. H. L.

[*Coal.*] *Causes for variations in volatile matter determinations.* Parr. *See* IIa.

Purification of paraffin and modification of the method of Marcusson and Meyerheim for characterising different paraffins by means of their iodine values. Istrati and Mihailescu. *See* IIa.

Testing the purity of cellulose. Richter. *See* V.

Amidosulphonic acid. Hofmann and Biesalski. *See* VII.

Volatility of metals of the platinum group. Crookes. *See* X.

Stability of detergents containing perborates. Bosshard and Zwicky. *See* XII.

Acids in tan liquors. Procter. *See* XV.

Dilution method of determining the quotient of purity [*of beet sugar factory products*]. Wohryzek. *See* XVII.

Use of the refractometer in beet sugar factory routine control. Fallada and Kulp. *See* XVII.

Determination of sucrose in exhausted beet slices. Levitcki. *See* XVII.

Methods employed for controlling the exhaustion of carbonatation scums. Lindet and Charpentier. *See* XVII.

Detection of small quantites of disaccharides. Neuberg and Saneyoshi. *See* XVII.

Volatile acidity of gum tragacanth compared with that of Indian gum. Emery. *See* XVII.

Detection of adulteration of butter. Robin. *See* XIXa.

Relation between the Kirschner and Polenske values for margarines containing coconut oil or palm-kernel oil. Bolton and others. *See* XIXa.

Determination of free carbonic acid in water by the Trillich method. Noll. *See* XIXb.

Determination of hardness of water by potassium palmitate. Blacher. *See* XIXb.

Assay of opium. Carles. *See* XX.

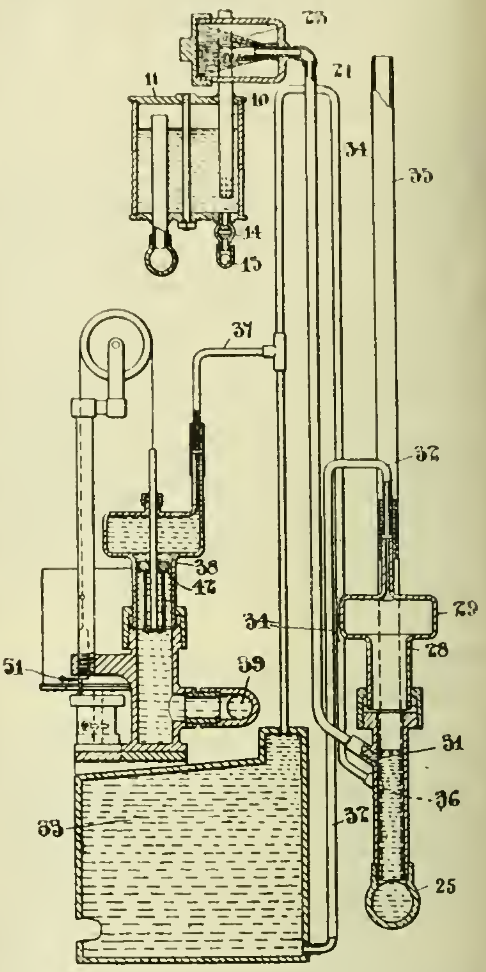
Determination of morphine in opiates, particularly in Pantopon "Roche." Anneler. *See* XX.

Recognition of quinine in the presence of pyramidone [*dimethylaminoantipyrine*]. Mannich and Schwedes. *See* XX.

Patents.

Gases; Apparatus for analysing ——. L. Sanders, New York, and Sanders, Rehders & Co., Ltd., London. Eng. Pat. 1683, Jan. 23, 1911.

A recording apparatus for determining the percentage of carbon dioxide in flue gases, or for any similar analysis by absorption, consists of one or more units, each comprising a sampling device, a measuring burette, an absorption chamber, and a recording burette. One unit of the apparatus is shown diagrammatically in the figure. A pipe, 10, leading from the flue, enters a liquid-seal vessel, 11, and gases are drawn through the vessel continuously by an exhauster. The vessels, 11, of the several units are connected by a pipe, 15, and valves, 14, with an oil reservoir, and the cocks are regulated so that the flow of gas is the same through each vessel. The gas for analysis is drawn from the pipe, 10, through a filter, 23, and pipe, 21, into the measuring burette, 29, by means of an oil siphon on the pipe, 25, which connects all the burettes. The pipe, 25, is in constant communication with an overhead oil reservoir, and when the siphon ceases to flow, the oil rises in the burette, traps a definite volume of gas above the inlet, 31, and forces it through the tube, 32, into the absorbing vessel, 33, and thence through tubes, 34, 37, into the recording burette, 38. The descending limb of the U-tube, 34, enters at 36, an open rising pipe, 35, branching from the pipe, 25, but the orifice, 36, is at this time sealed by the oil. The oil in the recording burette, 38, is displaced through a pipe, 39, into an open vessel, and a float, 42, in the burette, 38, operates a pen, 51, to indicate on a drum the percentage of gas absorbed. The siphon is arranged to come into operation again when the gases are all discharged from the burette, 29, and when the oil in the risers, 35, uncovers the orifices, 36, the oil flows back into the burettes, 38, and discharges the gases through the pipes, 37, 34, 35.—A. T. L.



Poisonous or inflammable gases in the air; Apparatus for determining the amount of ——. A. Guasco. Fr. Pat. 437,585, Nov. 22, 1911.

A Leslie differential thermometer is used, one bulb being coated with catalytic metal or alloy. Should inflammable gas be present, its combustion, induced by the catalytic metal, raises the temperature of the bulb. The thermoer stem is graduated empirically to represent certain ditions of the atmosphere. In another form of the aratus, wires are sealed into the stem of the thermoter and the rise of the mercury brings about a contact l rings a bell.—G. W. McD.

rmo-electric pyrometer. W. S. Peake, Cambridge, England, Assignor to Taylor Instrument Companies, Rochester, N.Y. U.S. Pat. 1,025,715, May 7, 1912.

E leads connecting a thermo-couple with a current ieating or measuring device are composed of materials similar to the materials forming the thermo-couple, l ar chosen so as to compensate for variations of temature at their junction therewith. In an example, one the leads is composed of copper and the other of a low istance alloy consisting of from 99·9 to 95 per cent. of per and from 0·1 to 5 per cent. of nickel.—H. H.

rometer; Acoustic ——. C. de A. M. Costa. Fr. Pat. 437,560, Nov. 13, 1911.

o similar whistles are mounted on tubes, of which one ept at a known temperature and is fitted with a piston. e other is placed in the furnace. It is of the same al length, and on passing compressed air into it, a tain note is given dependent on the temperature. The er whistle is adjusted in length by means of the piston give the same note, and the temperature of the furnace determined by the equation:—

$L\sqrt{\frac{T'}{T}}$, where T is the required temperature, T′ is e temperature of the cold whistle, L is the length of the t whistle, and L′ is the adjusted length of the cold istle.—G. W. McD.

pparatus for determining the consistence of bituminous road materials. Eng. Pat. 16,997. *See* IX.

XXIV.—MISCELLANEOUS ABSTRACTS.

nzymes which attack mannans, galactans and celluloses; Investigations on ——. H. Bierry and J. Giaja. Biochem. Zeits., 1912, **40**, 370—389.

HE authors give a historical summary of previous work lating to the occurrence, composition and enzymic ydrolysis of complex polysaccharides containing mannose d galactose residues. These substances, some of which e soluble and others insoluble in water, are widely istributed amongst plants, especially in seeds, tubers, c., and they occur also in algæ and fungi. Enzymes pable of hydrolysing them, in a more or less specific anner, occur in plants and similar enzymes are present the digestive juices of some of the lower invertebrate nimals. The author has studied the saccharification of ypical mannans and galactans by the digestive juices of *elix pomatia* (Roman snail), *Astacus fluviatilis* (craysh), *Homarus vulgaris* (lobster) and *Maja squinado.* In he first two cases the juices saccharified all the mannans nd galactans presented to them, whilst in the last two ases certain ones only were hydrolysed. Some juices roduce only mannose, and others only galactose from nannogalactans, and it is therefore probable that the nannogalactans are really mixtures of mannans and alactans, for the saccharification of which two classes of nzymes—mannanases and galactanases—are required. No such enzymes appear to be present in the digestive uices of the higher vertebrate animals.—J. H. L.

Books Received.

POTASH-BEARING ROCKS OF THE LEUCITE HILLS, SWEETWATER COUNTY, WYOMING. Bulletin 512, U.S. Geological Survey, Washington.

8vo pamphlet of 39 pages, containing nine figures and maps in the text.

A DICTIONARY OF APPLIED CHEMISTRY. By SIR EDWARD THORPE, C.B., LL.D., F.R.S., assisted by eminent contributors. Revised and enlarged edition. In five volumes. Vol. II. With Illustrations. Longmans, Green and Co., 39, Paternoster Row, London. New York, Bombay, and Calcutta. 1912. Price £2 5s. net.

LARGE 8vo volume, containing 786 pages of subject matter, with numerous illustrations. It commences with a table of abbreviations of the titles of journals and books, and a list of contributors. The first subject considered in Vol. II is "Chian turpentine," and the concluding articles are "Gorse," "Gossypitrin," and "Goudang wax." Among the articles treated in considerable detail may be mentioned the following: I. Chlorine. II. Corrosion (iron and steel). III. Coke, and recovery of by-products. IV. Copper. V. Cyanides. VI. Diazo-compounds. VII. Disinfectants. VIII. Distillation. IX. Dyeing and Dyestuffs. X. Ethyl compounds, etc. XI. Explosives. XII. Fermentation. XIII. Fertilisers. XIV. Fuel. XV. Gas, coal-; also gas mantles. XVI. Glass. XVII. Glycerin.

DIGEST OF COMMENTS ON THE PHARMACOPŒIA OF THE UNITED STATES (EIGHTH DECENNIAL REVISION), AND FOR THE NATIONAL FORMULARY (THIRD EDITION) FOR THE YEAR 1909. By MURRAY G. MOTTER and MARTIN I. WILBERT. Bulletin No. 79, Hygienic Laboratory, U.S. Treasury Department, Washington.

THE subject matter of this book, which contains 735 octavo pages, is classified as follows:—*General Comments* (1) Legal status and development. (2) Scope. (3) Non-pharmacopœial standards. (4) Analytical data. (5) Biologic products. (6) Vegetable drugs. (7) Pharmaceutical preparations. *International Standards* (1) International Conference for the unification of pharmacopœial formulæ for potent medicaments (Brussels). (2) Foreign pharmacopœias. (3) Comments on U.S.P. VIII. relative to the requirements of the Brussels Conference. Spanish Edition of the U.S.P. VIII. *Comments on official articles.*

MINERAL RESOURCES OF THE UNITED STATES. Part I, Metals. Part II, non-metals. U.S. Geological Survey, Washington.

PART I consists of 783 pages, with subject index and map, and Part II of 986 pages, with index and 19 maps. The volumes also contain 17 curves illustrative of the fluctuations in production and prices of various articles.

CIRCULAR OF THE BUREAU OF STANDARDS. S. W. STRATTON, Director. No. 32. (Department of Commerce and Labour.)

STATE AND MUNICIPAL REGULATIONS FOR THE QUALITY, DISTRIBUTION, AND TESTING OF ILLUMINATING GAS. 1st Edition. Issued April 1, 1912. Government Printing Office, Washington, U.S. America. 1912.

8vo volume, containing 133 pages of subject matter, subdivided and arranged as follows: PART I.—MUNICIPAL GAS ORDINANCES. A. Summary of requirements now in force: (i), Candle power requirements. (ii), Heating value requirements. (iii), Purity. (iv), Pressure regulations. (v), Meter-testing requirements. (vi), Inspection, official. B. Discussion of gas ordinance requirements:—(i), Principal kinds of illuminating gas. (ii), Candle-power and heating value. (iii), Purity (Hydrogen sulphide, total sulphur and ammonia, carbon monoxide). (iv), Gas pressure. (v), Meters and meter testing. (vi), Inspector. Appointment, deputies, duties, etc. (vii), Miscellaneous requirements. C. Proposed city ordinances. PART II.—STATE GAS LAWS. A. Summary of laws now in force. B. State control of gas service. (1), Present State inspection practice. (2), Requirements and their enforcement. (i), Form and powers of commission. (ii), Requirements and their enforcement. C. Proposed technical rules. PART III.—GAS LAWS QUOTED. A. Selected city ordinances. B. State laws quoted. APPENDIXES. Statistics of the gas industry.

PHOTOCHEMISCHE VERSUCHSTECHNIK. Von JOHANNES PLOTNIKOW, Dr. phil. et mag. chem. Akademische Verlagsgesellschaft m. b. H. Leipzig, Germany. 1912. Price M. 11; bound in cloth, M. 12.

8vo volume, containing 356 pages of subject matter with 189 illustrations and 53 tables, followed by alphabetical indexes of authors and subjects. The classification of the matter is as follows:—SOURCES OF LIGHT. I. Mercury arc light. II. Metal arc light and spark light. III. Carbon arc light. IV. Coloured flames. V. Nernst lamps. VI. Röntgen lamps. LIGHT THERMOSTATS. I. Light thermostat I. for outside lights. II. Light thermostat II. for liquid gas systems and external illumination. III. Light thermostat III. for internal illumination. IV. Various apparatus for investigating photochemical reactions (Plotnikow). OPTICAL MEASURING INSTRUMENTS. I. Photometry. II. Light absorption measurements. PHOTOCHEMICAL LECTURE EXPERIMENTS. I. Light reactions. II. Luminescence phenomena. III. Electric light demonstrations. IV. Demonstrations: Radiation phenomena. PHOTOCHEMICAL TABLES.

TABLES ANNUELLES DE CONSTANTES ET DONNÉES NUMÉRIQUES DE CHIMIE, DE PHYSIQUE ET DE TECHNOLOGIE. Publiées sous le Patronage de l'Association internationale des Académies, par le Comité international nommé par le VIIe Congrès de Chimie Appliquée (Londres, 2 Juin, 1909). Avec la collaboration de: S. L. Archbutt, W. Biltz, M. Bodenstein, M. Boll, E. Bontoux, F. Bourion, L. Bruninghaus, C. Chéneveau, H. Colin, G. Darzens, P. Dutoit, G. Fick, H. Gaudechon, H. B. Hartley, W. Hinrichsen, A. Mahlke, R. Marquis, Michaud, J. Nannan, E. Nusbaumer, M. Piér, A. W. Porter, A. Portevin, V. Rothmund, H. Rost, J. Saphores, O. Scheuer, L. J. Spencer, Th. Strengers, E. Terroine, N. T. M. Wilsmore. Volume I. Année 1910. Gauthier-Villars, Paris. Akademische Verlagsgesellschaft, m. b. H., Leipzig. J. and A. Churchill, 7, Great Marlborough Street, London, W. 1912. University of Chicago Press, Chicago. Price 21s. 6d. net (paper). 24s. net (cloth).

QUARTO volume, containing 726 pages of tabulated subject matter, and one page of errata. The tables, etc., contain constants and other data relating to the following subjects:—I. Coefficients of compressibility. II. Densities. III. Viscosity. IV. Surface tension. V. Coefficients of expansion. VI. Melting points. VII. Specific heats. VIII. Thermodynamics. IX. Vapour pressures. X. Thermal conductivities. XI. Radiation. XII. Photometry. XIII. Reflecting power. XIV. Emissive power. XV. Coefficients of absorption. XVI. Refraction and Dispersion. XVII. Spectrum analysis. XVIII. Rotatory power. XIX. Electricity. XX. Magnetism. XXI. Radio-activity. XXII. Electrons and ionization. XXIII. Atomic weights. XXIV. Atomic properties. XXV. Velocity of diffusion. XXVI. Osmotic pressure. XXVII. Degree of association. XXVIII. Mixtures. Changes of State. XXIX. Solubility. XXX. Thermochemistry. XXXI. Chemical equilibrium. XXXII. Velocity of Reaction. XXXIII. Electric conductivity of Electrolytes. XXXIV. Electromotive Forces (E.M.F.). XXXV. Colloids. XXXVI. Adsorption. XXXVII. Crystallography and Mineralogy. XXXVIII. Organic Chemistry. XXXIX. Essential Oils, Fats, and Waxes. XL. Animal Physiology. XLI. Vegetable Physiology. XLII. Engineering (Mechanical, Thermic, and Electric constants). XLIII. Metallurgy (i. Mechanical and other properties of alloys. ii. Mechanical constants). Supplement. Velocity of sound. Physical properties of ice. Vapour pressures of gases absorbed by charcoal, etc.

PAPER PULPS FROM VARIOUS FOREST WOODS. Experimental Data and Specimens of Soda and Sulphite Pulps. U.S. Department of Agriculture. Forest Service. HENRY S. GRAVES, Forester. (Forest Products Laboratory Series.) Compiled by HENRY E. SURFACE (Chemical Engineer in Forest Products.) Washington, U.S.A. 1912.

SMALL volume, pocket-book size, containing 29 pages of tables and subject matter, and 55 page sheets of dried pulp from various woods, etc. The subject treatment is as follows:—I. Purpose of the experiments. II. Preparation of the pulps. III. Raw materials tested. I Experimental data. V. Index to pulp specimens.

BLEACHING AND DYEING OF VEGETABLE FIBRO MATERIALS. By JULIUS HÜBNER, M.Sc.Tech. (Ma chester). F.I.C., Director of the Department for Bleac ing, Dyeing, Printing, and Finishing, and Pap Manufacture, Municipal School of Technology, Victo University, Manchester. With an Introduction b RAPHAEL MELDOLA, D.Sc., LL.D., F.R.S. Constal and Company, Ltd., 10, Orange Street, Leicester Squar London, W.C. 1912. Price 14s. net.

8vo volume, containing 386 pages of subject matter a Appendix of 20 pages with tables, constants, etc., and a alphabetical index. The text is illustrated with engravings, and its classification is as follows:—I. Pro Meldola's Introduction. II. The vegetable fibres. II Water. IV. Chemicals and mordants. V. Bleachin VI. Mercerising. VII. Mineral colours. VIII. Natur colouring matters (Artificial dyestuffs). IX. Bas cotton dyestuffs. XI. Substantive cotton dyestuff XII. Sulphur dyestuffs. XIII. Acid and resorcinol dye stuffs. XIV. Insoluble azo-colours, produced on th fibre. XV. The vat dyestuffs. XVI. Mordant dyestuff XVII. Colours produced on the fibre by oxidation. XVII Dyeing machinery. XIX. Testing of dyestuffs and fibre XX. Appendix.

THEORIE UND PRAXIS DES MAHLENS. Von CLAYTO BEADLE und Dr. HENRY STEVENS. Deutsch vo Ingenieur CARL FRANCK. Otto Elsner Verlagsgesellschaft m. b. H. 1911.

SMALL 8vo volume, containing 292 pages of subject matte on the beating process and machinery in paper-making with 34 illustrations of "beating" apparatus, hollanders etc. It is practically a translated reprint of articles in th "Papier-Fabrikant." There are 18 chapters and a Appendix.

TRATTATO DI CHIMICA ORGANICA GENERALE E APPLICAT ALL'INDUSTRIA. Dott. E. MOLINARI. Seconda edizion riveduta e ampliata. U. Hoepli, Milano. 1912. Pric Lire 18.

8vo volume containing 1054 pages of subject matter, with 506 illustrations, and an alphabetical index occupying 31 pages. The text is arranged and classified in th following manner:—I. General part. II. Special part.—Derivatives of methane: (A) Hydrocarbons. (B) Halogen derivatives. (C) Alcohols. (D) Derivatives of alcohols. (E) Acids. (F) Derivatives of acids. (G) Polyhydric aldehydic or ketonic alcohols. III. Cyclic compounds: (A) Aromatic hydrocarbons. (B) Halogen-substituted derivatives. (C) Sulphonic acids. (D) Phenols. (E) Quinones. (F) Nitro-derivatives. (G) Amino-derivatives. (H) Nitro-, amino-, and thio-phenols. (I) Azo-, diazo- and diazoamino-compounds and hydrazines. (L) Aromatic alcohols, aldehydes, and ketones. (M) Aromatic hydroxy-alcohols, hydroxy-aldehydes, and ketonic alcohols. (N) Aromatic acids. (O) Hydro-aromatic compounds. (P) Condensed benzene nuclei. (Q) Heterocyclic compounds. (R) Colouring matters: tests; textile fibres; machinery used in dyeing and finishing, etc. (S) Proteins. Glucosides and substances of unknown or uncertain constitution. Special features of the book are the descriptions of technical processes and the trade statistics, which include figures for 1910, and in some cases for 1911.

*New Books.

[The Roman numerals in thick type, here and under "Dissertations," refer to the similar classification of abstracts under "Journal and Patent Literature" and in the "List of Patent Applications."]

I. *Diefendorf*, H. G.: The gasoline engine, marine and stationary; its construction, operation and care. [Detroit, J. Bornman and Son.] c. 71 p. il. diagrs. 1912. 50 c.

Schneider, Dr. L.: Die Abwärmeverwertung im Kraft- aschinenbetrieb m. besond. Berucksicht. der Zwischen- . Abdampfverwertung zu Heizzwecken. Eine kraft- u. ärme-wirtschaftl. Studie. 2., bedeutend erweit. Aufl. VII, 155 S. m. 118 Fig. u. 1 Taf.) gr. 8°. Berlin, J. pringer. 1912. M. 5; cloth M. 5.80.

Matthews, F. E.: Elementary Mechanical Refrigeration. vo, Hill Publishing Co. London. 1912. Net 8s. 6d.

IA. *Arber*, E. A. N.: On the Fossil Flora of the Forest of Dean Coalfield (Gloucestershire) and he Relationships of the Coalfields of the West of England nd South Wales. 4to. sd., pp. 50. Dulau. London. 912. Net 3s. 6d.

VII. *Callendar*, H. L.: On the Variation of the Specific Heat of Water. With Experiments of a New Method. 4to. sd. Dulau. London. 1912. Net 1s. 6d.

VIII. *Stahl*, C. J.: Glaserkunst, Glasmalerei u. moderne Kunstverglasung. Ein Hand u. Nachschlagebuch. (VIII, 240 S. m. 54 Abbildgn.) 8vo. Wien. A. Hartleben. 1912. M. 4.; cloth M. 4.80.

IX. *Waterbury*, L. A.: Laboratory Manual for the use of Students in Testing Materials of Construction. Cr. 8vo. Chapman and Hall. London. 1912. Net 6s. 6d.

X. *Adressbuch* 1912 sämtlicher Bergwerke, Hütten- u. Walzwerke Deutschlands nebst der Nebenbetriebe. 3 Jahrg. (XXXVIII, 566 S.) 8° Leipzig. H. A. L. Degener. 1912. Cloth M. 8.

Statistik des Bergbaues in Osterreich f. d. J. 1910. Als Fortsetzg. des statist. Jahrbuches des k. k. Ackerbauministeriums, 2. Heft: "Der Bergwerksbetrieb Österreichs." 2. Lfg.: Betriebs- u. Arbeiterverhältnisse beim Bergbau. Naphtastatistik. Hrsg. vom k. k. Ministerium f. öffentl. Arbeiten. (386 S.) gr. 8° Wien, Hof- u. Staatsdruckerei. 1911. M. 5.

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Weinschenk, E.: Petrographic methods; the authorized English translation of Part 1. Anleitung zum Gebrauch des Polarisationsmikroskops (3d rev. ed.) and Part II., Die gesteinsbildenden Mineralien (2d rev. ed.) rendered into English by Rob. Watson Clark. N.Y., McGraw-Hill. c. 17+396 p. il. tabs., diagrs., 8°. 1912. $3.50.

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Hartmann, F.: Das Färben der Metalle. Eine Anleitung zum Färben aller wicht. Metalle auf chem., elektrochem. u. mechan. Wege. Für Metalltechnicker, Mechaniker, Gold- u. Silberarb., Bronzewarenfabrikanten, Metallgiesser, Metallwarenfabrikanten usw. (VIII, 480 S. m. 14 Abbildgn.) 8vo. Wien, A Hartleben. 1912. M. 6.; cloth M. 6.80.

Kautny, Th.: Handbuch der autogenen Metallbearbeitung. 2. völlig neu bearb. u. wesentlich verm. Aufl. (XIV, 712 S. m. 484 Fig.) 8°. Halle, C. Marhold. 1912. Cloth M. 9.

McFarren, H. W: Text-book of Cyanide Process. 8vo. Hill Publishing Co. London. 1912. Net 12s. 6d.

Schwarze, Dr. B.: Härteuntersuchungen an Radreifenstoff nach dem Kohn-Brinellschen Kugeldruckverfahren. (VIII, 65 S. m. 13 Abbildgn.) gr. 8°. Braunschweig, F. Vieweg und Sohn. 1912. M. 2.50.

Weidig, Dr. M.: Metallurgische u. technologische Studien auf dem Gebiete der Legierungs-Industrie insbesondere üb. das Ausglühen v. Metallen u. Legierungen. [Aus: "Verhandlgn. d. Ver. z. Beförderg. d. Gewerbfleisses." (III, 123 S. m. Abbildgn.) Lex. 8° Berlin, L. Simion Nf. 1912. M. 6.

XI. *Muller*, P. Th.: Lois fondamentales de l'electrochimie, 2e. édit. rev. (1912), 14 fig., in 8° Gauthier-Villars, Paris. 1912. 2 fr. 50.

Wilson, H. A.: The Electrical Properties of Flames and of Incandescent Solids. 8vo, pp. 126. Hodder and Stoughton. London. 1912. Net 6s.

XIII. *Margival*, F: Les encres, 4 fig., in-8°, Gauthier-Villars, Paris. 1912 2 fr. 50.

XVI. *Bruttini*, A.: L'influenza dell'elettricita sulla vegetazione e sui prodotti delle industrie agrarie: esposizione critica di quanto è stato fatto finora in Italia ed all'estero. Milano. 16° fig., p. xvi., 459. (Manuali Hoepli). 1912. Lire 4.50.

Mitteilungen der landwirtschaftlichen Lehrkanzeln der k. k. Hochschule f. Bodenkultur in Wien. Hrsg. v. R. u. H. Hitschmann. I. Bd. ca. 4 Hefte. (1. Heft. III., 129 S. m. 1 Tab. u. 1 Taf.) Lex. 8°. Wien, W Frick. 1912. M. 7.

XIXB. *Dague*, J. H., and S. J. *Phillips*: Mine accidents and their prevention; il. by 200 pictures taken in the mines by W. B. Bunnell, official photographer of the D. L. and W. R. R. Co., for the instruction of mineworkers. Especially adapt. for the teaching of English to the non-English speaking people; prepared under the direction of R. A. Phillips, superintendent. and C. E. Tobey, assistant superintendent, coal mining department, Delaware, Lackawanna and Western Railroad Company, Scranton, Penna. [Scranton, Pa.,] D., L. and W R. R. Co. c. 69 p. front. il. O. 1912. 35 c.

Haldane, J. S.: Methods of Air Analysis. Cr. 8vo., pp. 140. C. Griffin. London. 1912. Net 5s.

Diénert, P.: Eaux douces et eaux minérales. 45 fig., in-18. Ch. Béranger. Paris. 1912. Cloth, 6 fr.

XX. *Handlexikon*, Biochemisches. Hrsg. Prof. E. Abderhalden. Lex. 8°. Berlin, J. Springer. 1912. VII. Bd. 2, Hälfte. (Schluss.) Öle, Ätherische. Harze, Harzsäuren, Kautschuk. (III. u. S. 539—822.) M. 18.

Handbuch der Kosmetik. Hrsg. v. Prof. M. Joseph. Mit 164 Fig. u. 203 Rezepten im Text sowie e. Anh. v. 101 Rezepten. (VIII, 749 S.) gr. 8° Leipzig, Veit und Co. 1912. M. 22; cloth M. 25.

Kobert, Prof. R.: Kompendium der praktischen Toxikologie zum Gebrauche f. Aerzte, Studierende u. Medizinalbeamte. 5. gänzlich umgearb. u. erweit. Aufl. (XII., 328 S. m. 59 Tab.) gr. 8°. Stuttgart, F. Enke. 1912. M. 7.40; cloth M. 8.40.

Schule der Pharmazie. Hrsg. v. Prof. H. Thoms, E. Mylius, E. Gilg, K. F. Jordan. II. Chemischer Tl. Bearb. v. Prof. H. Thoms. 5., verb. Aufl. (VIII, 536 S. m. 105 Abbildgn.) gr. 8°. Berlin, J. Springer. 1912. Cloth M. 10.

Steudel, Prof. H.: Physiologisch-chemisches Praktikum. Eine Zusammenstellg. v. Übgn. aus der Gewichts- u. der Massanalyse u. v. Reaktionen u. einfachen Darstellungsmethoden aus dem Gebiete der physiolog. Chemie. (VIII, 123 S.) gr. 8°. Leipzig, S. Hirzel. 1912. Cloth M. 4.

XXI. *Behrens*, Prof. F.: Der Gummidruck. Praktische Anleitg. f. Freunde künstler. Photographie, Mit e. Zweifarbendr.-Beilage u. mehreren Abbildgn. 3. verb. Aufl. (98 S.) 8°. Berlin, M. Krayn. 1911. M. 1.50.

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David, L.: Ratgeber im Photographieren (Umschlag: f. Anfanger u. Fortgeschrittene). Leicht fassl. Lehrbuch f. Amateurphotographen. Mit 105 Textbildern u. 28 Bildertaf. 60—62. neu bearb. Aufl. 186. Taus. (VII. 268 S.) kl. 8°. Halle, W. Knapp. 1912. M. 1.50; cloth M. 2.

Dillaye, F.: Les nouveautés photographiques (1911-1912). in-8°. J. Tallandier. Paris. 1912. 2 fr. 50.

Garrett, A. E.: The advance of photography; its history and modern applications. N.Y., Dutton. 14+382 p. 8°. 1912. $4.

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XXIII. *Classen*, Prof. A.: Handbuch der analytischen Chemie. II. Tl. Handbuch der qualitativen chem. Analyse in Beispielen. 6. ganz umgearb. u. verm. Aufl. (X. 572 S. m. 56 Holzschn.) gr. 8°. Stuttgart, F. Enke. 1912. M. 13: cloth M. 14.20.

Hampshire, C. H.: Volumetric Analysis. For Students of Pharmaceutical and General Chemistry. Cr. 8vo, pp. 112. Churchill. London. 1912. Net 3s. 6d.

XXIV. *Abderhalden*, Prof. E.: Physiologisches Praktikum. Chemische u. physikal. Methoden. (XII. 283 S. m. 271 Fig.) gr. 8°. Berlin, J. Springer. 1912. M. 10: cloth M. 10.80.

Encyclopédie de science chimique appliquée aux arts industriels publ. par C. Chabrié. T. I. Les sources de l'énergie calorique. 1re partie. La combustion et la gazéification. par Emilio Damour. Le chauffage électrique, par Jean Carnot. 2e partie. Les combustibles, par Etienne Rengade. 131 fig., in-8°, cloth 20 fr.

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[*]Dissertations.

[Prices vary, ranging from two to three shillings.]

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IIA. *Schraube*, G.: Ueber das Gleichgewicht des Generatorgases. Berlin-Charlottenburg. 1911. 39 S. m. 9 Fig. i. Text. 8°.

III. *Frey*, M.: Ueber Kondensation von isomeren Dichlorphthalsäuren zu Dichlorchinizarinen und ihren Derivaten. Berlin. 1912. 52 S. 8°.

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IV. *Pummerer*, R.: Untersuchungen in der Indigo-Gruppe. München. 1911. 82 S. 8°.

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[*] Compiled by H. Grevel and Co., 33, King Street, Covent Garden, London, W.C., from whom all the works in the preceding lists can be obtained.

Journal of the Society of Chemical Industry.

No. 12, Vol. XXXI. JUNE 29, 1912. No. 12, Vol. XXXI.

THE SOCIETY OF CHEMICAL INDUSTRY.

INCOME AND EXPENDITURE ACCOUNT FOR YEAR 1911.

EXPENDITURE.

	£	s.	d.	£	s.	d.
Journal — Editorial and Sundry expenses—						
Editor's Salary	542	16	0			
Do. Expenses	28	18	5			
Do. Assistant	117	0	0			
Abstractors	726	18	1			
Sub-Editor's Salary	150	0	0			
Indexing Journal, &c.	118	18	0			
Foreign Journals	12	10	8			
Sundry Journals	13	5	0			
French and U.S.A. Patents and Specifications	61	8	9			
Insurance of Stock	7	3	0			
	1778	17	11			
Publishing expenses	2697	12	1			
				4476	10	0
Sectional expenses—						
Boston	0	0	0			
Birmingham & Midland	20	0	0			
Canada	18	0	0			
Liverpool	41	14	4			
London	125	10	1			
Manchester	65	14	3			
Newcastle-on-Tyne	43	19	0			
New York	150	0	0			
Nottingham	26	19	11			
Scottish	21	0	7			
Sydney	10	3	5			
Yorkshire	38	15	3			
				561	16	10
,, Annual Meeting expenses				167	1	9
,, Working expenses—						
Secretary's Salary	300	0	0			
Assistant in Office	225	0	0			
Honorarium to Treasurer's Assistant and Clerical Assistant	77	10	0			
Rent, Lighting and Cleaning	199	12	8			
Stationery and Binding	87	6	11			
Postages, Bank Charges, Telephone, and Sundry expenses	137	11	4			
				1027	0	11
				6232	9	6
,, Excess of Receipts over Expenditure, 1911				798	15	11
				£7031	5	5

INCOME.

£	s.	d.		£	s.	d.	£	s.	d.
			By Entrance Fees	221	11	0			
			,, Life Composition Fees	35	7	0			
							256	18	0
			,, Annual Subscriptions				5092	18	0
			,, Journal—						
			Advertisements	323	3	0			
			Sales	753	19	7			
							1077	2	7
			,, Collective Index—Subscriptions				3	0	0
			,, Decennial Index—Sales				10	13	0
			,, Dividends and Interest on Investments—						
4176	9	2	Metropolitan 3% Consolidated	126	9	4			
1000	0	0	New Zealand 3% (1945)	28	5	0			
1277	4	8	New South Wales 3% (1935)	36	1	8			
1231	0	10	Consols 2½%	28	19	8			
600	0	0	Gas Light and Coke 3% Debentures	16	19	0			
1084	13	4	North British 3% Consolidated	30	12	10			
1690	0	0	Midland Rly. 2½% Perpetual Preference	39	18	6			
1509	0	0	Great Eastern Rly. 4% Irredeemable	56	16	8			
673	0	0	South Eastern Rly. 4½% Preference	28	10	4			
1000	0	0	Metropolitan Water Board 3% Debentures	28	5	0			
200	0	0	Nottingham Joint Station 3%	5	13	0			
1250	0	0	Great Western Rly. 5% Guaranteed	58	17	1			
800	0	0	Great Northern Rly. 3% Debentures	22	12	0			
450	0	0	Nottingham and Grantham Canal 4½% Consolidated	17	4	7			
724	8	0	India 3½%	23	17	8			
834	9	2	India 3%	11	15	10			
			Interest on Deposit	29	15	8			
							590	13	10
							£7031	5	5

Birmingham Section.

Meeting held at the University, Birmingham, on Thursday, March 7th, 1912.

A NEW OXYGEN ABSORPTION METHOD FOR OILS.

BY L. P. WILSON, F.C.G.I., AND G. S. HEAVEN, B.SC.

Investigators have long sought for a method of readily and accurately determining the amount of oxygen which any given oil will absorb. Since most oils take time to complete their oxidation, the obvious method of weighing before and after exposure is precluded. Numerous proposals have been made to shorten the period; heating has been used by Casselmann, and exposure in very thin layers by Kissling (this J., 1891, 778) who obtained an increase in weight of 1·1 per cent. in 10 days with linseed oil. By heating at about 100° C. he obtained in some cases a gain in weight, in others loss.

Weger (Z. angew. Chem., 1898, 490; 1899, 207 and 330) and Lippert (*ibid.*, 1898, 412; 1899, 511 and 540; 1900, 133) describe a method in which the oil is spread in extremely thin layers as evenly as possible, and weighed at intervals. Livache (this J., 1886, 494) mixes the oil with finely divided metallic lead, in the proportion of two-thirds of a gram of oil to one gram of lead, spread over a watch glass and exposed to air and light at the ordinary temperature. Drying oils reach a maximum absorption in from 18 to 72 hours, while non-drying oils gain nothing for 4 or 5 days.

Other experimenters have varied Livache's method. Fox heats 1 grm. of oil with 0·5 grm. of lead to 105° C. in a sealed tube, and measures the oxygen absorbed. Bach (this J., 1899, 990) has followed Fox, and heats at 110° C. in a sealed tube of oxygen for 10 hours. Fahrion (this J., 1894, 405) soaks a strip of leather in the oil, exposes it to the atmosphere and weighs at intervals, obtaining a maximum in about four weeks. Bishop (this J., 1896, 475) mixes 1 grm. of oil containing 2 per cent. of manganese resinate with the same weight of precipitated silica, spreads the mixture in a dish to expose as great a surface as possible

THE SOCIETY OF CHEMICAL INDUSTRY.

BALANCE SHEET, 31ST DECEMBER, 1911.

	£	s.	d.	£	s.	d.
To Sundry Creditors................				920	1	11
,, Subscriptions received in advance .				92	15	0
,, Accumulated Fund—						
Balance—31st December, 1910	17,481	16	0			
Add—Excess of Receipts over Expenditure, 1911	798	15	11			
				18,280	11	11
				£19,293	8	10

£	s.	d.		£	s.	d.	£	s.	d
			By Sundry Debtors (Publishers, &c.) ..				431	10	
			,, Arrears of Subscriptions (received 1st January to 19th February, 1912)				50	0	
			,, Cash at Bank—						
			On Deposit	1000	0	0			
			Current Account	180	5	8			
			,, Cash in hand (Secretary)	31	7	10			
							1211	13	
			,, Investments as last year—						
4476	9	2	Metropolitan 3% Consolidated	4163	2	1			
1000	0	0	New Zealand 3% (1945)	870	0	0			
1277	4	8	New South Wales 3% (1935)	1122	3	1			
1231	0	10	Consols 2½%	1031	15	4			
600	0	0	Gas Light and Coke 3% Debentures ..	507	0	0			
1084	13	4	North British 3% Consolidated	900	5	6			
1696	0	0	Midland Rly. 2½% Perpetual Preference	1187	4	0			
1509	0	0	Great Eastern Rly 4% Irredeemable	1620	14	5			
673	0	0	South Eastern Rly 4½% Preference .	747	0	7			
1000	0	0	Metropolitan Water Board 3% Debentures	922	10	0			
200	0	0	Nottingham Joint Station 3%	166	0	0			
1250	0	0	Great Western Rly. 5% Guaranteed ..	1762	10	0			
800	0	0	Great Northern Rly. 3% Debentures ..	696	0	0			
450	0	0	Nottingham and Grantham Canal 4½% Consolidated	495	0	0			
724	8	0	India 3½%	700	0	0			
				16,900	5	0			
			Add—						
834	9	2	India 3% purchased in 1911 ..	700	0	0			
							17,600	5	0
							£19,293	8	10

We have examined the above Balance Sheet, dated 31st December, 1911, and have verified the Investments and the balance at the Bankers. In our opinion the Balance Sheet shows correctly the position of the Society at 31st December, 1911.

9, Old Jewry Chambers, London,
29th April, 1912.

(signed) NORTON, FEASEY & SLADE,
Chartered Accountants.

to the air, and keeps it at a temperature about 25° C., weighing at intervals during 24 hours.

A. Genthe (this J., 1907, 56) found that linseed oil spread over filter paper dried at the ordinary temperature very slowly in the dark, much more quickly in the daylight, and with considerable rapidity when exposed to the light of a mercury vapour lamp.

Endeavouring to find, what none of those mentioned can be called, a quantitative laboratory method, we decided that the oil should be exposed to the oxygen, spread over the maximum possible surface, and therefore chose kieselguhr as the medium with which it should be mixed, and after preliminary experiments, which were carried out as follows, determined to measure the volume of oxygen absorbed, rather than observe any increase in weight.

About 0·2 grm. of linseed oil was thoroughly mixed with 3 grms. of ignited kieselguhr and heated on a watch glass in a water oven at 95° C. for one hour; the increases in weight amounted to 8·0 per cent. and 7·5 per cent.

In an alternative method the mixture of oil and kieselguhr was put into a 250 c.c. flask the neck of which had been partially drawn out; the neck was then further drawn out to a capillary and the flask cooled to a known temperature by immersion in cold water, then the capillary was sealed and the flask weighed. The sealed flask was heated in water at 100° C. for on hour, then being cooled down to the temperature at which it was sealed, the capillary was broken under water, and taking the usual precautions to ensure barometric pressure in the flask, the whole was again weighed. After correcting the volume to 0° C. and 760 mm. the figures obtained for absorption were 19·0 and 19·3 per cent. These results are of the same order as those of Livache, Fox, and Genthe, and it was determined to further investigate the method, in order to decide upon the most suitable period of heating. For this purpose the sealed flask was replaced by one fitted with a side tube having a well ground in stopper fastened by a clamp, and the side tube was connected with a manometer by means of which the pressures required to maintain a constant volume was read at five minute intervals, after the flask had been placed in water at 100° C. The readings converted into change of volume give figures which show that after about 60 minutes the rate of change of volume is slow, and that this period is therefore suitable in which to measure the absorption under such conditions.

The pattern of the flask has been modified by bending the side arm and blowing in it a bulb, and the end of the tube is made capillary and sealed, stop cocks being often unsatisfactory. After the flask and its contents have been heated for the proper time, the flask is cooled, and the capillary end is inserted into one end of a short length of pressure tubing which is connected to a graduated tube, both being filled with water. The height of the water is read by the graduations, and the capillary is broken inside the rubber tube, when the water rises into the bulb. The water surfaces are now levelled, and the fall of the water in the graduated tube measures the absorption in the flask; during this operation the flask is of course kept at constant temperature by immersion in cold water.

By this method, using 0·2 grm. of oil, 3 grms. of kieselguhr and a flask of 250 c.c. capacity, in which the mixture was heated for one hour at 100° C., several oils have been tested with the results given below.

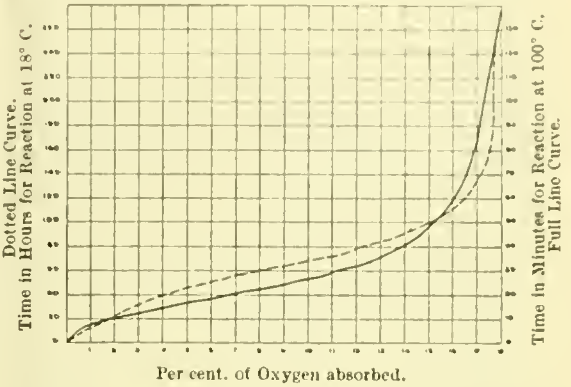
Oil.	c.c.'s absorbed (corr. to N.T.P.).	Oxygen absorbed. Per cent.
Linseed (Baltic)	28·0	20·0
,, ,, ...	29·8	21·2
,, (Calcutta)	25·3	18·1
,, ,, ...	24·1	17·2
,, (origin unknown)..	27·0	19·3
Poppy seed	24·4	17·4
Cotton seed	15·6	11·1
Sesame	8·1	5·8
Olive	0·	0·

More consistent results are obtained if 1 grm. of kieselguhr is used. The larger quantity mentioned above has been thought to impede diffusion of the oxygen, giving low results, which were only rectified by shaking the flask and further heating.

The method therefore gives results which mark well the difference between the various classes of drying, semi-drying and non-drying oils, separating them more distinctly than do the iodine values, as the table below shows, while the time required for the test is reasonable. The table compares the iodine values with the oxygen absorptions obtained by different methods, showing also the times required by the methods in question.

a direct absorption of free oxygen, or a condensation with the elimination of water.

It appears to us that a possible explanation of this discrepancy between the observed and calculated values for oxygen absorption, may be that the differently related unsaturated groups of oleic, linolic and linolenic acids behave differently with regard to oxygen.



Thiele has suggested that the effect of unsaturation is not only to attract external agents, but also to influence the behaviour of the remainder of the molecule; and we think that under the conditions which have been described, the oleic molecule does not form any addition compound with oxygen, while the acids with two unsaturated linkages do form such compounds because of the mutual interaction of the residual affinities; and the molecules having three such groups, as in linolenic acid, form compounds with a still greater amount of oxgyen, adding on for each unsaturated group not one atom of oxygen, but two.

Salway and Kipping (Trans. Chem. Soc., 1909, **95**, 166) have in this manner explained the atmospheric oxidation of β-methylhydrindone.

Taking for the present as correct the accepted composition of linseed oil acids, as given by Lewkowitsch, namely, oleic 5 per cent., linolic 15 per cent., and linolenic and isolinolenic together 80 per cent., and applying this theory we obtain the following figures:—

Oil.	Iodine value.	Oxygen absorption, per cent.					
		Calc. from iodine.	Fahrion.	Livache.	Bishop.	Fox.	Wilson and Heaven.
			28 days.	2–7 days.	1 day.	10 hours.	1 hour.
Olive	83	5·2	0·2	1·7	5·3	1·2	0·
Sesame	110	6·9	3·6	2·4	7·4	—	5·8
Cotton seed ...	108	6·8	5·6	5·9	8·6	3·5	11·1
Poppy seed	138	8·7	8·4	6·8	14·2	—	17·4
Linseed	180	11·3	12·4	14·3	17·1	27·2	20·6

The difference between the observed absorption and that calculated from the iodine value is noteworthy, and it will be observed that the values obtained by the method described, are, in the case of the semi-drying oils, of the same order as the calculated, while the drying oils give figures of about double that amount.

Sherman and Falk (J. Amer. Chem. Soc., 1903, 711, 716), from the results of an investigation of the influence of atmospheric oxidation on the composition of oils, conclude that in the case of non-drying and semi-drying oils the oxidation may be measured by the alteration of the iodine value, since the process consists of the addition of hydroxyl to unsaturated linkings, which are measured by the iodine value. In the case of unsaturated oils, such as linseed or fish oils, this is not the case, and there is either

Iodine absorption.

Oleic	885 × 5 × 127 × 6	336 × 10^4
Linolic	879 × 15 × 127 × 12	2001 × 10^4
Linolenic	873 × 80 × 127 × 18	.5930 × 10^4
		18267 × 10^4

Average molecular weight 875.
Per cent. iodine absorption 208.

Oxygen absorption.

Oleic	885 × 5 × 16 × 0	0
Linolic	879 × 15 × 16 × 6	1264 × 10^3
Linolenic	873 × 80 × 16 × 18	20100 × 10^3
		21364 × 10^3

Per cent. oxygen absorption 23·3

Both of these figures are in fair agreement with the results obtained, being high probably owing to an incorrect estimate of the proportions of the acids present in the oil.

Their relation to one another is in still closer agreement, viz., 100 to 11·2 and 11·4 by theory and practice, respectively.

Livache (this J., 1895, 811) has stated that non-drying oils, such as rape and olive, behave like drying oils with regard to their absorption of oxygen, at a high temperature (120°—160° C.), but that this is not the case with the present method is evident from the figures already given, and that the reactions only differ in velocity is demonstrated by the curves below, which show the rates of absorption for a linseed oil, at 100° C. and 18° C., measured by the change of pressure in the flasks. The relative velocities of absorption at differing temperatures are under consideration. We have found at the end of the absorption that carbon dioxide was present, and we also obtained a reaction for aldehydes, the smell indicating the presence of acrolein.

It is proposed to carry out further investigations by means of this method, with regard to other fatty oils, and acids, and also lubricating oils, to determine in the latter case the bearing of oxygen absorption upon gumming.

Discussion.

Mr. Heathcote referred to Liverseege's paper (this J., 1912, 207) and said that he felt that the method could not be regarded as perfect. Until the high results obtained by others (viz., over 30 per cent.) were satisfactorily explained, it could not be said that the subject of oxygen absorption was really mastered.

Mr. P. L. Whitehouse asked if the authors used materials other than kieselguhr, such for instance as magnesium oxide or barium sulphate. Kieselguhr did not appear to be the most suitable material, inasmuch as it consisted of minute tubes which would take up the oil, and instead of giving a maximum surface would only give a surface at the two ends, and some portion of the oils would not be affected by the oxygen. Possibly that might account for the difference in the results, and it might also influence them with different workers. He had no doubt the authors would effect further improvement.

The Chairman asked if the difference in the percentage of oxygen in the flask at the beginning and end of the experiment had any influence on the rate of oxidation of the oil. Again, had the authors taken into account the influence of the moisture? He had always understood that this and other conditions such as temperature, light, etc., had an influence on the oxidation of oils. Regarding the agreement between the theoretical and observed values for iodine absorption and oxygen absorptions, since the observed values differed from the theoretical values in both cases by nearly the same number of points per hundred; the ratios of observed and theoretical values for oxygen absorptions must necessarily agree with the same ratio in the case of the iodine absorption.

Mr. Wilson, in reply to Mr. Heathcote, said that Fenaroli had passed ozone through absorption bulbs containing linseed and other oils, and had obtained results which agreed with the figures calculated from the iodine values. The figures pointed to the formation of ozonides, which led one to suppose that the figure of 35 obtained by Genthe by the use of the mercury vapour lamp was due to the ozonides. He did not think they were likely to be obtained under the conditions now described. The use of magnesium oxide instead of keiselguhr might cause hydrolysis, when a magnesium soap would be formed. A drawback to barium sulphate, was that a very small quantity of oil was necessary to thoroughly wet any form of it. Kieselguhr would take several times its own weight and still be dry. Some of their figures were obtained several years ago; and tests made at intervals of some months agreed within one per cent., the same oil being used. The authors thought that the differing percentage of oxygen in the flask at the beginning and end of the experiment was of no real importance, as they had sometimes used flasks of double the usual capacity and the same results were obtained. They had not attempted to eliminate moisture. The kieselguhr was used freshly ignited, and he had not ventured to dry the oil immediately before using. He rather doubted the regularity of the effect of drying upon absorption. Concerning the question of agreement between theoretical and calculated values, the higher figures were obtained probably through other substances being present, making both iodine and oxygen figures high in proportion. But the agreement between the relations of iodine and oxygen found and calculated indicated that the theory might be considered as a possible explanation of what occurred when oxygen is absorbed by oils.

London Section.

Meeting held at Burlington House, on Monday, June 3rd, 1912.

MR. E. GRANT HOOPER IN THE CHAIR.

SOME PRESENT-DAY ASPECTS OF THE MATCH INDUSTRY.

BY E. G. CLAYTON.

The object of this paper is to summarise the more striking facts connected with the present condition of an industry which has undergone a virtual transformation within the past fifteen years. It is not my purpose to describe in minute detail the processes of manufacture, nor to touch upon the history of matches.

Industrially speaking, here and in many other countries white phosphorus is in match-works a memory only, its reign is over. Match-makers' necrosis in Great Britain is a bad dream of the past. In most countries where white phosphorus matches can still be made, increasingly stringent regulations safeguard the workers. At the instance of public bodies and of manufacturers who have as much regard for the welfare of their operatives as for the accumulation of profits, salutary measures are forced along; and it may be hoped that the goal of universal prohibition will at no distant date be reached. In this matter Denmark led the way, and in the year 1875 forbade the use of matches made with white phosphorus: Switzerland followed in 1879; and since the International Conference at Berne in 1906, the sale and importation of ordinary phosphorus matches have been probibited by law in France and the French Colonies, in Germany, Austria, Italy, Spain, Holland and Dutch India, Switzerland, Luxemburg, and Finland. The agreement between the plenipotentiaries at Berne led in 1908 to the passing by the British Parliament of the White Phosphorus Matches Prohibition Act, and since January 1st, 1910, matches containing white phosphorus have here been forbidden to be imported or sold. They may not be imported into the Australian Commonwealth; and it is probable that Canada will adopt similar legislation. So far, prohibition has not been enforced in Hungary, Belgium, the United States of America, Russia, and Japan; but in all these countries, excepting the United States, match-works are subject by law to strict regulation and supervision. In America, there is much trouble in connection with the prevention of necrosis. Owing to the very large proportions of white phosphorus used in the manufacture of the American double-dip matches, the operators' risk is considerable: and it is not diminished by the climatal conditions of the country. The humidity and warmth, which are often greater than in Britain and elsewhere, augment the danger to the workers.

At the hearings in 1910—1911 of the Committee of Ways and Means of the American House of Representatives, interesting evidence was given with reference to the use of white phosphorus and substitutes therefor in the United States and other countries. A Bill was introduced in June, 1910 ". . . to provide for a tax upon white phosphorus matches and for other purposes," the main object being "to eliminate through the exercise of the taxing power, the use of white, which includes yellow, phosphorus in the manufacture of matches." In the course of the arguments upon this Bill it was pointed out that "The United States is left in the unenviable position of permitting the use of a dangerous article in the manufacture of matches, and its position is the more unenviable because a substitute has been found which is entirely innocuous." At a further hearing of the Committee, on January 28th, 1911, the following statement was put in, and submitted by the American Association for Labour Legislation:—

"The 'double-dip' match, which is now made in the United States, and rapidly supplanting the old parlour match, generates in the process of manufacture 40 to 50 per cent. more poisonous fumes than the parlour match. The regulations in force in foreign countries, prior to the absolute prohibition of the use of white phosphorus, restricted the quantity of poisonous phosphorus to 6 or 7 per cent. (in no cases more than 10 per cent.—Denmark) of the match compositions. To-day in the United States the match manufacturers are using from 14 per cent. to 20 per cent. of poisonous phosphorus in match compositions."

In the light of these and other statements, it is not surprising that Mr. Taft recommended in a message the discouragement and stamping out of the manufacture of white phosphorus products by the imposition of "a heavy Federal tax." It is possible, indeed, that there will be prohibition before very long in the United States and British North America. The probability is the greater in the States, because the workers in American match-factories are stated to be confronted by increasingly dangerous conditions of work. The British match-works operative was never at any period exposed to phosphorus vapours in a degree approaching that associated with the manufacture of the white phosphorus "double-dip" or "double-tip" match, now so popular in the United States. The readily ignitable, sensitive, and softly burning added tip of this product, which in America is said to be superseding the ordinary paraffin-dipped strike-anywhere match, may contain as much as 20 per cent., or even more, of white phosphorus. Meanwhile, in view of these circumstances, and of the expressed wish of the President of the United States that American labour should be protected from the ravages of necrosis in the same degree that other countries, including Great Britain, have shielded their workers in match-factories, the Diamond Match Company last year took an important step. Sole owner of the Letters Patent covering the use of tetra-phosphorus trisulphide in America, the Company on January 27th, 1911, surrendered these for cancellation, so that that compound can freely be used as a substitute for white phosphorus, by any and all match manufacturers within the United States. This action, especially if followed by the taxation of white phosphorus matches, may put an end to the use of white phosphorus in America.

In addition to Great Britain, the chief match manufacturing countries are Sweden and Norway, America, Germany and Austria, China, and Japan. In France, the industry is a State monopoly.

British manufacturers in 1907 produced seven hundred and seventy-five thousand pounds' worth of matches, and of this amount nearly one-tenth part was exported. In 1910, about 17½ million gross of boxes were consumed in the United Kingdom: and about half these were of foreign production. Against these figures may be set those for America, Germany and Austria, Sweden and Norway, and France, for which I am indebted to Mr. G. W. Paton, Managing Director of Messrs. Bryant and May, Limited. Approximately they are:—

	Gross of boxes per annum
Sweden and Norway	24,290,000
Germany and Austria	14,000,000
France	4,800,000
America	21,800,000

In Japan, the total export is said to have been in 1909 41,407,083 gross: but the competition of Germany, Sweden, and, latterly, of China, have since caused very serious injury to the Japanese match trade, and the exports have greatly diminished.

The values of the exports of British manufacture to foreign countries and to the Colonies have recently been as follows:—

TABLE I.

Exports of British Matches.

		Total to Foreign Countries.	Total to British Possessions.		Grand Totals.
		£	£		£
1890	Safety matches and others.	16,517	129,366		145,883
1895	Safety matches and others	9,849	77,470		87,319
1900	Safety matches	1,175	7,728	89,016	8,903
	Other kinds	8,677	81,288		89,965
1905	Safety matches	1,260	8,581	60,232	9,841
	Other kinds	4,914	51,651		56,565
1908	Safety matches	853	9,850	81,017	10,703
	Other kinds	3,629	71,167		74,796
1909	Safety matches	1,212	15,144	84,752	16,356
	Other kinds	3,839	69,608		73,447
1910	Safety matches	1,626	13,092	82,569	14,718
	Other kinds	2,270	69,477		71,747

It is unfortunately too evident that there has been a gradual shrinkage in our foreign trade. Competition is, of course, extremely keen. The imports from foreign countries, during the corresponding period, are shown in Table II.

TABLE II.

British Imports.

			Total from Foreign Countries.	Total from British Possessions.	Grand Totals.
			£	£ From Australasia	£
1890	Safeties	(all)	368,886	30	368,916
	Other kinds			—	
1895	Safeties	(all)	362,900	—	362,900
	Other kinds			—	
1900	Safeties		203,818	—	203,818
	Other kinds		177,239	—	177,239
1905	Safeties		263,460	—	263,460
	Other kinds		318,238	—	318,238
1908	Safeties		327,573	—	327,573
	Other kinds		281,095	—	281,095
1909	Safeties		341,693	—	341,693
	Other kinds		256,967	—	256,967
1910	Safeties		306,519	—	306,519
	Other kinds		173,418	—	173,418

At one period Great Britain was far behind other countries in regard to the methods of manufacture in use. This is no longer the case. It is due to the enterprise and prescience of the larger British companies and firms that to-day we can claim to be among the most progressive match-producers of the world. The factories and methods of working in the United Kingdom now challenge comparison with those to be seen in any other country. At Bow, and Bromley-by-Bow, London, at Liverpool, Gloucester, Manchester, Belfast, Dublin, and elsewhere, there are match-works provided with plant and machinery second to none in completeness and modernity. The new factories of Messrs. Bryant and May, at Bow, and their works at Liverpool, are without doubt among the finest in the world.

Abroad, at Tidaholm, Jönköping, Uddevalla, and elsewhere in Sweden; at Lattenburg, Rheinaubaden and Vordamm (the Deutsche Zundholzfabriks Aktien-Gesellschaft), at Cassel and Kostheim (Messrs. Stahl und Nölke's), and at Habelschwerdt, Göppingen, Ulm, and Augsburg, in Germany; at Aubervilliers, Pantin and Marseilles, in France; at Schüttenhofen, Austria; in Ohio, New York, Michigan, and elsewhere in the American States; and in numerous other places in different parts of the world, there are match factories of the first rank, well provided with machinery and other appliances of recent types; and in most of these establishments there are stringent regulations providing for conditions of working favourable to the health of the operatives.

Formerly, for the production of a box of matches at least a dozen separate operations were necessary. Some were effected entirely by hand. Each required some manual labour. The boxes were made, or at least folded and pasted, by hand, in the homes of the workers, and the splints or sticks of wooden matches were cut by "toothing and flaking" machines from planks or deals, previously smoothed, cross-cut, and steamed. The splints were dried, either on trays in drying rooms, or in heated revolving cylinders, and then filled, at first, by very simple machines, into dipping frames or clamps, and later, according to a more elaborate process, into coils of cotton webbing. The coils, containing the match-sticks, double the length of a match and with the ends projecting on both sides, were carried by hand to the paraffining tank; and after a preliminary heating on a hot plate, the two ends of the splints were dipped in melted paraffin wax. I say nothing about the antediluvian method known as sulphuring, which was superseded by paraffining. The frames or coils of paraffined splints were conveyed, sometimes by a "creeper," to another department called the dipping room, and there dipped by hand in some of the igniting-composition, spread (also by hand) upon the steam-heated top-plate of a dipping table. When both sides of a coilful of splints had been dipped, drying was effected by exposing the coils or frames on racks, in drying rooms maintained at a suitable temperature.

The igniting composition, excepting that for safety matches, invariably contained white phosphorus, which had been stirred into a warm solution of glue and potassium chlorate, to which other constituents, such as powdered glass, "fillers," and colouring agents, were added. The resulting emulsion was then stirred and milled. The dipped and partly dried matches were then "racked out" or "laid out," "halved" by pivoted lever knives, and "boxed," all these operations being carried out by hand, excepting where "unwinding" machines were used, which simultaneously "laid out" and "halved" the two-headed splints as they were released from the coils. During the older process of "halving," and the final operation, "boxing," "firing" often occurred.

The foregoing is a brief summary of the older methods of manufacture; and it can readily be understood how much manual labour was required for these numerous and entirely separate operations.

During the past fifteen years, the mode of manufacture has been so changed that to describe it, even superficially, is like giving an account of a new industry. The principles of the manufacture are new: the chief constituents of the igniting compositions have been altered; and even the materials of the match stems are in numerous cases different from those used twenty years ago.

At the present time, the boxes, as well as the splints (at all events, the small, or "minik"-sized splints), are in the greater factories made by new and ingenious labour-saving mechanism. Many of the splints are cut actually in the match-making machines.

Manual labour has been replaced wherever possible by elaborate machinery, automatic, continuous, cleanly and hygienic. Rooms stuffy with the "fume" of partially oxidised phosphorus, or dim with the smoke from fired matches, have given way to spacious and lofty halls, admirably ventilated, brilliantly lighted, and destitute of odour; and the improved appearance of the workpeople testifies to the betterment of their health and surroundings.

For the production of the common aspen-wood match-boxes and splints, veneers are cut from barked logs by a log-peeling machine, and divided into bands, narrow for splints, wide for boxes. For the last-named, the bands are scored, guillotined, dyed, and transferred to box-making machines, of which there are two kinds, "inner" machines, for the drawers or "inners" of the boxes, and "outer" machines, for the covers or "outers." These machines fold up, paste, paper-coat, label, and deliver on to endless carriers, which convey the covers and drawers to drying rooms. The covers are "sanded," and the drawers are inserted, by special machines. For card-board boxes also, there are "inner" and "outer" machines, the former cutting, scoring, folding, glueing, and drying (on a moving chain) the insides of the boxes; the latter cutting, scoring, pasting, folding, printing, glueing, sanding, and delivering the outsides, at the rate of about 16 a second.

In making the aspen-wood splints for small-sized matches, narrow but somewhat thicker veneers than those used for the boxes are cut by a log-peeling machine, and guillotined by another machine into rectangular match sticks. These are rendered uninflammable by impregnation with ammonium phosphate solution, dried in a revolving cylinder, "cleaned" and "straightened" in "jogging" appliances, and packed in receptacles, so as to be ready for feeding into the hoppers of the match machines. Splints for the larger matches are cut at present from pinewood, by a different method: but such timber is becoming scarce, and probably aspen-wood will be adopted instead, to a still larger extent than is so far the case.

The match machines are of course the most striking and distinctive features in a modern match-works. An endless chain of match-plates, about 230 yards in length and travelling over a series of carrier-wheels, conveys immense numbers of single length rectangular splints, jutting downward from it like the bristles of a scrubbing brush. The splints are at first fed into a hopper, "jogged," and forced by plungers into rows of apertures in the match-plates. The great travelling chain carries the splints, successively, over a hot plate, through a steam-heated bath of paraffin wax, then over a dripping roller, partially immersed in a trough of dipping composition, and lastly over all the drums or carrier-wheels. This occupies an hour or thereabouts, during which the matches dry. The chain brings them to ejection-plungers in the fore part of the machine, where a box-filling machine places the matches in the drawers of match-boxes, inserts the drawers in the covers and transfers the finished boxes to a wrapping machine, which puts up the boxes in dozen packets. One such match machine, attended by eight girls, yields 1000 gross of boxes per diem, is automatic from beginning to end, and its production is continuous. This type of machine is used for the manufacture of small and large-sized ordinary and safety matches. Certain other forms of automatic and continuous match machines called grooved-stick and round-stick machines, punch out their own match splints from blocks of pine-wood fed in near the front of the machine. The cut splints—circular, or nearly so, in section—are conveyed by an endless chain of perforated match-plates over a hot plate, paraffin bath, and the rest, just as in the previous case, returning after the circuit of the carrier-wheels to the front of the machine, where the matches are discharged into the insides of card-board boxes. These are passed along continuously to an elevated table, at which several seated girls sheath them in the covers. The round-stick and grooved-stick machines, it will be seen, literally take in wooden blocks and turn out finished matches: the final part of the "boxing" is the only operation which is not effected automatically. Machines of the types here described require the attention of fifteen operatives, yield about 800 gross of boxes a day, and supply matches of the pine-wood vesta class, or the like. Wax vestas are made in wax match machines of very similar construction, but the cut lengths of taper are held by clips or springs in the endless chain, instead of in apertures or perforations; and for obvious reasons there is neither hot plate nor paraffining. The rest of the operations are identical with those previously described.

Machines such as those previously mentioned are used by Messrs. Bryant and May, and in America by the Diamond Match Company: but other automatic machines, constructed upon similar principles, though of very different appearances and capacities, are in use in this country and on the Continent. Roller of Berlin, Sebold of Durlach, the late A. Lagerman of Jönköping, Sweden, and Sévène and Cahen, of Paris, may be mentioned among the numerous makers and inventors of automatic match machinery.

I have to acknowledge much information received from the late Mr. Gilbert Bartholomew, Chairman of Messrs. Bryant and May, Limited, from his co-Directors, and from other of the British match manufacturers. The slides shown upon the screen were prepared partly from views handed to me by Messrs. Bryant and May: some of them are reproductions of illustrations in the blue-book, "On the Use of Phosphorus in the Manufacture of Lucifer Matches," 1899, for which indebtedness is expressed to the Controller of the Stationery Office; and for the view of the Lagerman machines in use at the Jönköping works I have to thank Chamberlain Berndt Hay, the general manager of the Jönköpings och Vulcans Tändsticksfabriks Aktiebolag.

In the modern operation of manufacturing strike-anywhere matches, the substitute for white phosphorus mostly adopted in this country, and largely on the Continent, is tetraphosphorus trisulphide, P_4S_3, the commercial name for which is phosphorus sesquisulphide; but scarlet phosphorus is used in England to a small extent; and, besides dark red, or "amorphous" phosphorus, several varieties of light red phosphorus, preparations of phosphorus and sulphur containing the elements in different proportions from those present in tetraphosphorus trisulphide, phosphorus hydrides, and certain metallic salts of hypophosphorous, thiophosphorous, and hypothiophosphorous acids have in various places been tried or are in use. This list is not by any means exhaustive; but if to the rest be added lead thiosulphate—very decently-striking matches made with which substance I have had for examination in the laboratory—and various sulphur and thiocyanogen compounds of metals, all the more important latter-day substitutes for white phosphorus have, it is believed, been named. Dark red phosphorus, commonly called amorphous phosphorus, is still used here and abroad on the rubbers of the boxes for safety matches; and there is nothing particularly new to relate about these. The rubbers of book-matches also contain red phosphorus. I may conveniently conclude the paper with some general remarks upon the various kinds of matches. The chief varieties of matches made in this country are square, wood-stemmed, strike-anywhere matches (of two sizes), wood-stemmed vestas, wax-stemmed vestas, wood-stemmed safety matches (of two sizes), and cardboard-stemmed safety matches, or book-matches. Vesuvians are also made, but are obsolescent. Strike-anywhere matches in the latter decades of the nineteenth century constituted over 80 per cent. of the matches used by the public, but in 1910 dwindled to under 64 per cent. of the total quantity. The popularity of safety matches has correspondingly increased. Wood-stemmed vestas are fast displacing vesuvians, and materially reducing the consumption of wax-stemmed vestas. A manufacturer not long since informed me that whereas some years ago he employed sixty girls daily at the machines for making "braided light" vesuvians, now he has one girl occasionally engaged on such work. The safety match with a cardboard stem, called a book-match, is produced chiefly for exportation, and has but a limited use in this country. It is in one respect an interesting reversion to the earliest type of "fusee," in that the stem is of cardboard. Cleverly devised little machines print the card, cut teeth in it, tip the teeth in the match composition, fold, stitch into books, and paint on the rubbing paste. Lastly the noiselessly and easily struck "double-dip" match, to which allusion has been made, is in the United States an extremely keen competitor of the ordinary strike-anywhere matches, which, by the way, are usually called in America "parlor" matches; but whether the double-dip match, in its present form, can continue to be made in the face of the agitation against the use of white phosphorus, remains to be seen.

DISCUSSION.

The Chairman said it was a very happy thing that so far as England was concerned the use of white phosphorus in the manufacture of matches had ceased, and it was also a matter of congratulation that machinery had been introduced to so large an extent, for they had heard a great deal in the past of the work girls contracting phosphorus poisoning by forcing the matches into the box with the palm of the hand. With regard to the fact that the British trade in matches was apparently diminishing, he imagined that was mainly due to two causes: first, that there was much cheaper labour elsewhere, and, secondly, that abroad wood could be obtained and utilised much more cheaply than in England. He should like to hear whether there was any other reason for the diminution of this British industry.

Mr. Spiller said he had hoped to hear something of the new compositions which were not limited to red phosphorus. Metallic phosphides might be used in connection with chlorate of potash or other oxygen furnishing material. Whilst with Sir Frederick Abel numerous experiments were made in connection with the Armstrong fuses, which had to be fired by friction like the lucifer match composition, and they tested a great many different substances, but settled at last on cupric phosphide with chlorate. He should like to know whether that was now used at all, or either of the other metallic phosphides. Phosphides of tin, cadmium, zinc and iron as well as copper, all made highly inflammable mixtures in combination with potassium chlorate.

Mr. W. F. Reid said that he thought the manufacturing chemists of Great Britain had removed a very great disgrace from the match industry by abandoning the use of phosphorus in this country. Some years ago some of them had the privilege of going over the extensive factory at Prescott of the Diamond Match Company, where they saw and admired the beautiful machinery. He thought they were only at the beginning of the true development of the match. When Kunckel or Brandt, or whoever it was, first produced a small proportion of phosphorus said to be worth more than 100 times its weight in gold, they had little idea of what was coming to pass in the match industry. It might be however, that the match itself would become a thing of the past. He had very recently heard from France that the spread of automatic lighters for cigarettes and other purposes was so rapid that the production of French Monopoly matches had very considerably decreased. Whether, through the introduction of such an apparatus, the match would die out, it was difficult to say; but it might be that this apparatus would soon be found in every house. That was a chemical apparatus; and, if he was not misinformed, this latest production for obtaining light under any circumstances was due again to the very intimate connection between various chemical industries. One of the constituents of the alloy used was cerium, which was made from the residue obtained in the manufacture of the thoria used for the incandescent mantle. That showed how the chemist came in everywhere; and one could never tell whether the waste product of one large industry might not become the chief factor in another equally large industry. He believed a heavy tax had been put upon those machines in France. The French match was no doubt very bad, but it was not so bad as some of the matches at the Exhibition at St. Louis, where the Japanese exhibited safety matches that absolutely refused to ignite. There might be an advantage, not from the point of view of the British manufacturer, but of others, if they could have some information as to the number of trees which were cut down every year simply to produce matches; he believed it was something astounding and might eventually have an effect on other industries of very great importance. They would perhaps in time find it difficult even to produce the daily papers if the forests continued to be destroyed at the present rate.

Mr. Clayton, in reply to the Chairman, said that no doubt cheaper labour abroad and cheaper wood were two of the causes of the diminution in the English trade; but another cause was that English matches were not received free of duty in foreign countries; and, though personally a free trader, he could not disguise from himself the fact that alien matches came here free of duty whilst ours were taxed abroad. He had made matches, not on a commercial scale but at any rate on a considerable scale; and, from practical experience, he said that it did not at all follow that even if a match did smell phosphoric it had white phosphorus in it. One might have a composition not containing a scrap of white phosphorus, but some sulphur compound of phosphorus, which would give almost the same odour on ignition as one made with white phosphorus. The same applied to matches made with red phosphorus and sulphur. He had heard it said that one could distinguish a sesquisulphide match from one made with red phosphorus and sulphur, by the odour; but personally he could not. Scarlet phosphorus was also used; that was quite a different commodity and made very good matches. In fact, matches might be made of a number of other things; there were probably about 15 different substances which could be used more or less successfully for the manufacture of strike-anywhere matches: none of these need contain white phosphorus at all. He could not say for certain whether any matches were now made with metallic phosphides—at any rate, commercially: he thought it doubtful. He had himself experimented with these phosphides. Many things suggested themselves as being likely to answer; but, when tried, they were found to be unsuitable; he was inclined to think that metallic phosphides came into that category; he had not been successful with them. He had also tried hypophosphites, with considerably greater success. He could not give any figures as to the quantity of wood which was used in the manufacture of matches. Without doubt, it was extremely large.

New York Section.

Meeting held at Chemists' Building on Friday, May 24th, 1912.

MR. M. C. WHITAKER IN THE CHAIR.

SOYA BEAN OIL FOR PAINT PURPOSES.

BY MAXIMILIAN TOCH.

From 1890 to 1909, the price of linseed oil fluctuated between 30 cents and 50 cents per gallon. On a few occasions the prices were higher, but a fair average for the 19 years was 40 cents per gallon, although in 1896 it went as low as 25 cents. Towards the end of 1909 it rose from 60 cents to 68 cents within two months, and in September 1910 it reached $1.01 per gallon. Since that time it has been fluctuating between that price and 75 cents. Owing to the high price of linseed oil in 1910, many painting operations were deferred, awaiting a lower price, or inferior material was used in place of linseed oil.

The value of menhaden fish oil had already been recognised, and while it is admitted that fish oil replaces linseed oil for many purposes, it is by no means a true substitute. The principal use, however, for fish oil to-day is in the manufacture of linoleum, printing inks, and certain paints which are exposed either to the hot sun, or on hot surfaces.

In 1909 soya bean oil as a paint oil was practically unknown. Since that time many investigators have published more or less conflicting articles concerning soya bean oil, and even the physical and chemical constants of soya bean oil vary to some extent. Owing to the fact that discordant results were continually obtained, it is only within the last year that it has been possible to state with some degree of certainty whether soya bean oil is a substitute for linseed oil, an adjunct to it, or neither. The reason for this uncertainty and discrepancy is apparent when it is stated that the author himself has experimented with 33 different varieties of soya beans, and in the records of the Department of Agriculture at Washington no less than 280 varieties of soya beans are listed.

From time immemorial, the soya bean has been grown in China and Japan, where it has served as one of the staple articles of food, and as the basis for a number of food preparations. In Europe and the United States, however, the value and uses of the bean have been but little appreciated until very recently (1908), when, on account of the scarcity in the cotton seed supply of the world, soap and glycerin manufacturers began to turn their attention to its possibilities. In Manchuria, where by far the major portion of the soya beans are grown, practically the entire crop is available for export. The following figures taken from the Consular Reports will serve to show the extent of the soya bean industry during the past three years:—

	1909. Tons.	1910. Tons.	1911. Tons.
Total shipments of beans from Far East	1,470,870	1,200,000	1,500,000
Imported into Europe	400,000	500,000	340,000

As the above statistics indicate, China and Japan retain for domestic consumption practically two-thirds of the available supply of beans. The sugar plantations in Southern China and the rice fields of Japan annually consume enormous quantities of soya beans and bean cake as fertiliser, while the extracted oil is used as food by the natives.

In connection with the use of soya beans and soya bean oil for edible purposes, it may be mentioned that there has been recently established at Les Vallées, France, a thoroughly up-to-date factory for the production of a wide assortment of food products from soya beans. Among the more important of these may be mentioned: milk, cheese, casein, oil, jellies, flour, bread, biscuits, cakes and sauces. According to Dr. G. Brooke, Port Health Officer of Singapore, the soya bean, more nearly than any other known animal or vegetable food, contains all the essential and properly proportioned ingredients of a perfect diet.

All soya beans are leguminous plants, which do not tend to deplete the soil of nitrogen, for the typical soya bean plant is self-nitrifying and grows in almost any soil that contains a reasonable amount of potash. In addition to this, the soya bean enriches even very poor ground when used as a ground manure. This is done by planting the seed promiscuously, allowing it to grow to a height of about 6 inches, and then turning it in. In this way both nitrogen and potash are given to the soil for future use in an available form. The average height of the soya bean plant is about 36 inches. The pods resemble those of our sweet pea. They are about 2½ inches in length and are covered with a hairy growth. Generally there are two or three beans in each pod. After the oil is extracted from the bean, the cake appears to be very valuable as a cattle food, while the leaves and stalks, if collected and set in a dry place, make excellent silage. We thus have practically the entire plant available for use, with the exception of the roots.

The average composition of the soya bean varies within fairly narrow limits among the different varieties of soya beans. In the following table are listed the analyses of a few of the varieties of soya beans:— *

Variety.	Water.	Protein.	Fat.	Nitrogen free extract.	Fibre.	Ash.
	%	%	%	%	%	%
Austin	8·67	36·59	20·55	24·41	4·00	5·78
Ito San	7·42	34·66	19·19	27·61	5·15	5·97
Kingston	7·45	36·24	18·96	26·28	4·79	6·28
Mammoth	7·49	32·99	21·03	29·36	4·12	5·01
Gnelph	7·43	33·96	22·72	25·47	4·57	5·85
Med. Yellow .	8·00	35·54	19·78	26·30	4·53	5·85
Samarow	7·43	37·82	20·23	23·65	5·05	5·82

When the author obtained discordant results from the soya bean oil then on the market, the first impression was that the oil might have been adulterated, but this did not prove to be the case. The oil was, in all cases, pure soya bean oil, but from a seed which was not particularly adapted for making a paint oil. Through the U.S. Department of Agriculture many varieties of seeds were received, and through the various seed dealers in the United States, quantities of seeds of all kinds were purchased. The method of extraction followed was to grind the seeds very finely in a mill and digest with gasoline in the cold. The solvent was then evaporated and the oil recovered. Without going into any lengthy details, the percentage of oil extracted averaged 18 per cent., and although soya beans range in colour from a cream white to a jet black, it must be noted here, that all the oils extracted from the various seeds were paler than finely pressed linseed oil, and none of them showed the chlorophyll extract as markedly as fresh flaxseed. On obtaining the various samples of oil, it became evident why the discordant results were obtained, for some of them dried within a reasonable time and some did not.

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* U.S. Dept. of Agric. Bulletin of the Bureau of Plant Industry.

It has been stated that soya bean oil is not as pale as raw linseed oil and belongs to the semi-drying class of oils. I must correct this statement; soya bean oils made from cold pressed seeds such as Haberlandt, Austin, Habaro, Ebony, Meyer, and Ito San give excellent results and have a specific gravity as high as 0·926, with a yield ranging from 16 to 19 per cent. Furthermore, a drier made from red lead or litharge is unsuited for soya bean oil, but a tungate drier, which is a mixture of a fused and a precipitated lead and manganese salt of china wood oil and rosin, acts on soya bean oil exactly the same as a lead and manganese drier acts on linseed oil. In other words, a fairly hard, resistant and perfectly dry film is obtained by the addition of from 5 to 7 per cent. of this drier within 24 hours. Soya bean oil, and when I mention this name hereafter, I refer only to that suitable for paint purposes, is the nearest oil we have to linseed, and under the proper impetus of the Department of Agriculture much of our waste and unproductive land between Maryland and Georgia, and from the Coast to the Mississippi, will yield productive and profitable crops. The only drawback to the planting of soya bean is the fact that it needs much water. In 1911, many of the experimental plantings failed on account of the drought which was prevalent in the United States, but in low marsh land this plant ought to yield a profitable crop. It is doubtful whether the soya bean would grow profitably in the extreme South. In Cuba the cow-pea, which is analogous to the soya bean, will sometimes grow to a height of 20 feet, and form a thick matt around the base or abuttment of a railroad bridge, and that within a few months. This would indicate that a soil would have to be selected where the bean would not grow to a height greater than 5 feet, otherwise the stalks would be too thick and it would be difficult to harvest it. Farmers' Bulletin No. 372 of the Department of Agriculture, makes the statement that 20 lb. of seeds are required to the acre, and that the production is from 25 to 40 bushels, each bushel weighing 40 lb. If this is a fact, and since little or no fertiliser is needed, and when fertiliser is needed a preliminary crop can be grown and turned in to form its own fertiliser, the American farmer should be encouraged to try this crop. Furthermore, in Kentucky two crops during the summer can be grown, for some of the soya beans that have been tried there have ripened early, and the second crop has ripened late, two different selections of seed having been used. The statement has been made that soya beans could not be harvested properly in this country on account of the high cost of labour as compared with that of Manchuria and Japan, but this is evidently erroneous, in view of the fact that enormous quantities of beans are grown in Minnesota for food purposes and harvested by machinery. Even in Manchuria the beans are allowed to dry and then thrashed out by means of horse power. At any rate, if we have any difficulties now with the harvesting of a new kind of crop, it is safe to assume that with the American inventive genius in harvesting machinery appliances will be invented which will overcome this, for the soya business has no greater harvesting difficulties than the edible bean.

Soya bean oil appears to consist of from 94 to 95 per cent. of glycerol esters.* Of these 15 per cent. are saturated acids such as palmitic acid, and 80 per cent. are liquid unsaturated fatty acids containing 70 per cent. oleic acid, 24 per cent. linolic acid, and 6 per cent. linolenic acid. The iodine number of soya bean oil has been given as ranging from 121 to 124, but the Manchurian cold pressed oil will average as high as 133.

It may be of interest to show a comparative table here between the physical and chemical constants† of soya bean oil of known origin like Manchurian cold pressed oil as compared with linseed oil.

Soya Bean Oils.

Name.	Colour of seed.	Colour of oil.	Sp. gr. 15° C.	Acid value.	Iodine value.
Meyer	Brown		0·9261	0·41	127·0
Peking	Black	Extremely pale	0·9270	0·14	135·4
Haberlandt	Straw-yellow		0·9244	0·90	129·8
Farnham ..	Straw-yellow		0·9231	0·65	131·8
Taha	Black Olive Saddle	pale amber	0·9248	0·16	127·0
Mammoth	Straw-yellow	somewhat deeper than above	0·9222	0·47	118·2
——	Brown		0·9218	0·17	129·3
Edward ..	Straw-yellow	med. amber	0·9257	1·14	124·6
Shanghai ...	Black	same depth as previous olive tone	0·9241	0·63	127·8
Refined linseed oil ..			0·933	1·0	180·1

The specific gravity determinations were made with the pyknometer. The iodine values were obtained in accordance with Hübl's method. The iodine values indicated are somewhat lower than those of cold pressed Manchurian bean oil. This is no doubt to be ascribed to the circumstance that the solvent with which the oil was extracted was driven off by evaporation in open vessels on the water bath, so that the oil became slightly oxidised.

Soya bean oil which is suitable for paint purposes has two characteristics which enable the chemist to determine whether this oil is suitable or not. In the first place, soya bean oil, when heated up to 500° F. for a few minutes will bleach, and remain bleached. Some samples which the author has examined have turned almost water white. Linseed oil has this characteristic, but not to the same degree. Cold pressed soya bean oil made from the samples indicated in the previous table, when heated to 500° F., and blown with dry air for from 5 to 7 hours, thickens exactly the same as linseed oil, and attains a gravity of 0·960 or over. This is the surest indication that the soya bean oil which will thicken under these conditions and remain pale is suitable for paint purposes. This thickened oil has excellent qualities and advantages for making what we call in this country "baking japans," and what is known in England as "stoving varnishes."

A sample of standard cold pressed Manchurian bean oil was heated to 500° F., and blown vigorously for 7 hours after cooling to 300° F. The following results were obtained:—

	Sp. gr. 60° F.	Acid value.	Iodine value (Wijs.)
Original oil	0·929	2·6	133·6
Blown oil	0·963	1·9	105·3

It is interesting to note that the acid value was reduced by blowing. The blown oil dried in 3½ days, whereas the original sample required from 5 to 6 days.

It appears that the varnish made from a suitable soya bean oil bakes to a very hard degree, and retains an abnormal flexibility. As regards the wearing quality of pure soya bean oil compared with pure linseed oil for paint, the author has had somewhat less than three years' experience, and can only say that it is not quite as good as that of linseed oil. A 2-year exposure on a 100-foot fence gave slightly better results for the linseed oil as to hardness and less gloss for the soya bean oil, but a mixture of half soya bean and half linseed oil showed approximately the same results, while a varnish made of 25 per cent. of China wood oil with 75 per cent. soya bean oil gave equally hard results as linseed oil. It is too soon to prognosticate the value of soya bean oil for exterior painting, but for interior painting soya bean oil is the equal in every respect to linseed oil, and particularly when treated with a tungate drier. Cobalt drier will, under many circumstances, dry even those soya bean oils which are not suited for paint purposes, but for the present cobalt drier is rather too expensive. It has been stated that from 1 to 1½ per cent. cobalt drier will dry soya bean oil and fish oil. This is practically true, but 5 per cent. is really needed to get the proper drying within 24 hours. Cobalt Tox Tungate[*] is probably the ideal drier for soya bean and fish oils.

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* H. Matthias and H. Dahle—Arch. Pharm., 1911, **294**, 424—435.

† Results obtained in the research laboratory of Toch Brothers.

This drier, when present in soya bean oil to the extent of from 5 to 7 per cent., will dry the latter within 12 hours.

It is, of course, possible to determine and differentiate a mixture of raw soya bean oil and raw linseed oil for the iodine values and specific gravities are good indications, but when 25 per cent. of soya bean oil is added to a mixed paint, neither the author nor anyone in his laboratory can, in all instances, detect its presence.

Blown and thickened soya bean oil is already used by a number of the linoleum and table oil cloth manufacturers, and for printing ink purposes it presents some advantages. For the manufacture of enamel paints, heavy bodied soya bean oil produces most beautiful results, and as perhaps 95 per cent. of all enamel paints are used for interior decorative or protective purposes, in this country its use should be encouraged.

It is not within the province of the writer to forecast the future of any paint oil, but there is no doubt that if a campaign of education be urged among the farmers, particularly in those states where soil has been regarded as unproductive, and the proper selected seeds of soya beans are planted, no scarcity in the flaxseed crop will ever again be a menace to the paint and varnish industries. At the time of writing linseed oil is quoted at 75 cents per gallon and soya bean oil at 55 cents per gallon. As soon as thousands of acres shall have been planted with soya beans, the proper machinery installed, and the sale for the cake and the silage arranged, soya bean oil will sell at from 25 to 35 cents per gallon, and after the ground has been productive of soya beans for some time, it will be fit for the growing of even the most difficult crops.

DISCUSSION.

Mr. R. H. **GAINES** said that his father had for a number of years grown soya bean in Virginia to fatten hogs. The soya bean was sown broadcast, and in autumn the hogs were turned into the field and ate the bean. They liked it better than corn, fattened very readily on it, and would not destroy corn when they could get the bean. The ground was kept in a good state of fertility by planting the soya bean with the corn. While the corn was a more or less exhausting crop, soya bean went deep into the earth, and while the plant extracted the nitrogen from the air, the root brought up the mineral ingredients planted, thus fertilising the ground.

Dr. **BAEKELAND** said that soya bean oil would be found one day to be one of the most valuable of edible oils, even superior to olive oil, but in addition the soya bean contained more of an easily assimilable proteid than any other vegetable product. Those who had attempted the study of vegetarian diets had been confronted with the difficulty of finding the necessary amount of proteid without ingesting at the same time a very large amount of solid matter and carbohydrates. The soya bean was remarkable because it contained an amount of nourishment and easily assimilable proteids which had no parallel, and that is why the eastern people, who lived on a vegetarian diet, had been compelled to study soya beans for centuries, and why it had become a staple. In China and Japan there was hardly a meal where there was no soya bean preparation. There was a soya bean cheese which was excellent. The Americans had advanced to the point of fattening hogs, but had forgotten that the whole agricultural system was upset. They planted a lot of vegetables which had poor food value, and which were fed to hogs, and were trying to devise means of getting nitrates into the soil. Why should they do this when it could be done by planting soya bean, which breathed nitrogen from the air.

Mr. **TOCH**, in reply, said that the interesting data that Dr. Baekeland had given with reference to the nutritive value of soya bean he had already tabulated. In 1903, in Berlin, Dr. Baekeland gave him some very specially prepared soya beans for dessert. The soya bean was remarkable because it contained no starch, and was the only complete vegetable food which was very good for diabetes. He could not go into the subject of cobalt driers at this time, because his principal assistant was preparing a paper for the Eighth International Congress of Applied Chemistry, at which time the whole subject would be published. They were not on the market, to his knowledge. His laboratory had been making them for some time, and he would be glad to give any reasonable quantity needed. There were some importers of cobalt resinates, and he had bought a quantity to see if they were usable. What he bought was found, on analysis, to be nothing but rosin containing 15 per cent. cobaltous sulphate, and was violet.

Dr. H. **SCHWEITZER** said that there were several food preparations made of soya bean, which were especially recommended as food for those who suffered with diabetes, on account of the absence of starch. It was also used in infants' food for modifying the food. There were millions of tons of seed cake, as a substitute for cotton seed cake, used for fodder, especially in Germany, with great success.

Mr. **TOCH**, in reply to a further question, said that he had been in correspondence for the past year with every Agricultural Experiment Station, and had been told that only experimentally had soya bean been grown in America. One man said that swamp was the proper thing for it. Another man, on trying the experiment in Georgia, found that instead of getting soya bean which he could harvest, got stalks 20 feet high, because the soil was too rich. Kentucky had had as much success as any, but Georgia was far too warm. As an analogous case, at Camaguey, Cuba, at the experimental station, where they had planted some long staple cotton, instead of getting cotton bush they got plants 15 feet in height, and they had to get two ladders to get to the top.

THE EIGHTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

BY WILLIAM H. NICHOLS, LL.D.

The subject of the Eighth International Congress of Applied Chemistry by this time is well understood, and I believe that people are thoroughly alive to its importance. Assuming that all are well acquainted with what has been done, a few facts connected with it may bring forward suggestions of which the Executive Committee may be able to avail themselves.

A Congress is a more difficult problem than a meeting of a society or some similar organisation thoroughly complete in itself, as a very large and complicated meeting must be provided for with 24 sections. For all this work no machinery was in existence. What is known as the International Commission, which consists of the Presidents of previous Congresses and one or two others, is the only chain that binds one Congress to another. While there are some precedents which must be followed, there is no regular way or order of organisation, so that each country in which the Congress is held must provide its own plans. The American Committee have endeavoured, in the preparations they have made, to arrange them in such a way that succeeding Congresses may have a somewhat tangible *modus operandi* for their work, subject, of course, to the difference which is necessitated by the differences in the country itself. The reference to the arrangements we have made is for the purpose of bringing out suggestions and seeing whether anything further can be done to benefit this and succeeding Congresses.

To the Seventh Congress held in London in June, 1909, the U.S. Government delegated thirteen gentlemen to represent it officially, and at the end of the Congress when the new officers were elected for the Eighth Congress these thirteen gentlemen were appointed as a nucleus to form n organisation for it. A year elapsed before it was ractical to call this meeting together. Its first work was o increase its number. That required a great deal of are, remembering the size of our country. It gradually nlarged itself until at the present time the organisation ommittee consists of 289 members, in addition to 26 ocieties and institutions. This organisation committee lso includes 49 official representatives from the different States, territories, and insular possessions of the U.S., early every Governor having appointed an official elegate, of which there are 49. This enlarged organisation ommittee, at its first meeting, proceeded to elect he officers of the 24 sections and sub-sections in which he Congress has been divided.

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[*] So called because it was first prepared by the author. It is a cobaltic salt of China wood oil. Unless the cobalt is trivalent, it will not act as a drier.

The first duties of the Committee after organisation were to complete our sectional organisations to conduct the campaign of publicity throughout the world, to the end that every chemist in the world should know about the Congress and, whether he could attend or not, be ready to send to it such papers or accounts of discoveries as he could prepare. The rules governing papers were somewhat stringent, but the Executive Committee have felt that the importance of the Congress demanded that nothing but original and important work should come before it. We have sent out descriptive literature comprised in three booklets covering 130 pages, more or less, and a large map of the U.S. Various tours to take place after the Congress has adjourned were outlined, showing invitations to visit 321 different establishments in various States, to which number a great many have been added since. In this respect we have an embarrassment of riches in the way of manufacturing plants to show our friends, which is in marked contrast to what has been done in other Congresses. We hope this will be one of the important features of the Congress.

The Executive Committee of the Congress, numbering 29 members, representing every section of the United States, issued formal invitations to a total of 1483 educational institutions and technical and allied societies that might be interested in the Congress. Of these 384 are in the United States and 1099 outside of this country. In response to this invitation 71 foreign educational institutions and societies have appointed delegates numbering 82, and 38 educational institutions and societies have appointed delegates to the Congress, numbering 57. Co-operation on the part of foreign chemists, to the extent of forming committees to co-operate with the Americans, has been effected in twelve countries, comprising a total of 504 individuals and 56 distinct societies. We believe that a number of other countries will soon report that they have concluded their organisations.

In addition to this, I personally last year visited chemists in Italy, Austria, Germany, Holland, Belgium, France, and England, and did what I could in the way of interesting the various societies and others in the work of the Congress.

The net result of all this at the present time is 683 papers promised and about 1500 members enrolled. This number is below our expectation. We are disappointed by the lack of applications from foreign countries—England particularly appearing to show very little interest in the Congress. Many are in the habit of leaving such matters until it is absolutely necessary to act, and I have every reason to believe that the membership of the Congress will be larger than of any of its predecessors; but this rush of members towards the end will only result in placing extra work upon those who are already overworked. It would be of great assistance if those intending to join should send in their applications at once.

We are going to try a new experiment this year in the printing line. As chemistry is a science which does not stand still, it is important that papers should be promptly published; and with this idea in mind we have arranged that all papers in hand by the first of July will be printed and bound before the opening of the Congress, so that members, on arrival, will receive them and will have to wait only a comparatively short period for those that are sent in after the first of July, as well as for the lectures and transactions, which, of course, cannot be printed until after the Congress. This arrangement, we hope, will have many good results, among them the production of valuable discussions. As these may be in any of the four official languages, the difficulty of recording them has been overcome, I trust, by the use of phonographs which Mr. Edison and his associates have taken great pains to perfect. To use these, of course, the speaker will have to stand on the platform, and one minor benefit of this will be that no one would care to do this and address a phonograph unless he has something valuable to say. The records will be immediately transcribed in the language of the speaker and be ready for editing the first thing the next morning. By this and other arrangements we hope to keep strictly up to date with everything that is said and done at the Congress.

Owing to the hospitality of Columbia University we have at our disposal all of the buildings of that institution during the Congress, which enables the Committee to assign suitable rooms, not only for sectional work, but for all other purposes for which they may be required.

The five lectures will be delivered in the Great Hall of the City College, which seats about 3000 people, and in which one of the greatest organs in the country is placed. The lectures will be preceded by an organ recital. In addition to these lectures, of which notice has been sent to every one, Mr. Samuel Eyde, of Norway, will give an account of the latest work on the fixation of atmospheric nitrogen. No one in the world is better qualified than he to discuss that subject.

Referring to the social functions during the Congress, during September the houses of most of our friends in this city are closed, and we cannot have the private entertainments which were given on such a lavish scale in London, where we met during the height of the season. This, however, will not prevent us from having a number of most agreeable entertainments which will be referred to more particularly later, including, of course, a banquet. The Ladies' Committee has been particularly useful, and, headed by its capable Chairman, Mrs. Baekeland, has made complete plans for the enjoyment of our lady visitors. Every function as far as possible will be open to the ladies. The ladies in Washington have also arranged a delightful programme.

The opening meeting will be held in Washington, and will be presided over by the President of the United States. The possibilities of Washington are so great that at the conclusion of this meeting and until the delegates return to New York, the hours will be thoroughly occupied by an agreeable as well as instructive programme.

After the Congress it is proposed to take two trips—a long and a short one—both leaving New York at the same time by special train. The short trip will include Philadelphia, Pittsburgh, Niagara Falls, Detroit, Chicago, Cleveland, and Boston, and will take ten or twelve days. At all of the points mentioned great preparations have been made for the reception of our guests. The long trip will probably be the same as far as Chicago. Leaving that city it will start West to Omaha, Denver, Salt Lake City, and San Francisco; thence South to the oil fields of California and Los Angeles; then East by the Grand Cañon of the Colorado to parts of Texas, including the great sulphur mines; thence to New Orleans; Birmingham, Alabama, with its great iron industries; Atlanta; Ducktown, with its great sulphuric acid industry; thence through some very interesting fields to New York. It will take altogether about thirty-five days.

These are the general preparations which have been made, and we shall be grateful for any suggestions or even criticisms. We want this to be the best Chemical Congress which has ever been held. Our own international pride is involved, and we must not forget that we shall have many visitors who have come a long way, and we do not want them to go back with a feeling that their visit has not been worth while.

Journal and Patent Literature.

Patent Specifications may be obtained by post by remitting as follows:—
English.—8d. each, to the Comptroller of the Patent Office, W. Temple Franks, Esq., Southampton Buildings, Chancery Lane London, W.C.
United States.—1s. each, to the Secretary of the Society.
French.—1 fr. 05 c. each, as follows: Patents dated 1902 to 1907 inclusive, Belin et Cie., 56, Rue des Francs Bourgeois Paris (3e.); Patents from 1908 to date, L'Imprimerie Nationale, 87, Rue Vieille du Temple, Paris.
German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

Patents.

Liquids; Adding coagulants or other reagents to ——. M. Deacon and W. Gore, London, and Palatine Engineering Co., Ltd., Liverpool. Eng. Pat. 11,251, May 9, 1911.

The patent relates to apparatus where the liquid to which the reagent is to be added passes upwards through a main provided with a restriction; according to the difference of pressure of the liquid on the two sides of this restriction, and dependent on the volume of liquid, a greater or smaller portion passes from the high-pressure side, through a tower, where it dissolves the reagent, and rejoins the liquid in the main at the low-pressure side. Claim is made for the interposition, between the reagent tower and the main, of a second vessel of the same capacity as the reagent tower, and into the bottom of which the dissolved reagent, which would otherwise go to waste, flows during the process of recharging, water being displaced instead from the top of this tower. A 6-way tap alters all the necessary connections at one movement.
—B. G. McL.

Drying liquids and apparatus therefor. G. H. Kunick, London. Eng. Pat. 11,979, May 18, 1911.

In the employment of internally heated slowly rotating drums on which the liquid to be evaporated is picked up from pans lying underneath, claim is made for a means of bringing about rapid evaporation at a temperature below the boiling point without the risk of overheating. Steam is introduced at about 1 lb. pressure, which is sufficient to overcome pipe resistances, the condensed water is continuously removed by a stationary sealed siphon pipe drawing from the bottom of the drums, the dimensions of the siphon pipe being proportioned to rapidly remove the condensed water and at the same time to maintain a slight vacuum in the drum. Evaporation is aided by means of a jacket surrounding the drums through which a current of air is drawn.—B. G. McL.

Drying and condensing liquids; Process and apparatus for ——. G. H. Kunick, London. Eng. Pat. 11,981, May 18, 1911.

In drying and evaporating apparatus of the type having rotary discs or cylinders heated by steam, etc., the waste heat contained in the vapour given off, is utilised for heating air which is led through the apparatus. For this purpose the discs or cylinders are partly surrounded by jackets connected at the top with vapour pipes through which the vapour is drawn by fans, while air, passing through pipes fitted inside the vapour pipes, is simultaneously drawn into the apparatus and heated before it reaches the jacket.—H. H.

Furnaces [for air-heating]. R. Okrassa, Antigua, Guatemala. Eng. Pat. 29,355, Dec. 30, 1911.

Each unit of the air-preheating battery consists of a vertical tube rounded at the lower end, of elongated tapering cross-section, and divided by an internal partition parallel to the minor axis into two compartments of unequal capacity, which communicate at the lower end; the units are joined together by a wedge-shaped rib and groove which jointing extends down to the same level as the internal partitions. The unit is built into a furnace setting in such a way that the hot gases striking the edges of the units pass downwards between them, round the end of the jointing and up the other side; the air to be heated is forced from a header down the narrower compartments of the units, passing up the wider compartments to a collecting header.—B. G. McL.

Gases [with liquids]; Method of treating ——. P. G. Schmidt, Olympia, Wash. U.S. Pat. 1,026,227, May 14, 1912.

The treatment is effected in a horizontal cylinder provided with an internal fan with perforated blades. The liquid with which the gas is to be treated enters by the hollow rotating shaft and is broken up into a fine mist by the action of the fan blades, which also produce a "wire-drawing action" on the gas, the latter being caused to pass in a direction contrary to the treating liquid.
—B. G. McL.

Cooling apparatus for hot-saturated solutions. K. Koelichen. Ger. Pat. 246,297, Sept. 18, 1910. Addition to Ger. Pat. 245,649, Oct. 6, 1909 (this J., 1912, 535).

Each cooling element is constructed of a cylindrical jacket, and two conical plates, having central concentric openings, so disposed that the unit consists of two independent compartments bounded by conical cooling surfaces, the solution to be cooled flowing through the inner compartment, and the cooling liquid circulating in the space between the conical plates and the cylindrical jacket. This space may be divided into a number of communicating chambers by radial projecting ribs on the inner surface of the jacket. A number of such units are superposed to form a cooling column.—A. S.

Decolourising agents [e.g., charcoal]; Recovery and revivification of ——. A.-G. der I. Oesterr. Ceresinfabrik H. Ujhely und Co. Nachfolger. Ger. Pat. 246,376, June 4, 1911.

In the revivification of decolourising agents, such as charcoal, by drying in a drum by means of hot air and then heating in a retort, a considerable quantity of fine material is carried away by the hot air and the gases from the retort, and is thus lost. According to the present patent, the hot air from the drying drum and the gases from the retort, are led to a dust-filter, and the material thus recovered is introduced into the conduit leading from the drying drum to the retort.—A. S.

Filter presses; Processes for treating a semi-solid material in the containers of —— *and removing the same therefrom.* C. W. Merrill, Berkeley, Cal., U.S.A. Eng. Pat. 2803, Feb. 3, 1911.

See Fr. Pat. 431,106 of 1911; this J., 1912, 16.—T. F. B.

Filters; Method of making ——. H. Passow, Blankenese, Germany. U.S. Pat. 1,027,754, May 28, 1912.

See Eng. Pat. 8233 of 1911; this J., 1911, 732.—T. F. B.

Evaporating, distilling, and concentrating apparatus of the column type for the treatment of liquids. G. P. Guignard, Melun, and H. L. A. M. Watrigant, Lille, France. Eng. Pat. 12,736, May 26, 1911. Under Int. Conv., May 28, 1910.

See Fr. Pat. 427,458 of 1910; this J., 1911, 1102.—T. F. B.

rying coffee and the like ; Machine for ——. R. Okrassa. Antigua, Guatemala. U.S. Pat. 1,027,146, May 21, 1912.

ee Eng. Pat. 29,355 of 1911 ; preceding.—T. F. B.

ising and forcing water ; Explosion apparatus for ——. G. Poore and H. A. Harvey, London. U.S. Pat. 1,027,430, May 28, 1912.

ee Eng. Pat. 24,188 of 1910 ; this J., 1911, 1099.—T. F. B.

efaction of gases. G. Claude. Assignor to Soc. L'Air Liquide, Paris. U.S. Pat. 1,027,817, May 28, 1912.

ee Fr. Pat. 370,850 of 1906 ; this J., 1907, 247.—T. F. B.

iln or oven ; Circular ——. J. Lunt. Stoke on Trent, and J. W. Hartley, Stone. U.S. Pat. 1,028,043, May 28, 1912.

ee Eng. Pats. 6215 and 18,962 of 1910 ; this J., 1911, 16.—T. F. B.

actions between liquids and gases or vapours ; Apparatus for producing reciprocal ——. J. A. Hart. Fr. Pat. 438,369, Dec. 14, 1911. Under Int. Conv., Dec. 17, 1910.

ee Eng. Pat. 29,391 of 1910 ; this J., 1912, 177.—T. F. B.

A.—FUEL; GAS; MINERAL OILS AND WAXES.

alician petroleum ; Nitro-products of the higher fractions of ——. M. Freund. Z. angew. Chem., 1912, 25, 1058—1059.

he following oils—1 to 5, fractions ; 6, an oil concentrate ; to 9, products of a "cracking" process ; all free from araffins—were refined by 1 per cent. of concentrated ilphuric acid, then nitrated by pouring 20 grms. slowly ito a mixture of 1 part of nitric acid (sp. gr. 1·492) and parts of sulphuric acid (sp. gr. 1·836), the temperature eing prevented from rising above 50° C. The nitroroducts obtained, after washing, were yellow to brown-red owders, easily soluble in alcohol, ether, acetone, or glacial cetic acid, and decomposing before they could be melted.

	Sp. gr. 20°/4°	Viscosity. (Engler's units.)	Flash-point ; open.	Solidifying point.	Yield of air-dry nitro-product.
		At 50° C.	° C.	° C.	%
1	0·858	1·1	90	—22	5·8
2	0·880	1·2	143	—20	6·5
3	0·900	3·0	180	7	8·0
4	0·908	4·0	160	8	10·0
5	0·910	4·2	169	12	17·5
6	0·940	6·9	205	10	48·8
		At 20°			
7	0·859	1·1	—	—	1·0
8	0·893	3·8	125	1·6	20·6
9	0·970	—	—	—	20·5

As the sp. gr. rises, so does the yield of nitro-products ; doubtless because the proportion of unsaturated hydrocarbons increases. The analysis of the product from No. 6 gave the formula, $C_{11}H_{17}NO_2$; but (since according to Normann the mean molecular weight of lubricating oils is 330—400) this formula should be doubled, and the product is probably a dinitro-derivative. The yield varied enormously with the temperature of nitration : in the case of No. 6 the percentages at 20°, 40°, 50°, 60°, and 70° C. were respectively 2, 60, 43, 12, and 9. These nitro-products yield with alkalis brown substantive dyestuffs ; with sulphur and alkalis, brown to brown-violet sulphur dyestuffs.—J. T. D.

Agglomeration of fine materials [*ores, fuels, etc.*]. Landis. *See* X.

Separation and determination of pyridine and ammonia. Bayer. *See* XXIII.

Explosions ; Reports on circumstances attending ——, etc. W. S. Smith and J. Jackson. *See* XIXa.

Gas companies and the manufacture of chemical products. Chem. Trade J., May 25, 1912 (see also this J., 1912, 322). [T.R.]

The Unopposed Bills Committee of the House of Commons have declined to insert the chemical clause in the Swansea and West Kent Gas Companies' Orders, but they have done so in the case of the Hatfield Gas Company, and the unopposed Bordon and Houghton-le-Spring Bills.

Patents.

Coke ovens. C. Still, Recklinghausen, Germany. Eng. Pat. 24,806, Nov. 7, 1911.

In horizontal ovens of the kind having vertical heating flues opening at their upper ends into a common horizontal waste flue, in order to equalise the draught, the waste flue is not connected directly with the shaft, but a second flue, connected with the shaft, is arranged parallel to and above the first, the two flues communicating by a series of openings which increase in size with their distance from the connection with the shaft. If desired, these openings may be adjusted by dampers. The air supply ducts may be arranged as described in Eng. Pat. 23,459 of 1910 (this J., 1911, 674). —A. T. L.

Coke ovens ; Horizontal ——. C. Still, Recklinghausen, Germany. Eng. Pat. 1458, Jan. 18, 1912. Under Int. Conv., Jan. 23, 1911.

The gas for combustion is admitted at the base of each heating flue, passing through two nozzles in succession. The lower nozzle is of the correct size to pass the quantity of gas required, and the upper nozzle is larger. The air for combustion is admitted above the upper nozzle. By this arrangement the lower nozzle is protected from heat and does not become obstructed by deposits of carbon. —A. T. L.

Gas scrubbers and washers ; Rotary ——. S. Chandler, London, and B. B. Waller, Stroud. Eng. Pat. 18,562, Aug. 17, 1911.

In rotary gas scrubbers of the kind in which washing devices composed of a large number of thin boards are rotated in contact with the washing liquid, the boards are spaced apart by means of nails clinched to the boards and having projecting wooden or cork heads.—H. H.

Briquettes ; Manufacture of ——. F. O. Gripp, Bremen, Germany. Eng. Pat. 22,424, Oct. 11, 1911.

See U.S. Pat. 1,016,939 of 1912 ; this J., 1912, 275.—T. F.B.

Coke-oven. T. von Bauer, Berlin. U.S. Pat. 1,026,894, May 21, 1912.

See Fr. Pat. 390,720 of 1908 ; this J., 1908, 1103.—T. F. B.

Coke-oven. T. von Bauer, Berlin. U.S. Pat. 1,028,087, May 28, 1912.

See Fr. Pat. 412,843 of 1910 ; this J., 1910, 998.—T. F. B.

Coke or similar substances ; Treatment or manufacture of ——. R. E. Allen and R. E. Gibson. Fr. Pat 438,372, Dec. 15, 1911. Under Int. Conv., Dec. 15, 1910.

See Eng. Pat. 29,189 of 1910 ; this J., 1912, 219.—T. F. B.

Coke ; Process and apparatus for making ——. J. Armstrong. Fr. Pat. 439,090, Jan. 18, 1912.

See Eng. Pat. 4427 of 1911 ; this J., 1912, 323.—T. F. B.

Gas for illuminating and like purposes and process of manufacturing thereof. G. A. Bronder, Brooklyn, N.Y., U.S.A. Eng. Pat. 10,325, April 28, 1911.

See U.S. Pat. 992,106 of 1911 ; this J., 1911, 735.—T. F. B.

Gas-generating furnace. G. Richter, Stettin, Assignor to Ofenbau-Ges. m. b. H., Munich, Germany. U.S. Pat. 1,027,154, May 21, 1912.

See Eng. Pat. 15,287 of 1911 ; this J., 1911, 1443.—T. F. B.

Gas washer. G. Aminoff. Fr. Pat. 439,196, Jan. 6, 1912.

See U.S. Pat. 1,019,003 of 1912 ; this J., 1912, 321.—T. F. B.

Distillation of coal tar, mineral oils and the like. Eng. Pat. 11,143. *See* III.

Apparatus for the distillation of ammoniacal and other liquors. Eng. Pat. 25,716. *See* VII.

Apparatus for the automatic analysis of gases. Eng. Pat. 13,691. *See* XXIII.

IIb.—DESTRUCTIVE DISTILLATION ; HEATING ; LIGHTING.

Patents.

Arc lamps ; Electrodes for ——. British Thomson Houston Co., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 6500, March 15, 1912.

An electrode for arc lamps is specified containing a mixture of lampblack, coke and a carbonised binder, together with a preponderating amount of a mixture of titanium carbide, calcium fluoride and cryolite. The ingredients are used in substantially the following proportions : titanium carbide, 28 ; calcium fluoride, 24 ; cryolite, 10 ; carbon mixture, 38 per cent. The carbon mixture is prepared by mixing together 20 parts of lampblack, 80 parts of powdered coke and 25 parts of a binder such as pitch. The mixture is baked until the binder has become carbonised and then ground for use.—J. F. B.

Coal [charcoal] ; Process of manufacturing strongly-absorbent ——. F. Richter, Frankfort, and L. von Orth, Charlottenburg, Germany. U.S. Pat. 1,027,153, May 21, 1912.

See Fr. Pat. 421,829 of 1910 ; this J., 1911, 407.—T. F. B.

Incandescent [gas] light ; Process of increasing the intensity of ——. R. P. Pictet, Assignor to Sauerstoff-Industrie Akt.-Ges., Berlin. U.S. Pat. 1,026,121, May 14, 1912.

See Eng. Pat. 20,556 of 1903 ; this J., 1904, 977.—T. F. B.

Refractory conductors and manufacture of same. W. D. Coolidge, Schenectady, Assignor to General Electric Co., New York. U.S. Pats. 1,026,343 and 1,026,429, May 14, 1912.

See Eng. Pat. 24,707 of 1907 ; this J., 1908, 849.—T. F. B.

Refractory conductors ; Binder for the manufacture of ——. W. D. Coolidge, Schenectady, Assignor to General Electric Co., New York. U.S. Pat. 1,026,344, May 14, 1912.

See Eng. Pat. 16,534 of 1908 ; this J., 1908, 1145.—T. F. B.

Filaments ; Apparatus for treating ——. W. D. Coolidge, Schenectady, Assignor to General Electric Co., New York. U.S. Pat. 1,026,345, May 14, 1912.

See Eng. Pat. 5576 of 1907 ; this J., 1907, 1272.—T. F. B.

Metal filaments. W. D. Coolidge, Schenectady, Assignor to General Electric Co., New York. U.S. Pats. 1,026,382 and 1,026,383, May 14, 1912.

See Eng. Pats. 23,336 and 23,334 of 1906 ; this J., 1908, 15.—T. F. B.

Metal filament. Tungsten purification. W. D. Coolic
Schenectady, Assignor to General Electric Co., N
York. U.S. Pats. 1,026,384 and 1,026,428, May 14, 19

See Eng. Pat. 282 of 1909 ; this J., 1910, 163.—T. F. B

Incandescent-lamp filament. C. A. Hansen, Schenecta
Assignor to General Electric Co., New York. U.S. P
1,026,392, May 14, 1912.

See Eng. Pat. 10,590 of 1908 ; this J., 1909, 302.—T. F.

[Metal] filaments ; Method of treating ——. H. I. Wo
Schenectady, Assignor to General Electric Co., N
York. U.S. Pat. 1,027,165, May 21, 1912.

See Eng. Pat. 24,707 of 1907 ; this J., 1908, 849.—T. F.

III.—TAR AND TAR PRODUCTS.

Alkyl-o-toluidines with phosgene ; Condensation of —
B. Rassow and O. Reuter. J. prakt. Chem., 1912,
489—497.

When dimethyl-o-toluidine and phosgene are heat
together with aluminium chloride to 160° C., dimethyl
o-tolylurea is produced. Attempts to transform t
into dimethyldiaminodi-o-tolylmethaneimine were
successful. Ethyl-o-toluidine in a similar way furnis
diethyldi-o-tolylurea.—J. C. C.

New reaction for organic bases. Charitschkoff. *See* X

Separation and determination of pyridine and ammon
Bayer. *See* XXIII.

Patents.

Distillation of coal tar, mineral oils, and the like ; Pl
for the continuous ——. H. P. Hird, Norwood Gree
near Halifax. Eng. Pat. 11,143, May 9, 1911.

The plant consists of a series of flat-bottomed, horizont
stills, provided with vertical baffle plates, and connect
in series ; two or more of these stills are provided at
near the bottom with a series of tubes, through which h
combustion gases are conducted, the further ends
these tubes terminating in a common flue. The last st
preferably has a series of steam pipes at or near the botto
The vapour outlets from each still lead to separate co
densers, and thence to separate collecting chambe
The casings of these condensers, which may have dom
shaped tops, are connected in series, so that the tar
oil may be passed successively through them before bei
supplied to the stills : the vapours generated in t
condenser casings are taken to a separate condenser. T
pipe leading from the last condenser to the first st
passes through the flue mentioned above, and is connect
with a by-pass pipe, entirely within the flue, throu
which the tar or oil may be run if it be desired to heat
further before entering the stills.—T. F. B.

Amino-anthraquinones ; Manufacture of ——. J.
Johnson, London. From Badische Anilin und So
Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pa
21,710, Oct. 2, 1911.

The conversion of anthraquinonesulphonic acids into t
corresponding aminoanthraquinones by heating wi
ammonia or an amino compound, may be made to procee
more smoothly, and with less formation of by-products,
an oxidising agent, which does not attack the amino com
pounds, be added to the reaction mixture. Mangane
peroxide, cupric and cuprous oxides, bichromates, arsen
oxide, and silver oxide are mentioned as suitable agen
for this purpose. *Example :* Four parts of the sodiu
salt of anthraquinone-2·6-disulphonic acid, 250 parts
25 per cent. ammonia solution, and 78 parts of copp
sulphate are heated in an autoclave for 24 hours at 200° C.
the 2·6-diamino-anthraquinone may be freed from copp
by recrystallisation or by extraction with dilute nitr

acid. The process is especially suitable for producing α-amino-anthraquinones in which the amino group contains an alkyl or aryl substituent, and unsubstituted β-amino-anthraquinones.—T. F. B.

o-Amino-anthraquinonecarboxylic acids ; Process for making ——. Act.-Ges. f. Anilinfabr. Fr. Pat. 438,621, Jan. 3, 1912. Under Int. Conv., Jan. 4, 1911.

o-Aminoanthraquinonecarboxylic acids are obtained by heating *o*-aminocarboxybenzoyl-*o*-benzoic acids with condensing agents, such as concentrated or fuming sulphuric acid or chlorosulphonic acid. Thus, when 1 kilo. of *o*-amino-terephthaloyl-*o*-benzoic acid is heated with 10 parts of fuming sulphuric acid (containing about 10 per cent. of anhydride) to 180° C. for about 15 minutes and the product poured on ice, a crystalline mass is formed, which consists of about 70 per cent. of 3-amino-anthraquinone-2-carboxylic acid and about 30 per cent. of 1-aminoanthraquinone-2-carboxylic acid ; the acids may be separated by taking advantage of the fact that the sodium salt of 3-aminoanthraquinone-2-carboxylic acid is almost insoluble in excess of alkali, whilst the isomeride is soluble. The new 1-aminoanthraquinone-2-carboxylic acid forms red needles, of m. pt. about 280° C. ; it is insoluble in water, but forms a readily soluble sodium salt. Its diazo derivatives readily combine with phenols, naphthols, etc., to form azo dyestuffs. The *o*-amino-terephthaloyl-*o*-benzoic acid, for use in the above process, may be prepared by nitrating *p*-tolyl-*o*-benzoic acid, oxidising the methyl group of the nitro compound (*e.g.*, by means of permanganate), and finally reducing the nitroterephthaloyl-*o*-benzoic acid ; the resulting product forms yellow crystals, of m. pt. about 265° C., almost insoluble in water, and readily soluble in alcohol, benzene, and other organic solvents.—T. F. B.

Sulphonic acids of the naphthalene series ; Process for making ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 438,737, Jan. 6, 1912. Under Int. Conv., Feb. 2 and June 7, 1911.

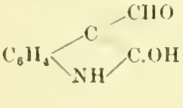
Sulphonic groups of di- or polysulphonic acids of naphthalene may be replaced by hydrogen by electrolysis ; to obtain sufficient tension it is advisable to use a cathode of mercury, zinc, or an amalgam. *Example :* 250 parts of 1-naphthylamine-3·8-disulphonic acid and 75 parts of caustic soda are dissolved in 2000 parts of water, and electrolysed in the cathode compartment of a cell, the anode compartment of which contains an iron electrode in a 25 per cent. solution of caustic soda. A current density of 3 amps. per 100 sq. cm. is sufficient to convert the disulphonic acid into 1-naphthylamine-3-sulphonic acid. Other naphthylamine- and naphtholsulphonic acids may be similarly treated (compare following abstract).
—T. F. B.

Sulphonic acids ; Process for eliminating sulphonic groups from organic ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 439,010, Jan. 15, 1912. Under Int. Conv., Feb. 2, 1911.

A sulphonic group of an organic di- or polysulphonic acid may be replaced by hydrogen by treatment with an amalgam of an alkali or alkaline-earth metal ; the amalgam is produced by electrolysis of a suitable solution over mercury in a vessel which communicates with the vessel containing the solution of the sulphonic acid, only by means of the layer of mercury, which is kept in circulation during the process. For example, a solution of 250 parts of 1-naphthylamine-3·8-disulphonic acid in 2000 parts of water is poured into a vessel containing from one to two cm. of mercury ; an open cylinder dips beneath the surface of the mercury and is filled with 25 per cent. caustic soda solution, which is electrolysed by means of a current of 10—20 ampères per 100 sq. cm., the mercury being stirred in the outer compartment during the process to bring the amalgam in contact with the sulphonic acid solution. The process is stopped when this solution contains sulphite corresponding to 88 per cent. or more of the quantity calculated for the elimination of one sulpho-group. The solution is now acidified, the sulphur dioxide removed by boiling, and the 1-naphthylamine-3-sulphonic acid separated by cooling.
—T. F. B.

Aromatic aldehydes containing at least one hydroxy-group adjacent to the aldehyde group ; Process for preparing ——. Kalle und Co. Ger. Pat. 246,338, June 10, 1910. Addition to Ger. Pat. 209,910, Jan. 9, 1908.

The products obtained by condensing 3-oxy-(1)-thionaphthene or its derivatives with *o*-diketones such as isatin, are decomposed by means of alkalis with the formation of thiosalicylic acid and an aldehyde containing a hydroxyl group in the adjacent position to the aldehyde group. Thus, the aldehyde obtained from Thioindigo Scarlet is oxindole-aldehyde,



—T. F. B.

Chloraralkyl-sulphochlorides and process of making them. O. Schmidt, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,027,908, May 28, 1912.

See Ger. Pat. 234,913 of 1910 ; this J., 1911, 946.—T. F. B.

Solid or elastic masses [from naphthalene residues] ; Process for making ——. K. Scherrer. Fr. Pat. 438,743, Jan. 8, 1912. Under Int. Conv., Jan. 9, 1911.

See Eng. Pat. 636 of 1912 ; this J., 1912, 426.—T. F. B.

Preparing aqueous solutions of phenols or their substitution products. Ger. Pat. 246,043. *See* XIXb.

IV.—COLOURING MATTERS AND DYES.

Aniline-black and allied compounds. Part II. A. G. Green and A. E. Woodhead. Chem. Soc. Proc., 1912, **28**, 136.

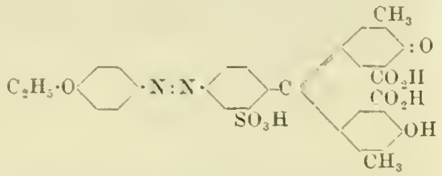
Willstätter and Cramer (this J., 1911, 1006) have advanced the view that the product of reduction of Emeraldine or Nigraniline with titanium trichloride or phenylhydrazine in the cold is not as the authors have stated, Leuco-emeraldine, $C_6H_5{\cdot}NH{\cdot}[C_6H_4{\cdot}NH]_4{\cdot}C_6H_4{\cdot}NH_2$, but the mono-quinonoid compound,

$$C_6H_5{\cdot}NH{\cdot}[C_6H_4{\cdot}NH]_4{:}C_6H_4{:}NH.$$

Such a view is improbable in face of the fact that the base is practically colourless, but in order to remove all doubt the compound has been subjected to the action of boiling titanium trichloride in an atmosphere of carbon dioxide. The compound remained unaltered, and only a slight change in the titre of the titanium trichloride (due to air oxidation) occurred. It must therefore be concluded that the base is actually the leuco-compound, and does not contain a quinonoid group. The true mono-quinonoid compound (proto-emeraldine) was prepared by reduction of Emeraldine with sulphurous acid. It is a violet base forming yellowish-green salts, and dissolves in 80 per cent. acetic acid with a grass-green colour. These observations confirm the previous conclusions of the authors as to the number of quinonoid groups in the primary oxidation products of aniline. The "Aniline Blacks" of Willstätter and Dorogi are mixtures of these primary products with polymerised derivatives, due to the action of the mineral acid used in purification, and cannot be regarded as identical with the true Aniline Black formed on the fibre.

Azo-dyestuffs of the triphenylmethane group. A. G. Green and R. N. Sen. Chem. Soc. Proc., 1912, **28**, 137.

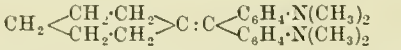
With the object of ascertaining the effect on the colour exerted by two chromohpors, the azo-group and the carbinol group, present in the para-position with respect to each other, the authors have prepared a series of azotriphenylmethane and azotriphenylcarbinol dyestuffs by condensing azoaldehydes, such as phenetoleazobenzaldehydesulphonic acid, $C_2H_5O{\cdot}C_6H_4{\cdot}N_2{\cdot}C_6H_3(SO_3H){\cdot}CHO$, with 2-hydroxytoluic and salicylic acids. The condensation occurs readily in cold concentrated sulphuric acid solution, giving azotriphenylmethane derivatives, which by reason of the presence of the azo-group are yellow dyestuffs. On oxidation with nitrosyl sulphate they are converted into azotriphenylcarbinols, as, for example, the compound



The latter are well defined polygenetic dyestuffs, dyeing wool directly in red shades, and producing various colours with different metallic mordants. The chromium lakes, which are black, can also be produced on wool fibre by dyeing with the azotriphenylmethane dyestuffs, and then boiling the wool with an acidified solution of sodium bichromate, when both oxidation and combination with chromium occur together, and the colour changes from yellow through maroon to black. The conclusion is drawn that the colour of these dyestuffs is an additive effect produced by the two chromophors acting separately.

Malachite Green; Hexahydro-derivative of ——: an example of two different leuco-bases giving the same colouring matter. P. Lemoult. Comptes rend., 1912, **154**, 1354—1356.

The hexahydro-derivative of Malachite Green, in which one phenyl group is replaced by the *cyclo*-hexyl group, has been previously obtained, and it is also formed by reducing the compound



$$CH_2{<}{\begin{matrix}CH_2{\cdot}CH_2\\CH_2{\cdot}CH_2\end{matrix}}{>}C{:}C{<}{\begin{matrix}C_6H_4{\cdot}N(CH_3)_2\\C_6H_4{\cdot}N(CH_3)_2\end{matrix}}$$

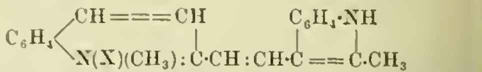
with hydriodic acid and red phosphorus. When oxidised with chloranil it furnishes Malachite Green, which is thus shown to be formed by the oxidation of either of two leuco-bases.—J. C. C.

Auramine and Crystal Violet; Some homologues of ——. B. Rassow and O. Reuter. J. prakt. Chem., 1912, **85**, 497—513.

When Auramine G is treated with methyl sulphate and magnesium oxide, trimethyldiaminodi-o-tolyliminomethane, $CH_3{\cdot}NH{\cdot}C_6H_3(CH_3){\cdot}C(NH_2){:}C_6H_3(CH_3){:}NH_2CH_3X$, is produced. This dyestuff, to which the name Auramine GG is given, has a greener shade than Auramine G. The tetramethyl compound was prepared by methylating dimethyldiaminoditolylmethane (obtained from Auramine G by the action of boiling dilute acid) in a similar manner, and converting the ketone by means of ammonium chloride and zinc chloride into the dyestuff, which the authors call Auramine GGG. This is also greener than Auramine G, but has only feeble dyeing properties. An isomeride of Crystal Violet, tetramethyltriaminophenyldi-o-tolylcarbinol hydrochloride, is obtained from dimethyldiaminodi-o-tolylketone by condensing it with dimethylaniline in the presence of phosphorus trichloride. The corresponding pentamethyl derivative is similarly prepared from trimethyldiaminodi-o-tolylketone (obtained from Auramine GG by the action of dilute acids) and the hexamethyl derivative is produced from Michler's ketone and dimethylaniline, the condensation being effected by means of phosphoryl chloride. The tetramethyl compound dyes in redder shades than Crystal Violet, the pentamethyl compound has a blue shade, and the hexamethyl compound a pure blue shade. The last two, however, have less affinity for the fibre than the former or Crystal Violet.
—J. C. C.

Quinoline-iodole dyestuffs. W. König. J. prakt. Chem., 1912, **85**, 514—522.

When β-aldehydo-α-methylindole is boiled with quinaldine methiodide in the presence of a little pyridine, condensation takes place with the formation of a dyestuff of the constitution,



where X, in this case, represents iodine. The chloride was prepared from quinaldine methylperchlorate and the resulting perchlorate converted into the chloride. It dyes tannin-mordanted cotton in orange red shades. An analogous dyestuff is obtained by condensing the above aldehyde with lepidine methiodide. This dyes tannin-mordanted cotton in bluish red shades.—J. C. C.

Santalin; Researches on ——. Part I. Santalin and its derivatives. J. C. Cain and J. L. Simonsen. Chem. Soc. Proc., 1912, **28**, 139—140.

The authors have examined the saplings of *Pterocarpus santalinus* (red sanderswood), and have investigated the colouring matter, santalin, contained in the wood of the tree. The colourless saplings contain free sugar and a *glucoside*, which on hydrolysis decomposes into a *phlobaphen* and dextrose. Santalin, whether obtained from the wood as grown in India, from the rasped wood imported into England, or from the commercial dyestuff, has the formula, $C_{15}H_{14}O_5$ and melts at 226° C. It forms *diacetyl*, *nitrodiacetyl*, and *dibenzoyl* derivatives, and the *nitro-* and *benzeneazo*-derivatives have been prepared, as well as the *oxime* and *dimethyl ether* and its *nitro*-derivative. Oxidation of the dimethyl ether furnishes veratric and anisic acids, and the nitrodimethyl ether when oxidised yields anisic acid and probably a nitroveratric acid.

Nitro-products of the higher fractions of Galician petroleum. Freund. *See* IIa.

Hydron Blue. U.S. Customs decision. Oil, Paint, and Drug Rep., May 27, 1912. [T.R.]

Hydron Blue, a dye prepared by condensing carbazole or ethylcarbazole with nitrosophenol and treating the indophenol with sulphur and sodium sulphide has been decided by the Board of Appraisers to be dutiable as a "coal-tar dye" under paragraph 15, tariff act of 1909, and not free of duty as "dyes derived from anthracin" under paragraph 487 of said act.

Patents.

Trisazo dyes and new intermediate products for use therein; Production of new ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 11,427, May 11, 1911.

Aminodiaryl-2-amino-5-naphthol-7-sulphonic acids are obtained by the action of benzidine, tolidine, etc., and of their derivatives on 2:5:7-aminonaphtholsulphonic acid or 2:5:7-dihydroxynaphthalenesulphonic acid. The interaction is effected by boiling the materials with sodium bisulphite solution, with or without addition of ammonium bisulphite solution. The new compounds can be diazotised and combined with suitable components or they can be combined with diazo- or tetrazo-compounds. The dyestuff produced by the action of diazotised *m*-xylidine-o-sulphonic acid-azocresidine on monosulphobenzidyl-2-amino-5-naphthol-7-sulphonic acid dyes cotton in reddish blue shades which are fast to light, and a dyestuff of similar shade is obtained from tetrazotised benzidine-o-disulphonic acid and monosulphobenzidyl-2-amino-5-naphthol-7-sulphonic acid. A greenish blue dyestuff results from the combination of diazotised *m*-xylidine-o-sulphonic acid-azo-1-naphthylamine-7-sulphonic acid-azo-1-naphthylamine-7-sulphonic acid and monosulphotolidyl-2-amino-5-naphthol-7-sulphonic acid.
—J. C. C.

yrazolone derivatives of the benzene series containing free hydroxyl groups; Production of new ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 23,197, Oct. 20, 1911.

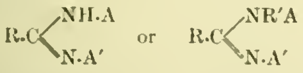
he pyrazolones are obtained by converting o-amino-henol or its derivatives into hydrazines and condensing hem with ketonic compounds such as acetoacetic ester, xalacetic ester or dioxytartaric acid. Example 1: amino 1 hydroxybenzene 4 sulphonic acid is diazotised nd the diazo-compound reduced to the hydrazine with tannous chloride and hydrochloric acid. The product is warmed to 60° C. with acetoacetic ester, when 1-2'-ydroxy-5'-sulphophenyl-3-methyl-5-pyrazolone is produced. Example 2: 1-3':5'-dichloro-2'-hydroxyphenyl-methyl-5-pyrazolone is similarly prepared from 4:6-ichloro-2-amino-1-hydroxybenzene. Example 3: The hazo compound of 4-chloro-2-amino-1-hydroxybenzene-6-ulphonic acid is reduced to the hydrazine with sodium isulphite and the product condensed with acetoacetic ster to 1-5'-chloro-2'-hydroxy-3'-sulphophenyl-3-methyl-pyrazolone. Example 4: The hydrazine described in he foregoing example is condensed with oxalacetic ester o 1-5'-chloro-3'-sulpho-2'-hydroxyphenyl-5-pyrazolone-3-arboxylic acid. Example 5: The preceding hydrazine-ulphonic acid is condensed with dioxytartaric acid. The product is a dyestuff which dyes wool from an acid bath in orange shades.—J. C. C.

Triphenylmethane dye: Green ——. *Yellow-green triphenylmethane dye. Triphenylmethane dye.* A. Hausdörfer, Elberfeld, and C. Heidenreich, Leverkusen Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,021,364, 1,021,365, and 1,021,366, March 26, 1912.

(1) 2·6-DICHLORO-5-AMINOBENZALDEHYDE is combined with two mols. of o-cresotinic acid to form a leuco compound, which is diazotised and combined with 1-phenyl-3-methyl-5-pyrazolone, and the product oxidised to form the triphenylmethane dye: this dyes wool from acid baths brown shades converted into green fast to fulling, potting, and light on treatment with bichromate. (2) The dyestuff is obtained from 2-chloro-4·6-dibromo-5-aminobenzaldehyde, o-cresotinic acid, and 1-phenyl-3-methyl-5-pyrazolone as described above. It dyes wool fast yellowish-green shades after chroming. (3) A dyestuff which dyes wool similar shades to that described in the first patent, is obtained from 2·6-dichloro-5-aminobenzaldehyde, o-cresotinic acid, and 1-sulphophenyl-3-methyl-5-pyrazolone.—T. F. B.

Condensation products [vat dyestuffs] of the anthraquinone series and process for making them. Badische Anilin und Soda Fabrik. Fr. Pat. 438,606, Jan. 2, 1912. Under Int. Conv., June 2 and Aug. 1, 1911.

THE amidines derived from β aminoanthraquinone, having the general formula,



$$R{\cdot}C{<}^{NH{\cdot}A}_{N{\cdot}A'} \quad \text{or} \quad R{\cdot}C{<}^{NR'A}_{N{\cdot}A'}$$

where R is hydrogen, alkyl, or aryl, R' an alkyl or aryl (including anthraquinonyl), and A and A' the same or different anthraquinonyl radicals, may be obtained by condensing β-aminoanthraquinone or its derivatives, preferably in presence of copper or its compounds or similar substances, with carbon tetrachloride and naphthalene, diphenyl, or similar compounds capable of combining with carbon chlorides with loss of hydrochloric acid. The product obtained by heating 10 kilos. of β-aminoanthraquinone, 50 kilos. of naphthalene, 10 kilos. of carbon tetrachloride, and 0·5 kilo. of copper to 140°—150° C., has a m. pt. of 298°—302° C., and corresponds with the formula, $C_{14}H_7O_2{\cdot}NH{\cdot}C(C_{10}H_8):N{\cdot}C_{10}H_7O_2$: when reduced by hydrosulphites it forms a vat in which cotton or wool is dyed pure yellow shades. Five other examples are given in the specification, the product in each case dyeing yellow shades.—T. F. B.

Vat dyestuffs of the anthracene series. Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 11,700, May 15, 1911.

SEE Fr. Pat. 428,996 of 1911; this J., 1911, 1205.—T. F. B.

Azo dye. Brown azo dye. M. Kahn and A. Ossenbeck, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,025,983 and 1,025,984, May 14, 1912.

SEE Eng. Pat. 2797 of 1911; this J., 1911, 1371.—T. F. B.

Azo dye. M. Kahn and A. Ossenbeck, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,027,132, May 21, 1912.

SEE Eng. Pat. 11,085 of 1911; this J., 1912, 119.—T. F. B.

Azo dye; Red ——. A. Ossenbeck, Elberfeld, and A. Zart, Vohwinkel, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,027,148, May 21, 1912.

SEE Eng. Pat. 316 of 1911; this J., 1912, 119.—T. F. B.

[Azo] dyestuffs for wool; Process for the production of mordant ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 438,211, Dec. 23, 1911. Under Int. Conv., May 2, 1911.

SEE Eng. Pat. 11,085 of 1911; this J., 1912, 119.—T. F. B.

Dye of the triphenylmethane series. A. Hausdörfer, Elberfeld, and C. Heidenreich, Leverkusen, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,026,089, May 14, 1912.

SEE Fr. Pat. 424,723 of 1911; this J., 1911, 738.—T. F. B.

Pyrazolone derivatives [dyestuffs]; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 438,624, Jan. 3, 1912. Under Int. Conv., Jan. 28, 1911.

SEE Eng. Pat. 23,197 of 1911; preceding.—T. F. B.

Pyrazolone-azo dye; Manufacture of a ——. K. Elbel, Assignor to Kalle und Co., Akt.-Ges., Biebrich, Germany. U.S. Pat. 1,026,257, May 14, 1912.

SEE Fr. Pat. 434,405 of 1911; this J., 1912, 327.—T. F. B.

Azo colouring-matter; Manufacture of ——. H. Bucherer, Assignor to Kalle und Co., Akt.-Ges., Biebrich, Germany. U.S. Pat., 1,026,902, May 21, 1912.

SEE Eng. Pat. 9744 of 1910; this J., 1910, 1297.—T. F. B.

Ortho-oxy-azo dyestuffs; Manufacture of fast ——. K. Elbel, Assignor to Kalle und Co., Akt.-Ges., Biebrich, Germany. U.S. Pat. 1,028,006, May 28, 1912.

SEE Fr. Pat. 434,405 of 1911; this J., 1912, 327.—T. F. B.

Anthracene compounds [dyes] and process of making same. J. H. Boner, Ludwigshafen, and O. Bally, Mannheim, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,026,557, May 14, 1912.

SEE Fr. Pat. 384,471 of 1907; this J., 1908, 442.—T. F. B

Anthracene dyes and process of making same. M. H. Isler, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,026,588, May 14, 1912.

SEE Fr. Pat. 416,734 of 1910; this J., 1910, 1369.—T. F. B.

Halogenated vat [anthracene] dyes and process of making same. O. Bally, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,026,621, May 14, 1912.

SEE Addition of April 2, 1910, to Fr. Pat. 408,787 of 1909; this J., 1910, 1197.—T. F. B.

Indigo colouring-matters ; Producing ——. W. Gaus. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,027,836, May 28, 1912.

See Eng. Pat. 23,873 of 1909 ; this J., 1910, 938.—T.F.B.

Gallocyanine compounds and process of making them. H. Mansfeld. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,028,045, May 28, 1912.

See Fr. Pat. 422,720 of 1910 ; this J., 1911, 612.—T. F. B.

Sulphurised colouring matters ; Process of manufacturing black ——. O. Reinhardt and J. Hoerlin. Assignors to Chem. Fabr. vorm. Weiler-ter Meer, Uerdingen on Rhine, Germany. U.S. Pat. 1,026,881, May 21, 1912.

See Fr. Pat. 372,104 of 1906 ; this J., 1907, 404. T. F. B.

Alkali salts of indoxyl ; Isalated —— *and process of making same.* A. Schmidt, Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,027,441, May 28, 1912.

See Fr. Pat. 420,947 of 1910 ; this J., 1911, 412.—T. F. B.

V.—FIBRES ; TEXTILES ; CELLULOSE ; PAPER.

Mechanical wood pulp ; Investigations on the steaming and boiling processes for preparing brown ——. F. A. Zacharias. Papierfabrikant, 1912, **10**, 65—70, 98—99, 132—135, 168—170, 195—198, 222—226, 253—257, 274—277, 301—303, 333—337, 362—365, 391—394, 423—426, 452—455, 502—504.

The author has carried out a comparative study of the two processes for preparing brown mechanical pulp from spruce wood, *viz.*, the ordinary steaming process and the boiling process (Ger. Pat. 117,380 of 1900), according to which the wood is alternately steamed and boiled with water under pressure. The loss of strength of the logs in the steaming process is only one-third of the loss in the boiling process. In steaming, the wood shrinks, in boiling it swells. These differences are due to the fact that in the steaming process the wood loses water of imbibition, whereas in the boiling process much water is absorbed. In steaming, dense wood loses less water than spongy wood and requires less power for grinding. In boiling, spongy wood absorbs more water than dense wood and requires less power for grinding. The saving of power in grinding boiled wood as compared with steamed wood amounts to 25—30 per cent. The removal of extractive matters from the wood amounts to 3—4 per cent. in the boiling process, as against only 0·1—0·2 per cent. in the steaming process. In steaming, the soluble matters and salts are driven towards the interior of the logs. In both processes the walls of the fibres become impregnated with the resins, waxes, and fats of the wood, whereby their hygroscopicity is diminished. Formic and acetic acids are produced in both processes to an equal extent, depending on the duration of the treatment. In the boiling process the quantity of tannin in the liquors is insufficient for their commercial utilisation ; the liquors from the steaming process are practically devoid of tannin. Differences in the percentage of cellulose in the products of the two processes are too small to be detected by the available methods of cellulose estimation. Boiled wood is coloured blue by the zinc chloride-iodine reagent, indicating probably a hydration of the cellulose. Microscopically the connections between the tracheids were observed to be loosened by both processes, especially in the summer wood and in the product of the boiling process. In steamed wood the tracheids of the spring wood had suffered direct injury and distortion by the compression. Boards made from the product of the boiling process show a higher tensile strength and a smaller loss of strength after folding than boards made from steamed wood ; the strength in the thickness (cohesion of component layers), the stiffness and the modulus of elasticity are also superior in the boiled wood boards. The apparent specific gravity of these brown pulp boards fluctuates in the neighbourhood of 1·2, without appreciable variations as to the different products. The percentage of ash in the boiled wood boards is lower than that in the steamed wood boards, the ash constituents of the steamed wood are not removed in the process of manufacturing into boards.—J. F. B.

Adansonia digitata [for paper-making] : The fibre of —— J. S. Remington, D. A. Bowack, T. P. Heald and A. Davis. Aynsome Annual, 1911, **3**, 62—75. From Worlds Paper Trade Rev., 1911.

The authors have conducted paper-making trials on a small scale with the separated bast of the *Adansania digitata* or Baobab tree. The commercial bast consists of strips of yellowish-red interlaced fibrous tissue, clean and well prepared, free from adherent woody matter and varying in length from 3 to 6 feet. An analysis showed 56·96 per cent. of cellulose, the length of the ultimate fibres ranging from 2·6 to 5·1 mm. ; average 3·6 mm. ; the ash amounted to 6·92 per cent. The material is only very slightly lignified but is rich in pectic matters. The ultimate fibres are smooth, tapered and rather thin-walled, like those of Manila hemp, but broaden out towards the middle in a characteristic manner, sometimes becoming flattened and twisted. The cellulose is separated by a fairly mild treatment, a proportion of 5 per cent. of sodium hydroxide being sufficient, provided a pressure of 5—7 atmospheres be employed. Using 7 per cent. of caustic soda, the material yielded 47·5 per cent. of pulp, which was readily bleached with an expenditure of 14 per cent. of bleaching powder, giving a final yield of 42 per cent. of bleached pulp. An experimental digestion by the bisulphite process yielded 44 per cent. of bleached cellulose. The paper-making trials showed that the Adansonia fibre is a very valuable material. It is characterised by the property of readily working "wet"; it blends well with sulphite wood pulp, imparting strength, rattle and length of pull ; it should prove to be an excellent raw material for tissue papers. The price of the raw bast is still somewhat high, but if the sources of supply were more fully developed, it should be brought within practicable limits. The authors suggest that possibly the entire tree might be utilised for pulp manufacture on a commercial scale.—J. F. B.

Paper pulp from American saw grass. J. S. Remington, D. A. Bowack and P. W. Davidson. Aynsome Annual, 1911, **3**, 5—11. From World's Paper Trade Rev., 1911.

In the southern United States, various species of *Cladium*, notably *C. Mariscus*, are known by the name of "Saw Grass," growing as a rush to the height of several feet. The authors have prepared paper pulp from this material by boiling it for 6—8 hours with 8—12·5 per cent. of caustic soda under a pressure of 2—7 atmospheres. According to the severity of the conditions adopted for digestion, the material yields on an average 35—40 per cent. of unbleached pulp. The average length of fibre is 3·6 mm., but in consequence of the presence of woody knots in the raw grass there is considerable difficulty in obtaining a half-stuff free from specks. The results of bleaching experiments were not encouraging ; in spite of the expenditure of a considerable proportion of bleach solution the degree of whiteness obtained was not high. The fibre does not show much power of resistance under mechanical treatment in the beating engine, but it is capable of blending well with stronger materials. The unbleached pulp makes a comparatively strong brown wrapping paper, but is inferior in quality to the pulp obtained from the salt-marsh rush (see this J., 1909, 540).—J. F. B.

Paper-making half-stuffs ; Testing the strength qualities of ——. G. Dalén. Mitt. K. Materialprüfungsamt, 1911, Ergänzungsheft, II, 12—22.

The author describes a new method of preparing sheets on the hand-mould from half-stuffs which have not been aten sufficiently fine to yield uniform papers in the dinary way. The mould is immersed in the dilute alf stuff in a horizontal position and the fibres are llowed to flow over it from all sides at once. The mould then shaken, in order to felt the fibres before it is comletely withdrawn from the liquid, instead of after, as sual. Sheets of paper prepared in this manner are ufficiently well made to afford reliable mechanical tests r the comparison of the actual strength qualities of ifferent half-stuffs. But the latent strength qualities re only developed during beating, and for this purpose e experimental beater must be set to work under onstant conditions as regards adjustment of roll and ower consumption over the duration of each comparative eries of trials; sheets of paper must be made at stated ntervals over a prolonged period of treatment. The eneral effect of the continued beating of half-stuffs is to ncrease the tensile strength, stretch and resistance to lding though not all in the same degree, up to a maximum oint, after which the stuff becomes "dead" and these ualities decrease. The study of the course of this evelopment of strength-qualities during beating affords new and valuable measure of the chemical condition of he half-stuffs. Chemically normal fibres show a steady ncrease in the strength-qualities of the papers during the hole period of beating, until the stuff can no longer be rmed into sheets. Chemically modified fibres, on the ther hand, develop their maximum strength rapidly at comparatively early stage, and on further treatment, hese qualities either remain stationary or decrease, never eaching the high maxima of the normal fibres of the same pecies. The resistance to folding is a particularly ensitive indicator of chemical deficiency, and falls off ery considerably during the prolonged beating of modified ibres. Examples are given showing this difference etween normal fibres and severely boiled and over-bleached ibres, in the case both of linen and sulphite wood pulp. ot drying of the half-stuff likewise has an injurious nfluence on the development of the strength-qualities. —J. F. B.

Paper; Kollmann's method for testing the hardness of sizing of ——. W. Herzberg. Mitt. K. Materialprüfungsamt, 1911, Ergänzungsheft 11, 23—29.

There has been some controversy as to the validity of Kollmann's method for testing the hardness of sizing of paper (this J., 1906, 905; 1910, 208), according to which a drop of 1 per cent. sodium hydroxide solution is placed on one side of the paper and a drop of phenolphthalein on the other. The author has examined over 200 samples, using Kollmann's method and his own method comparatively, the latter consisting in ruling lines of increasing width on the paper with a drawing pen, held at a constant angle and containing a definite supply of ink. In Kollmann's method the paper must resist for at least 20 seconds, before the two drops penetrate and react. In the author's method, no spreading at the edges of the lines must take place, and lines of 0·75 mm. or less width must dry without penetrating to the other side of the paper. The results of the entire series of tests showed that by the author's method, 93 per cent. of the samples stood the test, whereas by Kollmann's method only 56 per cent. would pass as properly sized. In the author's method the thickness of the lines is increased until one is found to strike through; the concordance between the results of two independent operators as to the critical point was 75—80 per cent., but in no case did the differences of opinion exceed 0·25 mm. The author concludes that Kollmann's method, using an alkaline penetrating liquid is quite unreliable for estimating the degree of resistance of paper towards inks. A reliable test can only be based on the use of ink itself as the penetrating liquid. However, since inks differ in composition and penetrating power, care must be exercised in selecting the ink, which should be of well recognised manufacture, produced under scientific supervision in large quantities. Small bottles should be procured, so that the decomposition which unavoidably occurs after the bottle has been opened, may exert as little influence as possible. Using four different inks of German manufacture, no appreciable differences in the results could be detected.—J. F. B.

Calcium sulphite lye [for sulphite cellulose manufacture], Preparation of, and the detection and separation of the different sulphur compounds in ——. Von Possanner and R. Dittrich. Wochenbl. Papierfabr., 1912, 43, 2042—2047.

After describing the methods of detecting sulphides and thionates in the solution, the following method is given for the determination of sulphites, sulphates, and thiosulphates. A portion of the solution is heated with hydrochloric acid in a current of carbon dioxide until sulphur dioxide is no longer evolved, the solution is filtered from the separated sulphur, and in the filtrate the sulphate is determined by precipitation with barium chloride. Another portion of the solution is treated with mercuric chloride, which decomposes the thiosulphate with formation of sulphate and mercuric sulphide, so that on subsequently heating with hydrochloric acid, sulphur dioxide is evolved only from the sulphites present. From the difference between the amount of iodine corresponding with the sulphites and the amount consumed in a titration of the original solution (sulphites plus thiosulphate), the quantity of thiosulphate can be calculated. In another portion of the original solution the total sulphur is determined by oxidation with bromine, bleaching powder, or ammoniacal hydrogen peroxide (not with fuming nitric acid), and precipitation with barium chloride. The proportion of sulphite present as bisulphite is determined in the usual way. Some experiments on the preparation of calcium bisulphite solution by passing air containing 6—8 per cent. by vol. of sulphur dioxide (obtained by burning sulphur at 380°—400° C. in a current of air) through milk of lime, showed that some sulphate and thiosulphate are always formed. The content of sulphites diminishes very rapidly when air is blown through the solution, and the content of sulphate increases, but less rapidly. On prolonged standing, calcium monosulphite and sulphate separate from the solution and sulphur dioxide is liberated. Calcium monosulphite and sulphate also separate when the sulphurous gases are passed into the solution beyond the saturation point.—A. S.

Patents.

Flax; Process of preparing ——. G. H. Campbell, London. Eng. Pat. 14,716, June 21, 1911.

Flax stalks or straw are dried, if necessary by artificial means, and passed through a breaking machine which removes the woody matter to the extent of about 45 per cent. of the original weight of the straw. The broken material is then subjected to a water-retting process either directly as it comes from the breaking machine or after it has gone through one or more of the various usual operations of scutching, hackling, spinning and weaving. The water-retting process should be mainly a bacteriological process, although small amounts of chemicals may be added to give the water an alkaline reaction or to serve as ferment-nutrients.—J. F. B.

Silk; Process of degumming ——. E. Schnurrenberger, Assignor to Weidmann Silk Dyeing Co., Paterson, N.J. U.S. Pat. 1,026,000, May 14, 1912.

The silk is placed in a closed vessel where it is sprayed or otherwise wetted with a solution of soap; it is steamed in the same vessel, whilst wetted with the soap solution, and finally washed.—J. F. B.

Acetylcellulose, Solvents for ——. W. G. Lindsay, Assignor to The Celluloid Co., New York. U.S. Pats. 1,027,486, 1,027,614, 1,027,615, 1,027,616, and 1,027,619, May 28, 1912.

Compositions are claimed consisting of acetylcellulose dissolved in (1) a mixture of acetodichlorhydrin and alcohol, with or without other solvents; (2) ethylene-chlorhydrin; (3) ethylene-acetochlorhydrin; (4) a mixture of ethyl chloride with methyl or ethyl alcohol, with or without other solvents; (5) a highly volatile solvent, such as acetone, mixed with benzyl benzoate. In the first four patents, it is mentioned that colouring matters and inert substances may also be added.—T. F. B.

Nitrocellulose; Solvents for ——. W. G. Lindsay, Assignor to The Celluloid Co., New York. U.S. Pats. 1,027,617 and 1,027,618, May 28, 1912.

The claims cover solutions of nitrocellulose in (1) ethylene-chlorhydrin; (2) ethylene-acetochlorhydrin. In each case other solvents or diluents, and also colouring matters and inert substances may be added.—T. F. B.

Cellulose acetates soluble in acetone; Preparation of ——. Chem. Fabrik von Heyden. Fr. Pat. 438,649, Jan. 4, 1912. Under Int. Conv., Jan. 5, 1911.

Acetyl derivatives of cellulose, which are soluble in acetone but insoluble in chloroform (in which respect they differ from those described in Fr. Pat. 358,079; this J., 1906, 195), are obtained by treating with 50 to 80 per cent. sulphuric acid, solutions of cellulose acetates containing 55 to 62 per cent. of combined acetic acid, such as are formed by treating cellulose with less acetic acid than is required to form the tri- or tetra-acetate. The time necessary for the treatment varies from one to six hours, according to the concentration of the acid and the composition of the acetate employed. The products contain 52 to 54 per cent. of combined acetic acid, and are suitable for use in preparing films, plastic masses, lacquers, etc. —T. F. B.

Threads, ribbons, or films from viscose; Coagulating bath for making brilliant artificial ——. Verein. Kunstseidefabriken A.-G. Fr. Pat. 438,718, Jan. 6, 1912. Under Int. Conv., Oct. 9, 1911.

Formic acid is found to be capable of coagulating viscose, with the formation of brilliant cellulose products containing very little sulphur. The acid may be used alone or in combination with salts. Its action is relatively slow, but sufficiently rapid for practical purposes. A saturated solution of common salt may be mixed with sufficient formic acid to form a coagulating bath containing 200 grms. of the acid per litre; the strength of the bath is varied according to the amount of alkali in the viscose and to the rapidity with which it is desired to act. —T. F. B.

Viscose; Process for the production of —— *and its use for covering or printing on suitable supports.* L. Lilienfeld. Fr. Pat. 439,040, Jan. 16, 1912. Under Int. Conv., Jan. 20, 1911.

Cellulose is treated with an excess of 15 to 18 per cent. caustic soda solution and the product is pressed until its weight is from 1·5 to 3 times that of the original cellulose; a similar product is obtained by mixing the cellulose with the necessary quantity of alkali solution to produce a mass containing not more than 36 parts of caustic soda to 100 parts of cellulose. The treatment of this mass with carbon bisulphide, and the other steps necessary to produce viscose, are performed in the usual manner. The alkali-cellulose may be matured by allowing it to stand for 3 to 24 hours before conversion into viscose. It is stated that the cellulose products obtained from viscose made in this way (which contain only small quantities of alkali) are tougher and more elastic than those produced from ordinary viscose. A process of applying coatings to fabrics, paper, etc., is claimed, in which viscose prepared in the above manner is employed, with or without colouring matters, filling materials, etc.—T. F. B.

Paper pulp from old paper; Method of producing ——. C. K. Hähnle, Reutlingen, Germany. U.S. Pat. 1,026,577, May 14, 1912.

Printed and written papers are cleansed by the use of alkaline liquids, which may be afterwards recovered, the process consisting in first soaking the paper in a dilute alkaline solution, then squeezing out the liquid by gentle pressure, mixing the mass with water, reducing it to fibres without pressure, and finally sprinkling the fibrous mass with water, for carrying off impurities.—J. F. B

Vegetable fibres; Treatment of —— *and apparatus therefor.* J. M. J. Debourg, Lyons, France. Eng. Pat. 11,750, May 15, 1911. Under Int. Conv., May 19, 1910.

See Fr. Pat. 427,113 of 1910; this J., 1911, 1050.—T. F. B.

Cellulose from suitable vegetable materials of all kin Process for the manufacture of ——. J. E. Pfiel, Vien Eng. Pat. 11,489, May 12, 1911. Under Int. Con June 19, 1910.

See Fr. Pat. 431,044 of 1911; this J., 1911, 1375.—T. F.

Cellulose products; Manufacture of ——. A. Chaum Fresnoy-le-Grand. Assignor to Comp. Franç. d Applications de la Cellulose, Paris. U.S. Pat. 1,027,68 May 28, 1912.

See Eng. Pat. 11,714 of 1911; this J., 1912, 428.—T. F.

Cellulose from materials containing cellulosic fibres; Man facture of ——. D. Rosenblum, L. Bleeh, and Tyborowski. Fr. Pat. 438,130, March 6, 1911.

See Eng. Pat. 5552 of 1911; this J., 1912, 329.—T. F.

Cellulose solutions; Process for producing —— *by mea of alkylenediamines.* W. Traube. Fr. Pat. 438,63 Jan. 3, 1912. Under Int. Conv., Jan. 9, 1911.

See Ger. Pat. 245,575 of 1911; this J., 1912, 532.—T. F.

Sizing compound [for paper] and the production there F. H. Kalbfleisch, Babylon, N.Y., U.S.A. Eng. Pa 10,846, May 4, 1911.

See Fr. Pat. 431,714 of 1911; this J., 1912, 123.—T. F.

Materials for finishing, sizing, filling, printing, or coatin and for making photographic films, threads, adhesive lutings, flexible, elastic, and plastic masses; Process f producing ——. L. Lilienfeld. Fr. Pat. 438,448, No 2, 1911. Under Int. Conv., Nov. 8, 1910.

See Eng. Pat. 26,928 of 1910; this J., 1912, 122.—T. F.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Arsenic in commercial sodium phosphate and its effect A. Feubel. Färber-Zeit., 1912, **23**, 235—236.

The author draws attention to the undesirability of usin sodium phosphate containing arsenic for weighting silk Sodium phosphate contaminated with arsenic appears t be present on the market in larger quantities than hitherto —P. F. C.

Dyestuffs; Change in the chemical properties of —— *afte deposition on animal fibres.* W. Suida. Chem.-Zeit., 1912, **36**, 622.

The nitranilines when deposited on wool cannot be diazotised and combined with azo dyestuff components. *p*-Aminoazobenzene, *p*-aminoazotoluene, and dehydrothio-*p*-toluidine darken in colour slightly on diazotisation, but no combination with azo dyestuff components can be effected, so that no true diazo compound is formed. If on the contrary the wool be first boiled with R-salt and then treated with nitrodiazobenzene the coupling takes place readily with the production of a red colour. It is therefore probable that the above bases are attached to the wool by means of their amino groups. Primuline, which contains a sulphoxy-group, retains all its diazotising and coupling properties on wool, which appears to suggest that in this case the amino group is free and that the sulphoxy-group is the point of attachment between the fibre and the dyestuff. Silk behaves quite differently from wool, and *p*-aminoazobenzene and *p*-aminoazotoluene can both be readily diazotised on the silk fibre.—W. H. P.

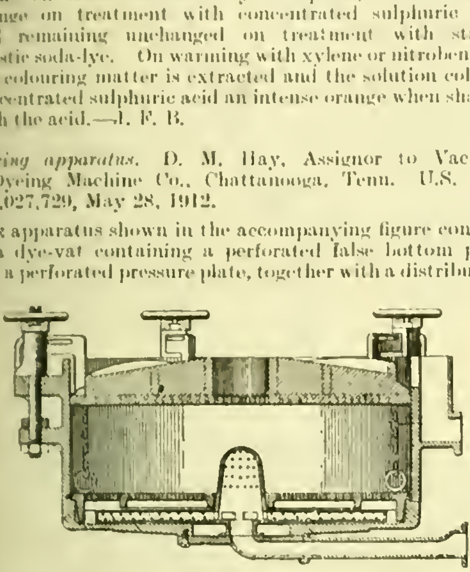
Patents.

Dyeing; Process of —— *and the product thereof.* G. Engi and J. Fröhlich, Assignors to Soc. Chem. Ind. in Basle, Basel, Switzerland. U.S. Pat. 1,026,574, May 14, 1912.

Yellow shades are produced on fibres by treating the products of the action of the halide of an aromatic acid on an indigo compound in presence of a condensing agent, with an alkali hydrosulphite, and applying the leuco-compound thus produced to the fibres, finally oxidising the dyestuff on the fibres. More particularly the product obtained by the action of benzoyl chloride on indigo is specified. The yellow fibre dyed with this type of dyestuff is claimed, characterised by changing to a Bordeaux red shade on treatment with hydrosulphite, to an intense orange on treatment with concentrated sulphuric acid and remaining unchanged on treatment with strong caustic soda-lye. On warming with xylene or nitrobenzene the colouring matter is extracted and the solution colours concentrated sulphuric acid an intense orange when shaken with the acid.—T. F. B.

Dyeing apparatus. D. M. Hay, Assignor to Vacuum Dyeing Machine Co., Chattanooga, Tenn. U.S. Pat. 1,027,729, May 28, 1912.

The apparatus shown in the accompanying figure consists of a dye-vat containing a perforated false bottom plate and a perforated pressure plate, together with a distributing head which enters the vat at the centre of the bottom, and extends above the false bottom in the form of a dome, provided with discharge apertures through which the liquor is forced into the material under treatment. The portion of the distributing head below the false bottom is provided with a number of perforated lateral branches, the outer ends of which are closed.—T. F. B.



Fabrics; Process for printing on —— and the product thereof. J., H., A., R., A., and G. Grass, London. Eng. Pat. 12,253, May 20, 1911.

The process for printing pictures, etc., on fabrics in imitation of tapestry, consists in applying mordant dyestuffs, preferably of the alizarin group, by means of shallow intaglio plates, to a previously mordanted fabric in a slightly damp condition, steaming the printed fabric, drying, and afterwards washing in cold dilute soap solution. The alizarin dyestuffs are "cut" by mixing them with zinc white and oil, thereby preventing them from spreading and reducing the vividness of the colours; the various colours are applied by hand to the portions of the plate on which they are to be reproduced. If an alumina mordant be used, the entire fabric is boiled for an hour in a solution of the mordant and dried: if an iron or chromium mordant be required, the solution is applied by hand by means of a brush, so that the mordanted portions of the fabric are in accurate register with the printing.—T. F. B.

Cotton fabrics used as back greys in calico printing; Decolourising or bleaching of worn ——. E. Bentz, Manchester. Eng. Pat. 12,283, May 22, 1911.

Cotton fabrics which have become coloured during use as "back greys" in calico printing, especially when certain vat dyestuffs have been used, such as indigo, thioindigo, Indanthrene, Algol, Helindone, and other dyestuffs, are sometimes difficult to decolourise by the ordinary treatment with lime and alkali liquors. The removal of such colouring matters is facilitated by adding to the usual alkaline liquors suitable aralkyl compounds such as monobenzyl-*p*-sulphochloride, dimethylphenylbenzylammonium hydroxide or chloride, the monocalcium or disodium salt of dimethylphenylbenzylammonium hydroxide disulphonic acid, and other analogous compounds. It is advantageous also to add a suitable reducing agent, such as sodium hydrosulphite or its formaldehyde compound, sodium formaldehyde-sulphoxylate, glucose, maltose, dextrin, and in some cases sodium sulphide. The agents may be applied under steam pressure, and anthraquinone or certain of its derivatives may be added to the lyes to facilitate their action. As an example of the quantities used, three tons of the coloured calico may be treated with lyes containing 20 lb. of dimethylphenylbenzylammonium chloride, 10 lb. of glucose syrup, and 10 lb. of 30 per cent. anthraquinone paste.—T. F. B.

Yellow or orange reserves by means of formaldehyde-hydrosulphite or sulphoxylate on dyeings with indigo or other vat dyestuffs; Process for producing ——, fast to light, and similar to Chrome Yellow or Chrome Orange. Farbwerke vorm. Meister, Lucius, und Bruning. Ger. Pat. 245,308, Aug. 9, 1910.

Yellow or orange cadmium sulphide is employed in conjunction with formaldehyde-hydrosulphite or -sulphoxylate to produce fast yellow or orange reserves on reducible vat dyeings; Chrome Yellow itself is reduced by hydrosulphite, whilst aniline dyestuffs which are not so reduced give reserves which are not fast.—T. F. B.

Bleaching apparatus. E. Herzog, Erlach, Austria-Hungary. U.S. Pat. 1,026,583, May 14, 1912.

See Eng. Pat. 9982 of 1910; this J., 1910, 1102.—T. F. B.

Bleaching straw. P. E. Wickham, London, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,027,953, May 28, 1912.

See Fr. Pat. 420,725 of 1910; this J., 1911, 354.—T. F. B.

Dyeing machines. J. Liddle, Glasgow. From The Psarski Dyeing Machine Co., Cleveland, Ohio, U.S.A. Eng. Pat. 26,584, Nov. 28, 1911.

See Fr. Pat. 436,936 of 1911; this J., 1912, 430.—T. F. B.

Drying sized threads and yarns; Apparatus for ——. A. N. Marr. Fr. Pat. 439,001, Jan. 15, 1912. Under Int. Conv., Jan. 18, 1911.

See Eng. Pat. 1303 of 1911; this J., 1912, 68.—T. F. B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

"*Blue acid*" (*in the reduction-products of nitrous sulphuric acid*). W. Manchot. Z. angew. Chem., 1912, 25, 1055—1058. (See this J., 1910, 1374.)

On cooling the "blue acid" in a mixture of solid carbon dioxide and acetone the colour changes to intense carmine-red: by alternations of temperature alternations of colour can be produced as often as desired. This forms a very delicate test for the presence of the "blue acid," for the red colour is far more intense than the blue. Endeavours to form "blue acid" without sulphuric acid (sulphur dioxide dissolved in glacial acetic acid and sodium nitrite added) were all fruitless. On the other hand, sulphurous acid is not necessary for its formation, for it is formed at very low temperatures (at which no sulphurous acid is produced) by the reaction of mercury on nitrous sulphuric acid, whilst it is not formed by passing sulphur dioxide gas through liquid nitrogen trioxide, whether water be present or not. Moreover, formic acid may be used in place of mercury, with the same result. Sulphurous acid, therefore, acts simply as a reducing agent, and is not contained in the substance. Water, too, is necessary to the production of "blue acid"—it cannot be formed from concentrated sulphuric acid—and hence is probably also present in the molecule. Again, though sulphuric acid containing nitrogen trioxide yields "blue acid" only on reduction, yet it cannot be formed from sulphuric acid and nitric oxide, so that the nitrogen oxide it contains must have a composition intermediate between these two. "Blue acid" is therefore certainly not the substance, H_2SNO_5, which Raschig asserts it to be. As to the nitric oxide compound of copper sulphate, the author points out that Raschig has shown how much copper is needed to fix a given amount of nitric oxide, but not how much nitric oxide is actually associated in the compound with a given amount of copper; he cannot be regarded, therefore, as having fixed the formula of the compound. (Compare also this J., 1912, 367.)—J. T. D.

Kelp industry; The ——. Possibilities of revival. Times Eng. Suppl., May 29, 1912.

It is contended that the manufacture of kelp products, for example on the Western Coasts of Scotland and Ireland, would prove commercially successful if undertaken on a comparatively large scale, with modern methods of evaporation and crystallisation under analytical and scientific control. The seaweed should be heated in a retort as proposed by Stanford, and ammonia and acetic acid (serving as raw material for the manufacture of acetone) recovered from the distillate. Stanford obtained 50—80 lb. of ammonium sulphate and 6—18 lb. of calcium acetate per ton of air-dried seaweed. The residual charcoal readily yields its soluble salts to hot water, and can be afterwards used as fuel. The soluble salts of kelp are as rich in potassium salts as, or richer than, many of the principal Stassfurth deposits and can be worked up in a similar manner. The iodides become concentrated in the mother liquors and can be recovered in the form of free iodine (12 lb. per ton of dry weed).—A. S.

Nitrates from the atmosphere; Manufacture of ——. E. K. Scott. J. Roy. Soc. Arts, 1912, **60**, 645—667.

An account of the progress and present position of the manufacture of nitrogen compounds from atmospheric nitrogen (see this J., 1909, 706, 882, 936, 1214). It is stated that the installations now working the Birkeland-Eyde process have a capacity of 200,000 horse-power, whilst it is estimated that another 300,000 horse-power will be at work by 1916. In connection with this process, it has been found possible to reduce the size of the absorption towers for the nitrogen peroxide to about one-half by using special earthenware packing instead of pieces of quartz. With regard to calcium cyanamide (nitrolim), the works now in operation and being built have a capacity of over 250,000 tons per annum. Reference is also made to the processes of Schönherr (this J., 1909, 706) and Pauling (this J., 1909, 882). The chief reason why the industry has no footing in the United Kingdom is the lack of cheap electrical power.—A. S.

Metasilicates; Fusion of —— with sulphides and chlorides. A. Woloskow. Annual of Peter the Great Polytech., St. Petersburg, 1911, **15** (Russian); Sprechsaal, 1912, Monatsbeilage: Arch. phys. Chem. des Glases u. keram. Massen, **1**, 19—20.

Impurities in minerals and fuels render the reactions between silicates and sulphides, and chlorides, of more than theoretical interest. Three binary systems were studied: manganese silicate (rhodonite) and sulphide, barium silicate and sulphide, and barium silicate and chloride. The influence on the melting-point is shown in the following tables:—

$MnSiO_3$—MnS

Molecular percentage composition.		Crystallisation temperature.	Eutectic temperature.
$MaSiO_3$.	MnS.		
		° C.	° C.
100	0	1216	—
96·57	3·43	1180	1125
93·15	6·85	1170	1130
87·07	12·93	1201	1130
77·88	22·12	1324	1132
69·88	30·12	1425	1134
60·17	39·83	1546	1128

$BaSiO_3$—BaS

$BaSiO_3$.	BaS.		
100	0	1464	—
90	10	1404	1320
80	20	1368	1328
75	25	1325	1325
70	30	1374	1325
60	40	1474	1328
50	50	—	1355

$BaSiO_3$—$BaCl_2$

$BaSiO_3$.	$BaCl_2$		
100	0	1464	—
90	10	1371	902
77	23	1225	904
65	35	1142	906
57	43	1104	900
50	50	1057	904
40	60	1042	904
30	70	1000	900
20	80	972	900
10	90	921	900
5	95	934	903
0	100	968	—

The barium silicate-chloride system is analogous in result to the calcium silicate-chloride and silicate-fluoride studied by Karandéeff (this J., 1910, 1249).—H. H. S.

Magnesium nitride; Preparation and heat of formation of ——. C. Matignon. Comptes rend., 1912, **154**, 1351—1353.

The heat of formation of magnesium nitride is 119·7 calories.—J. C. C.

Radium in minerals and rocks; Determination of ——. E. Ebler. Chem.-Zeit., 1912, **36**, 604.

The substance is rendered free from radium emanation by fusion (either alone or with a suitable flux) in a platinum boat, and is then allowed to remain for a definite period (2—30 days) in a closed quartz tube, from which the gaseous contents are ultimately pumped into a gasometer, the material being again fused. From the gasometer, the gases are transferred to an exhausted ionisation chamber, and the quantity of emanation is determined in the usual way, the amount of radium being found by a comparative experiment with the emanation from a known quantity of radium. Standards may be prepared from radium-barium salts, preferably the oxalates, by carrying out a relative atomic weight determination, by observing the loss of weight on ignition, using a micro-balance.—F. Sodn.

Preparation of, and the detection and separation of the different sulphur compounds in calcium sulphite lye. Von Possanner and Dittrich. *See* V.

Arsenic in commercial sodium phosphate and its effects. Feubel. *See* VI.

Separation and determination of pyridine and ammonia. Bayer. *See* XXIII.

Applications of arsenious acid in volumetric analysis. II. Volumetric determination of mercury. Litterscheid. *See* XXIII.

A study of cobaltinitrites and their application to analytical chemistry. Burgess and Kamm. *See* XXIII.

Sulphur in Sicily. Chem. Trade J., June 8, 1912. [T.R.]

The following figures are from the report of the Compulsory Sicilian Sulphur Consortium for the year ending

July 31 1911, showing variations as compared with the previous year's working:

Sulphur.	1909 10.	1910 11.
	Metric tons.	Metric tons.
Production	396,664	391,908
Exports	396,996	445,584
Stocks (July 31)	596,128	534,603
Warrants in circulation (July 31)	283,614	198,904

Of the stocks existing on July 31 1911, 11,462 metric tons were in private hands. The bulk of stocks in the warehouses of the Consorzio (523,141 metric tons) were valued at 39,288,925 lire 78 c. (£1,571,557). The improved demand for sulphur is attributed mainly to improved conditions of the wine market in wine-growing countries. There is also some increase in the use of sulphur for industrial purposes, as in the case of Sweden, where it is used in the preparation of wood pulp. Inundations in the Japanese sulphur mines are said to have temporarily diminished supplies from Japan and to be the cause of increased exports from Sicily to Australia.

Patents.

Sulphuric acid in lead chambers; Manufacture of ——. H. Rabe. Ger. Pat. 240,240, Aug. 15, 1909. Addition to Ger. Pat. 237,561, July 24, 1909.

The introduction of atomised liquid (preferably cooled sulphuric acid of lower strength than chamber acid) as mentioned in the chief patent (this J., 1911, 1159; see also this J., 1912, 71), is used for the purpose of producing or promoting the tangential motion of the gases in vertical cylindrical chambers. Gases withdrawn from the system of chambers at a suitable place may be used for atomising the liquid.—A. S.

Distillation of ammoniacal and other liquors; Apparatus for the ——. W. Wyld, Birmingham. Eng. Pat. 25,716 of 1910, date of Appl., May 3, 1911.

The apparatus is of the kind in which distillation is effected by spraying the liquor into one or more chambers through atomising jets. According to the invention, the several chambers are under different pressures or vacua. The liquor may be forced into the first chamber, and the pressure generated therein serves to spray the liquor which has not been evaporated, into the second chamber of a series and so on, the chambers having suitable vapour outlet valves to regulate the pressure. Steam may be injected into the chambers to assist the distillation. —A. T. L.

Ammonium sulphate; Manufacture of —— by oxidation of ammonium sulphite. Chemische Industrie A.-G. and F. Wolf. Ger. Pat. 245,873, July 25, 1909.

Ammonium sulphate is produced by passing moist ammonium sulphite, in a finely divided condition, through a closed vessel heated to 20°—70° C., through which a current of air is passing in the opposite direction.—A. S.

Compounds containing active oxygen, such as percarbonates, perborates, persilicates, perphosphates, peroxides, etc.; [Electrolytic] Preparation of ——. Bariumoxyd Ges. m. b. H. and E. Bürgin. Ger. Pat. 245,531, April 13, 1911.

For the preparation of per-salts or peroxides, neutral or faintly alkaline or ammoniacal solutions of the corresponding salts, or pure solutions of alkalis or alkaline-earths, are electrolysed by means of a continuous current and an alternating current, superposed one upon the other, the anode used being of such material that neither it nor its oxidation products have a destructive action on compounds containing active oxygen. The electrodes are preferably of such materials as become "passive," and the "passivity" is increased as far as possible before proceeding to the formation of the per-salts or peroxides. The "passivity" may be induced or increased by working at first with a continuous current alone.—A. S.

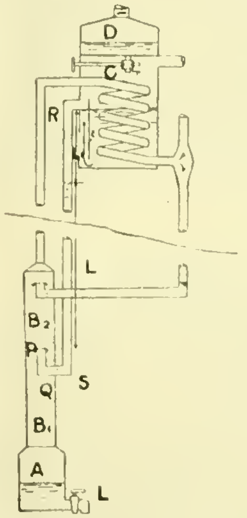
Cyanides; Process for obtaining —— from cyanamide salts by melting with fluxes in presence of carbon. P. Krüger. Ger. Pat. 246,061, Sept. 3, 1910.

A mixture of a cyanamide salt, a suitable flux, and carbon, is subjected to the action of an electric current. —A. S.

Nitrolim [crude calcium cyanamide]; Process and apparatus for the continuous manufacture of ——. G. Tofani. Ger. Pat. 246,077, July 26, 1910.

The process consists essentially in allowing more or less finely powdered calcium carbide to fall down a shaft furnace through which a current of nitrogen under pressure is passing in the opposite direction. In its passage through the furnace the carbide is heated electrically by means of flame arcs or resistance rods. The inlet pipe for the nitrogen in the lower part of the furnace is of T-shape, a portion of the nitrogen being thus directed downwards and serving to ensure complete saturation of the material depositing at the bottom of the shaft. By varying the pressure of the nitrogen, the rate at which the carbide passes through the furnace can be regulated.—A. S.

Air; Apparatus for the separation of liquid —— into its constituents by means of a rectifying column with a reflux condenser. E. Jänecke. Ger. Pat. 246,341, Nov. 12, 1910. Addition to Ger. Pat. 220,270, Feb. 13, 1908.



The claim is for providing the reflux condenser with a barometric overflow tube, through which the liquid flows continuously into the rectifying column. By means of a suction pump the pressure inside the condenser, C, is reduced to such a degree that there is a difference in pressure between the condenser and the rectifying column, B_1, B_2, correponding to a column of liquid air of the height, L. The cock, *p*, is opened to such an extent that this pressure is maintained, and liquid air flows from the reservoir, D, into the condenser, C, whence it flows under the partition, *t*, and through the barometric overflow tube, RSQP, into the rectifying column. In the latter, the liquid air is separated into its constituents in the known manner, and the separated oxygen is either run off from A, through the cock, *l*, in the liquid form, or is gasified in order to utilise its cold. —A. S.

Alumino-silicates or artificial zeolites; Process for the production of hydrated ——. W. E. Evans, London. From J. D. Riedel, Akt.-Ges., Berlin. Eng. Pat. 3871, Feb. 15, 1911.

See Fr. Pat. 425,342 of 1911; this J., 1911, 1014.—T. F. B.

Zinc compounds; Manufacture of ——. C. Ranson, London. Eng. Pat. 11,539, May 12, 1911.

See Fr. Pat. 437,889 of 1911; this J., 1912, 535.—T. F. B.

Hydrogen peroxide; Apparatus for the manufacture of ——. G. Müller, and Hydorion Washing Machinery Co., Zürich, Switzerland. Eng. Pat. 11,839, May 16, 1911.

See Fr. Pat. 432,235 of 1911; this J., 1911, 1451.—T. F. B.

Sulphur; Recovery of —— from the refining materials employed in the manufacture of gas or from other industrial residues. H. Gouthière et Cie., and P. Ducancel, Reims, France. Eng. Pat. 13,383, June 3, 1911. Under Int. Conv., June 7, 1910.

See Fr. Pat. 427,892 of 1910; this J., 1911, 1151.—T. F. B.

Nitrides; Process for obtaining —— from mixtures of boric acid and alumina or their compounds. Soc. Générale des Nitrures, Paris. Eng. Pat. 3344, Feb. 9, 1912. Under Int. Conv., Feb. 10, 1911.

See Fr. Pat. 437,168 of 1911; this J., 1912, 432.—T. F. B.

Nitrides; Production of ——. C. Bosch and A. Mittasch, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,027,312, May 21, 1912.

See Fr. Pat. 418,425 of 1910; this J., 1911, 86.—T. F. B.

Nitrogen compounds of silicon and aluminium; Process for making ——. Société Générale des Nitrures. Fr. Pat. 438,209, March 8, 1911.

See Eng. Pat. 25,141 of 1911; this J., 1912, 127.—T. F. B.

Rare gases from the air; Method of extracting ——. G. Claude, Assignor to Soc. l'Air Liquide, Soc. Anon. pour l'Etude et l'Exploit. des Proc. G. Claude, Paris. U.S. Pat. 1,025,962, May 14, 1912.

See Fr. Pat. 403,777 of 1908; this J., 1910, 88.—T. F. B.

Oxygen-generating composition. M. Herschkowitsch, Assignor to C. Zeiss, Jena, Germany. U.S. Pat. 1,027,333, May 21, 1912.

See Eng. Pat. 17,809 of 1910; this J., 1910, 1205.—T. F. B.

Ammonia and formic acid from alkali or alkaline-earth cyanides; Process for preparing ——. H. Sulzer. Fr. Pat. 438,965, Jan. 13, 1912.

See Ger. Pat. 243,797 of 1911; this J., 1912, 385.—T. F. B.

Electric furnace for endothermic gas reactions. Eng. Pat. 919. *See* XI.

VIII.—GLASS; CERAMICS.

Fusion of metasilicates with sulphides and chlorides. Woloskow. *See* VII.

Patents.

Glass-furnace. V. Thenis, Point Marion, Pa. U.S. Pat. 1,027,933, May 28, 1912.

The furnace comprises a main tank with a movable floating bridge therein, and a movable tank adjacent to the main tank and placed in a housing provided with a roof. This second tank is divided along each side into a number of compartments, bounded partly by floating walls movable vertically. The roof of the housing is provided with depending walls from which shelves extend inwards, and with glass-drawing apparatus. Molten glass flows from the main tank through a conduit into the middle of the movable tank, and thence into the compartments of the latter, and the tank is moved at predetermined intervals so as to bring any one of the compartments as desired under the glass-drawing apparatus.—A. S.

Refractory and abrasive product; Process for manufacturing a ——. I. Werlein, Paris. Eng. Pat. 11,846, May 16, 1911. Under Int. Conv., Aug. 26, 1910.

See Fr. Pat. 430,932 of 1910; this J., 1911, 1387.—T. F. B.

Porous [refractory] bodies; Process of manufacturing ——. B. Schwerin, Frankfort on Maine, Germany. U.S. Pat. 1,027,004, May 21, 1912.

See Fr. Pat. 426,072 of 1911; this J., 1911, 942.—T. F. B.

IX.—BUILDING MATERIALS.

Portland cement and blast-furnace slag; Comparison of th effects of pumice-sand and standard sand on mixture of ——. C. Schneider. Mitt. kgl. Materialprüfungsamt 1912, 30, 100—101.

The materials used for comparative tests were: Rüdersdorf Portland cement, blast-furnace slag heated to a red heat, ground pumice, and Freienwald sand, the three last-mentioned materials being all passed through a 60-mesh (per cm.) screen. The mixtures were made in the proportions of (*a*) 100 : 0, (*b*) 80 : 20, (*c*) 70 : 30, (*d*) 60 : 40, and (*e*) 20 : 80, parts by weight of Portland cement and of blast-furnace slag respectively. Using 1 volume of mixture to 3 volumes of standard sand or pumice-sand, the results shown in the following table were obtained, the figures representing averages of five separate tests:—

Kind of sand.	Mixture.	Water added.	Average volume—Weight, grms. per c.c., after			Average crushing strength, kilos. per sq. cm., after	
			1 day.	28 days.	90 days.	28 days.	90 days.
		Per cent.					
Standard sand	a	7·5	2·248	2·279	2·287	426	470
	b	8·0	2·087	2·158	2·283	203	248
	c	9·0	2·059	2·132	2·141	153	190
	d	10·0	2·020	2·096	2·104	100	126
	e	11·0	1·820	1·997	2·014	18	26
Pumice sand	a	28·0	1·651	1·710	1·727	261	303
	b	29·0	1·561	1·654	1·673	174	219
	c	30 5	1·527	1 631	1·648	144	179
	d	32·0	1·496	1·591	1·614	102	139
	e	34·0	1·307	1·497	1·549	27	3t

—O. R.

Patents.

Artificial stone; Manufacture of ——. C. W. Julians, Ponders End, Middlesex, and S. J. Hogg, London. Eng. Pat. 11,647, May 13, 1911.

A slaked mixture of lime and powdered stone is subjected to pressure (preferably by hydraulic means, and to the extent of about ¾ ton per sq. in. on the mass) and then disintegrated into small particles; while still moist the mass is tamped into moulds without the application of pressure, the blocks being subsequently carbonated in the usual manner.—W. E. F. P.

Bricks or the like; Manufacture of ——. J. Janes, Bilsen, Belgium. Eng. Pat. 1247, Jan. 16, 1912.

With the object of neutralising the action of lumps of lime in bricks, pottery, etc., hydrochloric and nitric acids (together or consecutively) or ammonium salts are introduced into the kiln containing the incandescent charge, the draught of the furnace having been previously reduced. —W. E. F. P.

[Magnesia] Cement compounds; Process for making ——. W. K. Freeman, Oscawana, N.Y. U.S. Pat. 1,027,118, May 21, 1912.

The magnesia-cement composition contains lime or commercial magnesium oxide, magnesium chloride, casein, pulverised stony material, and "fibrous vegetable matter reacted upon by an oleaginous compound and caustic alkali."—B. N.

Artificial stones; Process of making ——. E. E. Hippe. Fr. Pat. 438,189, Dec. 23, 1911.

See Eng. Pat. 30,035 of 1910; this J., 1911, 896.—T. F. B.

Brick-making products; Process for rendering harmless the calcareous fragments contained in ——. J. Janes. Fr. Pat. 439,048, Jan. 16, 1912.

See Eng. Pat. 1247 of 1912; preceding.—T. F. B.

Wood; Process for impregnating ——. C. S. Smith. Fr. Pat. 438,849, Jan. 10, 1912. Under Int. Conv., Jan. 11, 1911.

See U.S. Pat. 992,918 of 1911; this J., 1911, 805.—T. F. B.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron carbon system; The ——. A. Smits. Z. Elektrochem., 1912, **18**, 362—368. (See also this J., 1912, 131, and Ruff, this J., 1912, 233.)

The author offers theoretical arguments to show that the melting point curve investigated by Ruff requires the existence of further unknown stable carbides or else of two new modifications of graphite. The former, being the more probable case, is considered in some detail and diagrams are given illustrating the equilibria, on the assumption that the carbides, FeC and FeC_2, are formed. —W. H. P.

Iron pipes; Corrosion of zinc-coated ——. E. Heyn and O. Bauer. Mitt. kgl. Materialprüfungsamt, 1912, **30**, 101—114.

Two pipe lengths, each about 20 cm. long and 2 cm. in diameter, were investigated, the one having been coated with zinc electrolytically (E), and the other by the usual hot galvanisation process (F). Each pipe was cut into six rings or sections, and the several sections were immersed in distilled water and in tap water for periods varying from 74 days to nearly two years. The two bare edges of each section were covered with a layer of paraffin 2 mm. thick, to prevent any contact between zinc, iron, and water; each section was taken out of the water after the desired immersion, brushed free from adhering matter, dried, and re-weighed after removal of the paraffin layer, the loose, flocculent material, which was removed by brushing, being added to the water in which the section had been immersed, and the zinc content of the mixture determined. It was found that on the whole the ordinary galvanised rings (F) were less attacked both by distilled water and by tap water than the electrolytically galvanised sections (E), the latter quickly showing signs of rusting under the influence of distilled water, and rapidly becoming coated with a white, oxidised skin under the influence of tap water; the latter action also took place in the case of the rings (F), though only after a much greater lapse of time; the white coating so obtained in either case was not attacked when subjected to the further action of distilled water, but on the contrary tended to increase in thickness. The test rings were then exposed to the combined action of sulphur dioxide, carbon dioxide, and aqueous vapour for 13 days. Under these conditions both (E) and (F) became covered with a white coating, the former gaining and the latter losing in weight. On subsequent immersion in distilled water, sections (E) began to show signs of rust after a few hours and eventually became thickly rusted over in 31 days. Sections (F) showed slight traces of rust only after 3 days and were irregularly and only thinly coated with rust after 31 days.—O. R.

Iron and zinc; Study of compounds of —— by means of electromotive forces. E. Vigouroux, F. Ducelliez and A. Bourbon. Bull. Soc. Chim., 1912, **11**, 480—485.

A study of the electromotive force of the system $Zn/0{\cdot}05NZnSO_4$/zinc-iron alloy, for the whole range of iron-zinc alloys shows breaks in the curve corresponding to the compounds, $FeZn_7$, $FeZn_3$, Fe_3Zn and Fe_2Zn. By treating the alloy containing about 8 per cent. of iron with very dilute acetic acid, the compound $FeZn_7$ (10·8 per cent. of iron) can be obtained in the form of small non-magnetic crystals.—W. H. P.

Zinc; Extraction of —— in the blast furnace with use of water-gas. O. Nagel. Chem.-Zeit., 1912, **36**, 621—622.

Attempts have previously been made to reduce zinc by means of carbon in a blast-furnace, with provision for the condensation of the volatilised metal. The product in such a case is always zinc dust containing a large amount of oxide. Even the substitution of generator gas for air does not produce a compact metal, and the dust always contains some oxide. The fine state of subdivision is due to the condensation of zinc vapour diluted with a large amount of indifferent gas (see following abstract). The author proposes the injection of water-gas which on account of its freedom from nitrogen and from oxidising gases, as well as its low specific gravity, would be expected to overcome these difficulties as much as possible. The water-gas is preheated to about 1600° C. before passing into the reduction furnace, which contains the zinc ore with the theoretical amount of carbon. This is done by passing the gas through a regenerator system which has been previously heated by burning in it water-gas with a suitable quantity of air. The excess of water-gas after condensation of the metal may be returned to the injector. In this way the zinc may be condensed in a compact form, free from dust.—W. H. P.

Metal vapours; The condensation of ——. V. Kohlschütter and C. Ehlers. Z. Elektrochem., 1912, **18**, 373—380.

The authors have studied the effect of condensing the vapours of arsenic, selenium, cadmium and zinc *in vacuo* and in hydrogen, carbon dioxide, nitrogen and sulphur dioxide at various pressures (50—700 mm.). The photomicrographic illustrations show that *in vacuo* the metal exhibited a maximum tendency to deposit in the compact form, while increase in the pressure of any one of the indifferent gases showed a tendency to decrease the size of the deposited particles and to increase the number in a given area. At the same pressure in each case the dispersing effect was greatest for the denser gases. This effect is probably accounted for by the effect of the gaseous atmosphere on the Brownian movement of the suspended particles, the more concentrated the gas the greater being the resistance to the cohesive forces which tend to a reduction in the volume of a given mass of deposit. —W. H. P.

Electrolytic copper; Tensile strength of —— on a rotating cathode. C. W. Bennett. J. of Phys. Chem., 1912, **16**, 294—311.

On the rotating cathode devised by the author (see page 592), copper has been deposited at a current density of 4,000 ampères per sq. ft. (about 430 ampères per sq. dm.). It is found that increased rapidity of rotation and increased current density decrease the size of crystal in the deposit, while increased temperature increases the crystal size. The tensile strength of the deposited metal varies inversely as the crystal size, so that rapid rotation and high current density tend to increase the tensile strength. A good deposit of copper could probably be obtained at an infinite current density if the stirring were rapid enough to prevent local impoverishment. The author has obtained copper with a tensile strength of 68,000 lb. per sq. in. The current efficiency under extreme conditions is practically 100 per cent., and the concentration of the electrolyte can be varied quite considerably without changing the character of the deposit. When the temperature is kept down, "hard drawn" copper may be deposited at almost any current density, whilst at 75° C. the product is similar to annealed copper. The author has also attempted without great success to find suitable electrolytes and suitable conditions for the deposition of bronze and brass of high tensile strength. The difficulty to be overcome is the formation of colloidal material (*e.g.*, stannic hydroxide), and the electrolyte to be sought for must be an acid solution of readily soluble salts, with no possibility for the formation of colloids.—W. H. P.

Lead sulphide from an iron blast-furnace, and the system, lead sulphide—tin sulphide. W. Heike. Metallurgie, 1912, **9**, 313—319.

On closing down a blast-furnace in which iron ore containing galena had been smelted, a block of material was discovered containing 88 per cent. of lead, 3 per cent.

of tin and 8 per cent. of sulphur. It consisted of metallic and sulphide portions, which, on being separated, were found to be composed respectively of 99 per cent. of lead with 1 per cent. of tin, and of 95·11 per cent. of lead sulphide with 4·89 per cent. of tin sulphide. The presence of the tin was due to the mixing of tin-plate scrap with the charges. Of the total tin added, only 7 per cent. was found associated with the lead, the remainder having been removed by the iron. A thermal and micrographic investigation of the system tin sulphide and lead sulphide was made and the equilibrium diagram constructed. The melting point of lead sulphide was found to be 1106° C. and of tin sulphide, 800° C. With tin sulphide amounting to from 0 to 8 per cent., a solid solution α is formed, and from 38·73 to 100 per cent., another solid solution β. Between these two ranges of concentration, a mixture of the two kinds of solid solution results.—T. St.

[*Iron.*] *Flue-dust; Sintering and briquetting of——.* F. A. Vogel. Amer. Inst. Mining Eng., Bull. No. 65, May, 1912. 533—544.

THE relative merits of the "nodulising" and other sintering processes—including the Huntington-Heberlein, Gröndal, Dwight-Lloyd, and Greenawalt processes—are first discussed, the author being of opinion that all are expensive by reason of the loss of carbon entailed, and that with the exception of the Gröndal briquettes the products obtained, which are usually more or less glazed on the surface, are not of suitable physical structure for reduction. Of the methods for the briquetting of flue-dust, the processes employing lime or "sulphite pitch" (see this J., 1908, 466, 915) as a binding agent, and the Ronay process (employing high pressure alone), are regarded as expensive. In the author's opinion, the most satisfactory product as regards both quality and cost is that obtained by the Schumacher process in which a mixture of the fresh flue-dust with 0·25 per cent. of magnesium chloride and from 6 to 10 of water, is moulded into briquettes which set perfectly hard within a few hours. This process is stated to be extensively employed in Europe with highly satisfactory results.—W. E. F. P.

Agglomeration of fine materials [*ores, fuels, etc.*]. W. S. Landis. Amer. Inst. Mining Eng., Bull. No. 65, May, 1912, 527—532.

A CLASSIFICATION of processes in use for the agglomeration of finely-divided fuel, ore, flue-dust, etc., and a brief summary of the physical properties desirable in the finished product. In the latter connection the following tests are recommended: When a number of briquettes are dropped from a height of at least 6 ft. upon a hard, stone surface, not more than 25 per cent. should break and in no case should pulverisation occur. If the agglomerated material is to be stored before use, a weathering test should be applied; the product should withstand all atmospheric influences. For reduction in the shaft-furnace the product should be porous; a good briquette should have a porosity of 20 per cent. (*i.e.* should absorb 20 per cent. of its volume of water when immersed for 24 hours); one of the chief disadvantages of the "nodulising" process is that the product is non-porous and therefore difficult to reduce. Briquettes should not disintegrate when heated to redness or when exposed to water vapour at 150° C.; the former test is best made in a muffle (preferably in an atmosphere of carbon monoxide and dioxide), and the latter by subjecting the briquette to a steam pressure of 60 lb. per sq. in. for several hours.
—W. E. F. P.

Fusion of metasilicates with sulphides and chlorides Woloskow. *See* VII.

PATENTS.

Iron sands or other finely-divided material; Treatment of ——. [*Briquetting with peat.*] H. Keeble, Stoke Ferry, Norfolk. Eng. Pat. 2367, Jan. 30, 1911.

PEAT is heated in contact with liquid, so as to burst the peat cells, whereby the water present in the peat may be removed to a greater extent by means of pressure thus reducing the amount of evaporation necessary fo the drying process, whilst retaining the hydrocarbon in intimate association with the modified peat fibre. Th dry peat is mixed in approximately equal proportion with finely-divided metalliferous material, such as iro sands, and converted into agglomerate blocks by mean of pressure.—B. N.

[*Iron and steel*]. *Electric welding or soldering.* O. Kjellberg Gothenburg, Sweden. Eng. Pat. 3762, Feb. 14, 1911.

IN a process for welding or soldering metals electrically a paste composed of limestone, potassium carbonate aluminium silicate and "a carbonic-acid developing material" (with or without one or more of the substance zirconium silicate, zirconium oxide, magnesium carbonate and alumina) is employed for coating the metal electrodes. It is stated that when the paste is allowed to dry upon the latter, the coating becomes porous and brittle (by the generation of carbon dioxide) and subsequently falls off the electrodes in the same proportion as the metal is consumed during the welding or soldering process. Claim is also made for the use—either as ingredients of the above mixture or as a separate paste—of carbon, nickel, chromium, etc., in suitable forms for the purpose of replacing the loss sustained by the metal during welding.
—W. E. F. P.

Steel; Production of high grade ——, and slag rich in soluble phosphates in an open hearth or electric furnace. Deutsch-Luxemburgische Bergwerks u. Hütten-Akt.-Ges., Bochum, and A. Vogler, Dortmund, Germany. Eng. Pat. 27,400, Dec. 6, 1911. Addition to Eng. Pat. 19,640, Sept. 4, 1911 (this J., 1912, 496).

As an improvement in the process described in the original patent, the slag is removed by effecting the tilting and blowing operations simultaneously.—W. E. F. P.

Steel; Process for hardening low carbon ——. Gebr. Schubert, Berlin. Eng. Pat. 5702, Mar. 6, 1912. Under Int. Conv., Mar. 7, 1911.

IN a cementation process for locally hardening steel articles, a mixture of the hardening composition with a binding medium such as glue, molasses, starch, etc., is applied to predetermined portions of the objects and dried. The articles are then embedded in pure, calcined quartz sand, contained in a suitable vessel, and heated to the necessary temperature.—W. E. F. P.

Steel in the converter; Manufacture of ——. C. Zoernsch and T. Recknagel. Ger. Pat. 244,612, Dec. 8, 1910.

IN order that steels of different quality may be produced as desired, the furnace (blast-furnace or cupola), mixer, and measuring vessel are arranged in series in a closed system, and converters are disposed in groups in parallel with the measuring vessel. The iron from the blast-furnace or cupola is led to the mixer, in which the requisite scrap, etc., is added. A definite quantity of the molten metal is then run from the mixer into the measuring vessel, in which suitable additions may be made, according to the quality of steel desired, after which the metal is run into one of the converters. A further quantity of metal from the mixer is then run into the measuring vessel, treated with the same or with different additions, and run into the second converter, and so on.—A. S.

Iron alloy resistant to chemical agents and capable of being easily worked. W. Borchers and P. Monnartz. Ger. Pat. 246,035, Jan, 22. 1910.

THE claim is for alloys containing more than 10 per cent. of chromium, together with some molybdenum, titanium, or vanadium. An alloy containing about 60 per cent. of chromium and 2—3 per cent. of molybdenum is specially claimed. The alloys can be easily worked and are stated to withstand the action of all acids and acid mixtures
—A. S.

[Gold and silver.] Metals; Process for recovering —— from cyanide solutions. C. W. Merrill, Berkeley, Cal., U.S.A. Eng. Pat. 7602, Mar. 27, 1911.

The precipitant (zinc dust) is added to the cyanide solution during the passage of the latter to the pressure filter or is introduced into the filter simultaneously with the solution. Conditions for minimising oxidation are maintained not only during the actual filtration but between the filtering periods, this being effected by charging the press from the bottom and thus keeping it always full.—W. E. F. P.

Electroplating. E. R. Royston, Liverpool. From Electro-Chemical Rubber and Manufacturing Co., New York. Eng. Pat. 11,513, May 12, 1911.

A suitable base or article is plated with a number of metals, one of which is a metal of the antimony group. The electrolyte is prepared by dissolving an alloy containing copper, 60 per cent., zinc, 38 per cent., and antimony, 2 per cent. in nitric acid neutralising with ammonia, and then adding potassium cyanide until the blue colour disappears, the solution being diluted to 1 oz. of alloy per gallon of liquid. A second solution is similarly prepared from an alloy containing copper, 60 per cent., and zinc, 40 per cent., this solution being also diluted to 1 oz. per gallon. These two solutions are mixed in varying proportions according to the antimony content required, and the electrolyte is used in conjunction with an anode containing copper, zinc, and antimony in the proportions given in the alloy above. The amount of antimony deposited may be reduced by diminishing the potential of the current, the working limits being 1 to 4 volts, or the composition of the anodes may be varied, with the object of varying the composition of the deposit. the composition of the electrolyte remaining constant. (See also Eng. Pat. 2306 of 1912; page 595).—B. N.

Electroplating small articles; Rotary apparatus for ——. M. Hüttig, Goessnitz, Germany. Eng. Pat. 4127, Feb. 19, 1912.

A non-perforated pot-shaped trough, made of non-conducting material, is supported in an inclined position so that it may be rotated around its longitudinal axis. Cathode-contacts which are formed like stirrers, and a stationary anode fixed on the outside, are introduced through the mouth of the pot into the electrolyte, so that they are freely suspended in the vessel.—B. N.

[Nickel and iron] Metals; Electrodeposition of ——. A. Leuchter, New York. U.S. Pat. 1,026,627, May 14, 1912.

For the simultaneous deposition of nickel and iron upon a conducting surface, a nickel anode is employed and a preponderance of iron is maintained in the electrolyte, the electromotive force of the current being reduced by the rheostatic effect of the anode to a value intermediate to those required for the deposition of nickel or iron alone. —W. E. F. P.

[Nickel and manganese.] Electroplating. A. Leuchter, New York. U.S. Pat. 1,026,628, May 14, 1912.

The anode is composed of nickel alloyed with from 2 to 7 per cent. of manganese, and the electrolyte contains nickel-ammonium and manganese-ammonium sulphates in such amounts that the relative proportions of nickel and manganese in the solution are 75—85 and 25—15, respectively.—W. E. F. P.

Anode residues; Process of treating ——. H. Wehrlin, Berlin. Eng. Pat. 25,179, Nov. 11, 1911. Under Int. Conv., Jan. 11, 1911.

The anode sludge (from the electrolytic refining of lead, copper, etc.) is subjected at a moderate temperature to the prolonged and combined action of dilute sulphuric and hydrofluoric acids and a current of air: by this means, it is stated, arsenic is volatilised as fluoride, copper and antimony are dissolved as sulphates and fluorides while the precious metals and lead sulphate remain undissolved.—W. E. F. P.

[Zinc.] Volatile metals; Furnaces for extracting —— from their ores. A. Zavelberg, Hohenlohehutte, Germany. Eng. Pat. 16,821, July 22, 1911.

A series of enclosed, vertical shafts, separately heated internally by means of gas and provided with suitable exits for the volatilised metal and the residual slag, etc. A storage chamber for the charge (zinc ore and carbon, for example) is situated above each shaft, the passage connecting the two being provided with an upper and a lower damper, by opening which latter the hot gases from the shaft are permitted to circulate round the chamber and thus pre-heat the charge. The walls of the shaft being heated to incandescence (and the charge in the storage chamber to about 1000° C.), the upper damper is withdrawn and the charge allowed to fall into the shaft; the lower damper is then closed, the volatilised metal being thus caused to pass to the condenser. For the systematic working of the apparatus, alternate shafts are heated while the reduction is in progress in the others. —W. E. F. P.

Furnace; Metallurgical ——. G. H. Benjamin, New York. U.S. Pat. 1,026,197, May 14, 1912.

A series of communicating, horizontal chambers alternating with which are a number of horizontal heating-flues. The chambers are separated when required by means of valves situated in the connecting passages, each chamber being provided with independent means for charging, for the introduction of gases and for exhaustion. The heating-flues are fired independently to permit of the chambers being heated to different temperatures; and electrical means are provided for heating one chamber to a much higher temperature than the others.—W. E. F. P.

Smelter-furnace. W. M. Nesbit and E. Pike, Eureka, Utah. U.S. Pat. 1,027,882, May 28, 1912.

A stack having inlets in its walls below the smelting zone, communicates at its upper end with a heating chamber through which pass supply pipes leading to the inlets mentioned. The supply pipes are connected with "hot gas pipes" and with fluid fuel pipes, the connection with the latter being at a point between the heating chamber and the top of the stack. Suction is produced within the heating chamber and the upper portion of the stack, and air-supply ducts, increasing in width from the top downwards, extend down through the upper portion of the stack, along the inner face of the walls, and open into the stack above the charge.—A. S.

Electric refining-crucible. J. H. Reid, Newark, N.J., Assignor to The Patents Purchasing Co., Appleton, Wis. U.S. Pat. 1,026,281, May 14, 1912.

The crucible is constructed of material which is electrically conducting only when heated, the conductivity being varied as required by means of adjustable conductors adapted to be raised or lowered within recesses provided in the walls.—W. E. F. P.

Metals; Process and apparatus for recovering —— from their ores. J. A. Potter, Los Angeles, Cal. U.S. Pat. 1,026,999, May 21, 1912.

A furnace and a reduction chamber communicating with each other, the latter being provided with tuyères and adapted to be supplied with ore. The two series of regenerators, through which the furnace gases pass on their way to the stack, are provided with valves by manipulating which air and combustible gas are permitted to pass from supply conduits to the furnace and reduction chamber.—W. E. F. P.

Copper; Refining ——. W. S. Rockey and H. Eldridge, New York, Assignors to Metallurgical Research Co. U.S. Pat. 1,027,769, May 28, 1912.

The copper is melted and is then directed through a bath of fused anhydrous boron trioxide, the heat of the copper being maintained until all occluded gases have been expelled, and the oxides present have been dissolved by the boron trioxide. The copper, before being led into the boron trioxide, may be treated with a reducing agent to reduce a portion of the oxides present, or a reducing agent, such as carbon, may be added to the boron trioxide. —A. S.

[Chromium steel] safe or steel-vault wall. F. W. Schilling, Assignor to Fried. Krupp Akt.-Ges., Essen on Ruhr, Germany. U.S. Pat. 1,026,461, May 14, 1912.

See Fr. Pat. 416,051 of 1910; this J., 1910, 1458.—T. F. B.

Iron or steel; Process of refining ——. K. A. F. Hiorth, Christiania. U.S. Pat. 1,028,070, May 28, 1912.

See Eng. Pat. 25,915 of 1911; this J., 1912, 496.—T. F. B.

Armour plates; Process for making ——. Vickers Sons and Maxim, Ltd. Fr. Pat. 438,402, March 15, 1911.

See Eng. Pat. 6664 of 1910; this J., 1911, 961.—T. F. B.

Manganese steel; Process for producing rolled shapes of ——. Manganese Steel Rail Co. Fr. Pat. 438,923, Jan. 12, 1912. Under Int. Conv., Jan. 27, Feb. 27, and Dec. 28, 1911.

See U.S. Pats. 1,017,903, 1,017,906, and 1,018,000 of 1912: this J. 1912, 286.—T. F. B.

Zinc; Separation of —— from zinc sulphate solution. K. Namekawa, J. Miyazawa, K. Miyabara, and S. Emura, Tokyo. Eng. Pat. 5967, March 9, 1911. Under Int. Conv., March 19, 1910.

See U.S. Pat. 998,379 of 1911; this J., 1911, 1020.—T. F. B.

Metals, alloys, and steels; Process and apparatus for treating melted ——. L. Baraduc-Muller, Paris. Eng. Pat. 13,188, June 1, 1911. Addition to Eng. Pat. 30,198, Dec. 29, 1910.

See Addition of Jan. 13, 1911, to Fr. Pat. 434,865 of 1910; this J., 1912, 439.—T. F. B.

Casting metals; Process and apparatus for ——. F. de Buigné, Magdeburg, Germany. Eng. Pat. 21,167, Sept. 25, 1911. Under Int. Conv., Sept. 26, 1910.

See Fr. Pat. 434,545 of 1911; this J., 1912, 343.—T. F. B.

Casting metals; Process for ——. F. de Buigné, Magdeburg, Germany. U.S. Pat. 1,026,733, May 21, 1912.

See Fr. Pat. 434,545 of 1911; this J., 1912, 343.—T. F. B.

Ore roasting and like furnaces; Mechanical ——. J. Harris, Sheffield. Eng. Pat. 25,142, Nov. 11, 1911.

See Fr. Pat. 436,298 of 1911; this J., 1912, 440.—T. F. B.

Ores; Apparatus for roasting and sintering ——. *Process of roasting and sintering ores and the product resulting therefrom.* A. S. Dwight, New York, Assignor to Dwight and Lloyd Metallurgical Co., Jersey City. Reissues Nos. 13,423 and 13,424, May 28, 1912, of U.S. Pat. 916,391, March 23, 1909.

See Eng. Pat. 25,985 of 1907; this J., 1908, 1021.—T. F. B.

Lead; Process for obtaining refined ——. J. Asbeck, Krantscheid-Westerwald, Germany. U.S. Pat. 1,025,956, May 14, 1912.

See Ger. Pat. 218,839 of 1908; this J., 1910, 885.—T. F. B.

Gas-furnace for heating, scaling and hardening purpose P. Schmidt, Hanover, Germany. U.S. Pat. 1,026,88 May 21, 1912.

See Eng. Pat. 12,747 of 1910; this J., 1911, 901.—T. F. B

Copper; Process for refining molten ——. [*Preparatio of boron suboxide therefor*]. Comp. Franç. pour l'Exploit des Procédés Thomson Houston. First Addition dated Jan. 9, 1912, to Fr. Pat. 422,441, Oct. 26, 1910.

See Eng. Pat. 7103 of 1911; this J., 1911, 1014.—T. F. B

Attaching rubber to metals. Eng. Pat. 2306. *See* XIV

XI.—ELECTRO-CHEMISTRY.

Rotating cathode. C. W. Bennett. J. of Phys. Chem. 1912, **16**, 287—293.

The author has built a revolving cathode which can be rotated at a speed of up to 6000 revolutions per minute, and will carry 300 ampères, giving a current density of 3500 ampères per sq. foot when 4 inches of the cathode is receiving a deposit. The cathode itself consists of an aluminium pipe 1 inch outside and ¾ inch inside diameter, 9 or 10 inches long. The deposited metal can be removed for testing in suitable pieces, without bending or heating, and without damaging the aluminium pipe. If the deposited cylinder is required whole, a thin shell of fusible metal is first cast round the cathode, and after electrolysis the whole is immersed in boiling water.—W. H. P.

Manufacture of nitrates from the atmosphere. Scott. *See* VII.

Patents.

Furnace; Electric ——. A. Helfenstein, Vienna. Eng. Pat. 29,126, Dec. 27, 1911. Addition to Eng. Pat. 17,650 of 1910, dated July 27, 1909 (this J., 1911, 94).

Supports are placed between the multiple hearths for the purpose of supporting the roof, and, if necessary, the charging receptacle. These supports may take the form of water-cooled or fire-proof partitions, extending from the roof to the current-conducting base, or from the roof nearly to or into the material, thus forming separate gas-elimination chambers. In an alternative arrangement, the supports provided at the mouth of each charging shaft are doubled, space being provided between them, so that for each hearth partly-separated gas-elimination chambers, which have no supporting element in common with the gas chambers of the other hearths, are formed by the spaces.—B. N.

Electric furnaces for endothermic gas reactions. H. Grohmann, Innsbruck, Austria. Eng. Pat. 919, Jan. 11, 1912. Under Int. Conv., March 31, 1911.

The patent relates more particularly to the manufacture of nitric oxide from air by means of the electric arc. In a vertical furnace for this purpose, claim is made for the provision, co-axially with an electrode and insulated therefrom, of a member comprising two annular nozzles, air being blown "cylindrically" from the inner one and "conically" (divergently) from the outer one; the interior of the furnace is so shaped that the ascending divergent air becomes convergent at the upper end of the shaft and eventually assumes a direction parallel to the axis of the furnace. Two or more co-axial, annular, cooled slots are provided at the upper end of the furnace for the purpose of separately discharging the gases of different concentration.—W. E. F. P.

Battery-zinc. J. Beattie, Leete Island, Conn. U.S. Pat. 1,027,169, May 21, 1912.

The surface and also the interior portions of the electropositive element consist of an amalgam of zinc, mercury, and a metal more electropositive than magnesium, *e.g.*, an alkali metal, such as sodium.—B. N.

Electrode for reversible galvanic batteries. W. Morrison, Des Moines, Iowa. Reissue No. 13,420, May 14, 1912, of U.S. Pat. 975,981, Nov. 15, 1910.

See this J., 1910, 1461.—T. F. B.

Lead electrodes of secondary batteries; Process to regenerate and improve the structure of ——. E. H. Naylor, London. U.S. Pat. 1 026,527, May 14, 1912.

See Eng. Pat. 1558 of 1910; this J., 1911, 292.—T. F. B.

Electrolytic process. R. J. McNitt, Niagara Falls, Assignor to Roessler and Hasslacher Chemical Co., New York. U.S. Pat. 1,027,495, May 28, 1912.

See Eng. Pat. 20,519 of 1910; this J., 1911, 33.—T. F. B.

Electrolytic apparatus. L. G. Fixen, Chicago. U.S. Pat. 1 026,857, May 21, 1912.

See Eng. Pat. 27,902 of 1911; this J., 1912, 141.—T. F. B.

Electrolytic decomposition of liquids; Process and apparatus for the ——. L. Fixen (née Gottlieb). Fr. Pat. 438,159, Dec. 6, 1911.

See Eng. Pat. 27,902 of 1911; this J., 1912, 441.—T. F. B.

Furnace; Electric —— with re-charger mounted on the chamber. A. Helfenstein. First Addition, dated Dec. 29, 1911, to Fr. Pat. 418,567, July 25, 1910.

See Eng. Pat. 29,126 of 1911; preceding.—T. F. B.

Process for making sulphonic acids of the naphthalene series. Fr. Pat. 438,737. *See* III.

Eliminating sulphonic groups from organic sulphonic acids. Fr. Pat. 439,010. *See* III.

[*Electrolytic*] *preparation of compounds containing active oxygen, such as percarbonates, perborates, etc.* Ger. Pat. 245,531. *See* VII.

XII.—FATS; OILS; WAXES.

Olive tree and its products in Portugal. O. Klein. J. Landw., 1912, **60**, 31—58. Chem. Zentr., 1912, **1**, 1661—1665.

Experiments with fresh and dried olives and with olives preserved by keeping in running fresh water, by immersion in salt water, and by sprinkling with salt, showed that only the fresh olives and those preserved under salt water gave a pale edible oil of good quality; the fruit preserved by the other methods mostly gave less oil of a darker colour and having too high an acid value to be suitable as an edible oil. The temperature and pressure used in the extraction of the oil are not without effect. With rising temperature and pressure, the colour of the oil deepens and the odour and taste depreciate. The specific gravity and acid value increase and the iodine value decreases as the pressure is increased. From the results of the examination of 30 samples of oil prepared from known varieties of olives and of 30 commercial oils of good quality, the author gives the following limiting values for Portuguese oils:—

	Sp. gr.	Refractive index (25° C.)	Iodine value.	Saponif. value.
Maximum	0·918	1·4682	85·0	195·0
Minimum	0·915	1·4660	75·0	185·0
Average	0·9166	1·4670	80·5	190·0

(See also this J., 1898, 1055; 1900, 913.)—A. S.

Enzyme action; Studies on ——. *I. Experiments with castor bean lipase.* K. G. Falk and J. M. Nelson. J. Amer. Chem. Soc., 1912, **34**, 735—745.

An aqueous suspension of a lipase preparation obtained from castor seed kernels which had been freed from fat by extraction with solvents was placed in a U tube and an electric current of less than 0·5 ampère was passed through the liquid for two weeks. The slightly cloudy solution removed by means of a pipette from the limb of the tube carrying the anode had a marked hydrolytic action on methyl acetate whilst that from the cathode limb was inactive.—J. A.

Oleic acid; Dimorphism of ——. A Kirschner. Z. physik. Chem., 1912, **79**, 759—761.

In an attempt to prepare pure oleic acid, a quantity of the commercial acid was allowed to stand over night in flat dishes at 8°—10° C. On the next day larger and smaller groups of crystals were present. On adding a small quantity of these crystals to liquid oleic acid, cooled to a temperature above its usual melting point, the acid rapidly set to a white mass of very small crystals of higher melting point than the ordinary colourless crystals of oleic acid. The latter are obtained if the white crystalline mass be melted and then rapidly cooled in ice. The author did not succeed in obtaining perfectly pure oleic acid. By partial crystallisation as described above, followed by centrifuging, a sample of oleic acid was separated into two fractions of m. pt. 9·8° and 12·5°—13° C. respectively. By melting the crystals and repeating the treatment, crystals of progressively increasing melting point (up to 16° C., when the treatment ceased owing to lack of material) were obtained, but two successive fractions of constant melting point could not be obtained. Oleic acid readily crystallises spontaneously as the modification of lower melting point, but the modification of higher melting point apparently can be obtained by spontaneous crystallisation only when the acid has attained a sufficient degree of purity.—A. S.

Soaps; Physico-chemical studies on the manufacture of semi-boiled ——. F. Goldschmidt and L. Weissman. Z. Elektrochem., 1912, **18**, 380—396.

The authors record results of experiments on the potassium soap of palm-kernel oil similar to those of Farrow on sodium palmitate (this J., 1912, 289). The relation of viscosity and electrical conductivity of the soap to concentration and temperature is tabulated and represented by curves. The effect of added potassium hydroxide or potassium chloride on the viscosity of the soap solutions is first to produce a small reduction to a minimum value from which further addition raises the viscosity to a relatively enormous figure. After the minimum is passed it is also found that the temperature coefficient of the viscosity is very considerably increased. The electrical conductivity shows similar results. The conductivity of a soap solution to which an electrolyte has been added is not so great as would be expected considering the two constituents separately, and with greater concentrations of alkali the conductivity falls below that which would be obtained from the alkali alone. These results render it probable that by successive additions of electrolyte, the state of solution of the soap is changed continuously in the direction of the formation of colloidal material.—W. H. P.

Prevention of ignition during the boiling and oxidation of oils. Fritz. *See* XIII.

Reports on explosions at Glasgow and Liverpool. *See* XIXa.

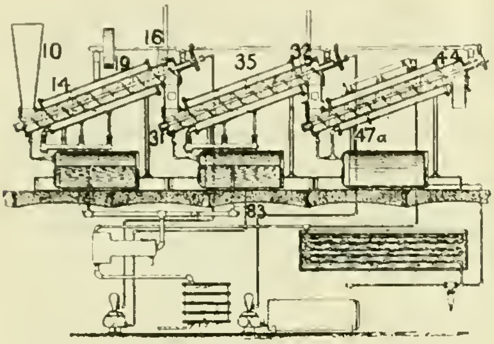
Soya bean oil; Denaturation of —— *in Australia.* Board of Trade J., June 6, 1912. [T.R.]

A By-law of the Australian Commonwealth (No. 216), dated 23rd April, 1912, prescribes additional methods to those referred to in By-law No. 195 of denaturing soya bean oil, in order that it may be imported free of duty under Item 234 (H) of the Tariff. Under this By-law, soya bean oil may be denatured as follows:—(1) By adding 25 gallons of commercial neatsfoot oil and 25 gallons of 300° test kerosene to 50 gallons of soya bean oil. (2) By adding 5 gallons of terebene and 5 gallons of turpentine to 90 gallons of soya bean oil. (3) By adding 25 gallons of tung oil to 100 gallons of soya bean oil.

Patents.

Oil-extracting device. C. Turner and H. J. Flood, Chicago, Ill. U.S. Pat. 1,024,230. April 23, 1912.

The apparatus (see fig.) comprises a number of inclined jacketed cylinders, arranged in series, the walls of the jacketed portions being perforated. The material is fed into the lower end of the first cylinder, 14, from the hopper, 10 and is conveyed upwards through each cylinder in succession by means of conveyors, 19, 31, and 44, passing from the upper end of the first into the lower end of the second cylinder, and so on, and being discharged from the upper end of the last cylinder. A solvent for the oil is introduced into the first and second cylinders, 14, 35, through the hollow shafts, 16, 32, which are provided with lateral perforations. Drain pipes are provided in the jackets of the cylinders at such a height that the level of liquid is kept above the receiving end of the cylinder. Steam is delivered into the last cylinder through two sets of nozzles, one set, at the receiving end of the cylinder, being inclined downwards, and the other set, at the discharge end of the cylinder, being inclined upwards. Means are provided for withdrawing vapours laterally from the last cylinder.—A. S.



Vessels suitable for containing oil and oleaginous products; Process for internally coating ——. C. Wenzelburger, Antwerp. Eng. Pat. 781, Jan. 10, 1912.

Casks or other wooden vessels are treated with hot dry air which is introduced through the bung-hole under a pressure of about 2 atmospheres and at a temperature of about 400° C. A quantity of boiling glue or size is then placed in the cask the air pressure is continued and the glue is caused to come into contact with every part of the interior of the cask. After the excess of glue has been drained from the cask, the interior of the latter is dried by means of the current of hot air.—W. P. S.

Fatty acids, their glycerides, and other esters; Process for the conversion of unsaturated —— into the corresponding saturated compounds. F. Bedford and C. E. Williams, Sleaford. U.S. Pat. 1,026,339, May 14, 1912.

See Eng. Pat. 29,612 of 1910; this J., 1912, 398.—T. F. B.

Fats, oils, and waxes; Process for decomposing [hydrolysing] ——. Verein. Chem. Werke Akt.-Ges. Fr. Pat. 439,209, Jan 13, 1912. Under Int. Conv., Feb. 2, 1911.

See Eng Pat. 749 of 1912; this J., 1912, 545.—T. F. B.

Disinfecting-soap. M. Engelmann, Assignor to Farbenfal vorm. F. Bayer und Co., Elberfeld, Germany. U. Pat. 1,027,707. May 28, 1912.

See Addition of Jan. 7, 1911, to Fr. Pat. 402,740 of 190 this J., 1911, 907.—T. F. B.

Detersive agents; Manufacture of ——. R. Macpherso Brondesbury, and W. E. Heys, Bushey. U.S. Pa 1,027,744, May 28, 1912.

See Eng. Pat. 5620 of 1909; this J., 1910, 889.—T. F. B.

Manufacture of chamois leather. Eng. Pat. 13,12 *See* XV.

Errata.

This J., 1912, 545, col. 2, l. 16 from top, *for* "Egerton *read* "Edgerton."

This J., 1912, 546, col. 1, l. 8 from top, *for* "Klopper *read* "Klopfer."

XIII.—PAINTS; PIGMENTS; VARNISHES RESINS.

Oils; Prevention of ignition during the boiling and oxidatio of ——. F. Fritz. Chem. Rev. Fett. Ind., 1912, **19** 124—125.

In March of this year an explosion took place in a linoleu factory at Eberswalde owing to the sudden increase i temperature of a mixture of linseed oil and magnesiu powder, which were being heated together in accordanc with Ger. Pat. 201.966 (this J., 1908, 1164). The explosion, which was due to the liberated hydrogen, followe the ignition of the mass. In these and similar cases, suc as the heating of tung oil, or blowing air into a mixtur of linseed oil and manganese resinate at 80° C., the temperature may be kept under control by adding a few pailsful of cold raw linseed oil to the mass. In this way the formation of formic acid (indicating too high a temperature and consequent loss of linoxyn) is prevented.
—C. A. M.

Resin acids; Occurrence and mode of formation of ——. Chemical investigation of resin of Picea excelsa Lk. J. Köhler. J. prakt. Chem., 1912, **85**, 523—564. (See this J., 1911, 1397.)

The so-called "winter resin" is met with more frequently on the trees in Switzerland than on Swedish trees, and whilst the resin found in Sweden consists almost exclusively of sapinic acids, in Switzerland it contains varying proportions of *l*-pimaric acid, and in one case, a crystalline mass consisting of practically pure *l*-pimaric acid was found on a tree at a spot about 10 m. from the ground. After several re-crystallisations, *l*-pimaric acid has the optical rotatory power, $[\alpha]^{20}_D = -280·5°$. In many cases after removing the "winter-resin" and loosening the bark of the tree, a clear liquid gushes out and from a chemical examination of this liquid and its transformation products, the author concludes that the parent substance of the natural resin acids is an aldehyde or camphor-like compound of the composition, $C_9H_{15}CHO$, which on contact with air is oxidised to an acid, $C_9H_{15}CO_2H$, the resin acid being produced by condensation of 1 mol. of the acid and 1 mol. of the aldehyde, with elimination of water:

$$C_9H_{15}CHO + C_9H_{15}CO_2H = C_{19}H_{29}CO_2H + H_2O.$$

—A. S.

Arsenic content of shellac and contamination of foods from this source. Smith. *See* XIXa.

Patents.

Varnish for coating leather ; Apparatus for manufacturing ——. G. W. Priest, Newton, Mass. U.S. Pat. 1,027,563, May 28, 1912.

The apparatus comprises a kettle mounted on a movable platform, which can be moved vertically so as to bring the kettle into engagement with a stationary dome-shaped cover. Extending downwards through the top of the dome is a vertical axial shaft, movable vertically, and fitted at its lower end with a cross-bar having a number of arms projecting upwards and forming a stirrer. Above the stirrer and fitting loosely on the shaft is another cross-bar extending across the dome, the ends fitting into vertical guideways on the inner wall of the dome, so that the bar can move vertically, but is prevented from turning around the shaft. From this cross-bar arms project downwards between the arms of the stirrer.—A. S.

Insulations, impregnations, coverings, or varnishes resistant to alkali ; Process for producing ——. S. Diesser. Ger. Pat. 246,038, Dec. 17, 1910.

The resinous condensation product of formaldehyde and ammonium sulphide is applied by known means, under the ordinary or reduced pressure, and with or without addition of solvents or other substances, to the surface to be treated. Solvents such as chloroform or tetra- or pentachloroethane may be used. The process is suitable for electrical insulation, for impregnating wood or fibres, and similar purposes.—T. F. B.

Phenol resins ; Process of forming fusible ——. J. W. Aylsworth, East Orange, Assignor to F. L. Dyer, Montclair, N.J. U.S. Pat. 1,027,794, May 28, 1912.

See Eng. Pat. 3498 of 1911 ; this J., 1912, 347.—T. F. B.

XIV.—INDIA-RUBBER ; GUTTA-PERCHA.

Latex ; Chemical nature of Euphorbia ——. J. v. Wiesner. Monats. Chem., 1911, **33**, 461—484.

After preliminary remarks on the position of chemical characteristics in systems of classification, the author shows that all of the specimens of *Euphorbia* latex which have been so far investigated are (with two doubtful exceptions in detail) characterised by occurrence of rubber in small amount, of resins in very large amount compared with the rubber, and of euphorbone. The rubber is not in sufficient quantity to be of much commercial significance (only a few per cent.). The author quotes K. Reiche (Engler's Botan. Jahrb. Bd. **45**, 1911) who states that the latex of *E. Lactiflua* occurring in Chili, only contains 5 per cent. of rubber to 39 per cent. of resin and is therefore useless as a source of rubber. —H. E. P.

Artificial rubber from fish ; Manufacture of —— in Holland. Board of Trade J., June 6, 1912. [T.R.]

A factory is in course of erection at the fishing harbour at Ymuiden for the manufacture of artificial rubber from fresh sea fish. It is calculated that fish rubber can be produced at a cost of about one-sixth of that of real rubber ; the cheapness of the former is due to the simplicity of the process and to the manufacture of a by-product in the shape of a concentrated food containing phosphorus and albumin (compare Fr. Pat. 416,644 ; this J., 1910, 1466).

Patents.

Rubber ; Method of attaching —— to metals. E. R. Royston, Liverpool. From Electro-Chemical Rubber and Manufacturing Co., New York, U.S.A. Eng. Pat. 2306 of 1912 ; date of appl., May 12, 1911.

It is found that alloys containing antimony are best adapted to the production of a "chemical" bond between rubber and metal on vulcanisation. The most suitable alloy consists of copper, 3¼ ; zinc, 1¾ ; and antimony, 3 oz. respectively. The proportion of antimony should however be decreased when the rubber contains a relatively large amount of antimony sulphide. When the metallic base to which the rubber is to be fastened cannot conveniently be made of this alloy, another metal may be plated with a coating of the alloy. The plating may be carried out in several ways :—(1) Against an anode made of the above alloy, at a potential difference of 2—3½ volts in a bath consisting of sodium bicarbonate, 10 oz. ; sodium bisulphide, 10 oz. ; copper carbonate, 3½ oz. ; zinc carbonate, 3½ oz. ; antimony chloride, ⅛ oz. ; water, 320 oz. ; and potassium cyanide, sufficient to dissolve the precipitate. (2) Against an anode of the alloy in a transfer solution consisting of crystalline sodium bisulphide, 14¾ oz. ; crystalline ammonium chloride, 9½ oz. ; potassium cyanide, 2½ oz. ; water, 10 quarts. (3) In an electrolyte prepared as described in Eng. Pat. 11,543 of 1911 (page 591.) The electrolyte is maintained at about 70° F. and the metal plated against an anode consisting of copper, 60 ; zinc, 38 ; and antimony, 2 parts, a P.D. of 3·75 volts being employed, with the electrodes 10 cm. apart. The proportion of antimony deposited may be increased by increasing the P.D. or by increasing the percentage of antimony in the anode, and *vice versa.* (4) Where the metal to be coated consists of brass or bronze a bath of Schlippe's salt (1¾ oz. to 35 oz. water) is employed together with a carbon anode. —E. W. L.

Rubber and other gums ; Apparatus for extracting —— from plants, barks, fibres, etc. L. Guignet, Lyon-Villeurbanne, France. Eng. Pat. 2478, Jan. 31, 1911.

In the apparatus described in Eng. Pat. 9064 of 1909 (this J., 1910, 579) the grooves in the casing and cone are made to decrease gradually in depth as well as width towards the smaller end of the agglomerator ; the pitch of the teeth of the agglomerator casing is made to decrease more or less than the pitch of the teeth of the agglomerator cone ; and, in addition a jet or stream of water is directed across the hopper into the space between the cone and its casing in order to facilitate the entry, between the teeth, of the material fed into the hopper of the agglomerator. With this arrangement the action at the larger end (inlet) is mainly a tearing action, whilst at the smaller end the action is mainly a compressing or rolling action.—E. W. L.

Rubber substitute, glue or flexible cement ; Composition for use as a ——. T. D. Kelly, Southend-on-Sea. Eng. Pat. 8613, Apr. 6, 1911.

One hundred parts of "peat of a gummy nature," or of linseed or cotton-seed, or of certain plants such as marsh mallow, are boiled in a 3 to 5 per cent. solution of lime or other alkali until of the consistence of thick cream, and if necessary the fibre is strained off. 30 parts of the substance thus obtained are then heated with 70 parts of vegetable oils in a steam-jacketed pan to a temperature of 450°—600° F., or the mixture is heated with 30 parts of nitric acid or of a mixture of 3 parts of nitric acid and 1 part of sulphuric acid at 100°—200° F. Tung seed oil when employed, is heated to 410—600° F. before use. Either of the substances may be treated with a 5 per cent. alkaline solution to remove greasy by-products. Rubber substitute is made by adding to either of these compositions (after straining), 1 to 50 per cent. of its bulk of sulphur or substances containing sulphur such as potassium sulphate, heating the mixture and compressing it in moulds. Water- and fire-proof flexible cement or glue is made by adding to either composition 10 to 30 per cent. of chalk, or Portland cement.—E. W. L.

Rubber ; Process for reclaiming old and waste ——. H. L. Terry, G. Spencer and E. L. Curbishley, Manchester. Eng. Pat. 11,482, May 12, 1911.

Finely comminuted waste rubber is heated in tightly-closed steam-jacketed pans or digesters with a very strong solution of magnesium chloride, at a temperature varying from 212° to 400° F., but preferably at 320°—330° F. Under these conditions the magnesium chloride is partially dissociated and the hydrochloric acid produced attacks the fibrous matter in the waste and disintegrates it. At the same time the free sulphur is eliminated and the rubber waste is rendered plastic. At the completion of the reaction the great bulk of the chloride is present in its original form. Suitable proportions for waste containing half its weight of canvas are as follows:—waste, 50; magnesium chloride ($MgCl_2,6H_2O$), 100; and water, 100 parts, the time of heating being in this case about 6 to 8 hours. (Reference is directed to Eng. Pat. 25,044 of 1902; this J., 1903, 753.) —E. W. L.

Caoutchouc-like substances; Manufacture of ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 27,361, Dec. 6, 1911. Under Int. Conv., Mar. 23, 1911.

The polymerisation of the hydrocarbons (butadiene and its substitution products) described in Eng. Pats. 17,734, 15,254, and 25,850 of 1910, and 6540, 1124 and 1125 of 1911 (this J., 1910, 1215; 1911, 226, 637, 1076; 1912, 141, 241) may be promoted by carrying it out in the presence of any or all of the caoutchouc-like substances obtained in the processes described in the above-mentioned patents, or in the presence of natural caoutchouc. For example (1), to 100 parts of the caoutchouc-like product obtained from butadiene by the action of sodium, 100 parts of erythrene liquefied by cooling are added. The mixture is allowed to stand. After some time the polymerisation is quantitatively complete. (2), To 500 parts of the caoutchouc-like product obtained by polymerisation of isoprene in the incubator by means of blood serum, 250 parts of isoprene are added. The mixture is kept at 30°—40° C. and after a time is quantitatively polymerised to a caoutchouc-like product. (3), To 1000 parts of the product obtained by polymerisation of β-γ-dimethylbutadiene, 1000 parts of β-γ-dimethylbutadiene are added. The mixture is heated in a closed vessel for 4 weeks to 70°C., when the caoutchouc-like substance is obtained. —E. W. L.

Rubber; Machine for treating ——. L. Norzagaray, and The Economic Rubber Washing Machine Co., Ltd. Fr. Pat. 438,137, Dec. 11, 1911.

See Eng. Pat. 22,201 of 1910; this J., 1911, 1268.—T. F. B.

Caoutchouc; Preparation of synthetic ——. A. Heinemann. Fr. Pat. 439,101, Jan. 18, 1912.

See Eng. Pat. 1445 of 1911; this J., 1912, 349.—T. F. B.

Manufacture of erythrene and isoprene. Eng. Pat. 18,935 *See* XX.

Preparing isoprene from nopinene. Fr. Pat. 438,789. *See* XX.

XV.—LEATHER; BONE; HORN; GLUE.

Deliming materials; Comparative valuation of ——. J. Hildebrand. Gerber, 1912, **38**, 129—132, 143—145.

Pieces of limed hide, 8 × 20 cm. and 15 mm. thick, were dried superficially and placed in 1½ litres of distilled water with a little phenolphthalein solution and the deliming material added until, in the case of the tests in which an acid was used, the phenolphthalein was decolourised. Small additional quantities of the deliming material were then added during four days, after which time no change of colour in the indicator was produced on standing, and the pieces were practically free from lime. The percentage of lime found in the hide after treatment was nearly the same with all the materials used. The dissolved hide substance in the deliming bath was estimated by precipitation with hypochlorous acid by Eitner's method and also by the Kjeldahl method. For the former method, 100 c.c. of the solution were mixed with 10 c.c. of a 12 per cent. sodium hypochlorite solution and 5 c.c. of 35 per cent. hydrochloric acid. The precipitate was washed till free from chlorine, dried at 100°C. on a tared filter and weighed. The following results were obtained:—

Deliming material.	Percentage of hide-substance dissolved.	
	Head.	Back.
Ammonium chloride	0·24	0·014
Ammonium butyrate	0·25	0·034
Butyric acid	0·74	0·160
Lactic acid	0·86	0·213
Formic acid	0·44	0·154
Hydrochloric acid	0·42	0·127

The results obtained by the two methods were identical. The hide substance dissolved during deliming with "Glycoformacin" was also estimated. The material is a brown fluid of density 1·145 containing much formic acid and a little molasses and salts of formic acid, resembling in some respects "Purgatol," another deliming material, consisting of ammonium lactate and molasses. The deliming with "Glycoformacin" was carried out as with the other materials, and the percentage of hide-substance dissolved was found to be 0·55 from the head and 0·10 from the butt. The cost of deliming with the various materials is as follows:—

	Cost of 100 kilos. loco. Graz.	Cost of neutralising 1 kilo. of lime.	Cost of neutralising 100 kilos. of hide.
	s. d.	s. d.	s. d.
Ammonium chloride	90 0	0 11	0 4·1
Ammonium butyrate	118 4	7 0	2 6
Butyric acid	69 9	2 8	0 11·7
Lactic acid	78 4	3 2	1 1·9
Formic acid	65 10	1 2	0 5·1
Glycoformacin	70 10	4 4½	1 6·8
Hydrochloric acid	6 8	0 3	0 1·1

A great difference in results for dissolved hide-substance was found between pieces taken from the head and the back which must be ascribed to the different constitution of the hide in these parts. The difference in the percentage of water contained (head 75·4, back 68·4) affects the diffusion considerably. The calcium salts are washed out of the hide more easily when ammonium salts are used than when acid deliming agents are employed. It was noticed that the deliming bath, when ammonium salts were used, always remained odourless and free from mould-growths while the acid baths soon decomposed, the ammonium salts having apparently an antiseptic action. The alkaline solution also containing less dissolved hide-substance offered less nutrient material for the decomposing organisms. Hydrochloric acid seems the best acid deliming material as it gives results equal to those obtained by other acids and is considerably cheaper and dissolves less hide-substance.—D. J. L.

Fat in leather; Determination of —— by means of trichloroethylene. E. Goldberg. Ledertechn. Rundschau 1912, 4, 49—50. Leather World, 1912, 4, 404.

The use of trichloroethylene as a solvent for grease in leather, is proposed because of more rapid extraction than with carbon bisulphide. The extraction must be carried out in flasks of brown glass to prevent decomposition of the solvent by the action of light. 10 grms. of the sample are shaken in a flask with 100 c.c. of the solvent for one hour. After shaking and filtering, 50 c.c. of the filtrate are evaporated on the water-bath in a tared flask and the flask is dried at 100° C. for 15 minutes. The results agree well with those obtained by extracting with carbon bisulphide.—J. R. B.

Tannery waste waters; Purification of ——. W. Appelius. 23. Jahresb. der deutschen Gerberschule zu Freiberg, 1911—1912. Leather World, 1912, 4, 420.

The systems of dealing with tannery effluents may be classed under two heads, (1), mechanical and mechanico-chemical and (2), oxidation and biological methods. Tannery effluents are nearly always treated, before filtration, with ferrous sulphate, iron alum or aluminium salts, or with peat, to assist sedimentation, and are then filtered through sand and finally through clarifying towers, basins or wells. The process of this kind most in use in Germany is that of König and Degener, in which peat is employed in a finely divided state, and also lime, iron or aluminium salts. A clear, colourless and odourless filtrate is obtained which may be discharged direct into the stream. 1—2 kilos. of peat and 100—300 grms. of iron salt are required per cubic metre of water. Kratschmer's process consists in treating the waste water, which generally contains free lime, with aluminium sulphate and filtering through spent bark, after settling for 6—8 hours. Calvert and Chatter's process consists in adding sulphuric acid and then passing through sawdust, coke or sand. If arsenic be contained in the water, it is treated with ferrous sulphate and milk of lime and allowed to settle for 24 hours. Soaks and washing waters are filtered through a layer of spent bark 2—3 feet thick and deodourised and disinfected by the addition of chloride of lime or calcium bisulphite. Spent tan liquors are treated with lime or filtered through sand or porous earth. Of the oxidation or biological processes, that of Dunbar is used to the greatest extent in German tanneries, but these processes can only be used when the amount of mineral matter present is low.—D. J. L.

Patents.

Chamois leather; Manufacture of ——. J. Lewkowitsch, London, and J. T. Wood, Nottingham. Eng. Pat. 13,126, June 1, 1911.

Instead of using marine animal oils for the conversion of skins into chamois leather, the fatty acids, prepared from the oils by saponification methods as used in candle and soap making, are utilised. The skins are "stocked" with the fatty acids, pressed and washed in the usual manner, and the recovered fatty matter is converted into degras, moëllon, sod oil and the like.—J. R. B.

Leather; Substitute for ——, *and process of preparing the same.* R. A. McLaurin, Milliken Park, Renfrewshire. Eng. Pat. 27,969, Dec. 13, 1911.

A substitute for leather prepared from vellum cloth by impregnating it with celluloid or nitrocellulose solution and calendering the surface.—J. R. B.

Preserving animal tissues; Process of —— *and the products obtained thereby.* J. R. Hatmaker, Paris. U.S. Pat. 1,027,128, May 21, 1912.

See Eng. Pat. 4351 of 1905; this J., 1906, 332.—T. F. B.

Chrome leather; Process for making ——. A. Wolff. Fr. Pat. 438,157, Dec. 16, 1911.

See Eng. Pat. 27,900 of 1911; this J., 1912, 292.—T. F. B.

Indurated albuminoid compound. Indurated casein compound. B. B. Goldsmith, New York. U.S. Pats. 1,027,121 and 1,027,122, May 21, 1912.

See Eng. Pat. 412 of 1909; this J., 1910, 227.—T. F. B.

Apparatus for manufacturing varnish for coating leather. U.S. Pat. 1,027,563. *See* XIII.

Rubber substitute, glue, or flexible cement. Eng. Pat. 8613. *See* XIV.

XVI.—SOILS; FERTILISERS.

Soil analysis; Modification of the method of mechanical ——. C. C. Fletcher and H. Bryan. U.S. Dept. Agric., Bureau of Soils, Bull. No. 84, March 23, 1912. Pp. 16.

The soils are divided into the following separate grades by mechanical analysis: fine gravel, coarse, medium, fine and very fine sand, silt and clay. Details are given, accompanied by working drawings, of a complete laboratory equipment for speedy and accurate soil analysis, particularly of the shaking machine, sieves and centrifuge. The samples collected in the field are reduced by quartering in the ordinary way and passed through a 2 mm. sieve. The fine earth is dried in aluminium dishes for two hours in the electric oven. Eight 5 grm. samples are weighed out, put in 8-oz. steriliser bottles with 2 oz. of water and a few c.c. of ammonia and shaken mechanically for at least 7 hours. Each of the eight soils is in turn brought into suspension by the use of a compressed water jet and sufficient time allowed for all the sands to settle, the process being controlled by microscopic examination. The liquid is decanted into the centrifuge tube, and centrifuged until there are no silt particles left in suspension. The clay suspension is poured into a pitcher and the process repeated. When the separation is complete, the sands are in the steriliser bottles, the silt in the centrifuge tubes, and the clay in the porcelain pitchers. The sands are removed to small platinum dishes, dried and weighed. They are then separated into five grades by three minutes' shaking in a set of sieves and each grade weighed; the total should come within 10 mgrms. of the initial weight. The silts are similarly transferred to platinum dishes, dried and weighed. The clay water is evaporated in enamelled cups having a capacity of 300 c.c. and weighed in these; the clay may also be determined by difference, a method stated to be accurate within 1 per cent. Certain difficulties encountered in mechanical soil analysis are discussed.—E. F. A.

Urease; Distribution of —— *in the higher plants.* G. Zemplén. Z. physiol. Chem., 1912, 79, 229—234.

The author examined the seeds of a considerable number of plants with regard to the presence therein of urease, an enzyme capable of producing ammonia from urea (see this J., 1910, 36; 1911, 566). The results, which are tabulated, show that the seeds of most of the plants belonging to the order, *Papilionaceæ*, contained a considerable quantity of urease, whilst in the seeds from plants of the order, *Gramineæ*, the enzyme could not be detected. The seeds richest in urease were those of *Amorphe fruticosa*, *Robinia pseudacacia* (false acacia), *Caragana arborescens* (Siberian pea tree), *Lupinus albus* (white lupin), and *L. luteus* (yellow lupin), the quantities of ammonia produced in 4—5 days at the ordinary temperature from 200 c.c. of a 1 per cent. solution of urea by 1 grm. of the finely-powdered seeds being 0·861, 0·670, 0·551, 0·373, and 0·358 grm. respectively in the order mentioned. One grm. of powdered *Robinia pseudacacia* seeds, acting on 200 c.c. of urea solution at the ordinary temperature, produced in 8 days, 1·073 grms. of ammonia from a 1 per cent. solution of urea, 1·997 grms. from a 2 per cent. solution, and 3·176 grms. from a 3 per cent. solution, the total possible yields of ammonia being 1·136, 2·268, and 3·402 grms. respectively. The activity of the urease was not diminished by keeping the powdered seeds for six weeks over sulphuric acid in a vacuum exsiccator. —A. S.

Urease; a selective enzyme. Studies on enzyme action. XV. H. E. Armstrong and E. Horton. Roy. Soc. Proc., 1912, **B**, 85, 109—127.

THE urease (see this J., 1910, 36; 1911, 566) was prepared by extracting ground soya beans with petroleum spirit, then mixing the meal with five times its weight of water and a little toluene, and filtering after 24 hours. Twenty c.c. of the faintly acid solution thus prepared, when mixed with an equal volume of a solution containing 0·5 grm. of urea, hydrolysed the latter within half an hour at 20° C. On keeping, the acidity of the solution increased and a coagulum was deposited, whilst the hydrolytic activity simultaneously decreased. The enzyme was found to be without action on various alkyl-substituted ureas and on biuret. In a given time about as much urea was hydrolysed in a $M/5$ solution as in a $M/1$ solution, whilst in a $5M$ solution of urea, less than one-half as much was hydrolysed as in a $M/1$ solution. The rate of hydrolysis was retarded slightly by ammonium carbonate, moderately by potassium and sodium chlorides and methylurea, and markedly by ammonia. It was increased slightly by ammonium chloride and by dextrose, and markedly by carbon dioxide and by glycocoll. The diminution of the activity of the enzyme on keeping was accelerated by small quantities of acid but not notably by small quantities of ammonia. The authors regard urease as a selective enzyme corresponding closely in structure with the hydrolyte, probably the hydrated form of urea, $C(OH)_2(NH_2)_2$, of which it is the specific hydrolyst. Its function is probably to condition the decomposition of the urea-hydrate into orthocarbonic acid and ammonia by a direct process of hydrolysis —$C(OH)_2(NH_2)_2 + 2OH_2 = C(OH)_4 + 2NH_3$—and thus prevent its reversion to ammonium cyanate by a process of dehydration.—A. S.

PATENT.

Phosphates; Process for treating ——. N. P. Pratt. Fr. Pat. 438,806, Jan. 9, 1912.

SEE U.S. Pats. 1,014,254 and 1,014,255 of 1912; this J., 1912, 196.—T. F. B.

XVII.—SUGARS; STARCHES; GUMS.

Juice extraction; New processes of beetroot ——. A. Herzfeld. D. Zuckerind., 1912, 37, 484—486. (*Cf.* also this J., 1909, 212, 949; 1910, 290; 1912, 85.)

THE author summarises the general advantages of the new juice extraction processes, particularly those of Steffen, Hyross-Rak and Bosse, as follows:—(1) They are more or less automatic; (2) the necessary plant requires relatively less space than that taken up by the ordinary diffusion apparatus; (3) exhausted slices are obtained of a high dry substance content; and (4) the formation of waste waters is obviated. Theoretically, with these new processes, it is possible to work with a low juice draw-off, only 89 litres, if the roots sliced contain 5 per cent. of marc; but in actual practice this figure is never realised, owing, it is held, partly to the fact that to attain the maximum extraction of sugar the pressed slices have to be treated with hot water, and also partly to the condensation of the considerable amount of steam that must be used to destroy the froth. Attention is called to the calculation of Claassen showing that a juice draw-off that is 10 per cent. in excess of the theoretical amount corresponding to the pure juice of the root, would require in a triple effect, a quadruple effect, and a quadruple effect with juice-heater attached, 4·01, 3·3, and 2·9 kilos. more steam, costing 0·80, 0·66 and 0·58 pf. per 100 kilos. of roots more respectively. As to the disadvantages, compared with ordinary diffusion, these are given as: (1) more power and heat is required; (2) greater experience is demanded, and special attention must be taken not to over-scald the slices; (3) except with the Bosse process, there is a considerable formation of froth; and (4) according to the fineness of the slices and the pressure used, a greater or smaller amount of fine pulp is formed, the removal of which as completely as possible is of the greatest importance.—J. P. O.

Fiehe's reaction; Study of ——. G. Halphen. Ann. Falsif., 1912, 5, 105—115.

FIEHE'S test for the detection of added invert sugar in honey (this J., 1908, 1127) depends on the red colouration produced in hydrochloric acid solutions of resorcinol by certain derivatives of furfural (see Van Ekenstein and Blanksma, this J., 1909, 536; Jägerschmid, this J., 1909, 805), formed during the artificial inversion or caramelisation of sucrose, but absent from pure honey. The value of this test has been much discussed, and it has been asserted that pure honey responds positively to it after heating (see Quantin, and also Reinhardt, this J., 1910, 1072; Witte, this J., 1911, 564; Hartmann, this J., 1911, 565; Voerman and Bakker, this J., 1912, 86). The author has found that positive results are also obtained with formaldehyde and certain aromatic essences, but not if the reaction is carried out in alcoholic solution. To avoid the influence of any such essences present in honey, it is recommended to dehydrate the ethereal extract (*e.g.*, by means of powdered alum dried at 100° C.) and to use 2 c.c. of it for the test, together with 2·5 c.c. of absolute alcohol, 0·3 c.c. of hydrochloric acid of 20°—21° Bé., and 0·02 grm. of resorcinol. Sucrose responds positively to the test after heating at 87° C. for 2 hours with ¼ of its weight of water and 1/1000 of its weight of acids—even organic acids—especially if sodium chloride is present during the heating.—J. H. L.

Honey; Fiehe's reaction in the analysis of ——. L. Stœcklin. Ann. Falsif., 1912, 5, 116—121.

IN applying Fiehe's reaction (see preceding abstract) the following process is recommended:—The reagent is prepared by dissolving 2·8 grms. of pure resorcinol in water, shaking with a little blood charcoal, previously extracted with acid, and then making up to 100 c.c.; 36 c.c. of this solution, after filtration, are diluted to 100 c.c. with hydrochloric acid of sp. gr. 1·19. In carrying out the test, 5 grms. of honey are triturated for 4—5 mins. in a mortar with 20 c.c. of ether, about half of which usually evaporates during the operation. The ethereal extract is carefully filtered into a test tube containing 10 c.c. of the reagent, so that it rests on the latter without mixing. The tube is then stoppered and kept in the dark for 24 hours. If the honey contains added invert sugar, a bluish-red colouration appears at the surface of separation of the liquids and persists for at least 24 hours. The presence of impurities in the reagents may give rise to the production of a yellow colour, afterwards becoming brown, and this may render the results of the test doubtful. The author has found that such doubtful results may be avoided by observing the following precautions:—The vessels used are cleansed with a mixture of chromic and sulphuric acids, washed well, and dried without wiping. The ether employed is purified by shaking successively with (1) a little water to remove alcohol, (2) a mixture of chromic and sulphuric acids, (3) water, and (4) a 10 per cent. solution of caustic alkali. The ether, which should be quite colourless, is then filtered and kept in the dark; if necessary it may be dehydrated by means of powdered anhydrous sodium sulphate. Ten c.c., run carefully on to an equal volume of Fiehe's reagent in a test-tube, should produce no trace of yellow colour within 24 hours, and such a blank test should always be carried out in parallel with actual tests of honey. The hydrochloric acid employed should be quite free from salts, and oxidising agents, particularly chlorine, which is liable to be formed on exposure to light. The presence of chlorine can be detected by adding a crystal of potassium iodide, dissolved in a little water, to 40 c.c. of the acid and shaking with 1—2 c.c. of recently distilled carbon bisulphide. The slightest pink colouration of the carbon bisulphide indicates the presence of chlorine, which may be removed by adding to the acid successive small quantities of urea, until the test just described gives a negative result. The hydrohloric acid used by the author required 10 mgrms. of rea per 100 c.c.—J. H. L.

Starch ; Action of ultra-violet rays on ——. J. Bielecki and R. Wurmser. Comptes rend., 1912, **154**, 1429—1432.

Potato starch, demineralised by the method of Malfitano and Moschkoff (this J., 1910, 1402), was employed ; the specific rotatory power of the demineralised product was $[a]_D^{20} = 217·45°$ in the 0·38 — 0·40 per cent. aqueous solutions used in the experiments. The solution was exposed, at a temperature of about 45° C., to the light from a quartz mercury vapour lamp. The solution thus treated, was found to have acquired an acid reaction and to contain dextrins, dextrose (but no lævulose), pentoses, and formaldehyde (but no acetic or propionic aldehyde). —L. E.

Patent.

Sugar for manufacturing bonbons ; Apparatus for boiling ——. C. Rost, Dresden, Germany. Eng. Pat. 11,546, May 12, 1911.

The sugar solution is pumped through a coil arranged in a steam-heated chamber, the quantity of solution passing through the pump being adjusted by a device which alters the piston stroke, and at the same time actuates a valve which regulates the amount of steam admitted to the chamber.—W. P. S.

XVIII.—FERMENTATION INDUSTRIES.

Beers in bottle ; Relation between alterations in the acidity and the stability of ——. L. v. Vetter. Woch. Brau. 1912, **29**, 303—307.

The stability of bottled beer, as measured by the time which elapses before the appearance of cloudiness or deposit, is raised to a maximum value by addition of small quantities of acid (about 0·03 per cent.). Larger amounts of acid, and any addition of alkali whatever diminish the stability (see Schönfeld and Hirt, this J., 1911, 1274 ; 1912, 87). If, however, the beer is filled into bottles which have been coated inside with varnish as a protection against alkali from the glass, the beer is most stable in its original condition, and any addition of acid whatever leads to a more rapid appearance of cloudiness. The author concludes that beers bottled in the ordinary way dissolve alkali from the glass, and the quantity of acid necessary to confer the maximum stability, is really that which is just sufficient to restore to the beer its original acidity. The quality of the glass may therefore exercise an important influence on the stability of beers in bottles.—J. H. L.

Salicylic acid [in wine, etc.] ; Rapid method for detecting ——. L. Stœcklin. Ann. Falsif., 1912, **5**, 220—223.

Ten c.c. of wine, or other liquid, are mixed in a test-tube with 1 c.c. of strong hydrochloric acid, and shaken up gently, so as to avoid emulsification, with 5 c.c. of dichloroethylene (commercial "dielene"). Separation will then occur at once. The supernatant acid liquid is siphoned off and the residual dichloroethylene is washed twice with distilled water, vigorous shaking being avoided. After the second washing, a layer of water about 1 mm. deep is left on the surface of the dichloroethylene. This is touched with a glass rod previously moistened in ferric chloride solution. After thorough agitation and subsequent rest, the colour of the aqueous layer is observed. In presence of 0·05 mgrm. of salicylic acid a distinct violet tint will appear. —J. O. B.

Distribution of urease in the higher plants. Zemplén. *See* XVI.

Urease ; a selective enzyme. Armstrong and Horton. *See* XVI.

Arsenic content of shellac and contamination of foods from this source. Smith. *See* XIXa.

Patents.

Colouring malt ; Method of preparing —— *in the form of meal.* H. Durst, Baden, Germany. Eng. Pat. 11,419, May 11, 1911. Under Int. Conv., May 11, 1910.

See Fr. Pat. 429,547 of 1911 ; this J., 1911, 1275. T. F. B.

Fermentation ; Processes of ——, *particularly brewing.* A. G. Bloxam, London. From W. Caspari, Charlottenburg, Germany. Eng. Pat. 13,189, June 1, 1911.

See Ger. Pat. 235,173 of 1909 ; this J., 1911, 1082.—T. F. B.

XIXa.—FOODS.

Explosions ; Reports on circumstances attending —— *which occurred* (1) *at the works of Messrs. William Primrose & Sons, Ltd., Centre Street, Glasgow, on Nov.* 10 1911, *and* (2) *at the works of Messrs. J. Bibby & Sons, Formby Street, Liverpool, on Nov.* 24, 1911. (1) W. S. Smith and (2) J. Jackson, H.M. Inspectors of Factories. [Cd. 6223.]

(1) The operations carried out in this factory consisted in grinding peas, beans, and wheat. At the time of the explosion all the millstones, except that used for grinding wheat, were running. The initiating cause of the explosion is considered to be a fall of dust from the overhead beams on to a portable Bunsen burner. An examination of some of the beams in the building showed that there was a thickness of dust which varied from 2 ins. to 5 ins. This dust was very fine and had the appearance of pale brown flour. When it was blown into an explosion tube it could be ignited at a lower temperature than many samples of coal dust, viz., 1050° C. and the flame travelled along the whole of the tube as a bright flash. Deposits of dust were probably present in the warehouse in sufficient quantities to be disturbed by the initial explosion, and the presence of this disturbed dust in the atmosphere of the rooms was responsible for the transmission of the explosion wave throughout the entire building. It is suggested that the prohibition of the use of naked lights, smoking, carrying matches, and the frequent cleaning of floors, beams, rafters, etc., would tend to minimise the dangers of dust explosions in similar buildings.

(2) As a result of this explosion 39 persons were killed and 101 were injured. The explosion undoubtedly originated in the basement where six large disintegrators, for grinding oil-cake, beans and other materials, and the necessary elevators, were at work. The explosion is considered to be due to the ignition of a dense cloud of dust produced by the breaking of the driving belt of one of the machines. This belt was 6 ins. wide and ran at a speed of about 5000 feet per minute. An examination of the dust produced in the factory gave the following results : —Carbohydrates, (30·81 per cent.), moisture (9·63), ether extract (12·16) albuminoids (38·90), ash (6·00), and fibre (2·50 per cent.). This dust was not explosive, if suspended in the air in small quantities, but an explosion was produced, in a dense cloud of the dust, by the introduction of a lighted lucifer, the flame of an ordinary gas jet, the flash caused by the fusing of an electric fuse wire, and the spark produced by breaking the circuit of an electro magnet. The originating cause of the explosion may probably have been due to either of the two latter causes. The following recommendations are made for warehouses or other places where carbonaceous dust is generated in dangerous quantities. The rooms used for the purpose should not have any other rooms above them, nor should they be adjacent to higher buildings which would be affected in the event of an explosion, and the roof should

offer little resistance. There should be no open beams, or girders, or other ledges on which dust could lodge. The floors, walls, machinery, etc., should be cleaned from dust daily—preferably by suction cleaners. The machinery should be so constructed as to prevent the escape of dust and should preferably be provided with exhaust draft. Efficient electro-magnetic separators should be provided on the feed of each disintegrator, to arrest particles of iron and steel. No naked gas lights, or electric arc lamps should be used, and incandescent electric lamps should have outer dust-tight glass covers. No matches or smoking should be allowed.—G. W. McD.

Shellac; The arsenic-content of —— and the contamination of foods from this source. B. H. Smith. U.S. Dept. Agric., Bureau of Chem., Circular No. 91, Feb. 20, 1912.

TWENTY-EIGHT samples of shellac purchased at random on the open market were all found to contain arsenic, the quantities present varying from 4 to 2080 parts of arsenious oxide per million parts of shellac; the majority of the samples contained over 200 parts of arsenious oxide per million. The practice of adding orpiment to shellac is very common, but appears to be wholly unjustifiable. As shellac is used largely by confectioners for the purpose of glazing goods, by brewers for coating casks, vats, etc., and by other manufacturers as a varnish on receptacles for various kinds of foods, it is evident that foods and beverages may become contaminated with arsenic from this source, although the quantity of arsenic likely to be dissolved from the shellac is very small.—W. P. S.

Rapid detection of salicylic acid [in wine, etc.]. Stœcklin. *See* XVIII.

PATENTS.

Vegetables and fruit; Process for retaining the colour of —— during sterilisation. F. Blassneck, Seesen-am-Herz, Germany. Eng. Pat. 27,017, Dec. 2, 1911. Under Int. Conv., Dec. 2, 1910.

THE vegetables, or fruit, are treated for about 15 minutes with a dilute solution of calcium hydroxide before being submitted to the sterilising process. If desired, the vegetables, etc., may be "blanched" before treatment and barium or strontium hydroxides may be used in place of calcium hydroxide.—W. P. S.

Milk; Process of treating and apparatus for drying ——. J. McIntyre, Jersey City, N.J., Assignor to W. M. Griffith, Freeport, N.Y. U.S. Pats. 1,026,756 and 1,026,757, May 21, 1912.

(1) THE milk is heated in an open vessel by means of a heating coil situated directly below the surface of the liquid, a current of highly heated air being also forced through the milk from the lower part of the vessel. The milk is agitated continuously, and, when it has been evaporated to a creamy consistence, the heating coil is removed and the evaporation continued by means of the current of hot air until the milk has been converted into a dry powder. The temperature during the operation is maintained above 90° F. (2) An apparatus for drying milk consists of a vessel open at the top and having its lower part semi-circular in cross-section; a movable heating coil is placed at the upper portion of the vessel and a slot extending the whole length of the bottom allows a current of hot compressed air to be introduced into the contents of the vessel. An agitator is fitted in the lower portion of the vessel and means are provided for clearing the slot.—W. P. S.

Chocolate masses and the like; Apparatus for refining ——. F. E. F. Neumann, Wandsbek, Germany. U.S. Pat. 1,026,110, May 14, 1912.

SEE Eng. Pat. 20,363 of 1911; this J., 1912, 43.—T. F. B.

Sugary fodder; Process for making —— by mixing conce trated beetroot juice with absorbent substances. Huillard. Second Addition, dated March 7, 1911, Fr. Pat. 416,307, Aug. 3, 1909.

SEE Eng. Pat. 16,823 of 1911; this J., 1912, 250.—T. F.

Milk; Process and apparatus for desiccating ——. H. Andrews. Fr. Pat. 438,143, Dec. 12, 1911.

SEE U.S. Pat. 1,012,578 of 1911; this J., 1912, 148.—T. F.

Production of ozone and its utilisation for the preservatio of chilled meat and for other purposes. Eng. Pat. 17,42 *See* XIXB.

XIXB.—WATER PURIFICATION; SANITATION

Nitrites in potable waters; Determination of ——. [Interference of ferric salts.] G. D. Elsdon. Chem. News, 1912, 105, 243.

IN the determination of nitrites by means of the starch-iodide reaction, the presence of ferric salts influences the results obtained. One part of ferric iron per million parts of water gives a colour which corresponds with that obtained with 0·07 part of sodium nitrite; one part of iron in 50 million parts of water can just be detected by means of the starch-iodide reaction, whilst 1 part in ten millions gives an appreciable reaction. The colouration is obtained when ferric iron and nitrites are present together. Ferrous iron does not itself yield a colouration but it diminishes the colour produced by nitrites. The author prefers the Griess-Ilosvay method for the determination of nitrites.—W. P. S.

Bacteria; Certain results of drying non-sporing —— in a charcoal liquid air vacuum. S. G. Shattock and L. S. Dudgeon. Roy. Soc. Proc., 1912, **B, 85,** 127—138.

THE authors have compared the vitality of certain non-sporing bacteria dried in a charcoal liquid air vacuum and kept *in vacuo* with that of the same bacteria dried and kept in air. In the dark, *Bac. coli* and *Bac. typhosus* were dead after four days both *in vacuo* and in air. With *Staphylococcus pyogenes aureus*, in one experiment the micro-organism was found to be dead after 40 days when kept in the air, whilst in another experiment, death occurred some time between nine and twelve weeks in the case of the staphylococcus kept in air, and between four and fifteen weeks in the case of that kept *in vacuo*. *Bac. pyocyaneus* proved remarkably resistant when kept *in vacuo* in the dark, being still alive even after seven months and seven days, whereas when kept in air, the bacillus never survived longer than nine days. The resistance of *Bac. pyocyaneus* to heat and to the action of sunlight is not increased by drying *in vacuo*. The lethal temperature is about the same for the bacillus in the wet state, when air-dried, and when dried and kept *in vacuo*. *Bac. pyocyaneus* dried and *in vacuo* is destroyed within six hours by bright sunlight, and much more rapidly still when it is exposed, in an atmosphere of nitrogen (to prevent possibility of formation of ozone) to ultra-violet rays from a quartz mercury vapour lamp.—A. S.

Purification of tannery waste waters. Appelius. *See* XV.

Determination of nicotine in tobacco. Harrison and Self. *See* XX.

Patents.

Sewage or the like; Treatment of ——. N. Testrup, London. Eng. Pat. 3247, Feb. 8, 1911.

The sewage is heated to a temperature of about 130° C. under pressure, and then filtered. The solid portion is extracted with acetone, or other solvent miscible with water, in order to separate fatty substances, and the latter are recovered by distilling off the solvent. After the removal of the fatty substances, the residual solid portion of the sewage may be utilised as fuel or subjected to destructive distillation, the resulting gas being used for heating purposes after the ammonia has been recovered. The process is carried out in a continuously acting digester, means being provided for causing the hot liquid leaving the digester to part with its heat to the cold liquid as the latter is introduced; the digester may be heated by the combustion of the solid portion of the sewage or by the gases derived therefrom.—W. P. S.

Ozone; Production of —— *and its utilization for the preservation of chilled meat and for other purposes.* F. A. Willcox and J. and E. Hall, Ltd., Dartford, Kent. Eng. Pat. 17,423, July 31, 1911.

Ozone produced by a suitable form of ozoniser is passed through a vessel containing sodium hydroxide, potassium hydroxide, or calcium hydroxide, in order that nitrogen oxides may be removed from the ozone. The reagents may be used in the solid state, or in solution.—W. P. S.

Insectides, sheep-dip, vermifuges, and the like. I. S., L., and S. McDougall, Manchester. Eng. Pat. 3204, Feb. 8, 1911.

An extract is prepared from the roots, bark, etc., of plants, bushes, or trees known in Borneo as "tuba rabut," "tuba tedong," "aere" (or "akar"), and "perkakal," and this extract is mixed with soap, sulphur, water, etc., to form preparations useful as insecticides.—W. P. S.

Concentration of aqueous solutions and extracts of tobacco containing free nicotine; Process and apparatus for the ——. J. Sartig. Fr. Pat. 438,175, Dec. 21, 1911.

It has been found that nicotine is distilled by steam from aqueous solutions only when the temperature of evaporation is 22° C. or higher, corresponding to a pressure of about 19·5 mm. or more. At lower temperatures and corresponding pressures no nicotine is carried over. The process therefore consists in evaporating aqueous liquids containing free nicotine at pressures of 18·5 mm. and less, corresponding to temperatures of 21° C. or lower. The process is advantageously carried out at 15° C. and 12·5 mm. An apparatus for the purpose consists of a still provided with a gauge-glass, and surrounded by a water-jacket supplied with water at the desired temperature. A hot-water vessel is provided beneath the still for heating purposes, and a reflux condenser is attached to the top of the still, its upper end being connected with a vacuum pump.—T. F. B.

Phenols or their substitution products; Process for preparing aqueous solutions of ——. F. Hoffmann-La Roche und Co. Ger. Pat. 246,043, March 14, 1911.

Phenols or their substitution products when mixed with the alkali salts of bile acids are easily soluble in water, giving perfectly clear solutions. These solutions are suitable for use as disinfectants on account both of their phenol contents and of the powerful bactericidal action of the salts of the acids of bile.—T. F. B.

Zeolites; Process for regenerating artificial —— [*after use for water purification*]. Latzel und Kutscha. Fr. Pat. 438,822, Jan. 9, 1912. Under Int. Conv., Jan. 10, 1911.

See Eng. Pat. 732 of 1912; this J., 1912, 406.—T. F. B.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Nicotine in tobacco; Determination of ——. E. F. Harrison and P. A. W. Self. Pharm. J., 1912, 88, 718—719.

A quantity of the tobacco or nicotine preparation, containing about 0·5 grm. of nicotine, is treated with alkali (slaked lime in the case of tobacco) and distilled with steam, the vapours being received in standard acid. The excess of acid is titrated with alkali, using litmus solution or tincture of cochineal as indicator, and the amount of total volatile alkali (nicotine plus ammonia) is calculated. An excess of 10 c.c. of $N/1$ acid is then added, the solution is concentrated to 50 c.c., and treated with a quantity of iodine solution ten times that required to precipitate an amount of nicotine equivalent to the total volatile alkali found. After making up the solution to 100 c.c. and shaking vigorously, the precipitated nicotine periodide is filtered off, and 75 c.c. of the filtrate are decolourised with thiosulphate and distilled with a large excess of caustic soda to determine the ammonia; the result is multiplied by $\frac{99}{75}$ (1 c.c. being allowed for the volume of the nicotine periodide precipitate) to obtain the amount of ammonia in the original sample. The nicotine is obtained by difference.—A. S.

Scopolamine. R. Willstätter and E. Hug. Z. physiol. Chem., 1912, 79, 146—163.

After long keeping, solutions of the salts of scopolamine show no change in their physical or chemical characters. The optical rotation of the hydrobromide was unaltered after the solution had been kept for six months. The reaction towards Methyl Red also was unaltered, nor was there any formation of aposcopolamine. Scopolamine and atropine form sulphuric acid esters by dissolving the base or the sulphate in concentrated sulphuric acid at the ordinary temperature. The base can previously be dissolved in carbon tetrachloride. After cautiously diluting and making alkaline with ammonia, the ester crystallises out. The esters are stable towards permanganate and bromine, but after making the solution alkaline with sodium hydroxide and acidifying, the apo-compounds are formed, which are attacked by these reagents. Scopolamine sulphuric acid ester crystallises from water in voluminous matted needles and melts at 244° C. with decomposition. It has the composition, $C_{17}H_{21}O_7NS$. Homatropine sulphuric acid ester can be formed in a similar way and melts at about 240° C. Aposcopolamine was prepared by adding excess of sodium hydroxide to the warm aqueous solution of the sulphuric acid ester, and extracting with ether when cold. The free base has the composition, $C_{17}H_{19}O_3N$, and melts at 97° C. after crystallising from ether. Scopoline was dissolved in sulphuric acid, and after standing, the solution was diluted with twice its volume of water. After warming on the water-bath and making alkaline, practically the whole of the base was recovered unchanged by extraction with ether. Scopolyl chloride, $C_8H_{12}OClN$, formed by the action of phosphorus pentachloride on scopoline hydrochloride, crystallises from ether in long prisms, m. pt. 38° C., b. pt. 102°—103° C. at 8 mm. It is very stable towards hydrolysing and reducing agents.—F. Shdn.

Organic bases. New reaction for ——. K. W. Charitschkoff. Chem.-Zeit., 1912, 36, 581.

The high-molecular, so-called inactive naphthenic acid, when dissolved in hydrocarbons or ether, has no action on copper sulphate, but if a small quantity of aniline, pyridine, quinoline, piperidine, coniine, nicotine, quinine, codeine, or other organic base soluble in ether, be also present, a green colouration is produced owing to the formation of copper naphthenate. In applying the reaction to the detection of organic bases, 1 part by volume of a solution of the naphthenic acid in ether or petroleum benzine is shaken with 0·5 part of a 3 per cent. solution of copper sulphate, and the substance under examination is added. Caffeine and dimethylamine do not give the reaction. Oleic acid may be used instead of inactive naphthenic acid.—A. S.

Euonymus atropurpureus; Chemical examination of the bark of ——. H. Rogerson. Chem. Soc. Proc., 1912, **28**, 138.

A DESCRIPTION was given of a complete examination of the root-bark of the *Euonymus atropurpureus*, Jacquin (Nat. Ord. *Celastraceae*). The new substances which have been isolated and characterised comprise a new crystalline acid, *furan-β-carboxylic acid*, $C_5H_4O_3$ (m. p. 121°—122° C.); a new crystalline alcohol designated *euonymol*, $C_{21}H_{30}O_4$ (m. p. 248°—250° C.), and a series of new alcoholic substances which give colour reactions similar to the phytosterols, and have been designated *euonysterol*, $C_{31}H_{51}O{\cdot}OH$ (m. p. 137°—138° C.), *homoeuonysterol*, $C_{40}H_{69}O{\cdot}OH$ (m. p. 133°—134°), and *atropurol*, $C_{27}H_{44}(OH)_2$ (m. p. 283°—285° C.) respectively. Various other definite substances have also been isolated and identified, amongst which may be mentioned dulcitol, $C_6H_{14}O_6$; citrullol, $C_{22}H_{36}O_2(OH)_2$; and a mixture of fatty acids. No evidence was obtained of the presence of a glucoside in the bark. *Euonymus atropurpureus*, Jacquin, is a good source of dulcitol, the yield being equivalent to 2·09 per cent. of the weight of root-bark taken.

Japanese Aralia and its glucoside. L. Danzel. J. Pharm. Chim., 1912, **5**, 530—534.

THE leaves of the Japanese Aralia (*Aralia japonica*, Thünberg) were extracted with hot 96 per cent. alcohol, and the extract diluted with water. The precipitate was purified by dissolving in alcohol and allowing to stand. Finally a colourless crystalline glucoside was obtained, styled *aralin*. This substance dissolves in ethyl acetate, but is insoluble in light petroleum spirit, chloroform, water and ammonia. It melts at 260° C. (Maquenne block) and has $[\alpha]_D = +52\cdot5^\circ$ in alcohol at 18° C. On boiling with dilute sulphuric acid, dextrose and an acidic substance, *aralidin*, are produced. The latter melts at 246°—248° C. The glucoside contains no nitrogen. About 0·80 grm. of the crude material was obtained from 1·5 kilos. of the leaves which had been collected in the autumn.—F. SHDN.

Glucosides; New synthetic ——. F. Mauthner. J. prakt. Chem., 1912, **85**, 564—568.

AN alkaline solution of *p*-hydroxyacetophenone was shaken vigorously for 18 hours with an ethereal solution of β-acetobromoglucose. The crystalline condensation product was separated and the acetyl group eliminated by prolonged shaking with a dilute solution of barium hydroxide. After removing the barium by means of carbon dioxide, and evaporating the solution to dryness at a temperature not exceeding 45° C. and a pressure of 12 mm., the new glucoside, gluco-*p*-hydroxyacetophenone, was isolated by extraction with alcohol. After purification it was obtained in colourless needles, m. pt. 195°—196° C., $[\alpha]^{23}_D = -87\cdot82^\circ$, easily soluble in water and warm alcohol, soluble with difficulty in cold alcohol, and almost insoluble in ether. Gluco-*p*-hydroxybenzaldehyde was prepared in a similar manner. It forms colourless needles, m. pt. 157°—158° C., $[\alpha]^{21}_D = -94\cdot45^\circ$, easily soluble in water and warm alcohol, soluble with difficulty in cold alcohol, and almost insoluble in ether.—A. S.

Minjak-Lagam. L. van Itallie and M. Kerbosch. Pharm. Weekblad, 1912, **49**, 274—279. Chem. Zentr., 1912, **1**, 1666.

MINJAK-LAGAM is the name given to certain liquid or semi-solid balsam-like products occurring in the Dutch Indies. One specimen examined by the authors consisted of an orange-yellow oil having an odour similar to that of copaiba balsam: sp. gr. at 14°/15° C., 0·9512; acid value, 10·45; saponif. value, 14·8. It was soluble in 5 parts of absolute alcohol and miscible in all proportions with chloroform. A semi-solid balsam obtained from a Dipterocarpus species had the acid value, 20·8; saponi value, 25; and was soluble in chloroform. On distillatio with steam, both samples yielded caryophyllene.—A. S.

Dipterocarpol. L. van Itallie. Pharm. Weekblad, 191 **49**, 314—321. Chem. Zentr., 1912, **1**, 1666.

IF the portion of the balsam from *Dipterocarpus Hasselti* Blume, or *D. trinervis*, Blume, insoluble in petroleum ethe be boiled with alcohol, and the alcoholic solution coole a phytosterol, $C_{27}H_{46}O_2$, separates This compound, t which the name *dipterocarpol* is assigned, forms colourle crystals, m. pt. 134°—135° C., insoluble in water, slightl soluble in cold alcohol, readily soluble in hot alcohol an in ether, $\alpha_D = +64\cdot6^\circ$ (1·199 grms. in 50 c.c. of chloroform On heating with acetic anhydride and sodium acetate t 160° C., or by the action of phenyl isocyanate, it is converted into *dipterocarpol anhydride*, $C_{27}H_{44}O$, m. pt. 69°—70° C., which also responds to the reactions for phytosterols Dipterocarpol takes up three atoms of iodine, partly b addition and partly by substitution.—A. S.

Essential oils; Solubility of water in ——. J. C. Umne and S. W. Bunker. Perfumery and Essen. Oil Rec. 1912, **3**, 101—104.

STEAM was passed into a mixture of essential oil and wate under a reflux apparatus for 30 minutes, and the mixtur allowed to cool to 25°—30° C. The oil was then separate and allowed to stand at 15° C. in a stoppered bottle fo three days, when the refractive index at 25° C. was observed The oil was then dried with sodium sulphate and th refractive index again observed. The decrease in thi value owing to the presence of water was used to calculat the amount of the latter dissolved by the oil. Oils consisting mainly of terpenes do not dissolve water to a appreciable extent. Where the chief constituent is a oxygenated body, the oil may dissolve as much as 0·5 pe cent. of water, independently of the chemical nature o the chief constituent. Turkish geranium and Jav citronella oils, however, dissolve 1·13 per cent. and 0·7 per cent. respectively. Oils containing constituents o the lactone or ketone type appear to be incapable of dissolving water. Contrary to expectation santal oil dissolves only 0·17 per cent. of water.—F. SHDN.

Essential oils. III. Oil of Sweet Basil [*Ocimum basilicum*] G. Laloue. Bull. Soc. Chim., 1912, **11**, 491—494.

THE essential oils from four varieties of the Sweet Basi (*Ocimum basilicum*) were examined both as to the yiel and the physical characters. The most satisfactory oi was that obtained from the variety with white curled leaves (var. *crispum* E. G. Camus). The yield from this plant was 0·1285 per cent. and the odour was similar to that of the oil obtained from the ordinary variety. The oi was soluble in 2—3 parts of 70 per cent. alcohol. The characters were: sp. gr. at 15° C., 0·9123; $\alpha = -10\cdot5^\circ$ in a 100 mm. tube; refractive index at 20° C., 1·484; saponification value, 4·9; saponification value after acetylation, 116·9.—F. SHDN.

Volatile oil plants; Wild ——, *and their economic importance: I Black Sage; II Wild Sage; III Swamp Bay.* F. Rabak. U.S. Dept. of Agric., Bureau of Plant Industry, Bulletin No. 235, Jan. 30, 1912.

THE oil distilled from black sage, *Ramona stachyoides*, (Benth.) Briquet, is composed essentially of camphor (over 40 per cent.) and cineol (22·5 per cent.), with a small quantity of an alcohol, probably borneol, a small quantity of thujone and traces of pinene and terpinene. If distilled during the full flowering stage, a yield of nearly 1 per cent. is obtained. The shrub thrives on low sandy hills or wastes, and is found in the middle and southern parts of California. The oil of wild sage, *Artemisia frigida*, Willd., contains 43 per cent. of borneol camphor (*l*-borneol), 35·8 per cent being free, the remainder being present as esters, 18 to 20 per cent. of cineol, 8—10 per cent. of fenchone, as well as small quantities of free fatty acids and terpenes.

The plant grows on sandy and stony hills in the North Western States. Swamp bay, *Persea pubescens*, (Pursh.) Sarg., grows abundantly in swamps from North Carolina to Florida and Texas. The oil contains over 21 per cent. of camphor, 19·8 per cent. of cineol, and borneol, as well as small amounts of fatty acids. Black sage and swamp bay should prove profitable sources of camphor, whilst borneol might be profitably obtained from wild sage. —F. Shdn.

Geraniol in oil of citronella; Direct determination of ——. J. Dupont and L. Labaume. Roure-Bertrand's Bull., April, 1912. Perfum. and Essen. Oil Rec., 1912, **3**, 106.

Ten grams of hydroxylamine hydrochloride are dissolved in 25 c.c. of water, 10 grms. of potassium carbonate dissolved in a separate quantity of 25 c.c. of water are added, and the mixture is filtered. 10 grms. of the oil are thoroughly shaken with this mixture for 2 hours at 15°—18° C. The oil is separated, dried by means of sodium sulphate, and boiled with twice its volume of acetic anhydride under a reflux condenser on the sand bath for 1½ hours. The oil is washed, dried, and saponified with alcoholic potassium hydroxide. The citronellal-oxime formed by the action of hydroxylamine is converted into the nitrile by boiling with acetic anhydride, and the nitrile is not affected by the potassium hydroxide solution. —F. Shdn.

Spearmint oil; Chemical investigation of American ——. E. K. Nelson. U.S. Dept. of Agric., Bureau of Chem., Circular No. 92, Feb. 5, 1912.

The oil distilled from American spearmint, *Mentha viridis*, had the following characters: sp. gr. 0·9290 at 25°/25° C.; optical rotation at 25° C., —52·16°; refractive index at 25° C. 1·4866; soluble in an equal volume of 80 per cent. alcohol; carvone, 65—66·5 per cent.; ester value, 12·4, after acetylation, 136·4. The oil was found to contain phellandrene and *l*-limonene, and also dihydrocarveol. There were present small amounts of a fatty acid and an acid crystallising from alcohol in pearly needles, m. pt. 182°—184°C.—F. Shdn.

Gingergrass oil; An abnormal sample of ——. W. H. Simmons. Perfum. and Essen. Oil Rec., 1912, **3**, 108.

A specimen of gingergrass oil which was soluble in 70 per cent. alcohol, had the following characters: sp. gr., 0·9364; optical rotation, —21°; esters (as geranyl acetate), 7·1 per cent.; total alcohols (as geraniol), 48·8 per cent.; saponification value after acetylation, 157. No indication of any adulterant was obtained by fractionation. The only abnormality was the high laevo-rotation.—F. Shdn.

Tanacetyl alcohols; Isomeric ——. V. Paolini and B. Divizia. Atti R. Accad. dei Lincei. Roma, 1912, **21**, I., 570—574.

The ketonic constituents of thuja oil were treated with semicarbazide and the semicarbazones submitted to fractional crystallisation as described by Wallach (this J., 1904, 1160). The semicarbazone melting at 186°—188° C., however, instead of yielding α-thujone ($[\alpha]_D = -10° 23'$), yielded its optical antipode ($[\alpha]_D = +10° 03'$). This new ketone and the ketonic constituents yielded by the remaining fraction (m.pt. from 140°—170°C) of the semicarbazones, when reduced with sodium and alcohol, both gave a mixture of alcohols (b. pt. 208°—210° C.), similar to that obtained from the ketones from tansy oil, and like the latter, yielding in preponderating quantity, β-thujyl alcohol (see this J., 1912, 300) when treated by the phthalic ester method. Starting from the tanacetyl alcohol (b. pt. 208°—210° C., $[\alpha]_D = +22° 20'$) from French wormwood oil, however, the authors succeeded in isolating by the phthalic ester method, a new thujyl alcohol, to which the name δ-thujyl alcohol is provisionally assigned. This new alcohol has the sp. gr. 0·923, b. pt. 206° C., $n_D = 1·4759$, and $[\alpha]_D = +50° 01'$.—A. S.

Arsenic compounds [sodium cacodylate and atoxyl]; Notes on some organic —— *recently introduced into therapeutics.* G. Bressanin. Gaz. chim. ital., 1912 **42**, I., 438—440.

Sodium cacodylate has been introduced into the latest edition of the Italian Pharmacopœia and a method for its determination is also given, based on its alkalinity to methyl orange. It is required that 10 c.c. of a solution of 1·6 grms. of the compound in 100 c.c., after addition of 1 c.c. of phenolphthalein, should be coloured by 0·5 c.c. of *N*/100 sodium hydroxide solution, and that the coloured solution when titrated with *N*/10 hydrochloric acid in presence of methyl orange, should require at least 7 c.c. of the acid to produce a pink colour: this is equivalent to 70 per cent. of sodium cacodylate. It is now pointed out that since carbonic acid like cacodylic acid is acid to phenolphthalein and neutral to methyl orange, the above method will fail in presence of sodium carbonate or bicarbonate, and the author recommends that after the titration with acid, the solution be boiled to expel carbon dioxide, and then titrated back with *N*/10 alkali until alkaline to phenolphthalein. With pure sodium cacodylate the amount of alkali required, will be exactly the same as that of the acid used in the previous titration.

Atoxyl (sodium *p*-aminophenylarsinate) has also been introduced into the Italian Pharmacopœia, and the author points out that the content of water of crystallisation of this substance may vary according to the method of preparation, etc., from two to six molecules, corresponding to a variation of arsenic content from 27·25 to 21·60 per cent.—A. S.

Cinnamic aldehyde; Adulterant of —— *[benzyl benzoate]*. T. Delphin. Svensk. Farm. Tidskrift., 1912, [12] Apoth-Zeit., 1912, **27**, 403.

A specimen of commercial cinnamic aldehyde having been found to give values slightly below the limits (1·054 to 1·056) for specific gravity, prescribed by the Swedish pharmacopœia, the suppliers were informed. They thereupon forwarded a specimen of "cinnamic fraction" with directions that this should be used to raise the sp. gr. to the required degree. As it was not evident how the addition of one pure substance to another, could alter its sp. gr., the so-called "fraction" was examined. It was found to be mixture of approximately one part of cinnamic aldehyde and 3 parts of benzyl benzoate.—J. O. B.

Acrolein; A method of formation of ——. W. Oechsner de Coninck. Comptes rend., 1912, **154**, 1353—1354.

When sodium formate is submitted to dry distillation, acrolein is formed. This was precipitated as the ammonia compound and the latter, when submitted to dry distillation furnished picoline.—J. C. C.

Rapid detection of salicylic acid [in wine, etc.]. Stoecklin. *See* XVIII.

Radium deposits; Austrian State purchase of ——. Board of Trade J., May 30 1912. [T.R.]

The Austrian Government is reported to have purchased the radium producing pitchblende mines of Joachimsthal at a cost of about £94,000. The annual production of ore from these mines is estimated at 10,000 kilos., which should contain about 3 grammes of radium.

Patents.

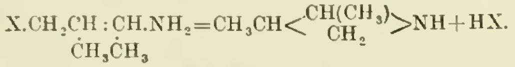
Oil-containing medicines; Solid ——. O. B. May, New York. Eng. Pat. 17,002, July 25, 1911.

Oils for medicinal purposes are combined with soluble starch and albuminous substances, forming dry products containing 33 per cent. or more of the oil. The method may be carried out, for example, by dissolving 33 parts of soluble starch in 60 parts of water, adding 33 parts of

gluten, and then thoroughly incorporating 33 parts of the oil with the mixture, the whole being slowly dried by heating. The product may be subsequently flavoured.
—T. F. B.

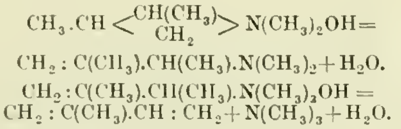
Erythrene and isoprene; Manufacture of —— and of intermediate products. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 18,935, Aug. 23, 1911.

Complete alkylation by Hofmann's reaction of αβ-dimethyltrimethylene-imine and of α-methyltrimethylene-imine and subsequent distillation results in the formation of αβ-dimethylallyldimethylamine and α-methylallyldimethylamine respectively. When these are converted into the quaternary ammonium compounds and treated by Hofmann's method, isoprene and erythrene are obtained. The parent materials may be obtained from ketobutanol and methylketobutanol by reducing their oximes to the hydroxy-bases, converting these into the corresponding halogen-bases (methyl- or dimethyl-γ-halogen-propylamines), and heating these to cause intramolecular condensation, *e.g.*,



$$X.CH_2\underset{CH_3}{\dot{C}H}:\underset{CH_3}{\dot{C}H}.NH_2=CH_3CH\left<\begin{matrix}CH(CH_3)\\CH_2\end{matrix}\right>NH+HX.$$

α-Methyl- and αβ-dimethyltrimethylene-imine are colourless, mobile oils, boiling at 75° and 88° C. respectively; they possess an ammoniacal odour and are soluble in water. The subsequent reactions may be represented by the following equations, for the preparation of isoprene:—



$$CH_3.CH\left<\begin{matrix}CH(CH_3)\\CH_2\end{matrix}\right>N(CH_3)_2OH=$$

$$CH_2:C(CH_3).CH(CH_3).N(CH_3)_2+H_2O.$$

$$CH_2:C(CH_3).CH(CH_3).N(CH_3)_2OH=$$
$$CH_2:C(CH_3).CH:CH_2+N(CH_3)_3+H_2O.$$

—T. F. B.

Isoprene from nopinene; Process for preparing ——. Chem. Fabr. auf Actien, vorm. E. Schering. Fr. Pat. 438,789, Jan. 8, 1912. Under Int. Conv., Jan. 12, 1911.

When nopinene (b. pt. 165°—166° C.) is heated to high temperatures, it is converted into isoprene, the yield being higher than when pinene is so treated. For example, a yield of 20 per cent. is obtained by passing nopinene in the form of vapour over an electrically heated metallic surface, and suitably condensing the product.—T. F. B.

β-Imidazolylethylamine; Manufacture of —— or of its salts. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 22,794, Oct. 16, 1911.

β-Imidazolylethylamine is produced by subjecting histidine to a process of artificial putrefaction, *e.g.*, by inoculating with putrefying pancreas. The base is precipitated as a salt insoluble in water or alcohol by the addition of a suitable acid or an alkaloid precipitant, and the free base is then liberated in the usual way.—F. Shdn.

Hydrohydrastinine; Manufacture of ——. H. S. Wellcome, London, F. L. Pyman and F. G. P. Remfry, Dartford. Eng. Pat. 23,736, Oct. 26, 1911.

Suitable reducing agents, such as sodium and alcohol, can be used to convert hydrocotarnine into hydrohydrastinine.—F. Shdn.

Hydrocinchona alkaloids; Manufacture of ——. Verein. Chininfabr. Zimmer und Co., Frankfort on Maine, Germany. Eng. Pat. 3948, Feb. 16, 1912. Under Int. Conv., April 26, 1911.

In the process described in U.S. Pat. 989,664 of 1911 (see this J., 1911, 649), the colloidal solutions of platinum metals may be replaced by the metals themselves, these being best used in a finely divided condition or deposited on inert substances. *Example.* One part of palladium black is added to a solution of 250 parts of quinine sulphate in 1400 parts of water and 40 parts of sulphuric acid, and the mixture is shaken with hydrogen under a low pressure until it is stable towards permanganate; after filtration the solution is neutralised whilst hot, when hydroquinine sulphate will at once crystallise in the form of fine needles.
—T. F. B.

Glycerophosphoric acid; Manufacture of ——. Southall Bros. and Barclay Ltd., and C. S. Roy, Birmingham. Eng. Pat. 2806, Feb. 3, 1912.

A mixture of equimolecular proportions of glycerin and syrupy phosphoric acid can be made to give a satisfactory yield of glycerophosphoric acid by heating the same with stirring to a temperature of 100°—105° C. and at a pressure of 30 mm.—F. Shdn.

Esters of phosphoric acid derived from phenols and naphthols, their homologues and derivatives; Process for making normal ——. Act.-Ges. f. Anilinfabr. Fr. Pat. 439,067, Jan. 17, 1912. Under Int. Conv., Feb. 10, 1911.

The normal phosphoric esters of phenols or naphthols, or their homologues or derivatives, are readily obtained in good yields when phosphorus oxychloride is caused to act on the anhydrous alkali salts of the phenol, etc., in presence of an indifferent liquid which does not contain water. The preparation of the anhydrous salts and their treatment with phosphorus oxychloride can be effected in one continuous operation. Thus, 108 kilos. of *o*-cresol and 100 kilos. of 40 per cent. caustic soda solution are successively introduced into 600 kilos. of xylene in a vessel provided with a stirrer; the mixture is distilled so long as any water comes over, after which 51 kilos. of phosphorus oxychloride are added, the temperature being kept between about 20° and 100° C.; after the addition is completed the mixture is heated and stirred for several hours. The sodium chloride is removed by washing with water, and the ester is obtained from the xylene solution by distillation, and purified by distillation in a vacuum.—T. F. B.

Arseno compounds and process of making same. R. Kahn, Frankfort. Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,026,094, May 14, 1912.

Aromatic arsinic acids which contain salt-forming groups (hydroxyl or amino) as substituents, or the corresponding arsenoxides, may be reduced to primary aromatic arsines by treatment with nascent hydrogen (zinc and hydrochloric acid) in strongly acid solution. The products are capable of forming salts soluble in water, and are readily oxidised with the formation of arseno-compounds (compare Eng. Pat. 15,438 of 1911; this J., 1912, 409).
—T. F. B.

3.3′-*Diamino-4.4′-dihydroxyarsenobenzene; Process for preparing neutral derivatives of —— soluble in water.* Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 245,756, May 18, 1911.

When salts of 3·3′-diamino-4.4′-dihydroxyarsenobenzene are treated in aqueous solution with formaldehyde-sulphoxylates and alkali, or when aqueous suspensions of the free base are treated with formaldehyde-sulphoxylate without addition of alkali, products are obtained which dissolve in water containing very small quantities of alkali, giving solutions which are almost neutral, and which possess the therapeutic properties of the pure base.
—T. F. B.

2-*Phenylquinoline-4-carboxylic acid* [*ethyl*] *ester.* L. Taub, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,022,444, April 9, 1912.

When 2-phenylquinoline-4-carboxylic acid is esterified with ethyl alcohol by the usual methods, its ethyl ester is produced in the shape of crystalline prisms, of m. pt. 61°—62° C.; it is tasteless, soluble in organic solvents, and forms salts with acids. It may be used as a remedy for gout.—T. F. B.

6.6'-Diquinolyl-4.4'-dicarboxylic acid, its homologues and derivatives; Process for preparing ——, phenylated and substituted-phenylated in the 2-position. Chem. Fabr. auf Actien, vorm. E. Schering. Ger. Pat. 246,078, March 1, 1911.

The compounds mentioned in the title are prepared by the action of pyroracemic acid and benzaldehyde or its derivatives on benzidine, its homologues or derivatives: they possess antirheumatic properties.—T. F. B.

Perfumes; Process for making solid ——. H. Casevitz. Fr. Pat. 438,939, Jan. 12, 1912.

An essential oil or other odorous substance is mixed with a hot solution of soap obtained by dissolving 5 to 6 per cent. of soap in boiling alcohol. On cooling, the whole sets to a solid or pasty mass.—T. F. B.

Alcohols; Process for preparing concentrated aqueous solutions of sparingly soluble ——. Dr. N. Gerbers Co. Ger. Pat. 245,699, Oct. 8, 1908.

The solubility of butyl and amyl alcohols in water may be largely increased by the addition of an alkali salicylate. Solutions produced in this way are of value in certain processes for the determination of fat in milk, etc. (compare U.S. Pat. 961,564; this J., 1910, 896).—T. F. B.

Cinnamic acid containing iodine in the side chain; Process for preparing amides, ureides, or esters of —— and their homologues and substitution products. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 246,165, June 26, 1910.

The above compounds (with the exception of di-iodo-cinnamic acid methyl ester) are prepared either by converting the iodo-derivative of cinnamic acid into the amide, ureide, or ester by the usual method, or by treating the derivative of phenylpropiolic acid with iodine or hydriodic acid. The new products, which are tasteless, readily liberate their iodine content in the organism. —T. F. B.

Mercuri-carboxylic esters and their saponification products; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 246,207, Feb. 8, 1911.

Esters of mono- or polycarboxylic acids, which contain one or more acetylenic linkages, are treated with mercury salts; the complex compounds thus formed may then be treated with saponifying agents. The products differ from the known mercury compounds of this nature in that the mercury is less firmly combined, being more readily split off, and therefore of greater therapeutic activity. Many of them resemble ointments in consistency, and can be used directly as such.—T. F. B.

Epichlorhydrin from dichlorhydrin; Process for preparing ——. Chem. Fabr. Griesheim-Elektron. Ger. Pat. 246,242, Dec. 22, 1910.

Dichlorhydrin is treated with an alkaline-earth hydroxide or an alkali carbonate at a temperature of 40° to 120° C., and the resulting epichlorhydrin is preferably removed as soon as formed by distillation. The yield is stated to be almost theoretical.—T. F. B.

p-Nitro-acetoacetanilide; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 246,382, March 8, 1911.

p-Nitro-acetoacetanilide may be prepared by the nitration of acetoacetanilide in sulphuric acid solution, the mixture being cooled during the reaction.—T. F. B.

Diolefines [isoprene, etc.]; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 10,826, May 4, 1911.

See Fr. Pat. 434,586 of 1911; this J., 1912, 301.—T. F. B.

Diolefines [isoprene, etc.]; Producing ——. F. Webel, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pats. 1,026,418, 1,026,419 and 1,026,420, May 14, 1912.

See Fr. Pat. 434 586 of 1911; this J., 1912, 301.—T. F. B.

Isoprene; Process of producing ——. G. Merling and H. Köhler, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,026,691 and 1,026,692, May 21, 1912.

See Eng. Pat. 975 of 1911; this J., 1911, 1230.—T. F. B.

Erythrene; Process for the production of ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 251, Jan. 3, 1912. Under Int. Conv., Jan. 10, 1911.

See Fr. Pat. 437,387 of 1911; this J., 1912, 557.—T. F. B.

Erythrene and isoprene; Process for making ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 438,782, Jan. 8, 1912. Under Int. Conv., Jan. 20, 1911.

See Eng. Pat. 18,935 of 1911; preceding.—T. F. B.

Camphene free from chlorine; Process for the manufacture of solid ——. L. Weitz, Aix-la-Chapelle, Germany. Eng. Pat. 11,029, May 6, 1911. Under Int. Conv., May 7, 1910.

See Fr. Pat. 429,415 of 1911; this J., 1911, 1231.—T. F. B.

Arsines; Manufacture of substituted aromatic ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 11,625, May 13, 1911.

See U.S. Pat. 1,026,094 of 1912; preceding.—T. F. B.

Pancreas preparation suitable for the treatment of diabetes. G. Zuelzer, Assignor to Chem. Fabr. auf Actien, vorm. E. Schering, Berlin. U.S. Pat. 1,027,790, May 28, 1912.

See Eng. Pat. 8514 of 1908; this J., 1909, 442.—T. F. B.

Iron-albuminous compounds containing phosphorus; Art of preparing ——. F. Zuckmayer, Assignor to Dr. W. Wolff und Co., Elberfeld, Germany. U.S. Pats. 1,027,967 and 1,027,968, May 28, 1912.

See Eng. Pat. 16,048 of 1910 and Ger. Pat. 241,560 of 1909; this J., 1911, 508, and 1912, 151.—T. F. B.

Iron glycerophosphate combined with milk or milk-albumin; Process of making a soluble compound of ——. P. Hoering, Berlin. U.S. Pat. 1,027,844, May 28, 1912.

See Eng. Pat. 13,006 of 1911; this J., 1912, 455.—T. F. B.

Ferruginous milk and milk products containing soluble iron and also glycerophosphoric acid combined with pure milk albumin; Process for preparing ——. P. Hoering. Fr. Pat. 438,515, May 13, 1911. Under Int. Conv., July 9, 1910.

See Eng. Pat. 13,006 of 1911; this J., 1912, 455.—T. F. B.

Ortho-oxalic acid ester of meta-cresol and process for the manufacture of the same. L. Kahl, Niederau, Assignor to Rutgerswerke-Act.-Ges., Berlin. U.S. Pat. 1,028,074, May 28, 1912.

See Fr. Pat. 403,863 of 1909; this J., 1910, 42.—T. F. B.

Medicinal oils in solid form; Product containing ——. O. B. May. Fr. Pat. 438,326, Aug. 11, 1911.

See Eng. Pat. 17,002 of 1911; preceding.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Developers; The fogging power of ——. *II. Sulphite fog and the solubility of silver bromide in sulphite solutions.* C. E. K. Mees and C. W. Piper. Phot. J., 1912, **52**, 221—237.

The solubility of silver bromide in aqueous solutions of sodium sulphite was determined by an optical method, depending on the observation of the point at which opalescence first appeared when solutions of potassium bromide and silver nitrate were simultaneously added to the sulphite solution. The results appeared to show that whilst the solubility was nearly proportional to the concentration of the sulphite solution, there was a minimum solubility at a sulphite concentration of about $N/6{\cdot}7$, and a maximum solubility at about $N/200$. These two values coincide with the known facts that sulphite fog tends to a minimum at sulphite concentrations between $N/10$ and $N/5$ and that it is at a maximum at about $N/160$. The fogging power of a quinol-caustic soda developer is unaffected by the amount of alkali used when the quinol is constant, but when the alkali is constant the fog tendency diminishes with increase of quinol, a solution containing 4·4 per cent. ($2N/5$) of quinol and 0·4 per cent. ($N/10$) of caustic soda giving very clean results. The addition of sodium sulphite to this solution lowers the development velocity gradually from 0·197 to 0·088 until a sulphite concentration of $N/20$ is reached, when the velocity rises rapidly, reaching a maximum of 0·335 at $4N/5$; at the same time the fogging velocity rises to a maximum at about $N/160$ and again falls to a minimum at about $N/5$; hence the "fogging power" of the developer (*i.e.*, the ratio of the fogging velocity to the development velocity) is at its maximum with a sulphite concentration of $N/160$ and minimum at between $N/10$ and $N/5$.—T. F. B.

Patent.

Photographs on metal surfaces; Production of ——. M. Jacobs, Birmingham. Eng. Pat. 9511, Aug. 22, 1911.

A paper support is coated with a layer of soft, soluble gelatin and then with a layer of insoluble gelatin which has been treated with formalin, chrome alum, etc.; the paper is now sensitised by immersion in a "solution of silver bromide," and the photograph prepared on it as usual and transferred to the metal surface by pressure when wet, the paper being finally stripped off.—T. F. B.

Photography of colours; Process for the ——. M. Obergassner. Fr. Pat. 438,746, Jan. 8, 1912. Under Int. Conv., Jan. 21, 1911.

Plates for the production of colour photographs are prepared by providing the reverse side of a photographic plate with a screen composed of colours (red, green, and violet) of such a nature that treatment with acids, alkalis, etc., will convert them into the complementary primary colours. For example, for the red, litmus may be used, for the violet, Metanil Yellow (changing to violet with alkali), and for the green a mixture of Acid Green, Neutral Green, Brilliant Yellow, and phenolphthalein. The colours are preferably contained in a support of gelatin or other colloid, which may be treated with a chromium compound if desired.—T. F. B.

Photographic plate especially for radiography. A. L. P. Roubertie. Fr. Pat. 439,121, Jan. 16, 1912.

A photographic plate coated with a silver salt emulsion is provided with a further coating of celluloid, collodion, or a suitable varnish in which is suspended a substance, such as an alkaline-earth tungstate or calcium sulphide, which is able to emit photographically active rays when it is under the influence of cathode rays, and even after the emission of the cathode rays has ceased. The plate is employed in taking radiographs as usual, but it is necessary, before development, to remove the coating containing the phosphorescent salt by treatment with acetone, ether-alcohol, or other suitable solvent.—T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Mercury fulminate. R. Philip. Z. ges. Schiess- und Sprengstoffw., 1912, 7, 180—182, 198—200, 221—225.

The author dissolves 0·3 grm. of mercury fulminate in 50 c.c. of $N/10$ sodium thiosulphate which contains 3 grms. of potassium iodide. The following reactions take place:—

(1) $Hg(ONC)_2+4KI=K_2HgI_4+2KONC$.
(2) $2KONC+2H_2O=2HONC+2KOH$.
(3) $2HONC+H_2O+2Na_2S_2O_3=$
$Na_2S_4O_6+2NaOH+HCN+HCNO$.

The free alkali is determined by titration with $N/10$ sulphuric acid and the excess of thiosulphate is then determined by titration with $N/10$ iodine and starch. Pure fulminate should give identical results by these two methods, which agree very closely with the gravimetric determination as sulphide. Fulminate, of a white colour, crystallised from a solution of potassium cyanide, is usually considered to be purer than the grey fulminate. It gives a higher value for the alkali titration than for the iodine method. This is ascribed to the presence of mercuric cyanide, which as direct experiments show, gives an alkaline reaction when mixed with thiosulphate but has no effect on the iodine titration results. Re-crystallisation from pyridine is considered to give the purest fulminate.
—G. W. McD.

Explosions; Reports on circumstances attending ——. W. S. Smith and J. Jackson. *See* XIXa.

XXIII.—ANALYTICAL PROCESSES.

Arsenious acid in volumetric analysis; Applications of ——. *II. Determination of mercury.* F. Litterscheid. Chem.-Zeit., 1912, **36**, 601.

The method depends upon the oxidation of arsenious oxide by mercuric salts, in the presence of sodium bicarbonate, in accordance with the equation,

$$As_2O_3+2HgCl_2+8NaHCO_3=$$
$$2Hg+4NaCl+8CO_2+2Na_2HAsO_4+3H_2O.$$

To 50 c.c. of the solution to be examined, which should contain 0·1 to 0·4 grm. of mercury, are added 50 c.c. of $N/10$ arsenious acid and about 5 grms. of sodium bicarbonate. The mixture is heated, with frequent shaking, until reduction is complete, then diluted with about 60 c.c. of water, cooled, and further diluted to 200 c.c. After repeated shaking, it is filtered, and, in 100 c.c. of the clear filtrate (the first portions being rejected), to which 5 grms. of sodium bicarbonate and 400 c.c. of water

are added, the excess of arsenious acid is titrated with $N/10$ iodine. Addition of precipitated chalk before filtration facilitates this process, and, if ammonium salts be present, the filtrate is slightly acidified with sulphuric acid and 10 grms. of bicarbonate are added before titrating.
F. Sodn.

Cobaltinitrites; A study of —— and their application to analytical chemistry. [Detection of potassium, etc.] L. L. Burgess and O. Kamm. J. Amer Chem. Soc., 1912, **34**, 652—659.

The silver-potassium cobaltinitrites are distinctly less soluble than the potassium- or potassium-sodium cobaltinitrites, hence the test for potassium by means of a cobaltinitrite reagent (see this J., 1910, 1218; 1911, 1282) is rendered more sensitive if carried out in presence of a silver salt. A 25 per cent. solution of pure sodium cobaltinitrite, obtained by precipitating with alcohol as described by Cunningham and Perkin (Chem. Soc. Trans., 1909, **95**, 1562), is used as the reagent, and the solution to be tested is rendered neutral or slightly acid with acetic acid and has added to it a quantity of silver nitrate solution sufficient to make the concentration of the silver $N/100$. Less than 1 part of potassium per million can be detected at 15° C., but the limit of sensitiveness is less at higher temperatures. The only substances which interfere are those which interfere with the usual cobaltinitrite test. Ammonium salts under similar conditions give an insoluble silver-ammonium colbaltinitrite, and in absence of potassium, the reaction may be used as a delicate qualitative test for ammonium.—A. S.

Pyridine and ammonia; Separation and determination of ——. A. Bayer. J. Gasbeleucht., 1912, **22**, 513—514.

For the determination of small quantities of pyridine in materials rich in ammonia, such as gas-liquor, the author recommends the separation of the ammonia as ammonium magnesium phosphate (this J., 1903, 1016) with subsequent titration of the pyridine with the use of ferric thiocyanate as indicator. The reagent employed is prepared by dissolving 2·5 grms. of magnesium hydroxide in just sufficient dilute hydrochloric acid, adding 25 grms. of crystallised disodium phosphate and 50 grms. of citric acid, then after the addition of a few drops of phenolphthalein, almost neutralising with sodium hydroxide, and finally diluting the liquid to 250 c.c. The solution containing ammonia and pyridine is made neutral to litmus with sulphuric acid, and one-third is distilled over. To the distillate, which contains the pyridine and some ammonia liberated by hydrolysis of ammonium sulphate, sufficient of the magnesia reagent is added and a solution of sodium hydroxide added drop by drop, with constant agitation, until the liquid remains alkaline and precipitation is complete, which is effected by agitation for about an hour at the ordinary temperature. With the aid of a filter-pump the precipitate is transferred to a filter paper, portions of the filtrate being used to transfer the last traces, and, without washing, it is transferred to a distillation flask, and after the addition of water and magnesium oxide the ammonia is distilled off and determined in the usual way. The pyridine, which is all in the filtrate, is distilled off and the distillate made acid with a known volume of $N/10$ hydrochloric acid and titrated with $N/10$ sodium hydroxide solution, after adding for indicator, 2 drops of a 2·7 per cent. solution of ferric chloride and 8 to 10 drops of a 2·4 per cent. solution of ammonium thiocyanate, until the clear liquid is colourless.
—B. G. McL.

Preparation of, and the detection and separation of the different sulphur compounds in calcium sulphite lye. Von Possanner and Dittrich *See* V.

Determination of radium in minerals and rocks. Ebler. *See* VII.

Determination of fat in leather by means of trichloroethylene. Goldberg. *See* XV.

Modification of the method of mechanical soil analysis. Fletcher and Bryan. *See* XVI.

Fiehe's reaction. Halphen. *See* XVII

Fiehe's reaction in the analysis of honey. Stoecklin. *See* XVII.

Rapid detection of salicylic acid [in wine, etc.]. Stoecklin. *See* XVIII.

Determination of nitrites in potable waters. Elsdon. *See* XIXb.

Determination of nicotine in tobacco. Harrison and Self. *See* XX.

New reaction for organic bases. Charitschkoff. *See* XX.

Direct determination of geraniol in oil of citronella. Dupont and Labaune. *See* XX.

Notes on organic arsenic compounds [sodium cacodylate and atoxyl]. Bressanin. *See* XX.

Mercury fulminate. Philip. *See* XXII.

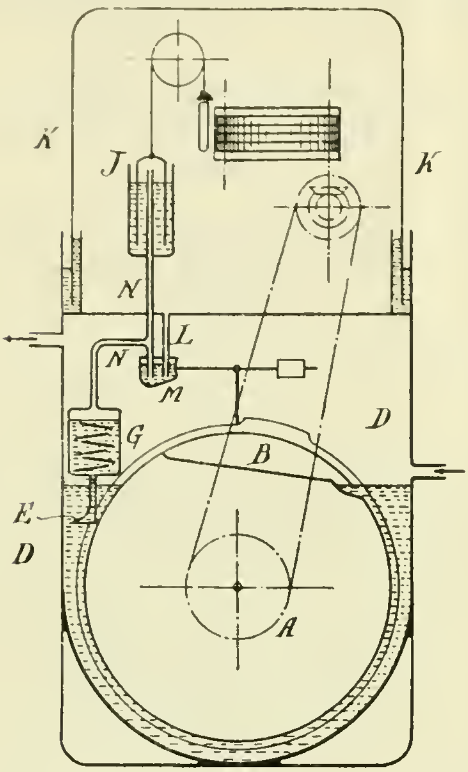
Patents.

Colorimeter. P. G. Nutting, Washington, D.C. U.S. Pat. 1,026,878, May 21, 1912.

A method of determining the colour, purity, and illuminating power of a beam of light consists in ascertaining the wave-length of the dominant colour (or its complementary), the proportion that the white light in the unknown bears to the pure light of dominant colour therein, and the illuminating power of the beam. Means are provided for producing a beam of white light and beams of light of any desired colour of the spectrum, the colour of the unknown beam being matched against combinations of the other beams, the comparison being made by means of a "photometer cube." The intensities of all the beams may be adjusted as desired.—W. P. S.

Gases; Apparatus for automatic analysis of ——. G. A. H. Binz, Enfield. From Allgem. Feuertechnische Ges. m. b. H., Berlin. Eng. Pat. 13,691, June 8, 1911.

The invention relates to devices for compensating for fluctuations of pressure in automatic gas analysis apparatus of the kind in which a sample of gas is trapped in a vessel carried by a wheel rotating in a sealing liquid and is then passed through an absorption vessel into a self-recording measuring bell. In one form of the apparatus, illustrated in the figure, the pressure is equalised in the measuring bell, J, the chamber, K, containing it, the absorption vessel, G, and the vessel, B, for the gas, by means of a liquid-seal valve, M, which opens and closes the communicating pipes, L, N, at the moment when the gas in the vessel, B, is trapped by the sealing-liquid in the lower part of the gas chamber, D. This is effected by means of the cam surface shown on the drum, A. The gas from the vessel, B, is guided into the funnel-shaped mouth, E, of the absorption vessel, G, by flanges on the periphery of the drum, it being understood that the liquid surrounding the drum must be of sufficient density to prevent the escape of the absorption liquid from the vessel G, through the mouth, E. In a modified form of apparatus, the measuring-bell, J, is outside the apparatus and therefore subject to atmospheric pressure. In this case the effect of pressure variations is eliminated by supplying a small additional volume of gas to the absorption vessel from a reciprocating bell or tube which periodically dips into the liquid in the chamber, D, the level of this liquid, and therefore the volume of gas delivered, being dependent upon the difference between the internal and external pressure.—H. H.



Testing air and gases; Apparatus for ——. M. Arndt, Aachen, Germany. Eng. Pat. 8199, April 4, 1912. Under Int. Conv., April 6, 1911.

SEE Ger. Pat. 242,540 of 1911; this J., 1912, 304.—T. F. B.

Preparing concentrated aqueous solutions of sparingly soluble alcohols. Ger. Pat. 245,699. *See* XX.

XXIV.—MISCELLANEOUS ABSTRACTS.

Water; Decomposition of —— at ordinary temperatures by magnesium. A. W. Knapp. Chem. News, 1912, 105, 253.

WHEN magnesium is mixed with water no reaction is observed at ordinary temperatures, although the formation of magnesium hydroxide and the liberation of hydrogen is an exothermic reaction. This is commonly explained by saying that the film of hydroxide first formed covers the metal and retards further action. However, if magnesium powder be added to ten times its weight of water, and then to this mixture such an amount of palladious chloride as contains about one hundredth part of the weight of magnesium used, a brisk evolution of hydrogen occurs. The magnesium reduces the palladious chloride and metallic palladium is formed, which acts as a catalytic agent. The small amount of magnesium chloride formed possibly also accelerates the reaction at first by dissolving the hydroxide. The temperature rapidly rises until the water boils and considerable white hydroxide is formed. The palladium, which has accelerated the decomposition of the water now accelerates its formation, for it is warm, and some of it rising on the bubble-films, which separate the hydrogen from the air, causes the hydrogen to ignite spontaneously.

Organic amalgams; Physical and chemical properties of some ——. H. N. McCoy and F. L. West. J. of Phys. Chem., 1912, 16, 261—286.

TETRAMETHYLAMMONIUM amalgam has been obtained in the solid form by electrolysis of an absolute alcoholic solution of tetramethylammonium chloride, with a mercury cathode and a silver-plated gauze anode. The electrolytic cell was surrounded by liquefied ammonia so that the electrolysis took place at —34° C. The mercury was contained in a muslin bag and after electrolysis the amalgam was drained in the reaction vessel and washed with carbon tetrachloride. It could be preserved under carbon tetrachloride at 0° C. for some time without decomposition. The amalgam was freed from mercury by filtering with suction at a low temperature through a plug of cotton, being protected from the air by a layer of carbon tetrachloride. The density of the amalgam decreased with increasing concentration of tetramethylammonium. This concentration is measured by the amount of colloidal mercury which is liberated on adding water. With 2·4 per cent. of colloidal mercury the density was 10·6. The electrical resistance is greater the greater the percentage of colloidal mercury, being about one and a half times that of pure mercury for the most concentrated amalgams used. The amalgam causes the discharge of a positively charged electroscope, but the phenomenon is not one of radioactivity. This is proved by the facts that a negatively charged electroscope is not discharged; the rate of discharge is very erratic, temperature having an enormous effect; the rate is greatest when the amalgam is closest to the electroscope; a thin aluminium leaf placed over the amalgam prevents the discharge and the amalgam has no photographic activity. The phenomenon differs from that exhibited by the alkali metals in being unaffected by ultra-violet light. The facts are probably best explained by assuming that during the decomposition of the amalgam, the gases evolved, escaping from the mercury in minute bubbles, are negatively electrified, in the same way as air is when it is bubbled through mercury (Lenard). The decomposition, which is slow at 0° but rapid at 25° C., takes place probably according to the equation, $4Hg_x(CH_3)_4N = 4(CH_3)_3N + 2CH_4 + C_2H_4 + 4xHg$. The decomposition probably takes place in stages, a velocity determination showing the reaction to be monomolecular. The preparation and properties of monomethylammonium amalgam have also been studied. It is less stable than the tetramethylammonium amalgam, and discharges an electroscope either negatively or positively charged. The rate of discharge is, however, much greater when the electroscope is negatively charged.—W. H. P.

The inventor, the public, and the law [*U.S.A.*]. W. F. Rogers. J. Ind. Eng. Chem., 1912, 4, 320—328.

THE U.S. Patent system was framed with the object of encouraging and securing an early disclosure of an invention. The invention is the creation of the individual and he had always the right to use it himself, or to work it secretly, or to allow the idea to become lost. In return for the disclosure, and for that alone, the State gives him the right to prevent others from working or using the invention for a limited period. By means of the disclosure, other inventors are stimulated and enabled to improve on the invention, and the invention becomes available to the public when the patent expires. There is no duty on the patentee to work the invention which he has disclosed and the proposals in a Bill now before Congress providing for compulsory working or for compulsory licences would infringe upon the property rights of patentees as epeatedly laid down by the Courts. These provisions are aimed at the large combines which refuse to work some of the patents they hold, but the requirements of the law could be easily met by them and these requirements would be burdensome to the independent patentees. The present system has secured the establishment of a large number of independent factories, but the proposed system would tend to concentrate the useful inventions into fewer hands. The Patent Bar believes that the complaints of the average inventor could be met by modifying the practice of the Courts so as to reduce litigation, by empowering some single Court to give a final decision covering the whole of the nine circuits, by ensuring that damages for infringement are commensurate with the loss inflicted, by making the information obtained by the Patent Office available to the public, and by modifying the intricate practice in "interference motions."—A. T. L.

Abuses of the [U.S.] patent system. L. H. Baekeland. J. Ind. Eng. Chem., 1912, 4, 333—337.

The difficulty and expense of enforcing patent rights in the U.S. Courts are very great and a patent is often worthless to a man of limited resources. Successful litigants seldom recover damages for infringement, or not sufficient to cover their legal expenses. The wealthy corporations are able to bluff their weaker competitors or to crush them by prolonged litigation, and the money so spent is paid ultimately by the consumer. Separate final decisions are given by each of the nine Circuit Courts of Appeal, and these decisions are not always in harmony. Evidence is not taken by testimony in open court, and in one case 36 large octavo volumes of printed testimony, containing much repetition and much irrelevant matter, were submitted. The proceedings in "interference" cases, involving the respective rights of inventors applying concurrently, may be prolonged for years. The reforms suggested are similar to those advanced by W. F. Rogers (see preceding abstract).—A. T. L.

Patents and chemical industry in the United States. B. Herstein. J. Ind. Eng. Chem., 1912, 4, 328—333.

A PATENT for a chemical invention differs from other patents in that an identical product may be obtained by different processes of manufacture, so that infringement of a patented process is not readily detected. Manufacturers sometimes prefer, therefore, to keep new processes secret, and the difficulty is only partially met by the fact that the product itself, if new, may be claimed as the invention. The statistics show that the patent system does not stimulate the chemical industries. During the period 1900—1910, 4068 patents were issued in the principal chemical industries, and only 38 per cent. of these were issued to persons resident in the United States, as against 88 per cent. for the whole of the patents in all subjects. More chemical patents are issued to German than to American inventors. Out of 1738 patents in the classes "Carbon compounds, and Bleaching and Dyeing Processes," which form the most profitable branches of chemical industry, only 200 were issued to Americans, whilst 1247 were issued to Germans, and 844 of these were assigned to four large companies which have an arrangement for interchange of stock and division of profits, under an agreement lasting till 1954. The foreign inventor prefers to import the article and is not compelled by law to manufacture in the United States; moreover the tariff does not affect him, while domestic manufacture is prevented by the patent. A compulsory working requirement would be of advantage to chemical industry. It is pointed out that as the result of the new compulsory working requirement in the United Kingdom, up to 1911, 50 foreign firms had begun or were about to begin manufacture in England, and that 7000 hands would be employed, and in addition many licences have been granted to English manufacturers. The industries affected are mainly the chemical and allied groups. The fact that a patent is granted, in the United States, for a new product, apart from the process of manufacture, tends to prevent the introduction of new and better processes for making the same product. Where the patent is for the process only, there is a direct incentive to experiment with the object of obtaining the product by other and better methods.—A. T. L.

Books Received.

ALUNITE. A NEWLY-DISCOVERED DEPOSIT NEAR MARYSVALE, UTAH. B. S. Butler and H. S. Gale. U.S. Geological Survey, Washington. Bulletin No. 511.

8vo book, containing 64 pages of text with two photographs and a map (see this J., 1912, 488).

JAHRESBERICHT UEBER DIE LEISTUNGEN DER CHEMISCHEN TECHNOLOGIE FÜR DAS JAHR 1911. 57 Jahrgang. Bearbeitet von Dr. P. F. SCHMIDT und Prof. Dr. B. RASSOW. I. Abteilung: Unorganischer Teil. Verlag von J. A. Barth. Leipzig. 1912. Price M. 1.

THIS 8vo volume is the fifty-seventh of the series of annual reports on the progress of chemical technology, of which vols. 1 to 25 were edited by R. v. Wagner, and vols. 26 to 56 by F. Fischer. It contains 692 pages of subject matter, with 284 illustrations, alphabetical indexes of authors' names and of subjects, and a list of the numbers of German patents referred to in the text. The classification of the subject matter is as follows:—I. Chemical technology of fuels. II. Metals. III. Heavy chemicals, including sections on artificial fertilisers, explosives, and water-purification. IV. Glass, clay, cement, lime. V Apparatus. There are also 31 pages of tables of statistics.

LEHRBUCH DER CHEMISCHEN TECHNOLOGIE UND METALLURGIE. Unter Mitwirkung hervorragender Fachleute, herausgegeben von Dr. B. NEUMANN. Verlag von S. Hirzel, Leipzig. 1912. Price M. 18; bound, M. 19.20.

8vo volume containing 864 pages of subject matter, with 898 illustrations and 5 plates, and an alphabetical index. There are sections on the following subjects: (1). Water and effluents. (2). Liquid air, liquefied and compressed gases. (3). Fuels, heating and power gases. (4) Illuminating gas. (5). Coke manufacture. (6). Destructive distillation, carbonisation of peat. (7). Wood distillation. (8). Salt. (9). Potassium salts. (10). Sulphuric acid. (11). Hydrochloric acid and sodium sulphate. (12). Nitric acid. (13). Hydrofluoric acid, phosphoric acid. (14). Soda. (15). Chlorine, electrolysis of alkali chlorides. (16). Ammonia and cyanogen compounds. (17). Alumina, aluminium, ultramarine. (18). Magnesium, calcium, barium compounds. (19). Peroxides and per-salts. (20). Fertilisers. (21). Mortars. (22). Ceramics. (23). Glass. (24). Iron. (25). Non-ferrous metals. (26). Explosives. (27). Petroleum. (28). Asphaltum, mineral wax. (29). Tar distillation. (30). Acetic acid, methyl alcohol, acetone. (31). Fats, glycerin, candles, soaps. (32). Rubber. (33). Glue, tanning. (34). Beet sugar. (35). Starch, glucose, dextrin. (36). Fermentation, wine, beer, spirits. (37). Cellulose and artificial silk. (38). Textiles. (39) Dyestuffs. (40). Dyeing and printing textiles.

DIE SYNTHESE DES KAUTSCHUKS. Von Dr. R. DITMAR. Verlag von T. Steinkopff. Dresden and Leipzig. 1912. Price M. 3.

THIS 8vo volume of 124 pages contains chapters on: I. The term "caoutchouc." II. The synthesis of caoutchouc. III. Preparation of substances for use in the synthesis of caoutchouc. IV. The most important patents and patent-claims. A photograph of C. Harries is given as a frontispiece.

Die elektrolytische Alkalichloridzerlegung mit starren Metallkathoden. Von Dr. J. Billiter. I. Teil. Verlag von W. Knapp. Halle a. d. S. 1912. Price M. 16.50.

8vo volume containing 265 pages of subject matter, with 189 illustrations, and lists of German, British, and American patents arranged in chronological order, and an index of authors' names. After a general introduction, descriptions of the various processes for the electrolysis of alkali chlorides, using solid cathodes, which have been patented in Germany, Britain, and the United States, respectively, are given, in each case with a discussion of the probable results, and indications of the extent to which the various processes have been worked on the large scale.

Kurze Analysen-Vorschriften. Zum Gebrauch in Metallhütten-Laboratorien. Zusammengestellt von E. Pancke. Verlag von W. Knapp. Halle a. S. 1912. Price M. 2.40.

8vo volume of 42 pages devoted to the sampling and analysis of metallurgical products, and the preparation of reagents therefor.

Steaming Tests of Coals and Related Investigations, September 1, 1904, to December 31, 1908. By L. P. Breckenridge, H. Kreisinger, and W. T. Ray. Dept. of Interior, Bureau of Mines, U.S.A. Bulletin 23. Govt. Printing Office, Washington. 1912.

The bulletin is divided into two parts. Part I. contains complete data and results of tests of a large number of different fuels in boiler furnaces, with a description of the plant and appliances. Part II. contains an analytic study of the tests reported in Part I. and a discussion of the fundamental principles of the combustion of coal, transmission of heat, and the movement of gases through boiler settings.

Les Rayons ultra-violets et leur applications. Les Lampes à vapeur de mercure. Par L'Institut Scientifique et Industriel. Le Mois Scientifique et Industriel, 8, rue Nouvelle, Paris. 1912. Price 2 fr. 75.

Small 8vo volume of 63 pages with 44 illustrations and a short alphabetical index. There are five chapters: I. Definition and properties of ultra-violet rays. II. Mercury vapour lamps and the industrial production of ultra-violet rays. III. Application of ultra-violet rays to sterilisation. IV. Medical applications of ultra-violet rays. V. Various applications of ultra-violet rays. At the end of each chapter is a list of bibliographic references.

Exercises in Chemical Calculations. By H. F. Coward, D.Sc., and W. H. Perkins, M.Sc. E. Arnold. London. 1912. Price 2s. 6d. net.

Small 8vo volume containing 152 pages of subject matter, including tables of atomic weights, logarithms, conversion numbers, and vapour pressure and density of water, and an alphabetical index.

Kolloidchemie. Ein Lehrbuch. Von Richard Zsigmondy. Professor an der Universität Göttingen. Otto Spamer's Verlag. Leipzig, Germany. 1912. Price M. 17 net.

Large 8vo volume, containing 281 pages of subject matter with 37 illustrations, and alphabetical indexes of authors' names and subjects. The subject matter is subdivided and classified as follows:—I. Introductory. II. Definitions. III. Properties of colloids. IV The theory. I. Inorganic Colloids. a. Colloidal metals. (i). Pure metallic colloids. (ii), Protected metallic colloids. b. Colloidal non-metals. c. Colloidal oxides, including colloidal sulphides and salts. II. Organic Colloids. a. Colloidal organic salts (Soaps. Dyestuffs). b. Proteins. Appendix. Special description of chemical nature of some dyestuffs.

The Analysts' Laboratory Companion: A Collection of Tables and Data for the use of Public and General Analysts, Agricultural, Brewers', and Works' Chemists and Students; together with numerous Examples of Chemical Calculations and concise descriptions of several analytical processes. By Alfred E. Johnson, B.Sc. Fourth Edition, with additions. J. and A. Churchill, 7, Great Marlborough Street, London. 1912. Price 6s. net.

Small 8vo volume, containing 160 pages of subject matter and an alphabetical index. The work consists of a classified collection of tables, and useful data interleaved with blank pages for notes.

Schutzfermente des tierischen Organismus. Ein Beitrag zur Kenntnis der Abwehrmassregeln des tierischen Organisms gegen körper-, blut- und zellfremde Stoffe. Von Emil Abderhalden. Julius Springer's Verlag. Berlin, Germany. 1912. Price M. 3.20; Bound M. 3.80.

8vo volume, containing 110 pages of subject matter, with 8 illustrations; 11 pages are devoted to a bibliographic arrangement of the literature of the subject.

Lehrbuch der Thermochemie und Thermodynamik. Von Dr. Otto Sackur. Julius Springer's Verlag. Berlin, Germany. 1912. Price M. 12; bound in cloth, M. 13.

Large 8vo volume, containing 334 pages of subject matter, one page of appendix, and alphabetical indexes of authors' names and subjects. There are 46 illustrations, and the classification of matter takes the following course:—I. Introduction, with definitions, etc., of temperature, heat and specific heat. Thermometry and calorimetry. II Behaviour of substances on heating. III. Equivalence of heat and work. IV. Employment of the first law of thermodynamics. V. The second law of thermodynamics. VI. General consequences of these two laws. VII. Theory of solutions. VIII. The laws of chemical equilibrium. IX. Thermodynamics and electrochemistry. X. Thermoelectric phenomena. XI. Thermodynamics and capillarity. XII. Radiant heat. XIII. Nernst's heat theorem

Über neuere thermodynamische Theorien. (Nernstches Wärmetheorem und Quantenhypothese). Vortrag, gehalten am 16 Dezember, 1911, in der Deutschen chemischen Gesellschaft in Berlin. Von Dr. Max Planck, Professor der theoretischen Physik an der Universität Berlin. Akademische Verlagsgesellschaft m.b.H. Leipzig, Germany. 1912. Price M. 1.50.

8vo pamphlet.

Die Entdeckung des Radiums. Rede gehalten, am 11 Dezember, 1911, in Stockholm, bei Empfang des Nobelpreises für Chemie. Von Mme. P. Curie. Akademische Verlagsgesellschaft m. b. H. Leipzig, Germany. 1912. Price M. 1.50.

Pamphlet, 8vo size, containing 28 pages. An authorised German edition. There are 5 illustrations

Fruits des Pays Chauds. Par Paul Hubert. Tome I. Etude Générale des Fruits. Ouvrage honoré d'une Souscription du Ministère des Colonies. H. Dunod et E. Pinat, 47 and 49, Quai des Grands-Augustins, Paris. 1912. Price 15 fr.

8vo volume, containing 674 pages of subject matter, with 227 illustrations, and an alphabetical index. The subject matter treats of the "Fruits of Tropical Countries."

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DR. A. MCGILL IN THE CHAIR.

THE TREATMENT OF WATER WITH CHLORINE.

BY JOSEPH RACE, F.I.C.

The use of chlorine as a disinfectant has developed ntirely within the nineteenth century, and its general se followed directly in the wake of the commercial reparation of bleaching powder. This substance was lten used in the early part of the century for the disnfection of sewage and water, and as early as 1854 its fficiency was so well recognised that an English Royal ommission recommended the use of this substance for leodorising the sewage of London. In 1885 a special ommittee of the American Public Health Association tated that "taking cost into consideration, hypochlorites n general were the most efficient disinfectants available."

During the nineties many experiments with bleach and soda were made by Traube, Lode, Sickenberger, Kaufmann, nd others, with the object of obtaining practically nstantaneous sterilisation of water, for the use of travellers nd troops in the field. Electrolytic processes were leveloped in 1889, when Webster in England and Woolf n America produced chlorine solutions from sea water, nd used them for various purposes.

In 1897 bleach was used by Sims Woodhead for the sterilisation of the water supply of Maidstone, England, subsequent to the outbreak of a typhoid epidemic. In 1904 and 1905, during the typhoid epidemic at Lincoln, a solution of sodium hypochlorite, commercially known as "Chloros," was used to the extent of approximately one part of available chlorine per million. This was carried out under the direction of Drs. Houston and McGowan, and was entirely satisfactory. A mawkish taste was, however, the subject of many complaints, and this was thought to be due to the action of the alkaline solution of chloros on the organic matter present.

Dr. Rideal has successfully used a form of electrolytic chlorine (oxychloride) at Guildford, England, for the treatment of water and sewage. Various combinations of chlorine were tried on the rivers Seine and Vanne in France, and at Meddlekerke and Ostend in Belgium. In North America chlorine was first used on the commercial scale for water purification at Boonton, N.J., in 1908, and at Bubby Creek, Chicago; since that date, the development of the process has been so rapid that over 200 cities are said to be using it at the present time.

In connection with sewage purification, the German experimental work at the Hamburg Hygienic Institute by Proskauer and Elsner in 1897, and later (1904-1905) the work of Dunbar and his associates, proved the practical possibilities of chlorine. In 1906 the Royal Testing Station at Berlin confirmed these results. In America, Phelps (1906), of the Massachusetts Institute of Technology, developed this branch of disinfection and carried out the first practical trial at Red Bank, N.J. Kellerman, Pratt, and Kimberley have also made experiments in this direction.

At the present time chlorine treatment of water or sewage is recognised in England and on this Continent as a process capable of yielding excellent results at very low costs, but owing to certain disadvantages inherent to its use, it cannot be applied indiscriminately to all disinfection problems. It ought to be regarded mainly as an emergency measure, and secondarily as an adjunct to other forms of purification to provide an additional factor of safety. Each case in which the use of chlorine is suggested should be considered separately, as, except under strictly limited and peculiar local conditions, it cannot be regarded as a substitute for other purification processes. At the present time the problem is not how to use chlorine, although this phase cannot be considered finally solved, for the disinfection of water and sewage, but under what conditions it should be applied, how much it is desired to accomplish, and what amount of supervision is necessary. The views held by many German sanitarians are very different; they have not the high opinion of the process that prevails elsewhere, and generally regard it as inefficient. They severely criticise the bacteriological methods of the workers using gelatin plates for determining the efficiency, and give preference to enrichment methods. A study of their methods of applying chlorine to water shows that instead of using small quantities of disinfectant and allowing prolonged contact, they have employed as much as 40 parts per million of available chlorine with a ten minutes' contact, the excess being then removed by reducing agents, usually sulphites. Even with these large amounts, typhoid and cholera germs were not invariably destroyed, as in many cases the bacilli could be found after treatment, by means of enrichment in broth. Unless the view be taken that one single bacillus is sufficient to create infection in a susceptible individual, the criticisms of the German workers are not well founded, and their methods must be regarded as too stringent. The decreased typhoid death-rate in Toronto and other cities subsequent to the use of hypochlorite treatment is conclusive proof of the efficiency of the process, and refutes the theories of our German confrères.

The general principles regarding the action of hypochlorites are fairly well understood, but the details differ in every case and must be determined, as a full knowledge of them is essential to successful and efficient operation. The active constituent of hypochlorites for disinfecting purposes is chlorine, which liberates oxygen in a nascent condition when these substances are mixed with water. Nascent oxygen in small quantities inhibits the reproductive faculty of micro-organisms, and in large quantities kills them. It should be remembered that the results of chlorination are largely judged by the bacteriological results obtained, and, in these, the enumeration of the bacteria present plays an important part. The methods of counting the bacteria at present in use are dependent upon the ability of the organism to reproduce at such a rate as to form a visible colony within the period of incubation. Any substance which prevents the appearance of a colony during the period of incubation would be regarded as a disinfectant, but this does not imply that it kills bacteria. All substances known as disinfectant probably act as antiseptics in small quantities, and as germicides in larger ones, the line of division being imperfectly defined. The following tables show the action of chlorine on micro-organisms in water:—

City water is water drawn from the tap at the John Street Pumping Station and represents the main Toronto City supply approximately an hour after treatment by hypochlorite.

Control is water from the same original source as treated water, but not treated by hypochlorite. In order to make the bacterial counts in this water approximately comparable with the counts obtained in the treated water shortly after treatment, the original high count is reduced by dilution of the sample with water of the same kind sterilised by boiling.

Plating. In the column marked "Plating" are given the time intervals in days or hours between the time when the several Petri dishes were plated.

Count after — hours. In these columns are given the bacterial counts made on the several plates after the stated periods of incubation at 20° C.

Ratio. In these columns are given the ratios between the bacterial counts on the same plates at the different periods of incubation, as indicated. These ratios indicate the relative increases under th different conditions.

Original sample, untreated, shows the bacterial count i the control sample, before dilution with sterile water and corresponds also to the count before treatment in th Toronto City water or in the water used in the laborator experiment.

Experiment No. 1.

Toronto City Water.

Treatment with available chlorine equals 0·25 part per million. City plant.

Plated.		Count, after					Ratio.	
Time.	Day.	48 hours.	72 hours.	96 hours.	120 hours.	144 hours.	2 : 6 days.	2 : 5 days.
10	1	17,600	21,440	liquid	—	—	—	—
12	1	1,570	5,820	12,000	11,680	11,960	1 : 6·9	—
2	1	752	650	1,250	3,460	3,680	1 : 4·9	—
4	1	692	1,440	2,910	4,520	5,240	1 : 7·5	—
10	2	165	410	620	930	—	—	1 : 5·6

Control, lagoon.

Plated.		Count, after					Ratio.	
Time.	Day.	48 hours.	72 hours.	96 hours.	120 hours.	144 hours.	2 : 6 days.	2 : 5 days.
10	1	260	296	338	380	404	1 : 1·5	—
12	1	254	304	310	364	412	1 : 1·6	—
2	1	246	244	236	368	432	1 : 1·7	—
4	1	318	474	508	510	540	1 : 1·7	—
10	2	12,880	12,440	13,960	14,000	—	—	1 : 1·08
10	3	288,000	508,000	630,000	—	—	—	—

Original sample, untreated, 23,700.

Experiment No. 2.

Toronto City Water.

Treatment with available chlorine equals 0·25 part per million. City plant.

Plated.		Count, after					Ratio.	
Time.	Day.	48 hours.	72 hours.	96 hours.	120 hours.	144 hours.	2 : 6 days.	2 : 5 days.
10	1	14,000	16.800	28.000	22,800	26,000	1 : 7·6	—
12	1	3,400	5,700	16,200	5,000	7,100	1 : 13·6	—
2	1	520	2.100	3.440	3.920	5,200	1 : 7·0	—
4	1	740	1,900	2,860	3,720	—	—	1 : 7·4
10	2	500	2,300	2,480	—	—	—	—
4	2	1,120	1,910	2,380	—	—	—	—
10	3	2,400	4,150	9.300	—	—	—	—

Control, lagoon.

Plated.		Count, after					Ratio.	
Time.	Day.	48 hours.	72 hours.	96 hours.	120 hours.	144 hours.	2 : 6 days.	2 : 5 days.
10	1	180	180	268	liquid	—	—	—
12	1	124	138	226	230	238	1 : 1·9	—
2	1	136	116	140	176	188	1 : 1·4	—
4	1	210	158	240	316	340	1 : 1·6	—
10	2	6.600	7,900	10.800	12,300	—	—	1 : 1·8
4	2	25,200	26.400	28,400	—	—	—	—
10	3	640,000	896,000	960,000	—	—	—	—

Original sample, untreated, 22,800.

Experiment No. 3.

Control, laboratory tap water.

Plated.		Count, after					Ratio.		
Time.	Day.	48 hours.	72 hours.	96 hours.	120 hours.	144 hours.	2 : 6 days.	2 ; 5 days.	2 : 4 days.
11	1	121	184	285	liquid	—	—	—	—
12	1	115	171	223	380	392	1 : 3·4	—	—
2	1	100	152	221	362	375	1 : 3·4	—	—
4	1	121	175	251	410	415	1 : 3·4	—	—
10	2	6,200	8,500	8,800	8,900	—	—	1 : 1·4	—
10	3	425,000	650,000	670,000	—	—	—	—	1 : 1·5

Available chlorine equals 0·1 part per million. Treatment in laboratory.

Plated.		Count, after					Ratio.		
Time.	Day.	48 hours.	72 hours.	96 hours.	120 hours.	144 hours.	2 : 6 days.	2 : 5 days.	2 : 4 days.
11	1	520	940	1,350	2,360	2,780	1 : 5·3	—	—
12	1	390	770	1,080	2,040	2,320	1 : 5·8	—	—
2	1	187	260	690	1,840	2,080	1 : 16·4	—	—
4	1	91	130	280	760	840	1 : 9·2	1 : 22	—
10	2	42	120	670	920	—	—	—	1 : 10·9
10	3	320	1,210	3,500	—	—	—	—	1 : 2·9
10	4	8,700	14,200	26,000	—	—	—	—	—

Available chlorine equals 1·0 part per million.

Treatment in laboratory.

Plated.		Count, after				
Time.	Day.	48 hours.	72 hours.	96 hours.	120 hours.	144 hours.
11	1	2	5	7	8	10
12	1	1	1	2	2	4
2	1	0	0	0	2	2
4	1	1	2	2	6	6
10	2	0	0	0	1	—
10	3	0	0	0	—	—
10	4	5	13	16	—	—
10	5	79	166	—	—	—

Available chlorine equals 4·0 parts per million. Treatment in laboratory.

Plated.		Count, after					Ratio.	
Time.	Day.	48 hours.	72 hours.	96 hours.	120 hours.	144 hours.	2 : 6 days.	2 : 5 days.
11	1	1	1	1	4	5	—	—
12	1	0	0	1	3	3	—	—
2	1	0	1	1	liquid	—	—	—
4	1	0	0	0	0	0	—	—
10	2	0	1	1	2	4	—	—
10	2	0	0	0	2	—	—	—
10	2	0	0	1	—	—	—	—
			Original	Sample, untreated.				
10	1	1,620	2,230	2,860	3,620	3,840	1 : 2·3	—

It is evident that chlorine, in quantities smaller than 0·25 part per million, under the conditions of the experiments, mainly retards the growth of bacteria and kills very few. One part of available chlorine per million acts as a germicide, and there is no evidence of revivication. Since small quantities retard the growth when placed in such a suitable media as nutrient gelatin, it is probable that reproduction in water with a low organic content would be still further diminished. This is also indicated by the results.

From the results of these experiments and many others of a similar nature, it was decided to abandon the two-day incubation period recommended by the American Public Health Association and to count all plates on the third day. Three days is the period during which the formation of visible colonies proceeds most rapidly, and very little advantage can be gained by increasing it to four days. A three-day incubation period raises the standard of quality if numbers are given any consideration, and eliminates the anomalous results so often found when counts are made of chlorinated waters.

In this connection it is interesting to note the experience of Clark and De Gage, at Lawrence, Mass., during 1909. In the report of the Board of Health, page 319, 1910, they state: "It has frequently been observed that the numbers of bacteria determined at body temperature in the disinfected samples were much higher than the numbers determined at the usual room temperature. This phenomenon of reversed ratios between counts at the two temperatures has been occasionally observed with natural waters, but a study of the records of many thousands of samples shows that the percentage of such samples is very small, not over 3 to 5 per cent. On the other hand 20 to 25 per cent. of samples treated with calcium hypochlorite show higher counts at body temperature than at room temperature. Similar counts have been noted elsewhere where waters are being treated with hypochlorites, but in many cases such results have been considered abnormal and have been omitted from the records. A phenomenon which has a frequency of 25 per cent., however, cannot under any circumstances be considered abnormal, and the omission of such counts from records is entirely unjustifiable. A careful study has been made of the conditions under which such reversed counts occur, and it appears that these counts are found in a considerable percentage of samples of water, sewage, etc., in which the room temperature counts have been reduced to less than 100 to 200 per c.c. by the use of hypochlorites, permanganates, and other oxidising agents. A study of the types of bacteria remaining after disinfection shows that the proportion of spore-forming bacteria is practically the same after disinfection as it was in the untreated water, and the appearance of the reversed ratios apparently cannot be attributed entirely to the non-destruction of spores. The true significance of this phenomenon cannot be stated at the present time. It is evident, however that, if the body temperature counts are omitted and reliance placed upon those at room temperature, a wrong and possibly a dangerous interpretation may be made as to the quality of the water which has been treated with hypochlorites."

This is possibly due to the cause previously mentioned, and the phenomenon would probably disappear by increasing the period of incubation.

Chlorine-treatment of the supply of the City of Toronto.

The city supply is obtained from Lake Ontario at a point approximately 2700 feet south of the south shore of Toronto Island. The water is conveyed by means of a six foot steel conduit to the north shore of the island where it descends a shaft (100 feet deep) and is then conveyed under the Bay in a tunnel 8 ft. in diameter to the main pumping station where it is pumped directly into the distributing mains.

Under normal conditions the treatment of the water with chlorine does not present serious difficulties. The turbidity is low, colouring matter absent, and the organic content comparatively low. Successful treatment depends upon two factors, viz., perfect admixture and sufficient period of contact. The early experiences with the city supply seemed to indicate that the second factor was the more important, and this point is clearly shown in the following tables :—

Bacteria per c.c. gelatin 3 days at 20° C.

Date.	Sampling point.	Count.
April 27th, 1911.	Main Pumping Station	34,000
	9,000 feet from Pumping Station ..	8,400
	13,000 ,, ,, ..	4,520
	19,000 ,, ,, ..	3,810
	*14,000 ,, ,, ..	2,340
May 11th, 1911.	Main Pumping Station	5,800
	2,000 feet from Main Pumping Station	5,680
	8,000 ,, ,, ,,	2,380
	14,000 ,, ,, ,,	2,140
	20,000 ,, ,, ,,	2,260
	24,000 ,, ,, ,,	1,980
	Average of series of samples.	
Oct., 1911.	5,000 feet from Pumping Station ..	300
	6,000 ,, ,, ..	203
	7,000 ,, ,, ..	103
	12,000 ,, ,, ..	86
	14,000 ,, ,, ..	87

* This sample represents water which has been partially stored in a high pressure service reservoir.

The treatment takes place at the north end of the island, the bleach solution being added to the water as it descends the shaft to the Bay tunnel. The capacity of the tunnel is such that with a normal consumption of 43 million gallons per day, the period of contact before reaching the main pumping station is approximately 50 minutes.

In the spring of 1911, when the Health Department decided upon the treatment of the island supply, it was thought that owing to the water going directly into consumption after treatment with chlorine, insufficient time would be given to reap the full advantage of the process. It was, however, decided that chlorine treatment should be used, and a mechanical appliance was devised by the chief engineer of the Island Pumping Station by which a constant amount of disinfectant could be added and perfect admixture ensured. This apparatus consisted of a small plunge pump, the piston of which was connected with the piston of the main supply pump and was fed with bleach from one of two storage vessels. Check valves were placed on the inlet and outlet of the small pump. As each stroke of the large pump corresponded to a stroke of the small one, by determining the relative quantities delivered by each it was possible to fix the amount of chlorine added by varying the concentration of the bleach solution. Perfect admixture was obtained by injecting the bleach solution into the water by means of a perforated injector. The process worked very satisfactorily, combining a very high efficiency with a low cost.

Samples of water were taken at a point only a few yards distant from the pump, and although the time elapsing between treatment and examination never exceeded 15 minutes and was usually much less, almost sterile water was obtained throughout the whole season. The results were as follows :—

Island results.

1911.	Available chlorine parts per million.	Bacteria per c.c.		Percentage of samples of treated water showing typical *B. coli* in		
		Raw water.	Treated water.	50 c.c.	10 c.c.	1 c.c.
July	0·20	864	27	Nil.	Nil.	Nil.
August ..	0·20	1,018	12	,,	,,	,,
September ..	0·34	725	28	8·0	,,	,,
October ..	0·50	1,256	15	Nil.	,,	,,
November ..	0·50	6,098	4	,,	,,	,,

Samples taken at various points in the distribution mains showed greater numbers of bacteria than were found immediately after treatment, and an increase in the amount of chlorine used had no appreciable effect on these increases. Blowing out the mains effected a slight reduction, but only of a temporary nature, and several hours' treatment with a strong solution of chlorine (4 parts per million) also gave but little relief. As *B. coli* was almost invariably unmoved, even when 100 c.c. were tested, the phenomenon must be ascribed to the growths in the mains and not to a revival of the original flora. The period of time required for the water to reach the points where increases were found was almost invariably less than one hour, and as revival could not take place in such a short time additional evidence is furnished in favour of the theory of contamination with secondary growths. Despite these increased counts, the process must be considered an excellent one and efficient admixture the essential feature for obtaining successful operation.

On Toronto Island, one million gallons per diem were treated during the summer season, and since it was first installed in May, 1911, the process has been put into operation at West Toronto and Sarnia, Ont., with equal success.

Chlorine-treatment in conjunction with filtration.

It is well known that turbidity reduces the efficiency of the chlorine-treatment, and since in the case of the Toronto supply an increase of turbidity is usually accompanied by increased pollution, the chlorine treatment of the raw lake water can only be regarded as a temporary expedient. Its use as such has been entirely justified as there is no doubt that the adoption of the process for the city supply has resulted in a decreased typhoid mortality rate. In 1910 the rate was 43, and in 1911, during the whole of which chlorine was in use, the rate was decreased to 20.

Until the system of slow sand filters recently put into operation had demonstrated its ability to sufficiently purify the water supply it was deemed advisable to continue the treatment with chlorine, and the effect of the reduction in turbidity and organic content is easily observable in the table given below. The filtration plant was first operated on January 4, 1912, so that the beds have not yet matured. It will be noticed that the efficiency is rapidly increasing despite the high rate of filtration (5·3 million gallons per acre per day).

Date. 1911.	Chlorine parts per million.	Bacteria per c.c. Gelatin 3 days at 20° C. Raw water.	Filtered water.	Chlorined water.	Samples showing typical *B. coli*. Raw water. 50 c.c.	10 c.c.	1 c.c.	0·1	Filtered water. 50 c.c.	10 c.c.	1 c.c.	Chlorined water. 50 c.c.	10 c.c.	1 c.c.	Turbidity. Raw water.	Filtered water
April ..	0·25	10,910	—	6,421	3	2	0	—	4	—	-	3	1	0	65	—
May ..	0·25	4,813	—	1,545	—	8	5	—	—	—	—	0	0	0	4	—
June ..	0·26	16,821	—	2,437	17	3	0	—	—	—	—	0	0	0	6	—
July ..	0·28	864	—	310	22	11	0	—	—	—	—	3	1	0	5	—
August ..	0·31	1,018	—	74	10	12	2	—			—	0	0	0	4	—
September	0·32	725	—	101	11	10	0	—	—	—	—	0	0	0	12	- -
October..	0·42	1,256	—	81	18	17	2	—	—	—	—	0	0	0	8	—
November	0·38	7,150	—	132	22	9	1	—	—	—	—	0	0	0	8	—
December	0·33	11,999	—	84	34	16	9	—	—	—	—	10	4	0	13	—
1912.																
January	0·33	2,163	473	23	16	9	6	0	18	6	1	4	1	0	5	2
February	0·31	19,232	2,228	14	20	11	5	2	16	6	1	0	0	0	10	1
March ..	0·28	17,264	1,629	43	23	15	4	0	21	9	1	1	0	0	9	0·6
April ..	0·27	18,524	815	5·3	24	17	10	3	20	11	2	2	0	0	44	2·0

As a result of prolonged incubation of city tap water after filtration and chlorine treatment, the following numbers of bacteria per c.c. at 20° C. (average of 12 samples) were counted :—After 2 days, nil ; after 3 days, 0·75 ; 4 days, 3·0 ; 5 days, 7·0 ; 6 days, 10·0.

Chlorine treatment of the city supply was commenced in May, 1910, but no results are given until April, 1911, as gelatin counts were not made until this latter date. From this date onwards there has been a steady progressive increase in efficiency, and the reason for this can only be attributed to a gradual removal of organic growths in the large distributing mains. No evidence of revival has been found within the period of time the water remains in the system, as the count decreases with increased period of contact, the best water being invariably found at the points farthest removed from the pumping station.

That is the reverse of the experience at Cincinnati with chlorine treatment of filter effluents. Elms (Eng. Record, Vol. 63, p. 472) finds that although the water at the reservoir appeared practically sterile, very much larger counts were obtained from city tap samples, and he attributes this to disturbances of the bacterial flora and secondary growths. The difference between the Toronto and Cincinnati results may be due to the presence of a larger amount of easily oxidised organic matter in the latter supply. Elms (*loc. cit.*) has shown that the efficiency of the process is inversely proportional to the amount of easily oxidisable matter present and that large increases of bacteria are common in such samples following a temporary reduction.

The point of application of chlorine used in conjunction with filtration systems varies in different countries. English practice being to apply it to effluents only, and American usually to treat the raw water. In mechanical plants where coagulants are used it is convenient and economical to add the bleach prior to sedimentation, but the full advantage of the bleach is not developed in this method as the chlorine is acted upon by the full organic content of the water. Furthermore, the Lawrence, Mass., experiments have shown that when small quantities of chlorine are used (less than 3 parts per million) in conjunction with coagulants the action is soon complete and that subsequent storage increased the bacterial count from 100 per cent. to 670 per cent. There is an increase when chlorine is not used, but not nearly so marked as these figures indicate. These factors detract from the efficiency of the plant and better results can undoubtedly be obtained by treatment of the filtrates. This is proved by the Cincinnati results.

Any excess of chlorine added to water is considered by many to be removed by filtration, but of this there is no proof. Chlorine after addition to water exists in various forms—as free chlorine, hypochlorous acid, and in combination with organic matter. The two former can only be removed by special methods, such as the "Dechlor" and "Ferrochlor" processes, and although a portion of the latter is undoubtedly removed by sand filters, filtrates are obtained that give a chlorine reaction after acidification.

Experience with slow sand filters shows that chlorine interferes with the efficiency of the filter by reducing the formation of the "blanket" layer, and retarding the biological processes taking place in the lower layers. During the chlorine treatment of the prefiltered water at Lincoln, Houston found that although the removal of *B. coli* and other organisms growing at 37° C. was satisfactory, there is almost invariably an increase in the bacteria growing on gelatin at 20° C. This, he thought, was possibly due to the chlorine acting on the organic matter and changing it into forms more suitable for microbic life and that in the filter and underdrains reproduction was accelerated. The chemical results support this view, as the effect of treatment with chlorine was to increase the amount of organic matter found in the effluent. Rideal's experiments with sewage at Guildford indicate that similar action may take place in contact beds.

Some experiments on sand treatment, made in the filtration plant laboratories, indicate a similar action, and two typical examples are shown in the following tables :—

Experiment 1.

Available chlorine in liquid parts per million.	Bacteria per gram of sand after. 3 hours.	24 hours.	48 hours.
Nil.	70,000	—	—
0·1	7,200	20,400	12,800
0·3	5,240	6,400	11,200
0·5	5,120	4,700	10,800
1·0	1,000	8,800	20,400

It is observable that the effect of large doses of chlorine is first to reduce the bacterial count, but the reduction is not maintained and the subsequent increase is abnormally rapid. The conditions were evidently unsuitable for the reproduction of *B. coli*, and it remained inert.

From a consideration of all the available data there is no doubt that if chlorine is to be employed to full advantage, it must be added to the filter effluents. The turbidity, colour, and organic impurities of a raw water are not apparently reduced by chlorine, but they are acted upon with consequent loss of available disinfectant.

Experiment 2.

Available chlorine in liquid.	Bacteria per gram of sand after		Typical *B. coli* after 24 hours.				Free chlorine after 24 hours.	
	3 hours.	24 hours.	100 gr.	10 gr.	1 gr.	0·1 gr.	Without acidification.	After acidification.
Nil.	12,100	71,000	+	+	+	—	—	+
3·0	80	114,000	—	—	—	—	—	+
5·0	55	150,000	—	—	—	—	—	+
7·0	25	214,000	—	—	—	—	—	+
10·0	26	500,000	—	—	—	—	—	+

The relative weights of water and sand were as 1 : 2.

The disadvantages of the addition of chlorine to pre-filtered water may be summarised thus:

Mechanical filters: Reduced efficiency of chlorine.
Slow sand filters: Reduced efficiency of chlorine, and reduced purification by filters *per se.*

Aesthetic considerations.—Any compound of chlorine which liberates the free element on addition to water has a tendency to impart a distinct taste and odour to it, and when present in amounts exceeding 1 part per million of available chlorine it can generally be detected by the senses. This is the result of many experiments with Lake Ontario water, and although in some cases quantities smaller than 1·0 part per million could be occasionally detected, many blanks were also said to contain chlorine so that many of the positive results were due to auto-suggestion. The taste of chlorine is sharp and acid, and the odour pungent, but these should not be confounded with the sensory characteristics of natural untreated waters. Many organisms such as *Uroglena, Volvox,* and *Eudorina,* impart a distinctly fishy taste and odour to the water in which they grow, and this is especially noticeable when the water is warmed. *Uroglena* probably effects this by the rupture of the oil sacs which it contains, and as the products of decomposition pass into solution they cannot be removed by the usual forms of purification. The majority of complaints regarding water supplies which are treated with small quantities of chlorine are due to these natural and uncontrollable causes, and although samples are often said to taste of chlorine it will generally be found that chemical tests give a negative result. As the reaction with potassium iodide and starch in acidified solutions is at least five times as delicate as the palate and nose, these complaints must generally be ascribed to auto-suggestion. In these cases the number of complaints will be found to bear no relation to the amount of disinfectant used: typical examples of this phase of the treatment were met with during the summer season on Toronto Island in 1911. Many complaints were received during the early part of the season when the rate was only 0·20 part per million of chlorine, and these entirely ceased during the latter half of the season when the rate was increased 150 per cent. The nature of the complaint has been the same as in other places where chlorine is in use, that it caused colic and other human ailments, that cattle and other animals refused to drink it, that it injured plants, fish, and birds, and extracted abnormal amounts of tannin from tea. No reliable evidence was ever produced in support of these statements, and they ought, therefore, to be treated as myths.

Corrosion.—There is no doubt that chlorine tends to increase the corrosive properties of water, but when the amount present is very small, the increased effect is so minute as to be inappreciable. Chlorine accelerates the action on iron by increasing the number of hydrogen ions, which are, according to the electrolytic theory of corrosion, mainly responsible for the deleterious effects produced. No injury has been noticed in the pumps at the main pumping station where chlorine-treated water has been pumped continously for over two years, but it must be remembered that actual "free" chlorine is generally removed by absorption during the 50 minutes' contact in the tunnel under the Bay. If chlorine were added to a water in excess of the carbonates present, it is easy to conceive that an electrolytic action would ensue in a pump constructed of different metals or alloys of metals. The water becomes an electrolyte, and corrosion would take place. If a contact period sufficient for the assimilation of the free chlorine cannot be obtained previous to pumping, it is a good policy to inject the chlorine into the discharge pipe of the pump. In the case of plunge pumps this can be done as previously described, whilst with centrifugal pumps, the plunger of the small bleach pumps could be operated by a water wheel connected in the discharge pipe. Dr. Houston in the 5th Report of the Royal Commission on Sewage Disposal gives some results of experiments on the action of chlorine-treated waters on lead piping. These show that chlorine (as "chloros"), in amounts varying from one to ten parts per million, does not appreciably increase the plumbo-solvent action of either unfiltered or filtered river water. Some experiments have been made within the last few days with the Toronto supply. Raw lake water, filtered water, and water treated with 0·25 and 0·50 part per million of chlorine all dissolved the same quantity of lead in 24 hours. The amount is, of course, so small that it cannot detract from the hygienic safety of the supply.

In conclusion, I wish to acknowledge the assistance I have received from the many valuable suggestions that have emanated from Mr. F. F. Longley, the Resident Engineer at the Filtration Plant.

London Section.

Meeting held at Burlington House, on Monday, June 17th, 1912.

MR. E. GRANT HOOPER IN THE CHAIR.

THE PRODUCTION AND POLYMERISATION OF BUTADIENE, ISOPRENE, AND THEIR HOMOLOGUES.

BY W. H. PERKIN, JUNR., F.R.S.

In the year 1908, when rubber had begun to attract the general attention of the chemists of the world as a possible object of attack for synthetic organic chemistry, it occurred to Mr. E. Halford Strange, of Messrs. Strange and Graham, Ltd., to direct the attention of his organisation of chemists, headed by Dr. F. E. Matthews, to the subject. In December 1909 Dr. Matthews made some suggestions for a route to isoprene in which acetone was one of the raw materials, and shortly afterwards he devised a much better route employing fusel oil as the raw material.

At that time I had already begun to experiment on the subject from another direction employing glycerol as the starting point, so when Mr. Strange approached me with a view to obtaining my assistance in working out Dr. Matthews' suggestions, I proposed an alliance. This was immediately arranged, and the group was shortly afterwards joined by Sir Wm. Ramsay in a consulting capacity, and later by Professor Fernbach, of the Pasteur Institute, Paris.

The immense amount of work which has been undertaken by the group has been conducted largely on the principle of a committee, and my own share of the work has been mainly that of suggestion and criticism. With the exception, therefore, of Dr. Matthews' original suggestion of the fusel oil route and his valuable dicovery of the sodium method of polymerisation and the remarkable experiments on fermentation carried out by Professor Fernbach, whatever credit there may be attached to the work accomplished, must be considered as belonging to the whole group.

The names of the chemists and bacteriologists who have been engaged in this work, arranged in alphabetical order, are as follows:—Henry J. W. Bliss, M.A., Harold Davies, Harry M. Elder, M.A., Professor A. Fernbach, Thomas Kane, Francis E. Matthews, Ph.D., F.I.C., Professor W. H. Perkin, F.R.S., Charles A. Pim, Rupert W. Pope, B.Sc., Sir Wm. Ramsay, F.R.S., Paul Schoen, E. Halford Strange, M.Sc., Charles Weizmann, Ph.D., Evelyn C. B. Wilbraham, Ph.D.

There can now be no doubt that rubber may actually be obtained synthetically by the polymerisation of isoprene and its homologues and that the synthetic product is really rubber and strictly comparable with natural rubbers, these facts having been confirmed by a large number of chemists working independently.

As regards the history of this synthesis, it seems to me desirable, in view of statements which have been made abroad, to review the work of earlier investigators, and particularly that of W. A. Tilden in England, and G. Bouchardat in France, in order that I may emphasise the fact, as I particularly wish to do, that much of the credit of the pioneer work in this subject belongs to this country and to France.

It is surprising that Prof. C. Harries (Gummizeit., 1907, 823 and 1910, 850) should doubt whether Tilden really had synthetic rubber in his hands in 1882 and 1884, and should advance the view that certain samples produced in 1909 by Bayer und Co., of Elberfeld, were the first true samples of synthetic rubber. This criticism is quite beside the mark, and the specimens of crude synthetic rubber which Tilden undoubtedly prepared were made many years before Bayer und Co. produced rubber by their process.

It would seem to be hardly necessary to point out the importance of a thorough study of the literature before attempting to decide claims for priority such as these. Especially in the case of a subject of such wide interest and importance as rubber, the literature of which is often contained in journals difficult of access, very careful search is imperative in order that credit for discovery may be given where it is due. For this reason, Mr. H. J. W. Bliss has been engaged for several months in compiling from the literature what seems to me to be a very valuable and necessary sketch of the progress of rubber research from the commencement.

It is of very great interest to notice than an Englishman, Greville Williams (Phil. Trans., 1860, 245: Proc. Roy. Soc., 10, 516) who, in 1860, was the first to isolate isoprene from the products of the destructive distillation of rubber in a fairly pure state, was also the first to observe the transformation of this hydrocarbon into a rubber-like body. He noticed that isoprene, if kept, becomes viscid and acquires bleaching properties. It is, he remarks, in fact ozonised. If this ozonised isoprene is distilled, the unaltered isoprene comes off first, the fluid then thickens and the boiling point rises rapidly. A sudden reaction then occurs, a cloudy vapour rises, and a very sharp odour is given off. Greville Williams uses these words: . . . "The contents of the retort instantly solidify to a pure white spongy mass, having if successfully prepared but slight tendency to adhere to the fingers. When pure it is opaque, but if allowed to become exposed to the air, especially when warm, it becomes transparent, first on the edges, and subsequently throughout the whole mass. When burnt it exhales a peculiar odour hitherto considered to be characteristic of caoutchouc itself." It is true that this substance, which Greville Williams regarded as an oxide, was not at his disposal in sufficient quantity, or purity for him to definitely identify it with rubber (which it undoubtedly contained), but it is clear from his remarks (p. 254 and 518 *ibid.*) that he considered that both caoutchouc and guttapercha are polymers of isoprene. Heinemann's patent (14,041/10; this J., 1911, 909) taken out in 1910, claims "treating the isoprene with oxygen or ozone and then heating the product until it becomes viscous," which seems to be almost exactly what Greville Williams had described fifty years before.

In 1875 (Bull. Soc. Chim. **24**, 108 and Comptes. Rend., **80**, 1446) G. Bouchardat examined the products of the distillation of rubber, and also came to the conclusion that the substances so obtained such as diisoprene (dipentene), $C_{10}H_{16}$; $C_{15}H_{24}$, etc., including rubber itself, are polymers of isoprene. He showed that isoprene is converted by heating in a sealed tube into a mixture of these polymers, including the indefinite substance named colophene, which there can be no doubt contained a considerable proportion of rubber.

In 1879 the same worker (Comptes Rend., **89**, 361) showed the similarity of turpentine to diisoprene, thus definitely connecting the terpenes with isoprene. In the same year (Comptes Rend., **89**, 1117), while preparing the hydrochloride of isoprene, he shook the latter with a saturated solution of hydrochloric acid, when combination ensued, as was indicated by a rise of temperature. But, on attempting to distil the hydrochlorides, he found that a proportion remained as a solid residue. This residue was examined and found to have, quoting his own words, "the elasticity and other properties of rubber itself. It is insoluble in alcohol, it swells up in ether, also in carbon bisulphide in which it dissolves after the fashion of natural rubber." This product was submitted to dry distillation and yielded the same volatile hydrocarbons as rubber. Again he says: "I isolated among the products of distillation a certain amount of a hydrocarbon $C_{10}H_{16}$ which with HCl gave $C_{10}H_{16}2HCl$ melting at 46° like the dihydrochloride from caoutchouc. All these properties seem to identify this polymer of isoprene with the source of isoprene, namely, rubber." The rubber obtained was as much as 1/6th of the weight of the isoprene used, but it was very difficult to eliminate the last traces of chlorine.

In 1881 we find the first example of the polymerisation of a homologue of isoprene, when Hofman (Ber., **14**, 665) noticed that piperylene, which he assumed to have the constitution, $CH_2:CH.CH_2.CH:CH_2$, but which Thiele in 1901 showed was a methylbutadiene of the formula, $CH_3.CH:CH.CH:CH_2$, and isomeric with isoprene, showed a tendency to polymerise during distillation. In 1882, Schotten (Ber., **15**, 425) in preparing the same hydrocarbon, also obtained a similar polymeride.

The solution of the rubber problem would probably have occurred earlier if it had not been the custom of chemists to immediately throw away anything resembling a resin. The comparatively recent commercial utilisation of some of the aldehyde resins which were previously thought to be worthless, is another case in point.

In 1882 (Chem. News, **46**, 120) Tilden published an article on isoprene from which I will quote the following passage:—"Isoprene presents two characters which distinguish it from the terpenes. One is the peculiar explosive property of the white syrupy substance which results from its oxidation by air. The other peculiarity is its conversion into true india-rubber or caoutchouc when brought into contact with certain chemical reagents, *e.g.*, strong aqueous hydrochloric acid as noticed by Bouchardat, or nitrosyl chloride as observed by myself. It is this character of isoprene which gives it a somewhat practical interest, for, if it were possible to obtain this hydrocarbon from some other and more accessible source, the synthetical production of india rubber could be accomplished."

It is a remarkable tribute to Tilden's intuition that he should not only at this early date have forseen the successful production of synthetic rubber, but he should also at the same time have suggested (p. 121) the correct formula for isoprene.

In 1884 (J. Chem. Soc., **45**, 411) Tilden published a paper on the pyrogenetic decomposition of turpentine. He showed that isoprene was one of the products and could be converted into rubber. This paper is of special interest since we have here the first possibility of the commercial manufacture of rubber. I shall have occasion to revert to this production of isoprene from turpentine in a later part of my paper. Tilden was able to confirm Bouchardat's observations, and says "the action of concentrated hydrochloric acid on isoprene converts a portion into caoutchouc. It appears to be produced most readily from the oily polymeride resulting from the action of heat. Contact with strong acids in the cold effects the change. Tilden also makes the very interesting suggestion that, just as isoprene polymerises to a series of terpenes (of which rubber and guttapercha were members according to the idea of many workers both before and after this date), so the analogues of isoprene, C_4H_6, C_6H_{10}, C_7H_{12}, etc., should polymerise to a series of terpenes and might also polymerise together to form terpenes containing an uneven number of carbon atoms.

In confirmation of Tilden's results, Lilley by heating isoprene, recently obtained a body which he called "mesoprene" (clearly Tilden's "oily polymer"), and showed that this may be converted into rubber by the action of acids or other agents.

In 1887 (Annalen, **238**, 88) Wallach observed that isoprene is polymerised by the action of light to a substance very like rubber in its properties. In 1892 Couturier added another member to the rubber series (Ann. Chim. Phys., **26**, 485), since he found that diisopropenyl (dipropylene), $CH_2 : C(CH_3).C(CH_3) : CH_2$, polymerises very easily, *e.g.*, by the action of heat (p. 489). He did not apparently very closely examine his "resin," about which (p. 491) he states little more than that it agglomerates and is soluble in ether, chloroform and acetic acid, properties somewhat resembling those of freshly precipitated rubber.

It should be mentioned that Mariutza had previously noticed in 1890 that an oily polymeride is produced (J. Chem. Soc., Abs., p. 728) when dimethylisopropenyl carbinol, $C(CH_3)_2OH{\cdot}C(CH_3) : CH_2$, is subjected to the action of dilute acids, and states that this oil is probably a polymeride of the diisopropenyl first produced.

In 1892 (Chem. News, **65**, 265) Tilden published a remarkably interesting paper which he had read at the meeting of the Birmingham Philosophical Society on May 18th, 1892, and from which I give the following extracts. Referring to specimens of isoprene which he had prepared several years previously, he says:—"I was surprised a few weeks ago at finding the contents of the bottles containing isoprene from turpentine entirely changed in appearance. In place of a limpid, colourless liquid, the bottle contained a dense syrup in which were floating several large masses of solid, of a yellowish colour. Upon examination this turned out to be india-rubber. . . . The artificial, like natural rubber, appears to consist of two substances, one of which is more soluble in benzene or carbon bisulphide than the other. A solution of the artificial rubber leaves, on evaporation, a residue which agrees in all characters with a similar preparation from Para rubber. The artificial rubber unites with sulphur in the same way as ordinary rubber, forming a tough elastic compound."

He thus showed for the first time that synthetic rubber is capable of vulcanisation and therefore sufficiently resembles natural rubber to be used commercially, if some means could be discovered for producing it in quantity.

In 1894 Weber (this J., **13**, 11) read a paper before this Society in which he stated that he had been able to confirm Tilden's results.

I pass over a number of observations made in succeeding years which show that many homologues of isoprene exhibit a tendency to polymerise to ill defined amorphous bodies. Examples which occur to me are hexadiene, cyclohexadiene, cyclopentadiene, and styrolene. The polymerisation may be due to a variety of causes, heat, acids, alkalis, etc., or may occur spontaneously. The resulting products were usually not examined further, since, in common with the natural rubbers, guttapercha, etc., they are of an indefinite nature and probably consist of a mixture of different polymers of the parent hydrocarbon. Thus, natural Para rubber itself has been shown by Harries to occur in at least three forms, an oily, the ordinary soluble form, and an insoluble modification.

It is not surprising, therefore, seeing that so much time had been spent in attempts to separate the different constituents of natural rubber without success, to find investigators hesitating before dealing with small quantities of homologues, the separation of which would doubtless be equally difficult.

In 1899, Kondakow (J. Prakt. Chem. (2), **59**, 299), whilst working on the action of alcoholic potash on pinacone bromide, obtained dipropylene and identified it with Couturier's diisopropenyl—

$$CH_3.C(CH_3)Br.C(CH_3)Br.CH_3 =$$
$$CH_2 : C(CH_3).C(CH_3) : CH_2 + 2HBr.$$

He also points out that the other members of the divinyl series should polymerise in a similar manner to isoprene, yielding homologues of dipentene, a suggestion which Tilden had already made in 1884.

In the same year, Mokiewsky (J. Russ. Chem. Soc., **30**, 885) also noticed the easy resinification of pure isoprene prepared from its dibromide.

In 1900, Kondakow (J. Prakt. Chem., **62**, 175; compare also *ibid.* 1901, **63**, 113) investigated the action of alcoholic potash upon diisopropenyl, and states:—"This treatment was undertaken to determine whether this hydrocarbon is isomerised under these conditions. By heating this hydrocarbon with alcoholic potash (1 part potash to 3 of alcohol) to 150° for 5 hours, a part of it polymerised, the remainder was unaltered. This shows that diisopropenyl is not as I formerly believed isomerised to tetramethylethylene by the above treatment. As regards the polymerisation product made by heating diisopropenyl with alcoholic potash, its properties resemble those of rubber or of the polymer of styrol. The product is a leather-like elastic mass, almost white in colour, which does not distil in steam, is insoluble in water but soluble in hydrocarbons, ether and alcohol." In 1901 Kondakow (J. prakt. Chem., **64**, 109) published particulars of the polymerisation of di-isopropenyl by keeping or by the action of light.

The product was also very like rubber but differed from the previous product in being insoluble in the usual solvents, for it only swelled up by contact with benzene. It, therefore, had very much the same relation to the soluble first product of polymerisation that the old insoluble rubber had to fresh. He, therefore, considered that it was a higher polymeride.

In 1901, Thiele (Annalen, **319**, 226) showed that the formula of piperylene was $CH_3{\cdot}CH : CH{\cdot}CH : CH_2$ and not $CH_2 : CH{\cdot}CH_2{\cdot}CH : CH_2$ as Hofmann (*loc. cit.*) had suggested, and that on keeping, it yielded a small quantity of a rubber like polymer, but not so readily as isoprene does.

Similar observations were made about this time by Harries (Ber., **34**, 303) on dihydrotoluene, Klages (Ber., **35**, 2650 and **37**, 2310) on phenylbutadiene, Kronstein (Ber., **35**, 4151) on cyclopentadiene, Willstätter (Ber., **38**, 1975 and **40**, 957 and 3994) on brombutadiene and cyclooctadiene (a substance considered by Harries to be the basis of the rubbers), and by other workers on a variety of compounds, all of which are characterised by containing the conjugated double linking—C:C.C:C—. The polymerides obtained were mostly incompletely investigated but their behaviour with solvents showed a general resemblance to that of rubber.

In 1906 Tilden exhibited his samples of spontaneously polymerised isoprene rubber before the British Association at York.

We now approach what may be termed the period of greater activity in the history of synthetic rubber.

The position may be summed up as follows:—It was generally recognised that most compounds containing the conjugated double linking showed a tendency to polymerise, in some cases very readily, but in others with difficulty. The polymerides varied from sticky, indefinite substances, through well defined rubbers, to hard resins, such as polystyrolene; their properties also varied somewhat with the method of polymerisation and with the molecular weight of the hydrocarbon polymerised. The methods of polymerisation included spontaneous polymerisation, and polymerisation due to heat, sunlight or the action of various chemical reagents, such as acids and alkalis.

But, in most of these cases the methods in use were uncertain, wasteful or slow. So much was this the case that Harries and Klages (Gummizeit., 1906, 1277, and Zeits. angew., Chem., **19**, 1330) were tempted, as has already been stated, to throw doubt on the validity of Bouchardat's and Tilden's polymerisation results; this, in spite of the confirmatory work of many other investigators on isoprene and its homologues to which I have already alluded. But no one who is really conversant with the literature of the subject, or who has had the opportunity of inspecting the preparations made by Tilden, can for a moment doubt that Tilden had polymerised isoprene to rubber as far back at least as 1884. And similarly there can be no doubt that Bouchardat had synthetic rubber in his hands as far back as 1875.

The well known rapid rise in the price of rubber which took place 4 or 5 years ago began to focus the attention of a number of chemists in this country and abroad on the problem of its artificial production, and a study of the patent literature from 1907 onwards will show what very considerable progress has been made, and how important are the results which it is claimed have been accomplished.

I should like next to call attention to a German application (H 44823) lodged in October 1908 by A. Heinemann, but apparently not published until September 1911. This patent (corresponding to the English patent, 21,772/07; see this J., 1908, 1075) describes the method of heat polymerisation of isoprene as follows:—"This hydrocarbon contains two double bonds and so is easily polymerised. This follows in known manner by heating in a sealed tube with or without the addition of acids, alkalis or neutral catalysts. The temperature is preferably kept at 100 —150° for three days. Higher or lower temperatures work in a shorter or longer time than three days. After polymerisation a rubber-like mass is obtained, in solution in unpolymerised hydrocarbon or hydrocarbon polymerised only to an oil. The hydrocarbon can be separated by distillation or by the known methods of precipitating natural rubber." Meanwhile, the Bayer Co. had been at work on the problem and filed an English patent, 17,734/10 (see this J., 1911, 226), dated September 11, 1909 and a French patent, 419,316, the first of a series of patents for the heat polymerisation of isoprene and its homologues. The gist of these patents is very well described by Heinemann's remarks, which I have just quoted, and they do not appear to contain much which was not known before.

On December 14, 1909, G. Lilley, working in England, took out the patent to which I have already referred (Eng. Pat. 29,277 of 1909; see this J., 1911, 561) for making "mesoprene" by the action of heat on isoprene, and then acting upon the oily polymeride thus formed, with acids, etc. We have seen samples of the rubber made in this way, and their formation by this process completely vindicates Tilden's early statements, if such vindication were necessary.

By this time I and my co-workers, Mr. Davies and Dr. Weizmann, were already working upon isoprene in Manchester, and Messrs. Strange and Graham's chemists, under Dr. F. E. Matthews, had also started work on the problem. In addition, the Badische Anilin und Soda Fabrik and the Bayer Co. were at work, as also Prof. C. Harries; Messrs. Schering apparently commenced a little later. The rather dramatic nature of the race in progress can be seen by the dates of the above and other patents.

I now come to what may perhaps be considered the most dramatic episode of all, a remarkable, though by no means unique example of the almost simultaneous discovery of a scientific fact by more than one observer. Prof. Harries announced (Lieb. Ann., 383, 157—227; see this J., 1911, 1073) last year the fact that sodium will cause the polymerisation of butadiene or divinyl, isoprene, and its homologues. This discovery was made by Harries at the end of 1910 and patented by Bayer und Co. early in 1911. But before this, during the summer of 1910, Dr. Weizmann had suggested to Dr. Matthews that dimethylallene might possibly be converted into isoprene by the action of sodium—such isomerisation being not unknown in the unsaturated series of hydrocarbons. It was found, however, that although isomerisation did take place to some extent, isopropylacetylene, not isoprene, was formed, $CH_3.C(CH_3) : C : CH_2 \rightarrow CH_3.CH(CH_3).C\ \ CH$, a fact which had also been noted by Fawosky (J. Russ. Chem. Soc., **19**, 558).

It then occurred to Dr. Matthews that it would be of interest to study the action of sodium upon isoprene itself. He, therefore, sealed up some isoprene with sodium and set it aside in July, 1910. In the month of August, during a holiday, he was reluctantly compelled to return to London, and discovered that the contents of the tube had become viscid and contained a proportion of a remarkably good variety of rubber. The tube was again set aside, and on examination in September was found to contain a solid mass of amber-coloured rubber.

Further work showed that sodium was a general polymerising agent of first class importance for this class of hydrocarbons. A patent was applied for on 25th October, 1910, or about three months before the German application, but the actual first announcement of this discovery to the world was made by Prof. Harries, in the extremely valuable and useful paper to which I have already drawn attention. The patent applications were not published until after the date of this paper, and it was then evident to all those interested that our claims had completely anticipated the work of Harries and Bayer und Co.

The great importance of the discovery of the sodium polymerisation process, in the first place, lies in the fact that the action is practically quantitative and is not seriously affected by the presence of impurities such as trimethylethylene or other hydrocarbons which are not capable of polymerisation to rubber. It may also be carried out in the cold or with the application of very moderate heat. On the other hand, all the other processes which have been proposed are either excessively slow, or involve a high temperature or the addition of reagents which affect the yield and quality of the rubber. Further, a high temperature always produces a proportion of terpenes, and has also, as you know, a deleterious effect on any rubber which may be formed. In addition the presence of some impurities adversely affects the yield or may greatly delay the polymerisation, a fact which perhaps accounts for the varying success of previous workers in their attempts to bring about polymerisation.

Kondakow is now publishing a series of articles on synthetic rubber in the "Revue générale de Chimie." He advances his undoubted claim to have made several important discoveries in this subject. I must, however, take this opportunity to make a protest against his attempt to claim almost universal priority. Thus, for example, he noticed in 1889 that sodium had some action upon diisopropenyl, because when this hydrocarbon was distilled over sodium the latter became covered by a brown deposit. At that time he considered that the deposit was a sodium derivative, but he now says that, of course, it must have been a kind of rubber. He, therefore, claims that he is the discoverer of the sodium polymerisation method. As a matter of fact, his former conclusion is the more correct, since the brown product, sometimes viscid, sometimes solid, undoubtedly contained sodium, and there is no evidence that the substance so formed had any connection at all with rubber.

The formation of such deposits upon sodium in distilling organic liquids is well known, but polymerisation of the whole mass by the action of a small quantity of sodium at a low temperature is an entirely novel observation, and this discovery must be credited to Dr. Matthews and Prof. Harries independently.

I have already mentioned that pure Para rubber itself has been shown to occur in at least three forms. Little is known of the chemical constitution of these substances, and less still of that of other natural rubbers and resins or of gutta-percha. Harries has investigated the ozonides of Para rubber, and identified some of the products of their decomposition, and, as a result, has suggested a formula for this substance, embodying an eight carbon ring.

Gutta-percha, which has also been examined by Sir Wm. Ramsay, gives ozonides which yield different proportions of the same or similar decomposition products, and it has been suggested that gutta-percha is merely a higher polymer of isoprene. If, however, this is so, old matured rubber should be similar to gutta, which is only the case to a limited extent.

No satisfactory explanation has yet been advanced for the difference between the members of the rubber family, and, until we have further facts to go upon, any satisfactory classification of the rubbers must be postponed. It is clear that a body containing two conjugated double linkages may polymerise in many different directions, of which three have been suggested by Tilden (Brit. Ass. York., 1906), Harries (Gummizeit., 1907, 21), and Pickles (J. Chem. Soc., 1910). It is, therefore, at least possible that any given sample of rubber may be formed from its parent hydrocarbon in several ways, and very probably consists of a mixture of polymerides of varying constitution.

During the course of our experiments on "synthetic" rubber we found ourselves in this position—that if butadiene (divinyl or erythrene), isoprene, diisopropenyl or other similar substances containing conjugated double linkages could be prepared cheaply, we could convert them practically quantitatively into rubber of good quality by our sodium polymerisation method, and thus the problem of the commercial manufacture of rubber would be solved.

The formula of isoprene, $CH_2:C(CH_3).C:CH_2$, which had been first suggested by Tilden, was confirmed by Gadziatsky and Kondakow, and finally demonstrated almost simultaneously by Ipatiew (J. Prakt. Chem., 1897, **55**) and Euler (Ber., 1898, **30**, 1989, and J. Prakt. Chem., 1898, **57**, 131) by different methods, and therefore since its constitution was established, it became possible to proceed with the synthesis not only of isoprene itself but also of its homologues.

In discussing this matter I propose to leave out of account such complicated methods as those which had been adopted by Hofmann in 1881 in his work on piperylene, by Ciamician and Magnaghi in 1885–6 in their researches on divinyl, and by Euler in his work on isoprene, for these methods yield but small quantities of hydrocarbons, and that at great expense.

A careful consideration of the whole subject suggested that a possible route to cheap isoprene might be the cracking of the hydrocarbons by some improvement of the existing processes.

We have already seen that Tilden had laid the foundation of this route as regards turpentine, whilst Armstrong and Miller in England, and Prunier and others in France, demonstrated the presence of erythrene with other unsaturated hydrocarbons among the products of the cracking of light petroleum.

We are ourselves aware of the large amount of work on the cracking of turpentine carried out in England by Mr. G. Lilley prior to 1909, and many patents have been taken out in England and abroad for improvements in the details of this process. In the case of the paraffin hydrocarbons the yields are very much less than from turpentine, since the latter is already very closely related to isoprene.

However, after many experiments we decided not to proceed further with this method for the following reasons. Firstly the yields, even the best yields claimed by some patentees, are not good. It is difficult also to see how they can be much improved in view of the numerous products, gaseous and liquid, which result from the decomposition of turpentine. Further the product is always contaminated with hydrocarbons which are difficult to separate from the isoprene or from the finished rubber. Secondly, there is no easily accessible raw material for the manufacture of the homologues of isoprene by this method and most important of all, the supply of turpentine is limited and liable to violent fluctuations in price. Thus, the imports into this country of American turpentine in the last few years were under 29,000 tons per annum, and the price ranged in 1911 from £35 to £71 per ton. In addition, turpentine is subject to the manipulation of "corners" and "rings," and these operations would be greatly facilitated by a demand for, say, another 100,000 tons annually for rubber.

Since turpentine seemed impossible as a starting point, we were induced to make a survey of other organic raw materials which might serve. These must, of course, be cheap, available in large quantities and impossible to corner, and of such a nature that the price is not likely to rise much in the future.

In making this survey, we limited ourselves by the following considerations. In the first place, it was probable that the price of rubber might fall somewhat rapidly to about 2s. 6d. or 3s. per lb. on the entry of synthetic rubber into the field. This price would leave the plantations a good profit, but would eliminate the greater part of the wild (Brazilian and African) and inferior rubbers. Secondly, it was possible that the plantations might ultimately be able to produce rubber at from 1s. to 1s. 6d. per lb., and we had to be prepared to meet such competition in the future. It was useless, therefore, to consider any raw material which did not offer at least a possibility of the production of rubber at 1s. or even less. The only substances fulfilling these conditions seem to be wood, starch, or sugar, petroleum, and coal.

From wood, acetone may be prepared and used for the synthesis of diisopropenyl by known methods, but as in the case of turpentine, the quantity is limited.

From coal, and coke ovens, we can obtain an almost unlimited supply of benzene, and it is possible, but unlikely, that a satisfactory method for the preparation of isoprene and analogous hydrocarbons from this substance or from some other product of the distillation of coal may yet be devised.

Light petroleum is more promising, and as the supply is also almost unlimited, we have carried out a large number of experiments on the halogenation of hydrocarbons, such as pentane and isopentane, and on the elimination of hydrogen halide from the products. Much work has been done in this direction, and the results are, in many ways, similar to those subsequently obtained with the use of the higher alcohols, a line of research to which I shall presently have to refer in detail.

Finally we come to starchy materials which are obtainable in any quantity in the form of cereals, such as maize, or tubers, such as potatoes, at a price of less than one penny per lb. This at once led us to consider the sugars and such fermentation processes as may be applied to sugars or to starch, directly or indirectly.

It thus came about that our first efforts were directed to lactic acid, $CH_3.CH(OH).CO_2H$, which may be obtained by fermentation at a price of less than 3d. per lb.

One line of investigation was the following:—

The lactic acid was converted into α-bromopropionic ester, by the action of hydrobromic acid and subsequent esterification, and this was caused to react with acetone in the presence of zinc when it yielded *β*-hydroxy-*αββ*-trimethylpropionic ester, $(CH_3)_2C(OH).CH(CH_3).CO_2Et$, from which, by elimination of water, *αββ*-trimethylacrylic ester, $(CH_3)_2C:C(CH_3)CO_2Et$, was obtained. When this ester was hydrolysed and combined with bromine, it yielded *αβ*-dibromo-*αββ*-trimethylpropionic acid $(CH_3)_2CBr.CBr(CH_3)CO_2Et$, which, when treated with agents for the elimination of hydrogen bromide such as pyridine, loses also carbon dioxide with the formation of bromoamylene, $(CH_3)_2C:CBr.CH_3$. Lastly, the bromoamylene is converted into a mixture of dimethylallene, $(CH_3)_2C:C:CH_2$, and isoprene, $CH_2:C(CH_3).CH:CH_2$, by passage over hot soda lime, the latter being produced in not inconsiderable quantity during the process by intramolecular change. But it is very doubtful whether so complicated a process as this can ever have any technical significance.

The obvious difficulty attaching to lactic acid is that it has not a sufficient number of carbon atoms to yield a substance containing conjugated double linkings directly, and the addition of atoms of carbon by synthesis must always be an expensive process.

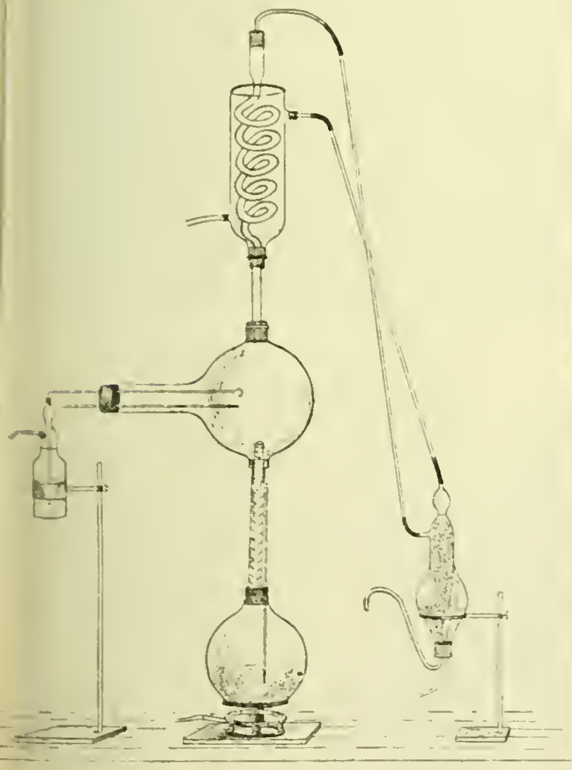
We, therefore, turned to the higher alcohols occurring in fusel oil and having four or more carbon atoms, since such substances were clearly suitable for conversion into hydrocarbons of the kind we required, and ultimately we were able to devise a very interesting and important method by which isoprene may be obtained readily and in quantity from *iso*amyl alcohol.

The *iso*amyl alcohol used in these experiments was fractionated from commercial fusel oil, and the portion distilling at 128°—131° was collected; according to the literature this consists of a mixture of approximately 87 per cent. *iso*amyl alcohol, $(CH_3)_2CH.CH_2.CH_2.OH$, and 13 per cent. active amyl alcohol, $CH_3.CH_2.CH(CH_3).CH_2.OH$.

The conversion of this into the chloride was done by passing dry hydrochloric acid gas into the alcohol contained in carboys heated in an oil bath: the chloride was allowed to distil over together with the water and the unchanged alcohol and after separating the water, the *iso*amyl chloride was readily obtained free from alcohol by careful fractional distillation. The fraction which we used in our subsequent experiments distilled at 97°—101° C.

The next step was to chlorinate the *iso*amyl chloride in such a way as to produce as far as possible only dichlorides and, in our initial experiments, we found this to be a troublesome matter since, when chlorine is passed into the boiling isoamyl chloride or into its vapour under ordinary conditions, a large proportion of higher chlorides is produced. However, this difficulty was ultimately overcome by employing a simple and ingenious apparatus devised by Mr. Pim, which proved to be of the greatest service, not only in this particular case, but also in our subsequent experiments with butyl chloride, and indeed this apparatus will probably be found valuable in connection with other research work, and especially in experiments in which it is necessary to limit the action of chlorine or bromine.

The following is a rough sketch of the apparatus as we have used it:—



The *iso*amyl chloride is boiled in the flask until the chlorinating chamber is full of vapour and liquid drops from the end of the reflux condenser, a stream of dry chlorine is then passed in fairly rapidly, but the *iso*amyl chloride must always be in excess, and this can easily be judged by observing the colour of the liquid as it drops from the condenser, for if the chlorine is being passed too rapidly it will be coloured yellow. During the whole operation the apparatus stands in a good light, and on dull days ultra-violet light from a mercury lamp may be used to facilitate chlorination. As fast as the higher boiling dichloride is produced it drops back into the boiling flask, and as this is provided with an efficient fractionating column, only the lower boiling *iso*amyl chloride can pass into the chlorinating chamber; the dichlorides are thus removed from the sphere of the action of the chlorine and therefore escape further chlorination. When the chlorination has proceeded far enough—a stage which, with a little practice, can easily be ascertained from the readings of the two thermometers—the product is submitted to fractional distillation with a Young fractionating column and thus separated into unchanged *iso*amyl chloride, and a mixture of dichlorides which distils roughly at 140°—175 C. By careful fractional distillation, repeated a large number of times, this mixture may be separated into the following principal constituents:—

1. Isopropylethylene dichloride,
$(CH_3)_2CH.CHCl.CH_2Cl$, b. p. 142 C.
2. *Gem*-Dimethyltrimethylene dichloride,
$(CH_3)_2CCl.CH_2.CH_2Cl$, b. p. 152—155° C.
3. *β*-Methyltetramethylene dichloride,
$CH_2Cl.CH(CH_3).CH_2.CH_2Cl$, b. p. 170°—172°.

1. The constitution of the dichloride boiling at 142 is indicated by the fact that when heated with soda lime it yields isopropylacetylene, $(CH_3)_2CH.C\ CH$, together with some isoprene produced doubtless by molecular rearrangement. The isopropyl acetylene was identified by treatment with mercuric bromide under the usual conditions, when it yielded isopropyl methyl ketone.

2. The dichloride boiling at 152—155° is the principal product of the chlorination of *iso*amyl chloride under the conditions I have described. That the two chlorine atoms in this substance are in the 1 : 3-position is clearly shown by the boiling point and by the fact that this dichloride is almost quantitatively converted into isoprene when its vapour is passed over hot soda lime.

3. The dichloride distilling at 170°—172° also gives isoprene when it is treated with hot soda lime, and as this particular dichloride does not appear to have been previously described, its constitution was proved in the following way. The dichloride was converted by treatment with potassium acetate, into the diacetate, and then, by hydrolysis, into the glycol, which, on treatment with phosphorus tribromide readily yielded the dibromide. From this dibromide *β*-methyladipic acid was obtained by treatment with potassium cyanide and subsequent hydrolysis of the nitrile thus produced.

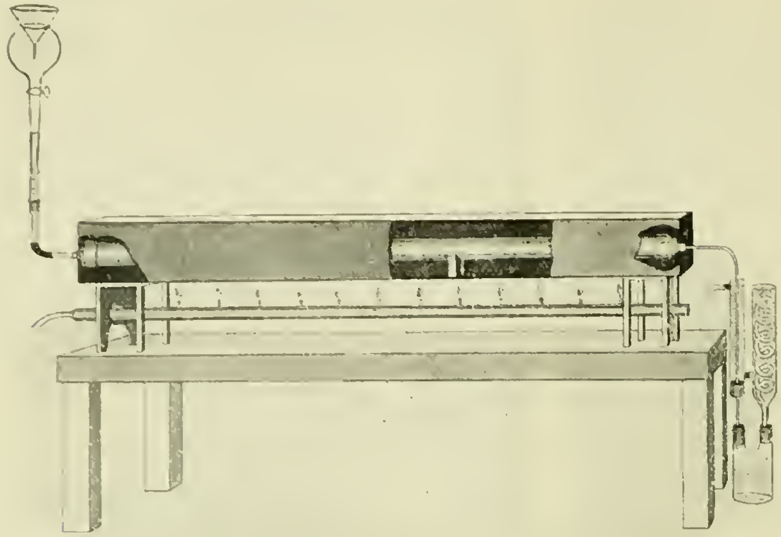
$$Cl.CH_2CH(CH_3).CH_2.CH_2Cl \rightarrow$$
$$CH_3CO.O.CH_2.CH(CH_3).CH_2.CH_2.O.CO.CH_3 \rightarrow$$
$$Br.CH_2.CH(CH_3).CH_2.CH_2.Br \rightarrow$$
$$CN.CH_2.CH(CH_3).CH_2.CH_2.CN \rightarrow$$
$$HO_2C.CH_2.CH(CH_3).CH_2.CH_2.CO_2H$$ (*β*-methyladipic acid).

It will be seen from this brief description that all three dichlorides yield isoprene together with small quantities of other unsaturated hydrocarbons, when hydrogen chloride is eliminated by passage over hot soda lime, and therefore, in our actual preparation of isoprene, separation of the isomerides was not necessary, and the fraction of dichlorides distilling at 140°—180° was employed. The method of removal of hydrogen chloride will be readily understood if I describe the laboratory apparatus which we employed with success for this purpose.

The crude dichloride is distilled over coarse soda lime contained in an iron tube heated in an air bath at a temperature of about 470° C., and the products are condensed in a worm surrounded by a freezing mixture and pass into a receiver also carefully cooled.

The condensed liquid is then fractionated and is thus readily separated into crude isoprene, distilling at 28—36° C., and higher products which still contain chlorine. Although the most suitable conditions have not yet been worked out, the yield of isoprene is already about 40 per cent. of that theoretically possible, and it would therefore seem that this is the most promising method which has yet been devised for the preparation of this important hydrocarbon.

The following is a sketch of this very simple apparatus:



In order to polymerise the isoprene to rubber, it is sealed up in tubes with about 3 per cent. of thin sodium wire and heated for several days at about 60° C., the dark brown product may be treated with acetone which precipitates the rubber, and this may then be washed with alcohol or treated with steam to remove acetone and any unpolymerised hydrocarbon. Although still in its preliminary stages the results are so encouraging that given cheap *iso*amyl alcohol, there is every reason to suppose that this method of chlorination of *iso*amyl chloride and subsequent removal of hydrogen chloride by passage over soda lime, may quite well be developed into an actual process for the manufacture of rubber, but in the meantime a serious difficulty has to be faced, and this is the scarcity and consequent high price of fusel oil.

As far as can be estimated, the world's production of fusel oil under existing conditions is only about 3,500 tons per annum, and as this substance is largely used for very varied purposes, the demand is constantly increasing, and the price has gradually risen during the last few years and is now about £140 per ton.

In order to meet this difficulty an alliance was made, as I have already stated, with Prof. Fernbach, of the Pasteur Institute, the initial object being to work out some process of fermentation which would yield fusel oil in larger quantity than can be obtained by ordinary alcoholic fermentation. There is a possibility of producing larger quantities, since Ehrlich has shown that the addition of certain nitrogenous substances, such as leucine or other amino-acids, to the fermenting mass results in an increased yield of the higher alcohols. The problem is obviously a very difficult one, but the experiments which are being actively carried on, indicate that a satisfactory solution will in the end be achieved.

In the meantime, Prof. Fernbach has discovered fermentation processes which are of the greatest importance, not only from the point of view of rubber, but also in connection with many other manufacturing operations. The starting material in each case is starch, which is converted by the one process into acetone and by the other into fusel oil, the yield in both cases being remarkably good and the product free from ordinary ethyl alcohol. The value of this extraordinary result will be readily understood when we consider that starch, in the form of cereals such as maize, costs under £10 per ton, and that the new processes are quite inexpensive.

Acetone is enormously used as a solvent, in the manufacture of explosives and many other products, and the supply is not equal to the demand. The only process available until now for its manufacture has been the distillation of wood and subsequent decomposition of calcium acetate, and as wood yields only 1 per cent. of its weight of acetone, the supply has necessarily been limited and the price is now £90 per ton. The cheap production of acetone which Prof. Fernbach has discovered, the cost being certainly not more than £40—£45 per ton, is therefore an important advance and a welcome addition to our manufacturing processes. The fusel oil obtained by the second process varies somewhat in composition, but its remarkable feature is that it contains a high percentage of normal butyl alcohol. It, therefore, follows that butyl alcohol, which till now had only been obtained with difficulty and was, therefore, very expensive, will soon be available in any quantity at a price probably not exceeding £40—£45 per ton. This again is an important matter from the general point of view, because experiments have already shown that butyl alcohol is, for most manufacturing purposes, at least as good, and in many cases much better, than ordinary fusel oil, and it will therefore take the place of much of the much more expensive *iso*amyl alcohol now in use. Lest there should be any doubt about these statements, the whole matter has been independently investigated by Mr. Otto Hehner under the most stringent conditions, and he has confirmed Prof. Fernbach's and our results in every particular.

From the point of view of synthetic rubber also, the value of cheap butyl alcohol cannot be over-estimated. Harries (Annalen, 1911, **383**, 213) has shown that, while excellent rubber is obtained by the polymerisation of isoprene, rubber of still better quality is produced by the polymerisation of butadiene or divinyl, the lower homologue of isoprene. Now the relationship of butadiene to butyl alcohol is the same as that of isoprene to *iso*amyl alcohol.

$$\underset{\text{butyl alcohol}}{CH_3{\cdot}CH_2{\cdot}CH_2{\cdot}CH_2OH} \rightarrow \underset{\text{butadiene}}{CH_2:CH{\cdot}CH:CH_2}$$

$$\underset{\textit{iso}\text{amyl alcohol}}{CH_3{\cdot}CH(CH_3){\cdot}CH_2{\cdot}CH_2OH} \rightarrow \underset{\text{isoprene}}{CH_2:C(CH_3){\cdot}CH:CH_2}$$

and it should therefore be possible to make butadiene from butyl alcohol by a process similar to that which I have described as leading from *iso*amyl alcohol to isoprene. In possession of several kilos. of butyl alcohol, we have tested this supposition in the following manner, and with results which look most promising. The butyl alcohol was converted into butyl chloride, $CH_3.CH_2.CH_2.CH_2Cl$, by the action of hydrochloric acid in the usual manner, and this was chlorinated in the Pim apparatus under the conditions I have already described in detail in the case of isoamyl chloride. When the product was distilled, it was found to consist almost entirely of dichloro-derivatives of butane, and on carefully fractionating with a Young column, these were separated into 1 : 2, $CH_3.CH_2.CHCl.CH_2Cl$. (b. pt. about 125°), 1 : 3, $CH_3.CHCl.CH_2.CH_2Cl$ (b. pt. about 137°), and a higher boiling dichloride which is obviously the 1 : 4 isomeride, $CH_2.Cl.CH_2.CH_2.CH_2Cl$.

When these dichlorides were passed over heated soda lime, they all gave butadiene, $CH_2:CH.CH:CH_2$, which is somewhat remarkable, and although the yield in each case has not yet been worked out, it is evidently considerable. In practice, therefore, as there is no object in separating the isomerides, the mixed crude dichlorides will be passed over the hot alkali, and there seems to be every reason to suppose that this process, when properly worked out, will prove to be a cheap source of butadiene and of butadiene rubber.

The formation of butadiene from 1·2-dichlorbutane, $CH_3.CH_2.CHCl.CH_2Cl$, necessitates the assumption that intramolecular change must have taken place at some stage during the elimination of hydrogen chloride, since normally only the 1·3- and 1·4-isomerides should yield butadiene.

In order to obtain the valuable 1·3-dichloride, another process has been devised which appears to work very smoothly, and is briefly as follows:—It is well known that aldehyde on treatment with very dilute potassium carbonate is converted into aldol, $CH_3.CH(OH).CH_2.CHO$, and that this, on reduction with neutral reducing agents, or, as we have lately discovered, by electrolytic reduction, yields 1·3-butyleneglycol, $CH_3.CH(OH).CH_2.CH_2.OH$. This glycol may then be converted into 1·3-dichlorobutane by the action of hydrochloric acid in the usual manner, and this yields, as has already been mentioned, on passage over hot soda lime, butadiene. Since the materials required in this process are easily accessible in any quantity and are cheap, it may ultimately be found that this is a cheap and convenient route to butadiene rubber.

We have thus worked out three routes to "synthetic" rubber which may, ultimately, quite well become manufacturing processes, and these are: *firstly*, the preparation of isoprene from *iso*amylalcohol and its subsequent polymerisation, a process which depends for its success on the discovery of some cheap method of obtaining *iso*amylalcohol in quantity; *secondly*, the conversion of butylalcohol, obtained cheaply and in any quantity by Prof. Fernbach's new method of fermentation, into butadiene; and *thirdly*, the conversion of aldehyde through aldol into butadiene, the butadiene being then, in each case, polymerised to butadiene rubber by Dr. Matthews' sodium polymerisation process.

In bringing forward what has, of necessity, been a very incomplete sketch of the production and polymerisation of isoprene and analogous substances, my object has been a twofold one.

In the first place, I wished to emphasise the fact, which on more than one occasion has been overlooked, that much of the pioneer work in connection with the discovery, production and with the polymerisation of isoprene was carried out in this country; and, secondly, that, while we recognise to the full the important work which our friends on the Continent have carried out, I wanted to make it clear that we in this country have also not been idle.

DISCUSSION.

The **CHAIRMAN** said this was a most interesting and valuable paper because it clearly indicated that they were at last within measurable distance of the actual synthetic commercial production of rubber. It was to them all a great satisfaction to know that Sir William Tilden was one of the first to produce really synthetic rubber; and it must be as great a satisfaction to them as it was to him to find that full justice had been done to the importance of that early observation of his which had at last come to fruition.

Sir **WILLIAM TILDEN** said that he felt rather like the old war horse neighing at the sound of the trumpet. He did not think he could add to the extremely interesting and lucid story which had been unfolded to them by Professor Perkin; but he tendered to him his grateful thanks for the more than justice he had done to the early work which he had undertaken. He also tendered his sincere congratulations to Dr. Matthews on the important discovery he had made with respect to the action of sodium on these hydrocarbons. About the year 1884 he made a very large number of experiments and he spent the spare time of about a couple of years working at this subject, when he thought he tried every reagent except the one which had proved successful. He therefore felt that the triumph on the present occasion largely belonged to Dr. Matthews; and he wished him and his associates complete success in their endeavours to make these extremely interesting reactions, not only scientifically successful, but a commercial source of wealth to this country and to the world.

Sir **WILLIAM RAMSAY** said that one always felt, under such circumstances, how easy it was to do a thing, if only one knew how; and he felt particularly in that position himself, because from 1874 to 1879 he was working at pyridine derivatives which had been left in the laboratory of the Glasgow University by Professor Anderson; they discovered dipyridine, and made some observations upon the polymerisation of pyridine with sodium; but it never occurred to him that the same thing could be applied to isoprene.

Dr. **E. F. EHRHARDT** said he could not help thinking—unless his memory played him false—that before 1887 Sir William Tilden had produced rubber from isoprene. The publications appeared to point to this polymerisation by allowing the isoprene to stand having been at a much later date; but he felt sure that he recollected seeing at that time a bottle of isoprene that had stood and had already made rubber. He could not from memory fix the date when the Badische anilin und Soda Fabrik commenced work on this subject, but it must have been rather more than three years ago. What they had achieved was to a great extent made known by their patents. He had not worked at it at all himself, and until the manufacture was ready it was advisable in many ways that there should be no publication except in the patents.

Mr. **W. F. REID** said his own experiments had been chiefly from the commercial point of view and had led to what was practically a technical success, but yet a commercial failure. The conclusion at which he arrived with regard to the manufacture of caoutchouc from isoprene under any conditions with which he was acquainted at the present time was that it would not be a commercial success. He was inclined to place the price at which natural rubber might ultimately be obtained at a much lower figure than that mentioned by Professor Perkin. He thought that 1s. per lb. was about the lowest which any of the companies now producing rubber as an agricultural product could work at, and that did not give very much margin for complicated chemical processes in the factory. He had worked chiefly on turpentine, and although the sources of American turpentine were limited and the price was continually rising, there were enormous possibilities with regard to the production of turpentine in Europe and particularly in Russia. Russian turpentine, as now made, certainly bore a lower value in the market than American turpentine, because of the crude method of its production, not because of the sources from which it was derived. A process had recently been worked out by which Russian turpentine could be produced containing a much larger percentage of pinene, and in smell and other properties practically identical with American turpentine. The interesting part of it was that the production of isoprene and butadiene could be carried out just as well from Russian turpentine as from the dearer American product. He thought that whatever was the price of turpentine it would still be too dear a material from which to make caoutchouc. Again, acetone was a most interesting material, and to one who had used many hundreds of tons for explosive purposes it was very interesting to hear of its production by a method that would permit of its use on a very much larger scale; its consumption would be almost unlimited if it were procurable at a cheaper rate, and this would keep the price at too high an average for use as a raw material for rubber. With regard to light petroleum as a material for making isoprene or rubber, some interesting work had lately been carried out in which he had played a part; he had seen very heavy petroleum fuel oil which had a market value of 2¼d. a gallon wholesale converted with a yield of 75 per cent. into very light oils which could be used for motor purposes: some of these products were very different from the products obtained simply by distilling natural petroleum: some of them had properties which no doubt would make them very valuable indeed in connection with that particular industry, and they had special properties for other purposes, such as solvents of rubber. In his researches the great difficulty he met with was that the apparatus used for catalysis and such processes as passing vapour over soda-lime, had not yet been worked out on a commercial scale. He devoted his attention particularly to that, and he found one which, with regard to catalysis at any rate, could be used continuously and the material regularly replaced. A laboratory process was very nice in which a quantity of vapour was passed through a tube with a catalytic substance and might give good results for a time; but how long would the catalytic substance remain of the same nature as at the beginning? The yield fell off very rapidly, and the process was not yet simple enough for factory work.

Dr. **Messel** delighted in the fact that Sir William Tilden had been the first to show the polymerisation of isoprene to indiarubber. The discovery was made in this country and he trusted the industry of synthetic rubber would likewise be identified with it. He (the speaker) had recently seen some tyres on a heavy motor car in Germany produced there from synthetic rubber which under precisely similar conditions had worn much less than those made of the best Parà rubber.

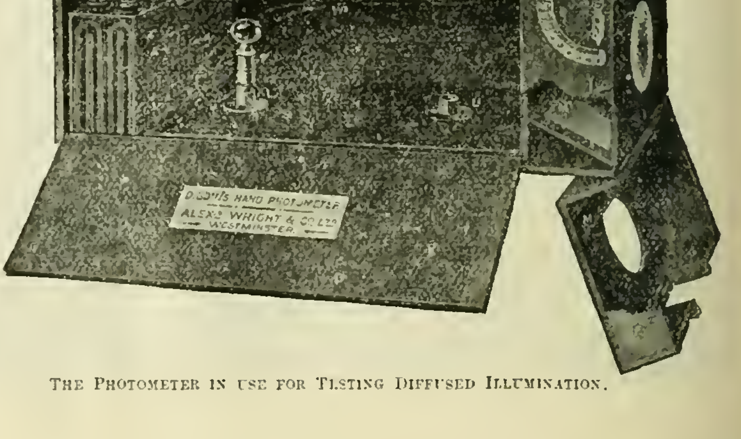
Dr. P. **Schidrowitz** said that what the author had told them would dispel much of that suspicion which had surrounded the whole question of synthetic rubber from the start. In the minds of a vast majority of practical rubber men it was still believed that synthetic rubber was purely the hand-work of charlatans and such like. Professor Perkin had shown the possibility of preparing ordinary rubber synthetically, but it still depended upon the production at a low price of isoamyl alcohol, the conversion of that cheaply into isoprene, and the conversion of isoprene in a very large proportion into rubber. Until all that was accomplished, as it possibly might be they might set it aside for the moment and devote their attention to the other rubber from butadiene, and super-rubbers if he might call them so, which might side by side with natural rubber, wild or plantation, play, in view of their specific properties, an important role in the rubber industry. They undoubtedly possessed physical and chemical properties very different from normal rubbers. He was struck by one remark in the paper in connection with the transforming of isoprene by the sodium method. He understood Dr. Harries' view was that the sodium rubbers were different from the normal rubbers; and he should be very glad if Professor Perkin could elucidate that point. If they considered in the future the production of ordinary normal rubbers, setting aside the proposed fermentation method of preparing isoamyl alcohol, there were but few substances which could be used, and the author had, in his view, exhausted them all. Suggestions had been made, particularly on the Continent, as to using alcohol as a basis; and he had made a rough calculation that if they did that and assuming they got a final yield of 40 per cent. of isoprene and wished to produce 80,000 tons of rubber a year in that way, it would need something like from 100,000,000 to 120,000,000 gallons of proof spirit—which was double the production of the United Kingdom, and about the same as that of Russia or the United States, say 20 per cent. of the world's supply. What the effect of that on prices would be he did not know; but if they took alcohol at its present price of about 2s. a gallon or 3d. a pound, and assuming a final yield of 40 per cent., they would have the price of the main raw material to start with at something like 7½d. per pound. It was curious how various industries re-acted on one another. The price of alcohol had not been coming down; on the contrary, like acetone, it had been going up; and one of the reasons was the throwing out of cultivation of sago and tapioca land for the cultivation of rubber. Other reasons were that sugar molasses were year by year becoming poorer in sugar, and that the present production of rice in Java no longer sufficed even for the needs of the population, and they actually had to draw upon Burma for supplies. The result had been that the price of starch and alcohol had been rising.

Professor W. H. **Perkin**, in reply, said a question had been asked as to whether he meant to say that synthetic rubber was absolutely the same as natural rubber; he did not mean to go so far as that, because there was as yet no sufficient evidence of the chemical composition of synthetic rubber. What he said was that synthetic rubber is comparable with ordinary rubber, that is to say it is in all respects at least as good for ordinary purposes as natural rubber—it vulcanised and answered all the other tests to which rubber must be put by the manufacturer. He might have called attention to the several samples on the table of the rubber in different stages of polymerisation and of vulcanised synthetic rubber. One sample, which had been standing some time was almost in proper condition; the others were not in quite so good a condition as they would be later on. With regard to the alcohol process, he supposed that if a great demand for alcohol to make aldehyde should arise, more acreage would be put under cereals than at the present time. Now a days less horses were employed; and therefore perhaps less grass might be required than formerly and some of the land that produced grass might be put under cereals in order to produce alcohol. There should thus not be any great difficulty in obtaining sufficient raw starch to convert into alcohol.

A NEW HAND PHOTOMETER.

BY W. J. DIBDIN, F.I.C., F.C.S., ETC.

In 1884 I described to this Society the Radial Photometer (this J., 1884, 277) which was designed for testing the light emitted by any radiant in all directions instead of horizontally only. That instrument was intended for use in the Laboratory, the useful intensity of the light for street lighting, etc., being calculated from the data thus obtained. The developments which have taken place in public illumination since then call for more direct methods which can be used when the illuminants are permanently fixed in position. Various more or less admirable instruments have been devised, but the author ventures to submit his new form of a "hand" or portable photometer which enables all the work done by the radial photometer and its many modifications to be carried out with that facility and accuracy which is so essential in the present-day practice of the photometrist.



THE PHOTOMETER IN USE FOR TESTING DIFFUSED ILLUMINATION.

The instrument now submitted weighs only a little over 6 lb. and measures only 17 in. by 5 in. by 5 in., and can be used either in the hand, or supported in any way desired. It is designed to embrace three important conditions, viz.: (1) Maximum open scale readings; (2) convenience and accuracy in comparing lights of different colours; and (3) reliability by reason of the facility with which its indications can be checked. The open scale readings are obtained by the employment of an electric incandescent lamp, the current to which from the storage cell is regulated by means of a specially wound rheostat which gives an unusually lengthy movement of the contact point, the position of which is read off a scale graduated in terms of "foot candles" and consequently more delicate graduations of lighting power can be measured than by direct readings of the voltmeter with which the instrument is nevertheless fitted as a means of checking the working of the storage cell supplying the current. The facility for comparing lights of different colours is secured by the use of the author's improved form of Leeson's star disc with which the radial photometer was fitted.

The following comparative results were obtained in the course of a series of simultaneous readings by two observers, one using a well-known high-class Standard instrument and the other the "Hand" photometer.

	"Standard."			"Hand."	
	0·20	ft. candles.		0·20	ft. candles.
	0·26	,,		0·25	,,
	0·30	,,		0·26	,,
	0·17	,,		0·15	,,
	0·23	,,		0·20	,,
	0·21	,,		0·20	,,
	0·23	,,		0·22	,,
	0·38	,,		0·38	,,
	0·17	,,		0·18	,,
	0·61	,,		0·60	,,
	0·30	,,		0·30	,,
	0·67	,,		0·65	,,
Average	0·31	,,	Average	0·30	,,

To ascertain the "illuminating power" of any radiant the square of the distance, measured in feet, from the photometer disc, is multiplied by the "foot-candle" power observed. As the instrument now shown will indicate up to 12 foot candles a light at 25 feet distance giving that degree of illumination on the photometer disc would have an intensity of 7500 candles, whilst if the "foot-candle" power at that distance was only 0·001 candle, the lowest for which the instrument is calibrated, thei nitial intensity would only be 0·625. Thus the range of the photometer is wide enough for all ordinary purposes, but it is obvious that by modifying the power of the battery and lamp, or by using a reflector still greater variations could be obtained without altering the essential features of the method.

Discussion.

The Chairman said this was a very useful instrument and the fact that it was capable of such close approximation that its results were practically as exact as those of a standard instrument made it very valuable.

Mr. J. H. Coste said the author's Radial Photometer described in 1884 marked a great epoch in photometry; it had been used in various forms for the useful comparison of lights. If one wanted to read a book on a table it was not of much advantage to know the horizontal component of a light above the table, because none of it would fall on the printed surface. It was very useful, therefore, to have an arrangement that could be sighted at the source of light at any desired angle and which would measure the intensity of the light emitted at this angle. The modification of Leeson's star disc afforded a very much better comparison than the ordinary Bunsen grease spot disc for lights of varying colours. In fact, when examining incandescence mantles he had found that each new man when he started work looked at the two lights—the standard pentane flame and the mantle light, and said that any exact comparison was impossible; but all obtained accurate results almost immediately. A friend who was a physchologist told him that on purely theoretical grounds he should expect the star disc to give a better integration of all the comparisons formed by the various parts of the retina than the Bunsen disc or the direct comparison paper used in Harcourt's table photometer. It was therefore gratifying to see the many great advantages of this instrument. A direct comparsion could be made of the normal rays falling on the disc, instead of a comparison based on the so-called sine law which was not of very general application. For the comparison of lights in rooms and streets, this little apparatus would be most useful, and it could be used without attracting an enormous crowd around the worker, which was a matter of great practical convenience.

Mr. Jacques Abady, as a rival worker in the same field, confirmed what had been said about the accurate results which, with care, could be obtained by this instrument. Mr. Coste had touched upon an important point which should not be absent from any instrument however simple it might be, and that was the facility which one had for standardising any part of it; it was based on such a fundamental principle that the electric lamp could always be checked by comparison with a standard one-candle at one foot from the disc. One could cut out the resistance at a different point until there was a light equal to one candle one foot from the disc; and by that means one could always check the accuracy of the photometer. One had only to establish once for all the curve for the relationship of candle power to drop in the voltage; and, from his experience of a large number of experiments he had made, he was prepared to say that the curve would remain constant, though the cutting out point would move down as the normal efficiency of the lamp varied. Thus that instrument was excessively simple and at the same time capable of being checked and used in an accurate manner at any time. Of course it was not strictly correct to call it a photometer; the eye was the photometer, but it was not really capable of comparing one light with another without calling in some external aid, such as Mr. Dibdin had devised.

Journal and Patent Literature.

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I.—GENERAL PLANT; MACHINERY.

Standard specifications for refractory materials. See VIII.

Patents.

Extracts; Process for obtaining —— by volatile solvents. O. Brücke. Fr. Pat. 438,919, Jan. 12, 1912.

The process consists in recovering the most soluble extract separately from the first portions of solvent removed from the extracting apparatus, so that it is not subjected to the harmful effect of the prolonged heating which would otherwise be necessary for the purpose of separating it from an extract containing the whole of the soluble matter.—H. H

Furnace. N. Lecesne. Fr. Pat. 438,239, Dec. 26, 1911.

The furnace comprises two cylindrical chambers or retorts, placed one above the other. A mixture of combustible gas and air is burned in the lower retort, and the hot gases of combustion leaving this, pass through the upper retort in the reverse direction, and are then utilised for preheating the air supply. The material to be heated is fed in at the top of the furnace, and passes downwards in succession through annular spaces between the outer walls of the retorts and the surrounding masonry, into a cooling chamber below, from which it is discharged by a screw conveyor. In consequence of the annular shape of the heating chambers, not only the radiant heat from the walls of the retorts, but also heat reflected from the surrounding masonry is utilised.

Extracts of plants and the like : Apparatus for making ——. J. G. B and J. Moorhouse, Lothersdale, Yorks. Eng. Pat. 29,214 of 1910; date of appl., May 30, 1911.

In order to facilitate the thorough cleaning of stills or other apparatus in which extracts of plants are made, the lid is made of a large size and readily detachable. It is provided with a blow-off valve and is secured in position by a bar and screw, the ends of the bar engaging with links fitted on lugs formed on the outside of the neck of the vessel.—W. H. C.

Furnaces, kilns, etc. ; Method of and apparatus for recovering heat in ——. C. von Forell, Berlin. Eng. Pat. 4161, Feb. 18, 1911.

In rotary kilns using gaseous fuel, the air for combustion is heated to the flashing point of the fuel before entering the furnace by passing it through the passage by which the treated material is discharged from the kiln. (Reference is directed to Eng. Pat. 4821 of 1903; this J., 1903, 951.)—H. H.

Furnace construction. J. B. Ladd and D. Baker, Philadelphia, Pa. U.S. Pat. 1,027,738, May 28, 1912

The furnace is supported within the enclosing shell-wall by a series of superposed rings, consisting of upright water-cooled plates having flanges, by which they are supported from the shell wall.—W. H. C.

Regenerative gas furnace : Continuous or intermittent —— *with two burners capable of being worked with an oxidising, reducing or neutral atmosphere.* P. A. J. Cousin. Fr. Pat. 438,873, Jan. 9, 1912.

The furnace is provided with two oxidising burners capable of easy regulation and placed on either side of the working chamber and also with a reducing burner. The latter is provided with a combustion chamber situated at a point below that at which the flame enters the working chamber.—W. H. C.

Rotary hearths and kilns. A. Smallwood. Fr. Pat. 439,030, Jan. 16, 1912.

A rotary hearth or kiln consists of a metal cylinder having a refractory lining provided with a considerable number of deep longitudinal grooves opening into the interior of the hearth. The grooves are enlarged at one end of the hearth adjacent to a number of stationary injectors, by means of which liquid or gaseous combustible, or air or steam, etc., may be injected into the grooves. The refractory bricks, which constitute the lining and between which the grooves are formed, may be made hollow and contain metallic surfaces adapted to facilitate radiation to the walls of the boiler or heater surrounding the hearth.—H. H.

Raising or forcing liquids ; Methods of and apparatus for ——. H. A. Humphrey, London. Eng. Pat. 11,527, May 12, 1911.

In internal combustion pumps of the type in which a column of liquid propelled outwardly from a combustion chamber by the expansion of an ignited combustible mixture returns inwardly towards the combustion chamber to compress the fresh charge (compare this J., 1908, 436, 1101; 1910, 75; 1911, 119, 524, 940, 1099, 1148; 1912, 216), a solid piston is interposed between the liquid and the combustible gases for the purpose of controlling the gas admission and exhaust valves. In most forms of the apparatus the piston rests on, and moves with, the water surface in the combustion chamber, and may control the valves: (1), by direct contact, when the valves project horizontally through the sides of the chamber; (2), by a cam carried on a rod passing through the head of the chamber, which is operated when the piston reaches the end of its stroke in either direction; (3), by tappets; (4), by fluid-transmission devices controlled by a small piston carried by the main piston. The downward stroke of the piston may be checked by buffer devices, and in one form of the apparatus scavenging air or combustible mixture is drawn in beneath the piston after it has been thus checked and is subsequently forced by the returning liquid through a suitable passage into the space above the piston.—H. H.

Raising or forcing liquids and compressing elastic fluids ; Methods of and apparatus for ——. H. A. Humphrey London. Eng. Pat. 11,817, May 16, 1911 (compare preceding abstract).

A method of raising or forcing liquids or elastic fluid by the energy of expansion of an ignited combustible mixture compressed before ignition, in which a column of liquid is propelled outwardly from a combustion chamber and returns inwardly under the influence of energy stored on the outward movement, so as first to compress an elastic cushion or cushions or other spring buffer and then to deliver liquid or fluid. The return movement may be brought about by the head of liquid in a vertical portion of the end of the "play pipe," or by the expansion of an air cushion compressed at the end of the pipe, or it may be effected by an explosion in a duplicate explosion chamber at the end of said pipe. In some cases liquid may be delivered on both the outward and inward strokes of the water column, and fresh liquid may be drawn in at either end of the play pipe. When applied to compressing air, the air may be compressed in two stages, low-pressure air being forced into a reservoir from a compressing chamber at the end of the play pipe on the outward stroke, and the air so compressed being admitted to scavenge the burnt products from the combustion chamber and to be highly compressed and delivered on the return stroke. The portion of air remaining in the combustion chamber is utilised as one of the constituents of the combustible mixture for producing the next explosion. The volume of the elastic cushion compressed in the explosion chamber is determined by the position of the exhaust valves and may be regulated by means of a vertical open-ended tube surrounding the admission valve and fitted with a regulable valve which determines the quantity of air or combustible mixture remaining therein at the moment when the exhaust valves close. The liquid-delivery valves are normally locked shut during the explosion stroke and are released by suitable valve gear to enable delivery to take place during the return stroke. The apparatus is adapted to work either on a two- or four-stroke cycle.—H. H.

Raising and forcing liquids ; Methods of and apparatus for ——. H. A. Humphrey. Fr. Pat. 438,594, Oct. 27, 1911. Under Int. Conv., Sept. 30, 1911 (compare preceding abstracts).

In internal combustion pumps of the type in which a column of liquid is forced outwards from a combustion chamber by the expansion of an ignited combustible mixture and returns inwards towards the combustion chamber to compress the fresh charge, (1) the walls of that portion of the combustion chamber in which the charge is compressed are arranged without valve or other openings so that there is no possibility of leakage and consequent damage due to impact of the returning liquid during the compression stroke, or, in the case of a four-stroke cycle pump, during the cushion stroke; (2) the admission and exhaust valves are arranged horizontally in the walls of the combustion chamber; valves so arranged operate in a similar manner to the vertically arranged valves hitherto used, and their position in the combustion chamber may be made adjustable; (3) a vertical partition may be arranged across the combustion chamber, dipping below the lowest level attained by the water column and passing nearly to the top of the chamber, and the admission and exhaust valves arranged on opposite sides thereof in such a manner that the return of the water column causes the fresh charge to sweep all the burnt products from the top of the combustion chamber, the level of the exhaust valve being so arranged that it is closed by the returning water at the moment when the whole of the burnt products have been expelled; (4) pistons or floats may work on the surface of the water column and air buffers or the like may be adapted to check the movement of such pistons or floats during the outward stroke to cause the advancing water column to suck up fresh liquid from a lower level; (5) the exhaust valves may be opened by a fluid-pressure device controlled by the movement of a float; (6) two or more combustion chambers connected at the top may be employed.—H. H.

Pump for corrosive fluids. U. Wedge, Ardmore, Pa. U.S. Pat. 1,027,917, May 28, 1912.

The shaft which operates the pump passes through a vertical casing attached to the pump casing and which projects vertically upwards. The stuffing-box is at the upper end of the vertical shaft casing, the lower part of which contains a column of the corrosive fluid being pumped. A column of non-corrosive liquid or lubricant maintained between the upper end of the column of corrosive liquid and the stuffing-box.—W. H. C.

Mixtures, emulsions, and dispersions of substances; Processes and apparatus for producing ——. F. Arledter, Hamburg. Eng. Pat. 12,037, May 18, 1911.

A process for making stable mixtures or emulsions with water or other solvents of colloids, dyes, pulverulent muds, partly or wholly saponified waxes, fats or oils, starches, or other chemicals used in the textile, paper, and chemical industries for sizing, dyeing, weighting, precipitating, and like purposes consists in heating water or other solvent by means of a jet of steam, passing the liquid through a heat-regulating device, drawing in the organic or other matters by injector action, adding further chemicals if desired, and introducing the hot mixture through an atomising nozzle into the storage tank for the emulsion. The process may be used for the purpose of intensifying chemical reactions.—H. H.

Evaporating and bye-product recovery plant and appliances connected therewith. B. Ely, Pye Bridge, and R. Masters, Dudley. Eng. Pat. 12,857, May 29, 1911.

The claim is for the combination of a gas producer with a regenerative furnace for heating an evaporator for waste liquids such as effluent from ammonium sulphate manufacture. The waste heat flues are vertical and are alternated with the secondary air flues which are arranged horizontally one above the other, so that the secondary air takes a tortuous path. Part of the vapour given off from the evaporator is passed, along with the secondary air, through the regenerators.—W. H. C.

Evaporator. O. Faller, Munich, Germany, Assignor to G. Stroh, Detroit, Mich. U.S. Pat. 1,028,086, May 28, 1912.

The evaporator consists of an upper vapour chamber connected with a lower liquid chamber by a tubular heating-chamber having a central return conduit. A deflecting plate in the upper chamber directs the liquid issuing from the upper ends of the tubes of the heater towards the return conduit, and an oscillating perforated pipe directs a spray of water upon the upper ends of the tubes. The apparatus is intended for liquids containing solid substances.—W. H. C.

Evaporation; Process of —— and apparatus therefor. P. Kestner, Lille, France, Assignor to Kestner Evaporator Co., Philadelphia, Pa. U.S. Pat. 1,028,737, June 4, 1912.

A definite proportion of the concentrated liquid is returned from the upper ends of the tubes of a vertical film evaporator to the feed chamber at the bottom of the tubes, and mixed with fresh portions of the liquid to be evaporated. W. H. C.

Evaporating apparatus. P. Kestner, Lille, France, Assignor to Kestner Evaporator Co., Philadelphia, Pa. U.S. Pat. 1,028,738, June 4, 1912.

The upper and lower liquid reservoirs of a tubular film evaporator are provided with partitions dividing each of them into a number of chambers connected in pairs by groups of tubes. The liquid from the first of the upper chambers is returned to the lower chamber of the next group and so on. Fresh liquid is fed into the first lower chamber and the concentrated liquid is discharged from the last upper chamber. The groups of tubes are all enclosed in a common casing, into which the heating medium is passed.—W. H. C.

Evaporating apparatus. J. A. Power, Babylon, N.Y. U.S. Pat. 1,028,777, June 4, 1912.

The apparatus consists of a cylindrical shell provided with a door and a suitable liquid inlet and a vapour outlet. The heating apparatus consists of a number of vertical coils attached above and below by conical joints to an upper and lower "manifold," each of which is connected by a conical joint with steam pipes which pass through the shell, one forming the inlet and the other the outlet. —W. H. C.

Liquids or gas under pressure; Receptacles for ——. L. E. Voorheis, Cincinatti, Ohio, U.S.A. Eng. Pat 13,868, June 10, 1911.

The cylindrical steel receptacles are formed of steel tube, the ends being closed by rotating the tube at a high speed and pressing a tool against the end to be closed. In this way sufficient heat is generated by friction to soften, close, and weld up the end.—W. H. C.

Pipes and the like [for sea-water, etc.]; Lining of ——. Continental Caoutchouc- und Gutta-Percha Co., Hanover, Germany. Eng. Pat. 16,111, July 12, 1911. Under Int. Conv., Oct. 15, 1910.

A mixture of india-rubber, gutta-percha, bitumen and resin is dissolved in a volatile solvent and the interior of the pipe or other vessel is coated with the solution and allowed to dry.—W. H. C.

Separating dust from air or gases; Appliances for ——. E. Samuelson, Banbury, and J. Backhouse, Bootle. Eng. Pat. 16,392, July 17, 1911.

The claim is for the provision within a fixed or rotating cylindrical dust filter, formed of fibrous material, through which the air passes from within outwards and leaves the dust on the inner surface, of one or more hollow nozzles connected by radial hollow arms projecting from a hollow shaft with a vacuum pump, for the purpose of removing the deposited dust.—W. H. C.

Heating liquids; Apparatus for ——. C. Poulsen, Copenhagen. Eng. Pat. 18,050, Aug. 9, 1911. Under Int. Conv., Aug 9, 1910.

A heating apparatus for liquids, *e.g.*, a pasteurising apparatus for milk, consists of a vertical deeply corrugated vessel built up of detachable sections and contained in a steam heating chamber. A rotary stirrer having blades fitting the corrugations works inside the vessel. The corrugations may either be flat or inclined upwards towards the centre.—H. H.

Drying apparatus. F. Lafeuille, Charmes, France. U.S. Pat. 1,026,683, May 21, 1912.

The apparatus comprises a rotary drying carrier with means for delivering materials to be dried on to the upper part of the carrier while a heating medium is supplied through a conduit situated beneath. Baffles are freely suspended within the carrier to prevent the flow of heating medium along the lower part thereof, whilst hinged shutters are arranged above the baffles to vary the cross-sectional area of the upper part of the carrier.—H. H.

Dryer. T. M. Wilson, Philadelphia, Pa. U.S. Pat. 1,027,513, May 28, 1912.

The drying chamber has a perforated floor through which air can pass from an air chamber or flue separating the chamber floor from the furnace and smoke flue below. Metal radiators are attached to the top of the furnace and smoke flue and project into the air flue to convey the heat from the furnace to the air, which passes into the drying chamber through the perforations.—W. H. C.

Desiccating apparatus for granular and pulverulent materials. Leflaive et Cie. Fr. Pat. 438,128, March 6, 1911.

A number of vertical perforated cylinders are mounted around a central axis which they are rapidly rotated, each cylinder receiving also a slow rotary motion around its own axis. The material to be treated is fed into the upper ends of the cylinders and after being desiccated by the centrifugal force is discharged from the lower ends.—W. H. C.

Rotary dryer; Direct fired ——. Soc. d'Études Speciales et d'Installations Industrielles. Fr. Pat. 438,230, Dec. 26, 1911.

The material to be dried is fed into one end of a horizontal cylinder which is mounted on rollers and rotated by suitable mechanism. The cylinder is provided with longitudinal metal plates attached by brackets to the shell. The plates are bent so as to form gutters or pockets, which pick up the material, and, as the cylinder rotates, shower it downwards. A number of centrally disposed plates or baffles break the fall of the particles and prolong the period during which they are exposed to the current of hot gas, which passes from a furnace situated at the feed end of the drum to a fan placed in the discharge chamber. —W. H. C.

Drying chamber. H. Brunner. Fr. Pat. 438,584, Dec. 30, 1911. Under Int. Conv., Jan 2, 1911.

The drying chamber consists of one or more long narrow rectangular heating chambers, arranged side by side, with openings below and above for the admission and exhaustion of hot air. The air is conducted from a single conduit through separate channels to different groups of air-admission ports, so that it is evenly distributed through the chamber. The air admission and exhaust conduits are arranged in duplicate, so that the air can be made to flow in either direction through the heating chambers, suitable interconnected valves being fitted to reverse the direction of flow.—H. H.

Drying apparatus. W. Greding. Fr. Pat. 438,745, Jan. 8, 1912.

In a drying apparatus of the type in which the material to be dried is carried forward upon a heated surface through the drying chamber, the conveyor is built up of a number of flat hollow heating plates, hinged together to form an endless band, and each separately heated by means of a heating medium flowing through flexible tubes from a central transverse conduit rotating at the same angular speed as the band.—H. H.

Drying apparatus, particularly applicable for powdered materials. V. Motrieux. Fr. Pat. 439,107, Mar. 29, 1911.

Powdered material, such as farina, is carried through heated conduits by means of spiral screw conveyors which are provided with mixing arms or beaters for the purpose of more effectively drying the material. The conduits may be arranged in series one above the other, and may have double walls so that they can be heated by vapour and the temperature regulated.—H. H.

Absorbing gases in liquids; Apparatus for ——. H. L. Whiteley, Lowell, Mass. U.S. Pat. 1,027,022, May 21, 1912.

The apparatus comprises three superposed chambers, viz., a reservoir at the bottom, an absorption chamber in the middle, and a "fuming chamber" at the top. The absorption chamber is subdivided into an outer annular space, to which liquid is admitted, and a number of inner concentric annular spaces. Air is drawn downwards through an air inlet at the top of the "fuming chamber," and passes over a hearth forming the bottom of the "fuming chamber" and the top of the absorption chamber, through the absorption chamber, and then through outlets in the bottom of the absorption chamber into the lower reservoir.—H. H.

Washing, absorbing, dissolving or separating partially or totally gases, vapours or hydrocarbons forming part of gaseous mixtures; Process and apparatus for —— at constant pressure. G. A. M. Arnaud. Fr. Pats. 438,195 and 438,196, Dec. 23, 1911.

The gaseous mixture and the absorbing liquid are forced in regulated quantities by separate pumps through an injector where the liquid is atomised and thoroughly mixed with the gases. The mixture is then forced through a conical main, to increase the pressure, into a reservoir formed of three cylindrical vessels grouped in a similar manner to an "elephant boiler." Here the mixture, still under pressure, separates into an upper gaseous and lower liquid layer. The gas escapes from the upper part of this vessel through an expansion valve and is passed through a coil in a chamber through which the exhaust steam from the engine is discharged. This is done in order to bring the gas, which has been cooled by the expansion, back to the normal temperature. The liquid, which is now charged with the dissolved portion of the original gaseous mixture, is discharged from the lower part of the separator vessel through an expansion valve and a jet, from which it impinges against a plate to facilitate the separation of the dissolved gas which takes place owing to the reduction of pressure.—W. H. C.

Refrigerating agent; New ——. W. Lachmann and Heylandt Ges. m. b. H. Fr. Pat. 438,727, Jan. 6, 1912.

Methyl fluoride either alone or mixed with other gases, for example methyl chloride, is used as a refrigerating agent.—W. H. C.

Separating solid [fibrous] matter in suspension from a liquid which is under pressure in a closed vessel; Method and apparatus for ——. A. Müntzing, Stockholm. Eng. Pat. 13,512, June 6, 1911. Under Int. Conv., June 9, 1910.

See Fr. Pat. 430,589 of 1911; this J., 1911, 1308.—T. F. B.

Separating substances in suspension by washing; Method of ——. B. Schwerin, Frankfort on Maine, Germany. U.S. Pat. 1,029,579, June 11, 1912.

See Ger. Pat. 241,177 of 1911; this J., 1912, 112.—T. F. B.

Cooling air, liquids, vapours, gases, and the like; Method of and apparatus for ——. W. Genseeke, Charlottenburg, Germany. Eng. Pat. 23,912, Oct. 28, 1911. Under Int. Conv., Oct. 29, 1910.

See Fr. Pat. 436,244 of 1911; this J., 1912, 479.—T. F. B.

Measuring gaseous fluids; Recording apparatus for ——. C. F. Simon, Stolberg, Germany. U.S. Pat. 1,028,145, June 4, 1912.

See Eng. Pat. 14,218 of 1911; this J., 1912, 111.—T. F. B.

Vegetable extracts; Apparatus for producing ——. A. Rosenberger, Assignor to A. Horowitz, Berlin. U.S. Pat. 1,028,282, June 4, 1912.

See Ger. Pat. 243,210 of 1911; this J., 1912, 374.—T. F. B.

Evaporating apparatus. T. F. Sanborn, Ensenada, Porto Rico, Assignor to Sanborn Evaporator Co., Delaware. U.S. Pat. 1,028,792, June 4, 1912.

See Fr. Pat. 433,573 of 1911; this J., 1912, 218.—T. F. B.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal dust; Experiments with —— in the Rossitz experimental gallery. Czapliński and Jičinský. Oesterr. Zeits. Berg- u. Huttenw., 1912, **60**, 171—177, 253—260, 298—304. (See also this J., 1909, 1224, and 1910, 1083.)

The galleries were changed about; the entry-shaft was converted into a ventilating shaft, a second explosion chamber was constructed, 48 metres from the first one at the end of the gallery, and the blind branch was driven further, and was connected by a new drift with the main gallery, so as to make an alternative or "shunt" path. In the shunt was built a pair of doors, one door opening away from, the other towards the explosion chamber; and a corresponding pair were built near either end of the portion of the main gallery between the two junctions with the shunt. Three of these were wooden doors armoured on one side with sheet iron, the fourth was an iron door. A set of experiments was conducted with "Hermanite," a patented preparation said to preserve a constant wet surface. The walls, roof and floor of a zone 60 metres long were dressed with "Hermanite," and coal-dust exploded as in the earlier experiments. The "Hermanite" proved quite ineffective in hindering the passage of the flame; and it was found that dust settling upon it was not effectively damped, but hung in a dry outer layer upon the thin layer immediately in contact with the "Hermanite," whence it was as easily disturbed as from the uncoated walls of the gallery. Much better results were yielded by what the authors call "concentrated zones." Open-framed gates were built into the gallery, opening towards the explosion-chamber, and on the bars of these gates were suspended fragile or not very stable vessels of water, holding about 47, 70, or 93 litres per square metre of cross-section of the explosion chamber. These gates were normally open, but not quite to 90°, *i.e.*, not quite back against the wall. The compression set up by an explosion and preceding the flame slammed these gates against the gate-posts, shattered or overturned the water-vessels, and a very thorough local wetting resulted just as the flame arrived, which was found to arrest the flame in practically every case. In an explosion, the doors opening towards the explosion-chamber, if shut, were usually uninjured; but if open, were hurled against their frames with such force that the wooden doors were broken or wrenched from their hinges,—the iron door was not injured. The doors opening the other way, when shut, were flung open but not injured. The pressure, in a dynamite explosion, reached at most 1·8 atm. in the main gallery [293·7 metres long]; in a coal-dust explosion, 1·4 atm. This lasted less than 2·2 seconds, and the flame travelled in the time 246 metres, thus having a velocity of more than 112 metres per second.—J. T. D.

Coal and coke; Methods of analysing ——. F. M. Stanton and A. C. Fieldner. U.S. Dept. of Interior, Bureau of Mines, 1912. Technical Paper 8.

A detailed account is given of the procedure followed at the laboratory of the U.S. Bureau of Mines, the methods in use being those recommended by the Committee of the American Chemical Society (this J., 1898, 608, and 1900, 174) with certain modifications and additions.

Preliminary treatment.—The coal sample, received in a moisture-tight, galvanised-iron can of about 3 lb. capacity, is first "air-dried" in a special oven at a temperature of 30°—35° C. to reduce the moisture to such condition that rapid change in weight will not occur during subsequent handling. The "air-drying loss" being noted, the sample is crushed to 10-mesh size and quartered down to about 100 grms., this portion being then ground (in the air-tight receptacle of an Abbe ball-mill) to pass a 60-mesh sieve. About 60 grms. of this product are placed in a rubber-stoppered bottle for use in the analysis.

Moisture.—The toluene bath recommended by the Committee is replaced by a double-walled copper cylinder, closed at one end and having a double-walled door at the other, the space between the two walls being filled with aqueous glycerin (sp. gr. 1·19 at 15° C.) of such concentration that the boiling liquid maintains a temperature of 105° C. in the interior of the oven. A current of air, dried by passing through sulphuric acid and preheated by passing through a copper tube encircling the oven between the walls, is forced through the oven at a rate sufficient to change the interior atmosphere completely from 8 to 10 times during the hour allowed for the determination. The concentration of the glycerin is kept constant by means of a reflux condenser, and it is stated that the temperature of the oven can be maintained at 105° C. without difficulty.

Ash.—The portion used in the moisture determination is gently ignited in a muffle until the difference in weight between two successive ignitions (each of 30 min. duration) does not exceed 0·0005 grm.

Volatile matter.—In the case of lignites and coals high in moisture, the usual seven-minute application of the full 20-cm. flame is preceded by a preliminary heating for 4 to 6 minutes at a low temperature in order to avoid mechanical loss.

Sulphur.—The method employed is substantially the same as that recommended by the Committee, the contents of the crucible (at the conclusion of the ignition) being digested with hot water for at least 30 minutes before filtration.

Carbon and hydrogen.—These constituents are determined by the combustion—first in air and then in oxygen—of 0·2 grm. of the sample in the usual manner.

Nitrogen.—The Kjeldahl method is employed. 1 grm. of the sample being boiled with 30 c.c. of concentrated sulphuric acid and 0·6 grm. of mercury until the liquid is nearly colourless, the boiling being continued for at least 2 hours after the solution has become straw-coloured. Potassium permanganate is then added, in small quantities, until a permanent green colour is produced. After dilution to about 200 c.c. and the addition of 25 c.c. of potassium sulphide solution (40 grms. per litre) to precipitate the mercury, 1 grm. of granulated zinc to prevent bumping, and a small fragment of paraffin to prevent frothing, the determination is completed as usual.

Phosphorus.—6·52 grms. of the sample are burned to ash in a muffle, the residue being then fused with from 4 to 6 times its weight of sodium carbonate and 0·2 grm. of sodium nitrate. The fused mass is dissolved in water, acidified and evaporated to dryness, the residue being taken up with hydrochloric acid and the phosphorus precipitated from the solution as phospho-molybdate, which is either weighed as such or titrated with permanganate.

Calorific value.—The bomb calorimeters of Mahler, Atwater, Williams and Emerson are employed for this determination in the laboratory of the Bureau; the corrections applied include those for heat loss and for the formation of nitric and sulphuric acids during the combustion.

True specific gravity.—A weighed portion (about 3½ grms.) of the 60-mesh sample is dried at 105° C., placed in a 50 c.c. specific gravity bottle and gently boiled with about 30 c.c. of distilled water for 3 hours (under reduced pressure, upon a water-bath) to ensure the complete expulsion of air. A vertical bulb-tube is attached to the neck of the bottle to prevent loss during the boiling, at the conclusion of which operation the bottle is cooled and the determination conducted in the usual way.

Apparent specific gravity.—A modified form of Nicholson's hydrometer is employed for this determination. The apparatus—constructed of brass—is provided at the top with two pans (the upper one for weights and the lower for the sample) and below the air-buoy with a perforated brass cage for retaining the sample when immersed in water. About 500 grms. of the dry material in lump form (1½ to 2 in. cubes) are used for this purpose.—W. E. F. P.

[*Coal and coke*]. *Fuels; Net calorific power of* ——, *calculated from the results obtained by the bomb calorimeter and the proximate analysis.* R. Lucion. Bull. Soc. Chim. Belg., 1912, **26**, 255—262.

From the results of the ultimate and proximate analyses of 63 samples of coal (including lignites, bituminous coals and anthracites) from various countries, the percentages of volatile matter (as determined at 100° C.) and hydrogen in the respective "coal substances" (*i.e.*, the materials free from moisture and ash) were calculated. The percentages of "water of combustion"—obtained by multiplying the figures for hydrogen by 9—were then compared with the corresponding percentages of volatile matter, a series of coefficients (N) being obtained by dividing the former by the latter. The samples being grouped according to their character and origin, average values for each group were calculated, from a selection of which a curve was plotted, the ordinates (N) being 0·91, 0·99, 1·16, 1·24, 1·24, 1·35, 1·47, 2·04, 2·34, 2·66, and 3·71, and the corresponding abcissæ (percentages of volatile matter) 59·2, 49·5, 41·1, 38·5, 37·5, 35·0, 31·0, 19·75, 16·6, 13·8 and 6·65 respectively. For calculating the net calorific power (P′) of a coal the formula $P' = P - 6(M + NV)$ is employed, P being the gross calorific value as determined by the bomb, M and V the percentages of moisture and volatile matter, respectively, in the sample, and N the coefficient (ascertained by reference to the curve) corresponding to the percentage of volatile matter in the "coal substance" of the sample. The net calorific power so deduced is stated to be as accurate as the gross value obtained by means of the bomb, *i.e.*, within 20 calories per kilo. This method of calculation was also found to be applicable to cokes of which a series of 22 samples was examined by the author, the values of N corresponding to 1, 1·5, 2·2, 3, 4, 5 and 6 per cent. of volatile matter in the cokes free from moisture and ash being 5, 4, 3, 2·5, 2·1, 1·8 and 1·5 respectively.—W. E. F. P.

Carbon monoxide in illuminating gas. From Circular of Bureau of Standards. No. 32. April 1, 1912. [*See under* "Books Received," this J., 1912, 561.]

Existing legislation shows no tendency to limit the carbon monoxide content of gas, although it is the only constituent of illuminating gas which, in the amounts ordinarily found, is poisonous. Coal gas contains from 5 to 10 per cent. of carbon monoxide: water gas from 25 to 30 per cent. The limiting of the amount of carbon monoxide in the gas sold therefore, might limit the amount of water gas made. Such regulations as would prevent the operation of water gas plants now in existence would be very severe, but the extension of present plants should not be directed toward increasing the use of coal gas rather than of water gas. The use of water gas may possibly not be much more dangerous than coal gas. A large proportion of the cases of death or illness caused by gas poisoning are suicidal; and in the majority of these cases the character of the gas would have only a small influence upon the result. Another large number of deaths and cases of poisoning called "gas poisoning" are due, not to the gas itself, but to the carbon monoxide formed by combustion of the gas with insufficient supply of air, due to faulty appliances. These matters all have an important bearing upon the subject, and it is possible that the protection of the public from danger will be found to lie rather along lines of regulation of appliance, and the general education of gas-users as to proper precautions, than in the limitations of the carbon monoxide content of the gas itself.

Natural gas; Liquefied products from ——: *their properties and uses.* I. C. Allen and G. A. Burrell. U.S. Dept. of Interior, Bureau of Mines, 1912. Technical Paper 10.

By fractionation, either during or after liquefaction, four products are commercially obtained from crude natural gas, the product of the first stage of the compression being a heavy liquid (high-grade gasoline), that of the second a light gasoline used for blending with heavy naphthas, and those of the third a semi-liquid ("wild") product—which must be regarded as a liquefied gas and not as an oil—and a gaseous residue forming the "natural gas" of commerce. The present investigation is chiefly concerned with the product remaining after the condensation and withdrawal of the gasoline from crude natural gas, the work of the authors being mainly directed to the commercial utilisation of this fraction, the wastage of which has been and still is very considerable. As the result of compression tests made in an experimental plant, it was found that the natural gas of Follansbee, W. Va., was completely liquefied by pressures of 415, 430, 506 and 600 lb. per sq. in. at temperatures of 2°, 4°, 9·1° and 77·5° C., respectively. The yield of gas from 1 grm. of the liquid produced at 2° C. was 600·9 c.c., that from the same weight of the liquid produced at 77·5° C. being 478·1 c. c.; it was calculated that 1 gallon of the liquid would yield about 50 cub. ft. of gas at 0° C. and 760 mm. The composition, etc., of the crude natural gas employed and of the volatilised liquid products of compression obtained are shown in the following table, in which is also included, for purposes of comparison, the analysis of the natural gas used for heating and lighting at Pittsburgh (No. 1.) Analyses 2, 3 and 4 show the nature of the products obtained in the commercial plant at Follansbee. The remaining data relate to the two tests made by the authors in which the liquefied gas obtained was allowed to escape from the top of the cylinder, samples being taken at regular intervals during the whole time occupied in emptying the receptacle. The two series of analyses (Nos. 5 to 8 and 9 to 14) show the variable nature of the gas obtained by this method of release, the authors pointing out that for the gas to be of uniform composition, the liquid product should be allowed to escape from the bottom of the container.

Analysis No	Kind of gas.	Sp. gr. as determined by effusion method (air = 1).	Heating value. (B.T.U. per cub. ft. at 0° C. and 760 mm.)	Percentage composition.				
				Methane.	Ethane.	Propane.	Butane.	Nitrogen.
1	Natural gas (Pa. and W.Va.) ..	0·64	1189	83·0	16·4	—	—	0·6
2	Natural gas (Follansbee, W. Va.)	1·39	2468	—	21·8	77·7	—	0·5
3	Residual gas after 50 lb. compression product has been removed	1·35	2364	—	34·9	64·6	—	0·5
4	Residual gas after 250 lb. compression product has been removed	1·15	2008	—	79·4	20·0	—	0·6
5	Gas from liquefied gas (400 lb. pressure, 0° C.)	1·01	1808	3·8	95·0	—	—	1·2
6		—	2066	—	72·5	27·0	—	0·5
7		2·28	2214	—	52·1	46·9	—	1·0
8		—	2621	—	1·1	98·0	—	0·9
9	Gas from liquefied gas (400 lb. pressure, 0° C.)	1·02	1816	4·7	94·9	—	—	0·4
10		—	1925	—	89·3	9·9	—	0·8
11		—	2108	—	67·0	32·5	—	0·5
12		—	2161	—	59·4	39·8	—	0·8
13		—	2708	—	—	89·2	9·9	0·9
14		—	3221	—	—	24·0	75·0	1·0

With regard to the analyses quoted, it is stated that, although the total hydrocarbons are correct, only the predominating ones are indicated in each case, these being calculated from the data obtained by the usual method of explosion with air or oxygen. Except in the case of No. 1, the heating values given are the gross values calculated from the analyses. For purposes of comparison, tables are also given showing the properties of the paraffins ordinarily present in natural gas and of the various manufactured gases in commercial use for illumination and heating. The specific gravity of the so-called "wild" liquefied product obtained in the third and fourth stage compressor (*i.e.* after the elimination of the gasoline fractions) was found to be approximately 0·63 at its boiling point (− 40 C.) or (by calculation) approximately 0·57 to 0·58 at 15 C. It was found that, when heated in a closed vessel to a temperature of 55° C., the internal pressure developed by this liquid was only 755 lb. per sq. in.—a pressure much lower than that of many of the compressed gases of commerce. The authors are therefore of opinion that the storage and transport of this product present no commercial difficulties, since the appliances necessary for handling the material are already commercially available. As regards the use of this liquefied product for purposes of illumination, the authors consider that owing to its high heating value, the greatest efficiency will be obtained by using the gas with inverted burners provided with mantles. For heating purposes a burner of the Méker type (having a large air-supply) is required on account of the high carbon content of the gas. Tests are described in which the liquefied gas was satisfactorily employed in a 10 H.P. two-cycle gas engine and for driving a 30 H.P. automobile.—W. E. F. P.

Cholesterol; Alleged occurrence of —— in Java petroleum oils. W. Steinkopf, A. K. Koss and S. Liebmann. Chem.-Zeit., 1912, **36**, 653—654.

The lævo-rotation of fractions of certain Java oils, distilling between about 130° and 200° C. (at 13 to 15 mm. pressure), was attributed by Engler and Bartinitzky (this J., 1908, 932) to the presence of cholesterol. The authors' experiments on this point supplement those of Koss (this J., 1911, 1104), digitonine solution now being used as a test for the presence of cholesterol in the fractions, as suggested by Windaus (Ber., 1909, **42**, 238). It is shown that cholesterol is not volatile with petroleum vapours distilling at lower temperatures and that therefore unaltered cholesterol cannot be the cause of the lævo-rotation of the low-boiling fractions of certain Java oils. If cholesterol occurs in petroleum oils at all, it must be sought for in the fractions distilling above 300° C. *in vacuo.*—C. A. M.

Petroleum industry of the Tampico region (Mexico). Board of Trade J., June 27, 1912.

The development of the Tampico oil region during last year progressed to such an extent that the position of Mexico has changed from that of an importer of approximately 1,000,000 barrels of crude and refined oils during 1910 to that of an exporter of more than 700,000 barrels of crude oil during 1911. The Tampico oil region is that part of the coastal plain between the Rio Soto la Marina and the vicinity of Jalapa, bounded on the east by the Gulf of Mexico and on the south-west and north-east by the front of the great central plateau. It comprises roughly, an area of about 1,700 square miles. The town of Tampico is the distributing point for the oil region. The asphaltum varies in consistency from a heavy oil (15° B.) to various hard veins, and in certain parts of the same region there are seepages of a paraffin-base light oil.

Production.—As the greater amount of the oil produced in Mexico has come from the Tampico region, the following statistics of the production of oil in Mexico may be of interest :—

	Barrels.
1900–1906	1,000,000
1907	1,000,000
1908	3,481,410
1909	2,488,742
1910	4,531,826
1911	12,620,319

At the present time there are nine fields in the Tampico region which are producing oil, or are capable of production, having a potential production of at least 175,000 barrels per day, of which 58 per cent. is controlled by the Aguila Company. The daily production is now about 80,000 barrels.

Pyrogenic acetylene condensations. Meyer. *See* III.

Standard specifications for refractory materials. *See* VIII.

Patents.

Peat; Getting or excavating ——. T. Rigby, Dumfries and N. Testrup, London. Eng. Pat. 13,281, June 2, 1911.

To ensure a continuous supply, especially during the cold season, the peat gathered and disintegrated in one portion of the bog is transferred by means of pipes to an adjacent excavation or reservoir, from the bottom of which (*i.e.*, below the freezing level) the material is pumped to the works.—W. E. F. P.

Fuel; Agglomerated ——, and manufacture of same. J. H. Fischbach and A. Barbé. Fr. Pat. 438,928, Jan. 12, 1912.

The fuel is prepared by briquetting a mixture of coal dust and vegetable fibres (wood fibre, &c.), with pitch as binding agent. The wood fibre is first treated with alkali so as to remove resinous substances, and is then placed in a hot saturated solution of ammonium borate and nitrate, and if desired a colouring matter may be added to this solution. After draining and drying, the treated fibre is mixed with coal dust and pitch and briquetted.—A. T. L.

Gases of combustion; Apparatus for the purification of ——. C. Flechtner, Langenbielau, Germany. Eng. Pat. 24,015, Oct. 30, 1911.

A purifying tank is inserted in the flue connecting the furnace with the chimney, the arrangement being such that the gases are caused to pass beneath the surface of the purifying liquid, with which latter they are agitated by means of a paddle-wheel provided in the outlet channel. —W. E. F. P.

Coke and bye-products; Manufacture of ——. P. Hoering, Berlin. Eng. Pat. 28,139, Dec. 14, 1911.

Coke is obtained by the destructive distillation of the briquettes made as described in Eng. Pat. 20,312 of 1911 from reeds and other aquatic plants such as are found in large quantities in the Soudan and the Congo State, where the cost of coal, coke, and charcoal is prohibitive. The coke has a heating value of 6500 cals. per kilo., is almost free from sulphur, and is very suitable for metallurgical purposes. The briquettes yield 40 per cent. of coke, 11 to 15 per cent. of tar, and combustible gases in addition. The tar water contains ammonia, methyl alcohol, and acetic acid.—A. T. L.

Coke-oven. E. Hohmann, Assignor to Stettiner Chamotte-Fabrik Akt.-Ges. vorm. Didier, Stettin, Germany. U.S. Pat. 1,027,845, May 28, 1912.

The heating flues are arranged in the side walls in the coking chambers and have apertures at each end which serve alternately for the introduction of the heating gas and the discharge of the products of combustion at the opposite end of each flue.—W. H. C.

Chamber oven with regenerators and recuperators, particularly for use with blast-furnace and producer gas. Stettiner Chamotte-Fabrik Akt.-Ges. vorm. Didier. Fr. Pat. 439,178, Jan. 20, 1912. Under Int. Conv., Sept. 11, 1911.

When blast-furnace gas, or producer gas made from cheap fuel, is available for heating, the gases formed in a coke-oven plant may be used wholly for lighting or for other purposes, but in order to use the weaker gas for firing the ovens, it must be heated in recuperators. For this purpose, the oven is formed with recuperators at one end and regenerators at the other end of each chamber, and the waste gases from the heating flues pass through a sole flue beneath each chamber, partly towards the right and through the recuperators and partly towards the left and through the regenerators, the quantities being regulated by dampers. The air from the regenerators and the gas from the recuperators pass through alternate flues beneath the sole flues, each air or gas flue having two series of branch pipes for delivering air or gas to the combustion chambers of two sets of heating flues.—A. T. L.

Porous refractory materials [gas retorts]; Treating —— to render them gas-tight or to increase their refractoriness or density. R. Lessing, London. Eng. Pat. 12,119, May 19, 1911.

Hydrocarbon gas or vapour is forced into the pores of the material by establishing a difference in pressure at opposite sides, and then carbon is deposited in the pores by the action of heat on the gas, either by heating one side of the material or by forcing into the pores enough air to effect partial combustion. In applying the process to a gas retort, the first charge of coal is heated with the gas outlet closed, so that the gas penetrates the heated walls of the retort and is decomposed in the pores.—A. T. L.

Gas retort and other furnaces; Regenerators for ——. A. Brown, Kirkmuirhill, Lanarkshire. Eng. Pat. 14,843, June 26, 1911.

The upright conduits for the secondary air are connected at their upper ends with air supply chambers communicating with the combustion chamber and are so arranged that the air traverses a winding course before reaching the latter; connections are also provided permitting access to the lower ends of the conduits.—W. E. F. P.

Vertical retorts for carbonisation of coal and the like. A. McD. Duckham, Little Bookham, Surrey. Eng. Pat. 1347, Jan. 17, 1912.

Claim is made for a continuously operated retort having a taper of wider angle at the top than at the bottom, and preferably a taper of successively narrower angle in successive zones from the top to the bottom. For example, in a retort 25 ft. high, the minor axis may be 8 inches at the top, 20 at the bottom and 12, 15½ and 18 inches at heights of 20, 15, and 10 feet respectively.—W. E. F. P.

Gas producer plants. K. Fuwa, Chikugo, Japan. Eng. Pat. 4895, Feb. 27, 1912.

In order to separate dust from the hot gases leaving the producer, the gases pass around a spiral baffle arranged in the down-pipe between the producer and the scrubber, and this baffle is made hollow and serves as a steam generator. In a suction gas producer, the steam passes to a superheating chamber formed in the upper part of the producer and is there mixed with air which has been heated in a jacket surrounding the gas outlet pipe. The down-pipe dips into a water seal, and a concentric pipe within it at the lower end forms an annular passage for the escape of dust into the water. In an ammonia-recovery plant, the steam passes into a separate superheater, and thence, together with air, through a jacket surrounding the gas outlet-pipe and through a casing formed around the lower part of the producer.—A. T. L.

Producer gas; Method of making ——. H. F. Smith, Lexington, Ohio. U.S. Pat. 1,027,290, May 21, 1912.

An air current is passed upwards into a producer of inverted conical form so that the velocity varies at different parts of the producer, while finely divided fuel is continuously fed in at the top. The finer particles of fuel are thus separated and supported by the air current in the upper part of the producer, while the heavier particles descend to the bottom.—H. H.

Gas producer. C. J. Atkinson, Milwaukee, Wis. U.S. Pat. 1,028,524, June 4, 1912.

The supply of water to a gas producer is regulated by means of a balanced lever, which controls the water supply valve and carries two interconnected tanks at the ends, one being closed and connected by a flexible tube with the gas producer and the other being open to the atmosphere. Pressure changes in the gas producer cause water to flow backwards or forwards from one tank to the other and so disturb the equilibrium of the lever, thus controlling the water-supply valve.—H. H.

Gas producer. G. A. Loehlein. Fr. Pat. 438,823, Jan. 9, 1912.

The producer, which is suitable for bituminous coal, comprises a double-walled cylindrical chamber, unlined, the annular space between the walls forming a steam generator, and having the usual boiler fittings. The top-plate of the outer casing carries a steam dome, and a central vertical tube passes through this dome and is connected with the top-plate of the inner casing, for charging the producer. The feeding hopper, placed above the steam-dome is provided with a charging-valve consisting of a cylindrical plug having a port or recess which transfers the fuel from the hopper to the tube below it. The gas outlet pipe from the producer is provided with a three-way cock, by means of which the gas can be passed into the atmosphere when not required.—A. T. L.

Gas purifier. C. H. Abbott, Lisbon, N.D. U.S. Pat. 1,028,419, June 4, 1912.

A gas purifier consists of two or more inverted conical casings arranged one within the other, the inner casing having a number of holes on one side and the outer casing having a single gas outlet leading to a filter bolted outside the casing. The gas is admitted at the top of the inner casing and passes in a circuitous path to the filter. Condensed moisture may be run off at the bottom of the outer casing.—H. H.

Petroleum and other hydrocarbons; Process for the solidification of ——. C. Gerard, Brussels, Belgium. Eng. Pat. 12,158, May 19, 1911.

Flour or fecula is mixed with hot water in an agitator and is thus caused to become swollen. The product is then mixed with a suitable proportion of petroleum previously heated to a suitable temperature.—W. H. C.

Solidifying petroleum or petrol; Process for ——. M. B. Blackler, Ilford, Essex. Eng. Pat. 12,291, May 22, 1911.

A small proportion of alcohol is added to the petroleum or petrol, and stearic acid together with a smaller proportion of another and more soluble fatty acid or resin is dissolved in the mixture, which is then heated, treated with an alcoholic solution of caustic alkali, and cooled. In an example the following proportions are used, viz., 100 parts by weight of petroleum, 1½ parts of methylated spirit, 1½ parts of commercial stearic acid, 0·25 part of commercial oleic acid, and 3 parts of a solution obtained by dissolving 12 parts of caustic soda in 100 parts of methylated spirit. The mixture is heated to 60 or 70° C. —H. H.

Petroleum; Process of treating ——. J. Collins, Assignor to W. J. Travers, Olinda, Cal. U.S. Pat. 1,028,439, June 4, 1912.

A process for treating petroleum containing water and hydrocarbons more volatile than water consists in heating the petroleum to a temperature above 212° F. while under pressure sufficient to prevent volatilisation of the water or light hydrocarbons, allowing the heated petroleum to rise slowly in a column of petroleum at substantially the same temperature, so as gradually to reduce the hydrostatic pressure on the petroleum until it becomes sufficiently low to permit volatilisation of the lighter hydrocarbons, collecting and drawing off such lighter hydrocarbons while maintaining the pressure on the surface of the column in excess of atmospheric, and then introducing the residue of the petroleum into another column where the pressure is gradually reduced to atmospheric and the water permitted to volatilise and escape as it reaches the top of the column.—H. H.

“*Proto-paraffins*” [*Solid non-crystalline paraffin hydrocarbons*]; *Extraction of* —— *from crude products, for the manufacture of ceresin.* J. Tanne and G. Oberländer. Fr. Pat. 439,175, Jan. 20, 1912. (See Fr. Pat. 409,516 of 1909, and First Addition, dated Oct. 6, 1910; this J., 1910, 717; 1911, 409.)

The process previously described is modified by using as solvent benzene, alone or mixed with glacial acetic acid or its homologues or with carbon tetrachloride, or with both; or in place of benzene, light tar oils may be used or a mixture of these with benzene. Other halogen substitution derivatives of hydrocarbons, saturated or unsaturated, for example, ethylene chloride or tetrachloroethane, may be substituted for carbon tetrachloride. —A. T. L.

Coke-oven; Vertical ——. A. O. Jones, Whitley Bay, Assignor to Stettiner Chamotte-Fabrik A.-G. vorm. Didier, Stettin, Germany. U.S. Pat. 1,028,569, June 4, 1912.

See Eng. Pat. 17,732 of 1910; this J., 1911, 881.—T. F. B.

Retort furnaces and the like. Stettiner Chamotte-Fabrik Act.-Ges. vorm. Didier, Stettin, Germany. Eng. Pat. 1608, Jan. 20, 1912. Under Int. Conv., Sept. 11, 1911.

See Fr. Pat. 439,178 of 1912; preceding.—T. F. B.

Gas producer or generator. A. J. Rickie, Cossipur, India. U.S. Pat. 1,029,084, June 11, 1912.

See Eng. Pat. 10,911 of 1911; this J., 1912, 323.—T. F. B.

Gas; Collection of fume, flue-dust, and other matter suspended in ——. R. F. Pearce, Liverpool. U.S. Pat. 1,028,487, June 4, 1912.

See Eng. Pat. 24,509 of 1910; this J., 1911, 732.—T. F. B.

Evaporating and bye-product recovery plant and appliances connected therewith. Eng. Pat. 12,857. *See* I.

Manufacture of pure hydrogen [*from petroleum, etc.*]. Eng. Pat. 13,397. *See* VII.

Filtering apparatus for purifying air and gases. Eng. Pat. 1215. *See* XIXb.

Preventing or extinguishing fires or explosions. Eng. Pat. 28,075. *See* XIXb.

Gas calorimeter. Eng. Pat. 19,051. *See* XXIII.

Apparatus for gas analysis. Fr. Pat. 438,390. *See* XXIII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

Illuminant and method of producing the same. J. H. James, Pittsburg, Pa. U.S. Pat. 1,028,357, June 4, 1912.

The illuminant consists of a mixture of acetylene, acetaldehyde vapour, and formaldehyde gas, and is produced by saturating liquid acetaldehyde with formaldehyde gas, charging acetylene into the saturated acetaldehyde, and then vapourising the liquid.—H. H.

Incandescence mantles; Manufacture of ——. W. Bruno. Fr. Pat. 438,260, Dec. 26, 1911. Under Int. Conv., Jan. 5, 1911.

The fabric is impregnated with a solution of suitable salts such as thorium nitrate, and is treated with ammonia or hydrogen peroxide and washed so as to remove all traces of nitrates. The mantles are then dipped in a 10 per cent. solution of oxalic acid, and incinerated —A. T. L.

Exhausting vessels [*incandescence lamps*]; *Method of* ——. C. J. Thatcher, Upper Nyack, N.Y. U.S. Pat. 1,028,636, June 4, 1912.

The vessel is first exhausted by mechanical means and then an electric current is passed through the filament to condense the traces of residual gas.—W. H. C.

Furnace for sintering metallic filaments for electric incandescent lamps. C. Trenzen, Kolen-Braunsfeld; and E. Haagn, Assignor to W. C. Heraeus Ges. m. b. H., Hanau, Germany. U.S. Pat. 1,028,832, June 4, 1912.

See Fr. Pat. 425,112 of 1911; this J., 1911, 883.—T. F. B.

III.—TAR AND TAR PRODUCTS.

Acetylene condensations; Pyrogenic ——. R. Meyer. Ber., 1912, **45**, 1609—1633.

The experiments of Berthelot on pyrogenic acetylene condensations have been repeated on a larger scale and with more elaborate apparatus. The apparatus is described and illustrated. It consisted essentially of two vertical, electrical tube furnaces, arranged in series, through which a mixture of equal volumes of acetylene and hydrogen was passed. By diluting the acetylene with hydrogen and controlling carefully the temperature of the tubes, decomposition of the acetylene with separation of carbon was to a large extent avoided. The first tube was heated to 640°—650° C., and the second to 800° C. A considerable quantity of a light brown tar, of aromatic odour, was formed, and the gases leaving the apparatus contained a notable proportion of methane ($2C_2H_2=CH_4+3C$). In one case the yield of tar was about 60 per cent. of the weight of acetylene used. The tar contained about one-fifth of its weight of benzene. Other hydrocarbons detected were naphthalene, anthracene, indene, toluene, diphenyl, fluorene, pyrene, and chrysene. Styrole could not be detected, and it is possible that the hydrocarbon identified by Berthelot as styrole was really indene. Ramsay's observation (Phil. Mag., 1876, 2, 269; 1877, 4, 24) that acetylene and hydrocyanic acid condense to form pyridine bases under the action of heat, is confirmed. The author discusses the question of the formation of benzene derivatives in the distillation of coal, and although the detection of ready-formed hydro-aromatic compounds in coal by Pictet and Ramseyer (this J., 1911, 1041, 1199) indicates that part of the benzene derivatives in coal tar is derived from this source, it is considered that pyrogenic condensation of acetylene is an essential, though not the sole, factor in the formation of the aromatic constituents of coal tar.—A. S.

Toluene; Nitration of —— A. F. Holleman and J. Vermeulen. Koninkl. Akad. van Wetensch. Amsterdam. Wisk. en Natk. Afd., 1912, **20**, 891—897. Chem. Zentr., 1912, **1**, 1820.

On nitration of toluene with nitric acid of sp. gr. 1·475 at 30° C., the reaction product was found to consist of 58·8 per cent. of ortho-, 4·4 of meta-, and 36·8 of para-nitrotoluene. The composition of the reaction product was calculated from the results of melting point determinations, the freezing-point curves of mixtures of ortho- and para-, and of ortho- and meta-nitrotoluene having been re-determined (compare van den Arend, Rec. trav. chim. Pays-Bas, 28, 408). The melting point of *p*-nitrotoluene was found to be 51·4° C.—A. S.

Aromatic compounds; Hydrogenation of —— with platinum and hydrogen. R. Willstätter and D. Hatt. Ber., 1912, **45**, 1471—1481.

By the use of platinum black prepared by Loew's method (this J., 1890, 550), but transferred to a vacuum desiccator immediately after washing, instead of being exposed to the air, a large number of reductions by means of hydrogen can be effected. In regard to its general applicability, the method resembles that of Sabatier and Senderens, but possesses the advantage over the latter that it can be applied to compounds which cannot be vapourised for passage over finely-divided nickel. Failures by other workers to obtain success with the method in certain cases (compare Wieland, this J., 1912, 276) have been due probably to the presence of impurities, which destroyed the activity of the platinum. Pure benzene and naphthalene, especially when dissolved in glacial acetic acid, are converted quantitatively into cyclohexane and decahydronaphthalene respectively at the ordinary temperature, but benzene containing thiophene and commercial naphthalene containing sulphur compounds cannot be hydrogenised by means of platinum and hydrogen. Toluene, the xylenes, durene, and hexamethylbenzene can also be perhydrogenised by the method. Phenol yields a mixture of cyclohexanol and cyclohexane. Aniline gives a mixture of dicyclohexylamine and cyclohexylamine. Pure pyrrole cannot be hydrogenised in ethereal solution, but when dissolved in glacial acetic acid, it is reduced to pyrrolidine.—A. S.

Reaction for coal-tar products (pyridine) in ammonia and ammonium salts. Wöhlk. *See* VII.

Patents.

Di- and poly[hydr]oxybenzene compounds; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 17,200, July 27, 1911.

See Fr. Pat. 437,281 of 1911; this J., 1912, 426.—T. F. B.

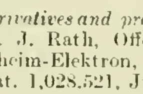
[Amino] anthracene derivatives and process of making same. A. Zitscher and F. J. Rath, Offenbach. Assignors to Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. U.S. Pat. 1,028,521, June 4, 1912.

See Eng. Pat. 3513 of 1912; this J., 1912, 528.—T. F. B.

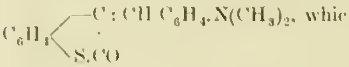
IV.—COLOURING MATTERS AND DYES.

Oxindole; Conversion of —— into 2-ketodihydro-1-thionaphthene ("thio-oxindole"). C. Marschalk. Ber., 1912, **45**, 1481—1485.

The author has described previously (Ber., 1912, **45**, 582) the conversion of oxindole into *o*-diazophenylacetic acid. By treating the latter with potassium xanthate (Leuckart, J. prakt. Chem., [2], **41**, 179), or by first replacing the diazo group by the thiocyanogen group by treatment with a mixture of cuprous and potassium thiocyanates and then heating the thiocyanogen compound with sodium sulphide (Gattermann, Ber., 1890, **23**, 738), *o*-mercaptophenylacetic acid, $C_6H_4(SH)CH_2.CO_2H$, is obtained, and this on distillation, is converted into its inner anhydride, 2-ketodihydro-1-thionaphthene (thio-oxindole):



This compound, like oxindole, possesses a reactive methylene group, and when condensed with suitable components yields chromogens or dyestuffs containing sulphur, to which the name, isothioindogenides, may be assigned. For example, with isatin, it yields the 3-thionaphthene-2-indole-indigo, already obtained by Friedländer (this J., 1908, 743), whilst with *p*-dimethylaminobenzaldehyde, it yields [*p*-dimethylamino-benzylidene]-thio-oxindole:



$$C_6H_4\left\langle\begin{array}{l}-C:CH.C_6H_4.N(CH_3)_2\\ S.CO\end{array}\right.$$

which dyes wool and silk orange shades from an acid bath.—A. S.

Leuco-bases and colouring matters from diphenylethylene; Preparation of some alkylated amino ethylenic derivatives. P. Lemoult. Comptes rend., 1912, **154**, 1622—1625.

Details are given of the preparation of compounds of the type, $RHC:C(Dm)_2$ or $R_1R_2C:C(Dm)_2$, where Dm = $C_6H_4N(CH_3)_2$, by the interaction of Michler's ketone, alkyl iodides and magnesium (see this J., 1911, 531). The compounds from normal propyl iodide, isopropyl iodide, primary normal butyl iodide, and secondary normal butyl iodide dissolve in cold acetic acid, giving faint colourations, which become much more intense (from bluish green to bluish violet) after heating for a few minutes on the water-bath. The acid solutions all give colourations when treated with a small quantity of lead dioxide, and when diluted with water, give the reactions with sodium nitrite described previously (*loc. cit.*). With primary isobutyl iodide, also, a compound of the type mentioned is formed, but could not be isolated. In this case, the reaction product consists to a considerable extent of the carbinol of the type, $:CH.CH.C(OH)(Dm)_2$.—A. S.

Methylene blue as an indicator in iodometric titrations. Sinnatt. *See* XXIII.

Patents.

Azo dyestuffs; New —— and their production. H. Levinstein, J. Baddiley, and Levinstein, Ltd., Manchester. Eng. Pat. 12,281, May 22, 1911.

New mono- and disazo dyestuffs are obtained by combining diazo- or diazoazo compounds of the benzene or naphthalene series with the azo-dyestuff components (arylaminoacetylaminonaphtholsulphonic acids, $(HO)(SO_3H)(X)_nC_{10}H_{5-n}NH.CO.CH_2.NH.R$, and arylamides of naphtholsulphonic acid glycines, $(HO)(SO_3H)(X)_nC_{10}H_{5-n}NH.CH_2.CO.NH.R$) described in Eng. Pat. 26,577 of 1910 (this J., 1911, 1372). The dyestuff from 2-phenylaminoacetylamino-5-naphthol-7-sulphonic acid and diazotised 2·6-naphthylaminesulphonic acid dyes unmordanted cotton in yellowish red shades; that from the anilide of 2-amino-5-naphthol-7-sulphonic acid and the diazoazo compound obtained by combining diazotised 2-naphthylamine-3·6-disulphonic acid with *p*-xylidine, and re-diazotising, gives reddish violet shades on unmordanted cotton; that from 2-*m*-nitrophenylaminoacetylamino-5-naphthol-7-sulphonic acid and diazotised 2-naphthylamine-6-sulphonic acid dyes cotton in bright yellowish red shades; that from 2-phenylaminoacetylamino-5-naphthol-7-sulphonic acid and diazotised aminoazobenzenesulphonic acid gives red shades on unmordanted cotton; that from the anilide of 2-amino-8-naphthol-6-sulphonic acid glycine and diazotised picraminic acid dyes wool in dark brown black shades changing to dark olive on chroming; and that from the *m*-sulphanilide of the same glycine and diazotised 4-nitro-2-aminophenol gives brown shades on wool, changing to brown black on chroming.
—A. S.

[Azo] Colouring matter suitable for the production of lakes; Manufacture of a new ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 23,791, Oct. 27, 1911.

Diazotised *p*-chloro-*o*-nitraniline is combined with the *a*-chloroanilide of acetoacetic acid. The new dye thus obtained gives, by the usual processes, greenish yellow lakes distinguished by their fastness to light.—A. S.

Direct cotton [azo] dyestuffs ; Process for preparing —. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 246,668, March 8, 1911. Addition to Ger. Pat. 234,637, May 11, 1910 (see Eng. Pat. 12,433 of 1910 ; this J., 1911, 612).

The dyestuffs are prepared in a similar manner to that described in the chief patent, from nitro-amino- or mono-acidyldiaminoazo compounds containing carboxylic or sulphonic groups, in which the nitro- or acidylamino-group is united to the phenyl residue of the azo compound by a group similar to that existing in an acid amide ; *e.g.*, nitro- or sulphaminobenzoyl-2·6 tolylenediamine-4-sulphonic acid is diazotised and combined with cresidine, and the product is treated with phosgene, thiophosgene, etc. A further modification of the principal patent consists in combining the dyestuffs there described, with nitro- or acidylamino-arylacidyl halogenides and finally reducing the nitro group or eliminating the acidyl radicle from the acidylamino group.—T. F. B.

Vat dyestuffs of the anthraquinone series ; Production of new ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 438,263, Dec. 26, 1911.

The colouring matters produced by the condensation of thioanthraquinones with anthraquinonecarboxylic acids halogenated in the ortho position to the carboxyl group, and treatment of the reaction products with dehydrating agents, are nitrated, and the nitro-derivatives either reduced or condensed with aromatic amines. The vat dyes thus obtained yield dyes of different shades when treated with acidylating agents. Example. 1 part (1 mol.) of the thioxanthone derivative obtained by the condensation of 2.3-*o*-halogenanthraquinonecarboxylic acid and α-thioanthraquinone is dissolved in 10 parts of 98 per cent. sulphuric acid and nitrated with a mixed acid containing 0·54 part (4 mols.) of nitric acid. After standing for 2 hours at the ordinary temperature, the mixture is heated to 80° C. for some time, thrown on to ice, and the yellow nitro-compound filtered off and washed. When reduced with sodium sulphide, it yields a dark brown dye giving pure reddish brown shades on cotton from the vat. The benzoyl derivative of this dyestuff gives orange shades, and the acetyl derivative of a dyestuff prepared in a similar manner but using six instead of four molecules of nitric acid for nitration, also gives orange shades on cotton from the vat.—A. S.

Monoazo dyestuffs and colour lakes made therefrom ; Manufacture of ——. A. G. Bloxam, London. From Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. Eng. Pat. 6379, March 14, 1912.

The dyestuffs obtained by combining diazo compounds of the benzene or naphthalene series with the arylamides of 2·3-hydroxynaphthoic acid, produce orange to bordeaux lakes of excellent fastness to oil and light. The manufacture of the dyestuff and lake may be combined in one operation. The products having a substituent in the *o*-position to the imino group in the arylamino residue are yellower in shade than the corresponding *p*-substitution products. Also the dyestuffs from arylamides obtained by condensing secondary amines with 2·3-hydroxynaphthoic acid are yellower than those produced from arylamides derived from primary amines. The dyestuffs which do not contain sulphonic groups are insoluble in water and fast to oil if they contain at least one negative group in the diazo compound. The dyestuffs which do not contain such negative groups are not fast to oil, but their fastness may be considerably increased by introducing chloro- or nitro-groups into the arylamino residue. Those dyestuffs which contain sulphonic groups furnish lakes completely fast to water and oil. Ten examples of the process are given, and 34 colour lakes are described.
—T. F. B.

Mono-azo dyestuff ; Manufacture of a red ——. Act.-Ges. f. Anilinfabr., Treptow, Germany. Eng. Pat. 6993, March 21, 1912. Under Int. Conv., Jan. 17, 1912.

A bluish-red dyestuff, suitable for the preparation of lakes which are very fast to light, is obtained by combining diazotised 3·4·5-trichloro aniline with 2-naphthol-3·6-disulphonic acid.—T. F. B.

Indigo, its homologues and substitution products ; Manufacture of new condensation products of ——. O. Imray, London. From Society of Chemical Industry in Basle, Switzerland. Eng. Pat. 8421, April 9, 1912. Addition to Eng. Pat. 29,368, Dec. 17, 1910 (this J., 1912, 22).

Red, blue-red to violet substances, the sulphonic acids of which dye wool and silk in an acid bath, are prepared by the action of an arylated fatty acid halide, such as phenylacetyl chloride, on indigo, its homologues or substitution products.—A. S.

Disazo dyestuffs [and lakes therefrom] ; Manufacture of ——. Farbw. vorm. Meister, Lucius, und Bruning. Fr. Pat. 439,005, Jan. 15, 1912. Under Int. Conv., Feb. 24, 1911.

Yellow disazo dyestuffs for dyeing wool and for the preparation of lakes, are obtained by combining tetrazotised 2·2′-benzidinedisulphonic acid with 1-(2-chlorophenyl)- or 1-(2·5-dichlorophenyl)-3-methyl-5-pyrazolone. Separate claims are made for the process of manufacture, for the dyestuffs, and for the lakes prepared therefrom.—A. S.

Indigoid vat dyestuff ; Process for preparing an ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 246,579, July 2, 1910.

By the action of the α-chloride or α-bromide of methylenedioxyisatin on α-anthrol, a vat dyestuff is obtained which dyes bluish black shades of good fastness to washing and bleaching.—T. F. B.

Dyestuffs of the indigo series ; Process for producing finely-divided ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 246,580, Feb. 5, 1911. Addition to Ger. Pat. 237,368, Sept. 28, 1909 (see Eng. Pat. 18,761 of 1910 ; this J., 1911, 1047).

This is a modification of Eng. Pat. 242,532 (this J., 1912, 278), one of the previous additions to the principal patent. Instead of treating indigo leuco compounds with air in presence of formaldehyde, the freshly prepared (nascent) indigo-white-formaldehyde compound is treated with air in presence of alkali.—T. F. B.

Dye ; New —— which does not stain the hands of the workers. L. Hubert and L. Garnica de La Cruz. Fr. Pat. 439,181, Jan 20, 1912.

The claim is for the use of soaps of all kinds in the manufacture of dye-pastes.—A. S.

Vat dyestuffs ; Process for preparing ——. Kalle und Co. Ger. Pat. 246,265, April 28, 1907. Addition to Ger. Pat. 198, 864, Jan. 18, 1906.

As a variation of Ger. Pat. 245,630 (this J., 1912, 484), in place of starting with 3.5.6-trimethylphenylthioglycollic acid (ψ-cumylthioglycollic acid), 3-methyl-4.6 dichloro- or 3.6-dimethyl-4-chlorophenylthioglycollic acid is heated with sulphur, with or without a substance to facilitate condensation. The resulting dyestuffs are red or violet, respectively.—T. F. B.

Vat dyestuffs ; Process for preparing ——. Kalle und Co. Ger. Pat. 246,581, Jan. 21, 1911. Addition to Ger. Pat. 182,260, Nov. 14, 1905.

By condensing N-benzylisatin, or its derivatives containing substituents in the benzene ring of the isatin or of the benzyl group, or their homologues or analogues, with oxythionaphthene or indoxyl, or their derivatives, homologues, or analogues, vat dyestuffs are obtained which furnish fast dyeings in pure shades.—T. F. B.

Aryl ethers of meta [hydr] oxybenzaldehydes substituted in the nucleus; Manufacture of —— and of triphenylmethane dyes therefrom and from the alkyl ethers of meta [hydr] oxybenzaldehydes substituted in the nucleus. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 17,129, July 26, 1911.

See Fr. Pat. 437,667 of 1911; this J., 1912, 529.—T. F. B.

Leucoquinizarine; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 23,924, Oct. 28, 1911.

See Fr. Pat. 437,970 of 1911; this J., 1912, 529.—T. F. B.

Azo dye. F. Rünkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,028,493, June 4, 1912.

See Eng. Pat. 13,527 of 1911; this J., 1911, 1267.—T. F. B.

Vat [anthracene] dye. P. Thomaschewski, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,028,637, June 4, 1912.

See Ger. Pat, 235,094 of 1910; this J., 1911, 885.—T. F. B.

Azo dyestuffs of the anthraquinone series; Manufacture of ——. A. Schmidt, Höchst, and G. Kränzlein, Sindlingen, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Hoechst on Maine, Germany. U.S. Pat. 1,028,139, June 4, 1912.

See Eng. Pat. 21,727 of 1911; this J., 1912, 119.—T. F. B.

Disazo dyestuff; Black —— and process of making same. F. Scholl, Assignor to Farbwerke vorm. Meister, Lucius, und Bruning, Höchst on Maine, Germany. U.S. Pat. 1,028,140, June 4, 1912.

See Eng. Pat. 22,069 of 1911; this J., 1912, 119.—T. F. B.

Vat [indigoid] dyestuffs; Reddish-blue —— and process of making same. A. Schmidt and K. Thiess, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,028,911, June 11, 1912.

See Fr. Pat. 421,096 of 1910: this J., 1911, 413.—T. F. B.

[Azo] colouring matters; Black ——. J. Turner and H Dean, Huddersfield. U.S. Pat. 1,028,306, June 4, 1912.

See Fr. Pat. 430,321 of 1911; this J., 1911, 1306.—T. F. B.

Production of azo colouring matters on the fibre. Eng. Pat. 13,076. *See* VI.

Manufacture of azo colouring matter. Eng. Pat. 9843. *See* VI.

Coloured lakes [for colouring food, &c.] from vegetable substances containing dyestuffs in the form of glucosides. Fr. Pat. 438,563. *See* XIII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Moulds and mildews: their relation to the damaging of grey cloth and prints. T. G. B. Osborn. J. Soc. Dyers and Col., 1912, **28**, 204—208.

The mildew of cotton is not due to any one specific organism, but to a large collection of both fungi and bacteria, commonly present in the air, among which the following have been identified:—*Penicillium glaucum*, *Fusarium*, *Mucor racemosus*, *B. megatherium*, *Sarcina aurantiaca*, etc. The author has found the spores of these to be present in non-mildewed cloth, and such organisms are probably present in every consignment of cotton goods shipped, only needing favourable conditions begin their growth. The mildew is produced by the common moulds feeding upon the starchy matter in tl size, but, as the fungi can only grow in the presence sufficient moisture, the goods must become damp befo there is any likelihood of mildew making its appearanc The author shows that the humidity of a Lancashire facto is often such as to give about 15 per cent. of moisture p dry weight of the cotton goods; further, the use of hygr scopic salts, such as calcium and magnesium chlorid leads to absorption of water, and, in other ways, such through leaky cases, the goods may become sufficiently dam to encourage the production of mildew.—B. N.

Thamson displacement process [for nitrocellulose]. Delp *See* XXII.

Patents.

Grease and similar matter from wool, skins, textiles an other materials; Method of and apparatus for the extractio of ——. C. R. Mayo, London. Eng. Pat. 13,340, June 1911.

This is an improvement on a previous patent (see Eng Pat. 8600 of 1909; this J., 1910, 941), the suction pum and the compression chamber into which the pump delive the vapours withdrawn from the condensing chamber being both arranged between the condenser and th reservoir, so that the whole of the products of condensatio and vapours from the condenser pass through the pum and the compression chamber.—P. F. C.

Plastic masses; Process for manufacturing —— by mean of cellulose xanthogenate. O. Eberhard, Heidena Saxony. Eng. Pat. 3042, Feb. 6, 1912. Under Int Conv., Feb. 13, 1911.

The cellulose xanthogenate (viscose) to be coagulate is freed as far as possible from air and carbon bisulphid this being effected preferably in a vacuum, and may tak place during the mixing with the necessary colourin matter. The mass is now poured into open moulds avoiding inclusion of air, and coagulated by heating in pressure boiler under such conditions that the pressur exceeds the vapour tension of the gases generated an also prevents the expansion of any air or gases that may b enclosed in the mass; for example, a pressure of from 2 to atmospheres and a temperature of 40°—60° C. may b employed. By this means it is stated that the natura expansion of the coagulating mass takes place withou harm to the product.—T. F. B.

Cellulose with salts of copper; Process of treating —— La Soie Artificielle du Nord. Fr. Pat. 437,815, Nov. 27 1911.

A salt of copper, *e.g.*, the sulphoacetate, and sodiu carbonate are dissolved in a mixture of equal parts of wate and ammonia. To 200 parts of this solution, about 14 parts of cellulose are added and allowed to steep until almost dissolved. After half an hour, 3 parts of caustic soda in 10 parts of water are added to the mixture and a perfect solution of the cellulose is thereby obtained.—J. F. B.

Pulping or reducing material in a wet or semi-liquid state; Apparatus for hydrating ——. H. Jackson, Garstang, Lancs. Eng. Pat. 12,933, May 30, 1911. Addition to Eng. Pat. 6019 of 1911, dated Oct. 28, 1910 (this J., 1912, 225).

The gentle hammering action mentioned in the principal patent can be obtained by a revolving disc carrying beaters operating against a corrugated casing or by beaters pivoted to the casing operating against a corrugated disc or by a combination arrangement of such heaters.—P. F. C.

Parchment paper; Manufacture of vegetable ——. A. Sansen. Fr. Pat. 437,527, Dec 13, 1911.

In the manufacture of parchment paper by this process, the bibulous paper to be treated undergoes a preliminary moistening with the acid, first on one surface and then on the other. The excess of acid is removed by press rolls and the paper is passed over a guide roller, to give time for the reaction to become completed before the acid is removed by a bath of water. In the preliminary moistening baths the paper passes over and under a pair of moistening rolls which are adjustable relatively to one another on the horizontal plane, so that a longer or shorter time may elapse between the application of the acid to the two surfaces. These guide rolls are sprayed with acid which is circulated through the bath. The paper may be supported during this treatment by a rubber band. Designs on the moistening rolls may be communicated to the paper passing over them. At the press rolls a number of webs of paper similarly or dissimilarly treated by the moistening rolls may be united to form a single compound web. The guide roll over which the paper passes after pressing is adjustable over a long distance in a vertical direction, so that the time of action of the acid may be controlled regardless of the speed of the machine.—J.F.B.

Cellulose compounds; Manufacture of ——. H. Peters and H. W. Cullum, London. Eng. Pats. 16,000, July 10, 1911, and 822, Jan. 10, 1912.

See U.S. Pats. 1,008,489 and 1,008,557 of 1911; this J., 1911, 1147.—T. F. B.

Cellulose solutions; Process for the manufacture of ——. W. Traube, Berlin. Eng. Pat. 356, Jan. 4, 1912. Under Int. Conv., Jan. 9, 1911.

See Ger. Pat. 245,575 of 1911; this J., 1912, 532.—T.F.B.

Filaments and other products obtained from cellulose compounds. L. Lederer, Sulzbach, Germany. U.S. Pat. 1,028,748, June 4, 1912.

See Fr. Pat. 368,766 of 1906; this J., 1907, 30.—T. F. B.

Formyl esters of cellulose or solutions of the same; Transforming —— *into stable, plastic solutions.* E. Bronnert, Niedermorschweiler, Assignor to Verein. Glanzstoff-Fabriken A.-G., Elberfeld, Germany. U.S. Pat. 1,029,341, June 11, 1912.

See Eng. Pat. 8313 of 1911; this J., 1911, 1050.—T. F. B.

Sizing agent and method of making same. F. H. Kalbfleisch, Babylon, N.Y. U.S. Pat. 1,029,131, June 11, 1912.

See Fr. Pat. 431,714 of 1911; this J., 1912, 123.—T. F. B.

Producing mixtures, emulsions, and dispersions of substances. Eng. Pat. 12,037. *See* I.

Direct utilisation of wool washings in the manufacture of soap. Fr. Pat. 438,243. *See* XII.

Infusible insulating varnish for electric construction, the covering of wires, etc. Addition to Fr. Pat. 418,347. *See* XIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Affinity of cotton for dyestuffs; Action of high temperature as well as steaming on the ——. C. Favre. Bull. Soc. Ind. Mulhouse, 1912, **82**, 183—184.

The author states that a high temperature or steaming changes the physical properties of cotton, in a manner the reverse of that of mercerising, and that it is less able to absorb dyestuffs after steaming. Mercerised cotton loses its power, under these conditions, of absorbing more dyestuff than unmercerised cotton, without however losing its brilliance.—B. N.

Patents.

Bleaching and dyeing textile materials; Process and apparatus for ——. P. M. Havez. Fr. Pat. 438,504, Dec. 27, 1911.

The yarns to be dyed are wound directly on to metallic bobbins consisting of perforated metal tubes and these are mounted on a suitable support fixed on the dyeing machine. Designs are appended showing suitable shapes for the bobbins.—P. F. C.

Mercerising cotton yarn in skeins; Method and machine for ——. P. Hahn, Niederlahnstein-on-Rhine, Germany. Eng. Pat. 22,534, Oct 12, 1911.

The skein is placed on carrier rollers adapted to rotate about their own axes, and whilst the yarn is moving, it is sprayed from all sides with the treating liquid, so as to ensure simultaneous treatment of all parts of the skein. The spraying device comprises a drum-shaped casing which encircles the yarn carriers, the inner wall of the casing being provided with perforations which can be opened or closed at will by means of a slide.—P. F. C.

Silk; Process of weighting ——. Landau and Co. and L. Kreidl. First addition, dated Nov. 18, 1911, to Fr. Pat. 415,657, May 6, 1910 (this J., 1910, 1300). Under Int. Conv., Dec. 5, 1910.

In the process for weighting silk with salts of the rare earths, described in the original specification, the salts of those metals, which in the form of hydroxide undergo further oxidation on exposure to air, could not be employed, owing to the injurious effect on the fibre. Thus, pure cerium salts were unsuitable. But in presence of the salts of other rare earths, these readily oxidisable hydroxides lose this objectionable property, and in general become permanent in air. The use of such mixtures is now claimed, particularly the salts derived from the cerite earths as by-products in the manufacture of incandescence mantles.—J. F. B.

Algarrobo; Process of utilising the natural exudations and the sawdust of white and black —— *as colouring matters* [*and mordants*]. J. A. Dominguez. First Addition, dated Dec. 13, 1911, to Fr. Pat. 437,020, Oct. 10, 1911 (this J., 1912, 426).

Extracts of white or black algarrobo or of their kinos may be used as mordants for basic colours, and in conjunction with alumina, iron, etc., as mordants for acid colours. They are stated to be useful also for imparting strength (weight) to textiles, especially silk, during the dyeing process.—A. S.

Azo colouring matters on fibre; Production of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 13,076, May 31, 1911.

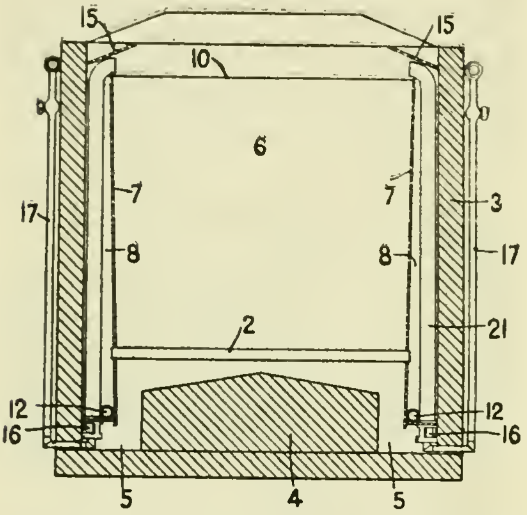
A diazo, diazo-azo, or tetrazo compound of the benzene or naphthalene series is combined with an unsulphonated derivative of 1·3-aminophenol, which may be substituted in the amino-group or in the benzene nucleus, or in both, but which contains hydrogen in at least two of the positions, 2, 4, and 6. The intermediate dyestuff thus produced is combined on the fibre with a diazo compound. The shades thus obtained vary from yellow-brown to dark brown; they are very fast towards washing and light, and readily lend themselves to the production of discharge effects. If a soluble diazo compound is used for combining on the fibre (*e.g.*, one from a mononitraniline), it is advisable to pad the material with an alkaline solution of the intermediate dyestuff and then to treat this with the diazo solution. The diazo compound may be produced by diazotising Primuline, Oxamine Violet, or other substantive dyestuff on the fibre, and treating with an alkaline solution of the intermediate dyestuff. Among the 1·3-aminophenol derivatives which may be used are *m*-aminophenol, *p*-amino-*o*-cresol, *m*-hydroxyphenylglycine, and *m*-hydroxydiphenylamine.—T. F. B.

Azo colouring matter; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 9843 of 1912, date of appl., May 31, 1911.

The intermediate colouring matter for use in the process described in Eng. Pat. 13,070 of 1911 (see preceding abstract), is obtained by combining diazotised aniline with *m*-aminophenol in presence of sodium carbonate. —T. F. B.

Dyeing and washing machine. W. Higgins and J. Rhodes, Bradford. Eng. Pat. 14,190, June 15, 1911.

Inside a rectangular vat, 3, provided with a liquor-displacing block, 4, is fitted a tank, 6, having sheet metal sides, 7, and a false bottom, 2. The tank is preferably divided into compartments by cross partitions, 10, and each compartment contains a cage (capable of rotation around a horizonal axis) for the material to be treated. The steam pipes, 12, have perforations cut in their upper surfaces so as to produce an upward current of liquor in the space, 8, baffle-plates, 15, being arranged near the top of the vat to deflect the current on to the tops of the compartments of the tank, 6. The liquor then percolates by gravity through the material to be treated. Each compartment is also fitted with a separate blower, 16, connected with a steam pipe, 17, and open to the liquor in the canal, 5. By this means a rapid circulation can be obtained through any one compartment.—P. F. C.



Dyeing vegetable fibres with halogenated indigo and indigoid dyestuffs; Process of ——. A. Kertesz, Mainkur, Germany. Assignor to Cassella Color Co., New York. U.S. Pat. 1,029,066, June 11, 1912.

The material to be dyed is treated in a hot alkaline liquor containing a halogenated indigo or indigoid dyestuff, together with sodium sulphide as reducing agent; if addition of hydrosulphite is necessary, it is only made towards the end of the operation.—T. F. B.

Dyeing textile fibres; Machine for ——. O. Kunz. First Addition dated Dec. 20, 1911, to Fr. Pat. 350,868, Jan. 19, 1905 (see Eng. Pat. 1156 of 1905; this J., 1906, 798). Under Int. Conv., Dec. 30, 1910.

Two sets of yarn carriers are attached to a vertical support in such a way that they can be raised from or lowered into two dye-vats arranged one on each side of the support. Each set of carriers can also be swung in a horizontal plane so as to place it above either dye-vat. By these means a two-phase process can be begun in one dye-vat and completed in the other, without removing the yarn from the carriers. The carriers are fitted with devices for imparting a to and fro movement to the yarn whilst it is immersed in the dye-liquor.—P. F. C.

Dyeing skins and furs; Process of ——. Farbw. vorm Meister, Lucius, und Brüning. Fr. Pat. 438,476, Dec 2 1911. Under Int. Conv., Mar. 4, 1911.

Grey or greyish blue shades can be obtained on previousl mordanted skins or furs by treating them with a solutio of 2·5-diamino-*p*-cresol, with or without the additio of an oxidising agent such as hydrogen peroxide.—P. F. C

Dyeing with substituted Coeramidonines which do not contai sulpho groups; Process of ——. Farbwerke vorm Meister, Lucius, und Brüning. Ger. Pat. 246,337, Nov 10, 1910.

A substituted Coeramidonine containing no sulphoni groups is reduced by means of a suitable alkaline reducin agent to a vat, in which form it may be applied equall well to cotton or wool, golden yellow to red-brown shade being produced. The dyestuffs are prepared by the actio of condensing agents on aryl-aminoanthraquinones, suc as 4-chlorophenyl-α-aminoanthraquinone, α-naphthyl α-aminoanthraquinone, di-αanthraquinonylbenzidine, o di-α anthraquinonyl-*p*-diaminobenzophenone.—T. F. B.

Discharge effects on vat dyestuffs; Process for producin white or coloured —— by means of formaldehyde-sulphoxyl ate or formaldehyde-hydrosulphite, hydrosulphites, or othe reducing agents. Badische Anilin und Soda Fabrik. Ger. Pat. 246,252, April 17, 1910. Addition to Ger. Pat. 231,543, Oct. 15, 1909.

In the principal patent and additions (see Fr. Pat. 414,93 of 1910; this J., 1910, 1247), the sulphonic acids of the organic ammonium compounds containing alkaryl radicals, may be replaced by alkaryl compounds of the formula R.CHR.'hal; these compounds may contain one or more acidic groups. The results are similar to those obtained according to the previous processes.—T. F. B.

Finish on fabrics; Permanent ——. E. T. J. Watremez. First Addition, dated Dec. 23, 1911, to Fr. Pat. 427,573, Mar. 20, 1911 (this J., 1911, 1053).

The excess of acid contained in the aluminium salt used in the process described in the principal patent is replaced by a weak volatile acid.—P. F. C.

Dyeings on vegetable and animal fibrous material; Production of ——. G. W. Johnson, London. From F. A. Bernhardt, Zittau, Saxony. Eng. Pat. 17,999, Aug. 8, 1911.

See Fr. Pat. 435,252 of 1911; this J., 1912, 383.—T. F. B.

Printed textile goods; The soaping of ——. Schmid frères, Basle, Switzerland. Eng. Pat. 26,328, Nov. 24, 1911. Under Int. Conv., Nov. 26, 1910.

See Fr. Pat. 434,450 of 1910; this J., 1912, 331.—T. F. B.

Producing mixtures, emulsions, and dispersions of substances. Eng. Pat. 12,037. *See* I.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Acid and ammonia industry; Proposals for the ——. [*Use of sprays*]. O. Nagel. Z. angew. Chem., 1912, 25, 1220—1224.

The author suggests the use of sprays in the chamber process of sulphuric acid manufacture, for the purpose of effecting more intimate mixture of the gases, and thus reducing the necessary chamber space. He proposes a large injector with three successive nozzles, into which the pipe from the Glover tower opens sideward, so that the whole of the gas from the tower passes through the injector with the steam, and is thoroughly mixed and churned up. The injector tube widens out into a large cylinder, furnished with water-fed cooling tubes, and from is the gases pass into a single small chamber which is llowed by two plate towers. A set burning 7 tons of rites daily, or 3·15 tons of sulphur, will have to deal th 26,460 cub. metres (roughly a million cubic feet) of s daily; the necessary steam will be 1·323 tons, for which 2 cm. nlet pipe to the injector, with steam at 30 lb. ssure will be enough. The gas-supply pipe from the lover tower would be 75 cm. in diameter. The total nount of water necessary for the process would be 4·528 ns daily, so that 3·205 tons would be available, if supplied rough the injector, to create or aid draught. A chamber 850 cub. metres (31,500 cub. feet) capacity would suffice, followed by two plate towers of about 20 layers of 20, d 30 layers of 12 plates each. A similar usage of the jector permits of the thorough mixing of gases without eam, if one of the gases, or one portion of it, be compressed d introduced through the injector, drawing in the rest. like manner, a water-spray can be very economically tilised for the absorption of gases such as hydrochloric d and ammonia. The author prefers to send the water rough under low pressure, so that little atomising occurs. ut a thin sheet or film is formed, through which the gas ust pass. The jet is enclosed in a small chamber into hich the gas is introduced from the side; the chamber narrowed conically at its exit, so that the aperture is st filled by the expanding conical sheet of fluid, and ommunicates with another expanding cone resting on a ylinder, in which, if necessary, perforated plates or other lling can be arranged to complete the absorption.

—J. T. D.

hloric acid and chlorates; Volumetric determination of ——. A. Kolb. Z. angew. Chem., 1912, **25**, 1168.

A MIXTURE of 10 c.c. of the chlorate solution (about N/10), grm. of potassium iodide, and 50 c.c. of concentrated ydrochloric acid (sp. gr. 1·125) is allowed to stand for —10 minutes in a closed vessel, in the dark, and is then iluted with 200—300 c.c. of water and titrated with N/10 thiosulphate, 1000 c.c. of which indicates one-ixtieth of a gram-molecule of potassium chlorate. The cid must be rendered free from air, before use, by a urrent of carbon dioxide, and the chlorate be dissolved n boiled water containing the same gas, with which also the reaction vessel is filled.—F. SODN.

Coal-tar products (pyridine); New reaction for —— in ammonia and ammonium salts. A. Wöhlk. Ber. Deutsch. Pharm. Ges., 1912, **22**, 285—288.

AMMONIUM salts containing pyridine, rubbed in a mortar with borax, give an odour of pyridine. If 0·25 to 0·5 grm. of salt be taken, with double the quantity of powdered borax, less than 0·1 per cent. of pyridine can be detected. Ammonia solution is tested by pouring it into excess of hydrochloric acid, evaporating to dryness, and testing the chloride formed. Such pyridine-contaminated salts can be purified by dissolving in water and evaporating to dryness once or twice with one or two c.c. of ammonia.

—J. T. D.

Calcium carbonate; Solubility of ——, in water. J. Kendall. Phil. Mag., 1912, **23**, 958—976.

BY the use of large silica flasks, which were found to be absolutely unacted on by any of the substances used, it proved possible to make trustworthy direct determinations of the solubility of calcium carbonate in water. Two or three litres of solution were prepared by digestion at definite temperatures of an excess of the substance with water, and the solution filtered into excess of acid and weighed. It was then evaporated down to small bulk, its weight again ascertained, and a portion titrated with baryta solution. The mean results with water and air freed from carbon dioxide, were as follows:—

	grms. per litre at		
	25° C.	50° C.	100° C.
Calcite	0·1043	0·0150	0·0178
Arragonite	0·0153	0·0162	0·0190

The ratios of the solubilities at each temperature are almost alike, 1·064 to 1·075, and are almost identical with the ratio of the specific gravities of the two solids, 1·066. Attempts to determine the solubility of the carbonate by passing air through, or boiling, solutions of bicarbonate, gave higher figures, which were traced, however, to the difficulty of removing the carbon dioxide completely. The carbonate precipitated in these experiments was never amorphous, but consisted at 25° of calcite, at 100° of arragonite, and at 50° C. of a mixture of the two. All attempts to determine the solubility of the amorphous carbonate failed, and only showed that this substance is very unstable, and readily converted into calcite. The small amount of carbon dioxide in atmospheric air exerts a powerful influence on the solubility. The solubility of calcite in water, in equilibrium with ordinary air, was found to be at 25° C. 0·0461, at 50° C. 0·0292 grm. per litre: at 100° C. it was practically identical with that given above, owing to the expulsion of carbon dioxide by boiling. The electrical conductivities of solutions of sodium bicarbonate, calcium bicarbonate, and calcium suphate were determined for high dilutions, and tabulated results aro given in the paper.—J. T. D.

Arsenic and antimony; Supposed penta-iodides of ——. E. Quercigh. Atti del Reale Istit. Veneto d. Sci., 1912, **70**, II., 667—673. Chem. Zentr., 1912, **1**, 1812.

A STUDY of mixtures of iodine with the tri-iodides of arsenic and antimony respectively by the thermal method, showed that the penta-iodides do not exist, the contrary belief being due to the fact that the eutectics have approximately the composition of penta-iodides. For mixtures of arsenic tri-iodide and iodine, the eutectic point is 71·5° C., and for mixtures of antimony tri-iodide and iodine, 80° C.

—A. S.

Chromium sesquioxide insoluble in acids; Detection of ——. U. Jankowitsch. Z. anal. Chem., 1912, **51**, 483.

STRONGLY ignited chromium sesquioxide is converted into chromate by warming with red lead and concentrated nitric acid.—F. SODN.

Radium standard preparations; Definition of the Vienna ——. S. Meyer and V. F. Hess. Monats. Chem., 1912, **33**, 583—611.

THE evolution of heat from a radium preparation purified by O. Hönigschmid was found to be 132·26 calories per hour for 1 grm. of radium element, where there was equilibrium with the decomposition products up to and including Ra C, and when all the α- and β-rays and 18 per cent. of the γ-rays were absorbed. Using Eve's number for the percentage proportion in which the γ-rays contribute to the total energy, the calculated evolution of heat for the absorption of all the rays was equal to 138 calories per hour. It is possible to get an approximation as to the total amount of radium in preparations by comparing the γ-rays and making use of the above data. The equivalence of 1 curie to $2{\cdot}7 \times 10^{6}$ electrostatic units was confirmed, also the value $3{\cdot}4 \times 10^{10}$ for the number of α-particles emitted per second. Quartz vessels are unsuitable for the preservation of radium preparations, as numerous cracks develop in time. Glass vessels can be used, strengthened by fine platinum wire sealed into the glass.—F. SODN.

Separation of beryllia and alumina [and ferric and chromic oxides]. Wunder and Wenger. *See* XXIII.

New reagent for thorium. Koss. *See* XXIII.

Sulphur, pyrites, and sulphuric acid in the United States. W. C. Phalen. U.S. Geol. Survey, 1912. [T.R.]

THE production of sulphur in the United States in 1911 amounted to 265,664 long tons, valued at $4,787,049, as compared with 255,534 long tons, valued at $4,605,112, in 1910. It is estimated that the production for the year

1911 is very close to the present rate of consumption. Prices remained fairly constant throughout the year at approximately \$22 per long ton for prime Louisiana sulphur.

The production of pyrites in the United States in 1911 amounted to 299,904 long tons, valued at \$1,162.261; the production of 1910 was 241,612 long tons, valued at \$977.978. The figures are the maximum ever recorded by the Survey for the pyrites industry. Though low-grade sulphide ores of copper containing considerable quantities of pyrites and pyrrhotite, and zinc sulphide concentrates have been used in recent years in the manufacture of sulphuric acid, this has not curtailed the output of pyrites, the last five-year period having been a period of rapid development of the by-product sulphuric acid industry. It is estimated that the quantity of sulphides other than straight pyrites used in the manufacture of sulphuric acid in 1911 is equivalent to about 200,000 long tons of pyrites, which would bring the tonnage of this mineral theoretically produced in 1911 up to nearly 500,000 long tons. This does not include copper-bearing Spanish pyrites used in making sulphuric acid. The world's production of pyrites in 1909 amounted to 1,813,499 tons, representing 816,075 tons of sulphur.

Sulphuric acid.—Under the production for 1911, all sulphuric acid is given regardless of whether it was sold as such or consumed in the factories where it was made.

In the following table the quantity in short tons, and value and price per ton are given of the three main grades of acid, together with similar data for other strengths of acid combined. With the exception of the small quantity of acid included under "Other grades," the output is also expressed in terms of 50° B. acid for the sake of comparison:—

Grade.	1904.		1911.	
	Quantity.	Value.	Quantity.	Value.
		\$		\$
50° B.	1,169,141	8,314,646	1,026,896	5,447,958
60° B.	48,688	581,523	421,165	2,624,042
66° B.	411,165	5,917,699	751,541	9,176,297
Other grades	(*c*)13,268	361,018	(*d*)10,728	121,575
Total	1,642,262	15,174,886	2,210,330	17,369,872
Total reduced to 50° B. acid	(*a*) 1,869,437	—	(*b*) 2,688,456	17,313,822

(*a*) Includes 968,445 tons, with an assigned value of \$7,232,675, consumed in establishments where manufactured; and also sulphuric acid produced by establishments engaged primarily in the manufacture of other products.

(*b*) Exclusive of acids of strength greater than 66° B.

(*c*) Reported as oleum by the census for 1904.

(*d*) Includes acid of 53° and 63° B., which accounts for the lower valuation per ton of this acid as compared with 66° acid.

The following figures show the quantity of sulphuric acid in short tons recovered from the gases from smelters throughout the United States; this is 20 per cent. of the total sulphuric acid produced in the United States during the year:—

—	60° B. acid.	
	Quantity.	Value.
		\$
Copper smelters	207,657	1,056,185
Zinc smelters	230,643	1,677,511
Total	438,300	2,733,696
Total acid reduced to 50° B.	547,875	—

The figures given in the table do not include acid manufactured from copper-bearing Spanish pyrites.

Chemical trade of Finland. For. Off. Ann. Series, 1912. [T.R.]

The imports into Finland of chemicals and fertilisers in 1911 from the United Kingdom showed a decided increase over 1910, especially in the importation of phosphates, of which 75 per cent. comes from the United Kingdom; and in the amount of sulphate of soda received from the United Kingdom, which was double that of the previous year. This trade is likely to improve steadily by reason of the constantly increasing demand caused by the development of Finnish agriculture and allied trades, such as the dairy industry. The imports of dyes and colours from the United Kingdom show a downward tendency, the British article being ousted by German, Swedish, Danish, and French goods. Red earth, minium, colour clays, and white lead are still imported in considerable quantities, and in these the United Kingdom could compete successfully with Germany. The United Kingdom is losing ground in the paint used for ships' bottoms. Fine colours for artistic purposes, etc., are the only kinds which, as regards the import from the United Kingdom, show an increase.

Patents.

Chloride of zinc; Process of and apparatus for the dehydration of ——. R. Threlfall, Birmingham. Eng. Pat. 13,081, May 31, 1911.

Zinc chloride solution is boiled down to a point at which the hydrolytic action becomes excessive (the boiling point rising to about 220° C.), and the drying is then completed by forcing a current of hydrogen chloride (either alone or mixed with some inert gas, such as substantially dry air) through the melt, and raising the temperature to a point above the melting point of zinc chloride, the steam removed is condensed, and the unabsorbed gas, after drying, is repumped through the material. The process is carried out in an apparatus consisting of a containing vessel of refractory material, the interior of which is heated electrically, preferably by means of an alternating current which passes from one or more graphite electrodes, depending into the vessel and adjustably insulated by refractory material, so that the area exposed to the electrolyte may be regulated and the source of heat as near as possible to the bottom of the vessel. Hydrogen chloride is led into the vessel by a tube of refractory material, the open end of which is supported against the bottom, and, passing out, together with the water vapour, is led to condensing, separating, and pumping apparatus of known type. Fresh hydrogen chloride is fed into the system at any convenient point, a strong current of the gas being required, especially when the solution is in the neighbourhood of 300° C., and samples are tested from time to time, until the melting point rises to about 313° C. and a solution of 20 grms. in 200 c.c. of cold water is neutral or acid to methyl orange. The product is free from zinc oxide.—F. Sodn.

Titanium salts and their production. H. Spence, T. J. I. Craig, and Peter Spence and Sons, Ltd., Manchester. Eng. Pat. 13,260, June 2, 1911.

Metallic aluminium is dissolved, under suitable conditions, in solutions containing titanic acid, for example, a solution containing about 30 per cent. of titanic sulphate and 5 per cent. of sulphuric anhydride is treated with an excess of thin sheet aluminium in small pieces. The treatment is commenced at the ordinary temperature, the metal being added gradually as reduction proceeds, and part of the aluminium sulphate produced may be crystallised out as alum, by adding potassium or ammonium sulphate. The solution of aluminium and titanous sulphates may also be concentrated, if desired, so as to give a solid product. The process is said to give solutions which are more stable than those of titanous oxide alone in acids, the titanic oxide, produced by their utilisation as reducing agents tending more to remain in solution.—F. Sodn.

Ammonium sulphate; Process for the production of —— E. Collett and M. Eckardt, Christiania. Eng. Pat. 16,629, April 28, 1911.

Ammonia is made to react with a mixture of sulphur dioxide and oxygen (preferably in the form of air), in presence of water, so that a neutral sulphite solution is obtained, in cordance with the equation, $3NH_3+2H_2O+2SO_2=$ $H_4)_3H(SO_3)_2$, and then, in a separate absorption and cidising system, into which oxygen and ammonia are ntinuously introduced, this salt is oxidised to ammonium lphate, the sulphur dioxide liberated, as shown by the quation, $2(NH_4)_3H(SO_3)_2+3O=3(NH_4)_2SO_4+H_2O+SO_2$, ing again transformed into the neutral sulphite, by mbination with ammonia, and oxidised by continued tion of air upon the solution. Gases obtained by the asting of poor sulphur ores may be utilised in the process, nd the oxidation is preferably carried out in a system of wers, according to the counter-current principle, the quid being kept warm.—F. SODN.

hlorates and perchlorates; Neutralisation of alkali in the electrolytic manufacture of ——. M. Couleru. First Addition, dated March 11, 1911, to Fr. Pat. 437,831, Feb. 27, 1911 (this J., 1912, 535).

REE chloric or perchloric acid is used instead of salts of hese acids for neutralising the alkali formed during the lectrolysis.—A. S.

itrides and ammonia; Manufacture of —— from nitrogen. Soc. Générale des Nitrures. Fr. Pat. 438,248, March 9, 1911.

N intimate mixture of beryllia and charcoal, both finely owdered, is heated in a current of nitrogen or of a gas ontaining nitrogen, at a temperature of 1400° C. or igher; carbon monoxide is evolved and beryllium itride is produced. The nitride evolves ammonia when reated with acids, alkalis, superheated steam, etc. The eryllia may be replaced by compounds of beryllium, specially natural silicates of aluminium and beryllium, uch as emerald or beryl, in which case a mixture of the nitrides of beryllium, aluminium, and silicon is obtained. he mixture also evolves ammonia on treatment with uitable reagents.—A. S.

Boiler for the concentration of alkaline solutions, especially of solutions obtained by the lixiviation of crude soda from seaweed, and also for the desulphurisation of mother-liquors of similar origin. L. Le Gloahec. Fr. Pat. 438,309, Dec. 27, 1911.

THE apparatus for the purposes mentioned in the title consists of a boiler containing the liquid to be heated, and provided with one or more large tubes, immersed in the liquid, through which steam is introduced. Inside the steam tube is a smaller tube which is connected with the steam-outlet and serves for the removal of condensed water.—A. S.

Alkali amides; Preparation of ——. Chem. Fabr. von Heyden A.-G. Fr. Pat. 438,487, Dec. 2, 1911.

AN alkali metal alloy, *e.g.*, a lead-sodium alloy, in a finely-divided fused condition, is subjected to the action of ammonia gas. For example the molten alloy may be brought to a state of fine subdivision by means of a disc or an endless screw rotating rapidly within the reaction chamber, or the reaction may be effected in an apparatus similar to a rectifying column, through which the molten alloy and ammonia gas are passed in opposite directions. It is stated that lead-sodium alloys containing only up to about 8 per cent. of sodium, such as can be readily prepared electrolytically, are quite suitable for the preparation of sodium amide by the process described.—A. S.

Aluminium sulphate; Treatment of ferruginous ——. Ges. für Tentelewschen Chemischen Fabrik. Fr. Pat. 438,625, Jan. 3, 1912.

THE claim is for the oxidation to the ferric condition of the iron contained in commercial aluminium sulphate. The oxidation may be effected by any suitable method, which may be applied to the raw aluminous material used for the manufacture of the sulphate, or during the treatment of the raw material with sulphuric acid, or during the evaporation of the aluminium sulphate solution. The aluminium sulphate containing ferric iron is stated to possess many advantages over ordinary aluminium sulphate for use in water purification. When it is to be used for the treatment of potable waters, it should be prepared with sulphuric acid free from arsenic.—A. S.

Carbon dioxide; Apparatus for the extraction of ——. G. A. Schutz. Fr. Pat. 438,788, Jan. 8, 1912.

IN the extraction of carbon dioxide from gases containing it, by absorption in a suitable solution, a filter is provided through which the gases pass immediately before entering the absorption apparatus.—A. S.

Tablets of per-salts, unaffected by keeping and by temperature, suitable for the preparation of hydrogen peroxide; Process for producing ——. Chem. Werke vorm. Dr. H. Byk. Ger. Pat. 246,713, Dec. 7, 1910.

IN order to prevent the loss of active oxygen which occurs when tablets made of hydrated per-salts (*e.g.*, sodium perborate) are stored, especially at higher temperatures, the water of crystallisation is partly or wholly removed from the per-salt before or after its compression into tablet form. —T. F. B.

Hydrogen; Process for the manufacture of pure ——. R. P. Pictet, Wilmersdorf, Germany. Eng. Pat. 13,397, June 3, 1911. Under Int. Conv., June 4, 1910.

IN preparing hydrogen from crude petroleum or petroleum tar oils as described in Fr. Pat. 421,838 of 1910 (this J., 1911, 542), the vapours are heated in such a manner that 18·1 calories are supplied to 16 grms. of gas, with a tube temperature of 1200°—1350° C.—T. F. B.

Diamond; Preparation of ——. A. Guntz and J. Minguin. Fr. Pat. 438,166, March 7, 1911.

"CARBON in the nascent state," produced by any convenient reaction, or pure carbon, is exposed to ultra-violet rays, at a suitable temperature.—A. S.

Oxygen; Process of producing ——. D. Helbig, Gampel, Switzerland. Eng. Pat. 28,404, Dec. 16, 1911. Under Int. Conv., Dec. 17, 1910.

SEE Ger. Pat. 244,839 of 1910; this J., 1912, 490.—T. F. B.

Hydrogen; Processes of and apparatus for the preparation of —— by auto-combustion. G. F. Jaubert, Paris. Eng. Pat. 5005, Feb. 28, 1912. Under Int. Conv., March 4, 1911. Addition to Eng. Pat. 9623 of 1911, dated May 21, 1910.

SEE Fr. Pat. 438,021 of 1911; this J., 1912, 536.—T. F. B.

Hydrogen; Process for the preparation of —— by auto-combustion. G. F. Jaubert, Paris. U.S. Pat. 1,029,064, June 11, 1912.

SEE Fr. Pat. 422,296 of 1910; this J., 1911, 685.—T. F. B.

Hydrogen; Apparatus for the separation of —— from a gaseous mixture. C. von Linde, Munich, Germany. U.S. Pat. 1,027,862, May 28, 1912.

SEE Fr. Pat. 427,983 of 1911; this J., 1911, 1212.—T. F. B.

Hydrogen; Apparatus for the separation of ——. C. von Linde, Munich, Germany. U.S. Pat. 1,027,863, May 28, 1912.

SEE Addition of March 31, 1911, to Fr. Pat. 427,983 of 1911; this J., 1911, 1253.—T. F. B.

Hydrogen gas; Apparatus for producing ——. H. Lane, Birmingham, Assignor to Internationale Wasserstoff A.-G., Frankfort on Maine, Germany. U.S. Pat. 1,028,366, June 4, 1912.

SEE Eng. Pat. 17,591 of 1909; this J., 1910, 1057.—T.F.B.

Oxides of nitrogen; Process of absorbing ——. C. Bosch and H. Keller. Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,029,528, June 11, 1912

SEE Fr. Pat. 412,788 of 1910; this J., 1910, 1010.—T. F. B.

Evaporating and by-product recovery plant and appliances connected therewith. Eng. Pat. 12,857. *See* I.

VIII.—GLASS; CERAMICS.

Refractory materials; Standard specifications for ——. (Report of the Refractory Materials Committee of the Institution of Gas Engineers). J. Gas Lighting, 1912, **118**, 828—829.

SECTION 3. *Silica bricks, blocks, tiles, etc.*—The material covered by this specification is divided into two classes:—(1) That containing 92 per cent. and upwards of silica, and hereinafter called "silica" material. (2) That containing from 80 to 92 per cent. of silica, and hereinafter called "siliceous."

Refractoriness.—(1) Test pieces of the material shall show no sign of fusion when heated to the following temperatures: "Silica" material—not less than Seger cone 32 (about 1710° C.). "Siliceous" material—not less than Seger cone 29 (about 1650° C.). The test shall be carried out in an oxidizing atmosphere; the temperature of the furnace being increased at the rate of about 50° C. per five minutes.

Chemical analysis.—(2) A complete chemical analysis of the material is to be provided when required by the engineer (or purchaser), for his personal information only.

Surfaces and texture.—(3) The material shall be evenly burnt throughout, and the texture regular, with no holes or flaws. All surfaces shall be reasonably true and free from flaws or winding.

Contraction and expansion.—(4) A test piece, when heated in a gas-muffle or electric furnace to a temperature of Seger cone 12 for two hours shall not show, on cooling, more than 0·75 per cent. linear contraction or expansion. The temperature of the furnace shall be maintained constant throughout the testing period; and the test-piece shall be at least 4½ inches long by 4½ inches wide—the ends being ground flat, and the contraction or expansion measured by means of Vernier callipers reading to 0·1 mm.—a suitable mark being made on the test-piece, so that the callipers may be placed in the same position before and after firing. The test sample shall not be taken out of the middle of a brick, block, or tile, but shall be representative of the whole.

Variations from measurements.—(5) In the case of ordinary bricks, 9 in. by 4½ in. by 3 in. or 2½ in. thick, there shall not be more than ± 1½ per cent. variation in length, nor more than ± 2½ per cent. variation in width or thickness; and in all cases the bricks shall work out their own bond. Special bricks, blocks, or tiles shall not have more than ± 2 per cent. variation from any of the specified dimensions.

Cement clay.—(6) This shall be machine ground, and at the discretion of the manufacturer may contain a suitable percentage of fine grog. But in all cases the cement clay shall be quite suitable for the purpose of binding together the bricks, blocks, or tiles, for which it is supplied, and shall be capable of withstanding the same test for refractoriness.

Inspection and testing.—(7) The engineer (or purchaser), or his agreed representative, shall have access to the works of the maker at any reasonable time, and shall be at liberty to inspect the manufacture at any stage, and to reject any material which does not conform to the terms of this specification. Pieces representative of the bulk may be selected for the purpose of testing either before or after delivery; but in every case a representative of the maker shall, if he choose, be present when such selection is made, and shall be supplied with a similar piece of the material to that taken for the purpose of testing. Any complaint as to quality of material to be made by the purchaser before the expiration of ten days after delivery. If the engineer (or purchaser) and the maker are not prepared to accept each other's tests, they shall agree to submit the samples for testing to an independent authority to be mutually agreed upon; and the engineer (or purchaser) reserves to himself the right, if the material does not conform to the tests laid down in the specification, to reject any or all the material in the consignment from which the test-pieces were taken. The cost of these independent tests and of any bricks, blocks, or tiles, damaged before delivery for obtaining test-pieces, shall be equally divided between the purchaser and the maker if the test proves satisfactory; and if unsatisfactory, such cost, and that for all other subsequent tests required on this account from the same consignment, shall be borne by the makers. The cost of any tests or of any material damaged for the purpose of obtaining test-pieces after delivery shall be borne by the purchaser in the event of the test being satisfactory, and if unsatisfactory by the manufacturer, in a similar manner to that specified for the tests prior to delivery.

Appendix and notes.—Refractoriness. (1) For general remarks and suggestions for testing, also table for softening temperatures of Seger cones, *vide* appendices of Sections 1 and 2 (this J., 1911 28, 804). The cones should in all cases be placed relative to the sample, so that both are subjected to the same temperature.

Contraction or expansion.—(4) For general remarks, *vide* appendices of sections 1 and 2. As soon as cone 12 has squatted, it ceases to furnish any further indication of the temperature of the muffle; so that the subsequent temperatures should be ascertained, at about 15-minute intervals, by means of a pyrometer. It is essential, however, that the temperature should be maintained constant; and if it is necessary to remove plugs, etc., for the purpose of obtaining the temperature, great care must be taken to avoid cooling the furnace by such means. As in the test for refractoriness, the cone should be placed in such a position relative to the sample under test, that both may be subjected to the same temperature.

Inspection and testing.—(7) It has been pointed out by the representatives of the manufacturers that, owing to the high cost of carriage, they may be involved in serious loss if material is extensively condemned after delivery. They agree that the purchaser must have entire freedom to test, and reject if necessary, any material delivered to him; but it is suggested that, until all the manufacturers have suitable arrangements and appliances for constantly testing their goods, it may be possible to render them some assistance by allowing a fairly large sample of their material to be sent in for testing and general approval before extensive deliveries are made. This is in no way, however, to be construed as removing the right of the purchaser to test material in any subsequent consignment.

Revision of the sections of the standard specifications already issued (loc. cit.). Retort material. Contraction or expansion.—(5) For "cone 12" substitute "cone 14," and for 1 per cent. variation substitute 1¼ per cent. After the test temperature has been reached, the furnace shall be maintained constant at that temperature throughout the testing period. The size of the test-piece shall be 4½ inches long by 4½ inches wide, and shall be representative of the whole piece of retort or retort-tile from which it is taken.

Inspection and testing.—(6) This shall now read as slightly amended in Section 3 of the standard specification—viz., test-pieces are to be reasonably representative of the bulk of the material, and no complaint as to quality can be made after the expiration of ten days after delivery.

Fire-bricks, blocks, tiles etc. Contraction or expansion.—(4) For "cone 12" substitute "cone 14;" and, in the case of No. 1 grade material, for 0·75 per cent. (expansion or contraction) substitute 1 per cent. In No. 2 grade material, for 1 per cent. substitute 1·25 per cent. After the test temperature has been reached, the furnace shall be maintained constant at that temperature throughout the testing period. The size of the test-piece shall be 4½ inches long by 4½ inches wide, and representative of the whole piece from which it is taken.

Inspection and testing.—(9) This clause is amended in the same way as clause 6 in Section 1—see above.

Appendices and notes. Test for refractoriness.—Add to existing notes the following: "The cones should in all cases be placed relative to the sample so that both are subjected to the same temperature."

Tests for contraction or expansion.—Add to existing notes that given under this heading in Section 3 as to maintenance of temperature of testing-furnace, substituting "cone 14" for "cone 12."

Inspection and testing.—Add note in appendix of Section 3 above.

Patents.

Quartz bodies; Process for the manufacture of hollow ——. F. Wolf-Burckhardt. Fr. Pat. 438,257, Dec. 26, 1911. Under Int. Conv., Dec. 28, 1910.

In the manufacture of hollow quartz bodies, by fusing the raw material in electric resistance furnaces, the temperature of the resistance is raised beforehand to such an extent that the silicic acid is volatilised on this resistance and is deposited in the layers of raw material nearest to it. In this way, these layers become better conductors, and thus promote the concretion and fusion of the other layers and so reduce the amount of material required for forming a hollow body.—W. C. H.

Ceramic materials; Process of uniting ——, *to metals and the products obtained thereby.* G. Hidoux and J. Bernheim, Paris. Eng. Pat. 23,730, Oct. 26, 1911. Under Int. Conv., Nov. 4, 1910.

Before the ceramic material is pressed into contact with the metal, the latter is coated with a mixture composed of "a silicate appropriate to the nature of the metal" (*e.g.*, potassium silicate), and a concentrated solution of "a flux appropriate to the nature of the ceramic powder" (*e.g.*, borax or sodium carbonate). A pressure of 1500 kilos. per sq. cm. is employed, the article being subsequently heated to a temperature approximating to the melting point of the powder. As industrial products obtained by this process, claim is made for a handle with a metallic core and also for a sparking plug.—W. E. F. P.

Ceramic ware; Production of drawings and pictures on ——. Keramische Druckwerke, G.m.b.H., Neustadt a. d. Haardt, Germany. Eng. Pat. 2919, Feb. 5, 1912. Under Int. Conv., Sept. 30, 1911.

The unglazed ware or biscuit is moistened with water or with tanning materials, tannic acids, tannin or acidulated water, and a transfer picture is applied by the aid of a lac or varnish such as quince mucilage or gum arabic. The decorated ware is treated with hot water or water acidulated with oxalic, citric or phosphoric acid, or with the neutral salts of these acids containing potassium and ammonium. This treatment acts on the varnish and renders the picture layer porous, so that it can be glazed without a separate firing of the picture.—A. T. L.

[*Refractory*] *Silicon products.* F. J. Tone, Assignor to The Carborundum Co., Niagara Falls, N.Y. U.S. Pat. 1,028,303, June 4, 1912.

The refractory condensation product consists of silica and a solid solution of silicon carbide and silica, in the proportion of approximately 50 parts of silicon, 44 parts of oxygen, and 6 parts of carbon. It has an approximate apparent density of 0·15, but a real density of about 2·3; it has a greenish or gray-white colour, a pliant felt-like structure, and possesses a high thermal resistivity.—B. N.

Refractory substance at high temperatures. Soc. Gén. des Nitrures. Fr. Pat. 438,998, March 28, 1911.

The refractory substance is obtained by heating a mixture of alumina, or an aluminous body and carbon in the presence of nitrogen in such a way that all the aluminium is not completely converted into aluminium nitride. The product consists of a mixture of aluminium nitride, alumina and carbon, containing about 4 or 5 per cent. of nitrogen. The substance may be agglomerated into blocks or bricks by means of sodium silicate.—W. C. H.

Enamels; Process of manufacture of white ——. Vereinigte Chemische Fabriken, Landau, Kreidl, Heller und Co. Fr. Pat. 438,908, Jan. 11, 1912. Under Int. Conv., Sept. 30 and Nov. 4, 1911.

Hydrates of suitable metallic compounds, such as those of zirconium, tin, etc., are used as opacifying agents. These hydrates are able either to retain alkali, or can be used in such a form that they can take only small quantities of alkali from the enamel composition. The alkali content in the opacifying agent may be between 2 and 7 per cent., and is preferably 3 or 4 per cent.—W. C. H.

Ceramic products; Process for the manufacture of thinning materials for ——. W. Eckardt and E. Hotop, G.m.b.H. Fr. Pat. 438,445, Sept. 27, 1911. Under Int. Conv., Nov. 1, 1910.

See Ger. Pat. 242,897 of 1910; this J., 1912, 282.—W.C.H.

Treating porous refractory materials to render them gas-tight. Eng. Pat. 12,119. *See* IIa.

IX.—BUILDING MATERIALS.

Cement raw materials; Electrical conductivity of ——. E. Dittler and K. Herold. Tonind.-Zeit., 1912, **36**, 965—967.

Reference is made to Dittler's work on the fusion of silicates (this J., 1911, 211) and to the thermo-chemical experiments on Portland cement of Dittler and Jesser (this J., 1911, 623). The conductivity at various temperatures was determined in square vessels, made of Marquardt's composition, which was practically unattacked by the raw materials. The platinum electrodes were 10 mm. broad, 10 mm. high, and about 30 mm. apart, the resistance being determined in the usual way by means of a Wheatstone bridge and telephone. It was found that cement raw materials began to conduct electricity at 700°—750° C., and that the resistance decreased very rapidly with rise of temperature until at 900° C. it was only from one-tenth to one-half of the initial resistance. At higher temperatures ionisation took place, the raw materials being electrolytically dissociated; polarisation did not take place to any marked extent. Raw materials prepared in the dry way and those composed of marl had higher conductivities than those made from wet slurries and containing clay. The former clinkered more rapidly, and the conductivity of the clinkering material was found to be directly proportional to the speed of the clinkering process. The formation of alite was accompanied by an increase in the resistance simultaneously with the occurrence of an exothermic reaction.—O. R.

Cinder concrete; Disintegration of ——. G. Borrowman. J. Ind. Eng. Chem., 1912, **4**, 405—406.

Experiments with test mixtures of cement, sand, and cinders indicated that the cracks which appear in cinder concrete are due to internal stresses produced by oxidation of sulphides and ferrous iron, aided by general weakness in consequence of diffusion of soluble sulphates. The necessary oxygen for the oxidation is provided by the porous coke present in the cinders, which is capable of occluding considerable quantities of oxygen. Much better results are obtained if the cinders, before use, are exposed to the air, with occasional washing, until the ferrous iron and sulphur have been oxidised and leached out.—A. S.

Patents.

Mixing binding agents and other substances with granular materials; Method of and apparatus for ——. E. Sprenger, Goldach, Switzerland. Eng. Pat. 13,899, June 10, 1911.

The material, such as sand, ground slag, sawdust, cork, etc., is graded according to the size of its granules, and subjected to contact with a stream of the binding agent or other material, such as cement, lime, gypsum, colouring matter, etc., in such a manner that the duration of the exposure of the graded granules to the stream is proportioned to the sizes of the granules. For this purpose a drum is employed containing a sifter with apertures of increasing size, and the stream of finely divided binding material is projected over the sifting surface in a direction opposed to the direction of feed of the granules, so that the duration of exposure of the granules is proportional to the duration of the retention of the granules on the sifting surface.—H. H.

Wood-impregnating composition capable of resisting low temperatures. G. Krojanker, Berlin. Eng. Pat. 22,793, Oct. 16, 1911. Under Int. Conv., Nov. 9, 1910.

SEE Ger. Pat. 240,919 of 1910; this J., 1912, 222. The bituminous oils are dissolved in middle or heavy coal tar oils of b. pt. 150° to 300° C.—T. F. B.

Wood; Preserving ——. C. Ellis, Montclair, N.J., Assignor to Copper Oil Products Co., New York. U.S. Pat. 1,028,201, June 4, 1912.

THE wood is subjected to the action of a preservative oil under pressure, and then to the action of a fixed gas under higher pressure, the gas containing less oxygen than ordinary air. The same body of gas is used repeatedly in the treatment of successive charges of timber, without restoring it to atmospheric pressure.—B. N.

Plaster; Process of manufacture of ——. Lambert Frères et Cie. Fr. Pat. 438,232, Dec. 26, 1911.

THE gypsum rock, either crushed or not, is subjected to a preliminary but incomplete dehydration, in any suitable furnace, and is then stored in silos where the dehydration is carried to the desired degree by the heat accumulated in the material during the preliminary burning. The heat thus retained by the mass in the silos may also be used to dehydrate raw gypsum, which has not been subjected to a preliminary burning, but is introduced, either crushed or not, directly into the silos in question. The product drawn from the furnace may be ground either before its introduction into the silos or after its removal from them.—W. C. H.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Ferro-nickel containing zinc, aluminium, and manganese; Analysis of ——. E. C. Carron. Ann. Chim. Analyt., 1912, **17**, 205—206.

SODIUM peroxide is added to a solution of the alloy (containing 0·1 grm., as sulphates, in about 100 c.c.), until the liquid is strongly alkaline, the precipitate formed becoming almost black; the precipitate is washed by means of hot water, re-dissolved in hot dilute sulphuric acid (1 : 2), the solution oxidised by adding a few drops of perhydrol (hydrogen peroxide), and iron and manganese precipitated by adding ammonia to the boiling solution, the ammoniacal filtrate is then evaporated in a platinum, or quartz, dish and the residue ignited several times, in the presence of strong nitric acid, is weighed as nickel oxide. The precipitate, consisting of the hydrated oxides of iron and manganese, and possibly some alumina, is ignited and weighed, and iron and manganese are determined together by dissolving the oxides in the least possible quantity of hydrochloric acid, containing perhydrol, adding 50 c.c. of water, 10 c.c. of carbon bisulphide, and 10 c.c. of potassium iodide solution (20 per cent.), allowing the mixture to stand for 10 minutes in a closed flask, and titrating with $N/10$ thiosulphate, each c.c. of which corresponds to 0·0056 grm. of iron or 0·0055 grm. of manganese; the iron is then also determined alone in the original solution by means of permanganate. Aluminium is determined in the alkaline filtrate by adding ammonium chloride and heating to 60° C. for 15 minutes, and, finally, after filtering off the aluminium hydroxide, the solution is neutralised by sulphuric acid, treated with ammonia, and used for the determination of zinc by Schaffner's method (titration with sodium sulphide, using ferric indicator). The method is said to be capable of giving good results in 5—6 hours.—F. SODN.

Galvanised iron; Structure of ——. W. Arthur and W. H. Walker. J. Ind. Eng. Chem., 1912, **4**, 397—402.

THE equilibrium diagram of zinc-iron alloys (Von Vegesack, this J., 1907, 153) shows that iron dissolves in molten zinc to at least 24 per cent. The crystals of unknown composition which first separate from the melt are termed by the authors "binding alloy." A number of samples of galvanised iron prepared by the hot galvanising, "sherardising," and electrolytic processes have been examined micrographically in cross-section. The precautions adopted to obtain satisfactory sections are described in detail; a 0·5 per cent. solution of nitric acid in 95 per cent. alcohol was used for etching. *Hot galvanised iron.* A number of photomicrographs are shown. In a section of ordinary galvanised iron, four layers can be distinguished, viz., the iron, a very thin layer of the "binding alloy," a layer of the compound, $FeZn_3$, and a layer of zinc which is permeated by minute crystals of the compound, $FeZn_7$. If the immersion in the galvanising bath be prolonged, much larger crystals of $FeZn_7$ are produced. If an ordinary galvanised plate be treated cautiously with caustic soda, the zinc can be dissolved away so as to leave the minute needles of $FeZn_7$ visible against the darker polygons of zinc. The parting of the coating when a piece of galvanised iron is sharply bent, takes place at the surface of the "binding alloy," but in the blistering and subsequent "flaking off" observed when galvanised iron is heated, the parting takes place between the zinc and the compound $FeZn_3$. *Sherardised iron.* According to the temperature, time, and composition of the zinc powder mass employed, the coating may vary from a very thin layer of the alloy $FeZn_3$, with a more or less distinct layer of the "binding alloy" to a thick coating of zinc iron alloys with a surface layer of zinc. In all sherardised coatings, numerous cracks running through the alloy can be observed. *Electrogalvanised iron.* According to the conditions, coatings of very pure zinc or of zinc-iron alloys of widely varying composition can be obtained, but in all cases there is a very thin layer of "binding alloy." (See also this J., 1911, 546.)—A. S.

[Gold and silver]. Cyanide solutions; The action of mineral sulphates and arsenates on ——. A. F. Crosse. J. Chem., Met., and Min. Soc. S. Africa, 1912, **12**, 405—407.

THE author remarks upon the frequent occurrence of calcium sulphate (as gypsum), magnesium sulphate (as kieserite) and ferric arsenate (as scorodite or as a product of the roasting of arsenical pyrites) in ores and products requiring cyanidation, and describes the manner in which various ores containing these compounds were successfully treated. For ores containing calcium or magnesium sulphate, preliminary treatment with sodium carbonate is recommended, the sulphates not being completely removable by water; the proportion of sodium carbonate required is determined by allowing 100 grms. of the finely powdered ore to remain for some hours in contact with 500 c.c. of warm water containing a known weight of the alkali, and subsequently determining the excess of the latter remaining in the solution. When ferric arsenate is present in the ore, soluble arsenates are produced during treatment with alkali hydroxide or cyanide, the arsenic being ultimately deposited with the precious metals in the latter case. For the treatment of ores containing this compound, the use of an excess of lime in the presence of a small proportion of sodium hydroxide is recommended. It is stated that the ferric arsenate is first attacked by the sodium hydroxide, the arsenic in solution being then precipitated by the lime as calcium arsenate. The proportion of lime required is calculated from the amount of alkali consumed by 200 grms. of the finely powdered ore which is allowed to remain in contact for 7 or 8 hours with 200 c.c. of a 1 per cent. solution of sodium hydroxide. —W. E. F. P.

Copper; Determination of oxygen and occluded gases in ——, and a correction to the electrolytic assay in the complete analysis of copper. G. L. Heath. J. Ind. Eng. Chem., 1912, **4**, 402—404.

It is stated that the gases (0·005 per cent. or more) present in cast copper can be expelled by heating the metal to redness in an atmosphere of pure dry carbon dioxide for 20—30 minutes. The loss in weight is due to the evolution of occluded hydrogen, with traces of carbon monoxide, nitrogen, and possibly argon. On subsequently heating the metal in hydrogen in the usual way, the loss in weight is not equivalent to the oxygen (cuprous oxide) content of the copper, for the metal retains a considerable quantity of occluded hydrogen. In order to avoid this error, which has hitherto escaped attention, after the heating in hydrogen, the metal should be again heated for 20 minutes in pure carbon dioxide, in order to expel occluded hydrogen, before cooling and weighing. The gases in steel can, it is stated, be determined in a similar manner by substituting nitrogen for carbon dioxide.

The method described previously (this J., 1911, 365) for the electrolytic assay of refined copper is sufficiently exact for the valuation of the metal, but for more accurate work, the electrolyte, after deposition of the copper, should be treated with hydrogen sulphide, the precipitate filtered off, roasted directly in a porcelain crucible, treated with a few drops of nitric and sulphuric acids, diluted with a little water, and the copper deposited on a small weighed platinum strip, and added to the main deposit. Electrolytic deposits on platinum obtained by the method described (*loc. cit.*) are free from any appreciable quantity of occluded hydrogen.—A. S.

Zinc ores; Assay of —— ; Separation of iron by ammonia. L. L. de Koninck and E. von Winiwarter. Bull. Soc. Chim. Belg., 1912, **26**, 238—243.

The retention of zinc by ferric hydroxide (in the usual method of separation by ammonia) being regarded as due to the formation of a double hydroxide rather than to adsorption, the authors have sought to reduce or obviate it by the addition to the zinc-iron solution of a metal for which ferric hydroxide has at least an equal affinity. Comparative tests were made in which magnesium was employed for this purpose, solutions of zinc, iron and magnesium chlorides being used and the zinc determined by titration with sodium sulphide. It was found that in the presence of sufficient ammonium chloride (5 grms.) to prevent the precipitation of magnesium hydroxide by ammonia, the retention of zinc by ferric hydroxide was completely obviated by the addition of 5 per cent. of magnesium (as magnesium chloride) to the solution. Similar results were obtained by the addition of the same proportion of magnesium to a blende containing 45 per cent. of zinc and 20 of iron.—W. E. F. P.

Lead assay; Effect of lime on the ammonium molybdate method of ——. C. O. Bannister and W. McNamara. Analyst, 1912, **37**, 242—247.

The results of a number of experiments on the influence of calcium sulphate on the molybdate method of lead assay are tabulated. Using 0·3415 grm. of lead, and from 0·0 to 0·0512 grm. of calcium sulphate, the amount of lead calculated from the volume of ammonium molybdate used varied from 100 to 105·8 per cent. Using 0·2005 grm. of lead, and from 0·0 to 0·2415 grm. of calcium sulphate, the amount of lead calculated varied from 100 to 109·1 per cent. It is concluded:—(1) That lime or calcium sulphate in solution in ammonium acetate does not form an insoluble molybdate when boiled with ammonium molybdate solution. (2) That they do not react with lead molybdate. (3) That when present with lead sulphate in an ammonium acetate solution, then, on boiling with ammonium molybdate solution, the insoluble molybdate contains both lead and lime, and it is impossible to determine lead sulphate directly by solution in ammonium acetate when lime or calcium sulphate is present. (4) In the lead assay of materials containing lime, it is necessary either to separate the lead or to take special precautions to wash the lead sulphate free from calcium sulphate before proceeding with the solution of the lead sulphate. (5) Barium and strontium sulphates do not act in the same manner as calcium sulphate, but tend to give low rather than high results.—A. H. C.

Lead; Spontaneous and progressive destruction of certain articles of ——. C. Matignon. Comptes rend., 1912, **154**, 1609—1611.

The residues of lead articles which had undergone destruction by keeping were shown to contain chlorides, and artificially chlorinated lead plates became regularly attacked during a period of three years. Equations are given showing the catalytic action of sodium chloride on the system lead—oxygen—carbon dioxide, with the intermediate formation of either lead chloride or oxychloride.—A. H. C.

Aluminium; Influence of various impurities on the activation of ——. E. Kohn-Abrest and Rivera-Maltes. Comptes rend., 1912, **154**, 1600—1602.

Active aluminium is produced by amalgamation with a trace of mercury, whereby it becomes easily oxidisable in contact with moist air or water. A table is given in which it is shown that the oxidation of active aluminium containing up to 0·70 per cent. of iron, and 0·40 of silicon was independent of these impurities. An alloy containing 4 per cent. of silicon was not activated by mercuric chloride, and traces of copper (0·01 per cent.) also prevented it from becoming active.—A. H. C.

Porous metals. Hannover. Comptes rend., 1912, **154**, 1594—1597.

Microphotographs are given: (1) Of the structure of porous antimony obtained by allowing an alloy of antimony containing 50 per cent. of lead to cool to below 450° C., at which temperature the antimony begins to crystallize, and then, by centrifuging, to extrude the liquid eutectic which does not finally solidify until a temperature of 225° C. is reached and which then contains 87 per cent. of lead; (2) Of porous tin obtained in a similar manner from a tin-lead alloy containing 20 per cent. of lead. It is suggested that such metals might be used to form semi-metallic alloys by filling the pores with fats, resins, or enamels, whilst by the inclusion of lead oxide in the case of porous lead, accumulator plates could be produced. —A. H. C.

Metals; Finely divided ——. V. Kohlschütter and A. Noll. Z. Elektrochem., 1912, **18**, 419—428. (See also this J., 1912, 188 and 589.)

The authors have investigated the phenomenon of the pulverisation of a silver cathode, during the passage of a discharge through hydrogen, nitrogen, or argon at low pressure. The thin layers of metal produced were investigated microscopically, and also by determination of conductivity and its variation with time. The amount of metal required to produce a given conductivity is greater in hydrogen than in nitrogen, and greater in nitrogen than in argon. The deposits of metal undergo a rapid spontaneous change of resistance, the mode of progress of this change being a characteristic of the gas used in the discharge tube. The microscopic measurements show that the finest subdivision is produced in argon, the largest particles being formed in hydrogen. With time the deposits become more transparent, owing to the formation of large particles. The cause of these changes is a kind of sintering process in the silver which tends to produce a denser deposit, but where the quantity of metal is small the layer may be broken. The spontaneous change in resistance can be greatly delayed by increased gas pressure, so that the gas may be looked upon as a despersion medium for the metal. At 100° C. the deposited silver is oxidised by the atmosphere, the most rapid attack being that on the finest deposits, *i.e.*, those produced in argon.—W. H. P.

Standard specifications for refractory materials. *See* VIII.

The production of tin and aluminium. "Times" Financial Suppl., June 15, 1912. [T.R.]

The production of tin reached its maximum of 109.000 tons of metal in 1908, and has since declined—the production last year was about the same as in 1910, 104.000 tons, or thereabouts. Straits tin began last year at £180 per ton in London and ended the year at £205. In the interval it fell to £176 and rose in June to £230. Both the average and the maximum last year were records. The average last year was £189 18s., compared with £156 10s. for 1910, and with £135 for 1909. The high prices of tin during recent years have led to attempts to open up new tin districts, particularly in the United States and in British Africa, but the totals contributed by these new sources are hardly yet appreciable: the production in Nigeria, for example, in the first four months of this year probably did not reach 350 tons. The American production so far has been negligible. South Africa last year provided about 2.000 tons. In the ten years 1902-1911 the old tin districts produced tin as follows—for comparison the output for last year is also set out.

	1902-1911.	1911.
	Tons.	Tons.
Straits Settlements	575,829	53,670
Australia	50.621	3,825
England	46,763	4,500
British Empire	673,213	61,975
Malay Archipelago (Banca, &c.)	147,053	15,131
Bolivia	166,193	22,064
China (Yunnan)	38,204	3,600
Total	1,024,663	102,770

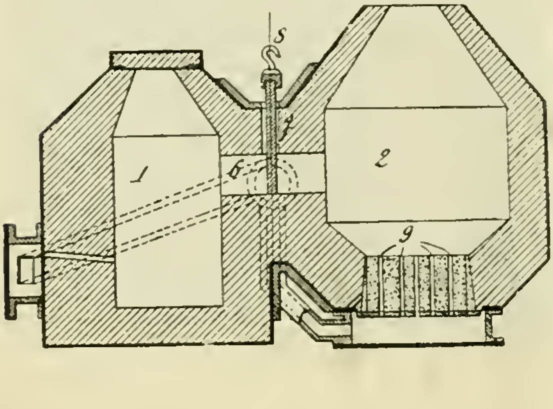
The Bolivian output in 1901 was 9.600 tons and it has more than doubled in ten years. The production of the Empire is falling off. The output of the Straits last year was almost the lowest since 1902, whilst the Australian production has fallen continuously from 6,600 tons, in 1907, to less than 4,000 last year. The Cornish production last year also fell off considerably; and, indeed, only Africa in the British Empire shows progress.

It has often been predicted that aluminium would displace tin from many of its present uses, and certainly aluminium now competes with the older metal in regard to some minor uses. The production of aluminium now exceeds 20,000 tons a year and is likely to increase. Aluminium has not been found satisfactory so far to replace tin for coating iron plates for use as a preservative wrapper or container of food substances.

Patents.

Iron and steel: Manufacture of ——. T. Levoz, Givet, France. Eng. Pat. 18,016, Aug. 8, 1911.

Pig iron containing up to 4 per cent. of silicon and 2 of phosphorus is treated in a double converter (see fig.), the two compartments of which are connected by a passage, 6, so that the metal can be transferred from one to the other without contact with air. In one of the converters, 1, having an acid lining and lateral tuyères, the carbon and silicon are removed, whilst in the second converter, 2, with a basic lining and bottom tuyères, 9, the dephosphorisation may be performed; the connecting passage may be closed by a damper, 8. The pig iron in the first converter is subjected to the action of a large volume of air at a low pressure, and in the second converter to a smaller volume of air at double the pressure. —A. H. C.



[*Iron and steel*]. *Cementation; Process of* ——, *and apparatus therefor.* Soc. des Etablissements Partiot. First Addition, dated Jan. 6, 1912, to Fr. Pat. 421,961, Oct. 28, 1910 (this J., 1911, 552).

The process is conducted in a horizontal retort, one part of which is adapted to contain the metal to be treated and the other part the carburising material. When the apparatus has attained the necessary temperature, the carburising powder is pushed along the retort in a horizontal direction, so as completely to cover the metal. —W. E. F. P.

Steel; Method of treating —— [*to prevent brittleness*]. A. J. Rossi, Niagara Falls, Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,028,389, June 4, 1912.

After the addition to the steel of sufficient carbon to produce the requisite degree of hardness, sufficient titanium is added to prevent undesirable brittleness in the resulting product, the final product containing less than 0·5 per cent. of titanium.—W. E. F. P.

Iron, steel and other metals; Cupola for the manufacture and fusion of ——. *at high temperatures.* O. Delfosse. Fr. Pat. 439.003, Jan. 15, 1912.

A cylindrical, metal casing is lined with segmental, refractory bricks, the weight of which is supported by a system of reinforced bricks at the base of the structure. Around the lower part of the casing an annular blast-chamber is situated, the tuyères projecting from the latter into the furnace being provided, for cleaning purposes, with corresponding openings (each covered by a coloured glass) upon the outside of the chamber. Before entering the annular chamber the blast is preheated by the furnace gases, a horizontal T-pipe (communicating with the chamber by external vertical conduits) being provided in the upper part of the furnace for this purpose. The base of the cupola is formed by a steel casting lined with concrete and sand to the level of the tapping hole; and an opening adapted to be closed by a metal plate is provided below the blast chamber for purposes of ignition. —W. E. F. P.

Electric furnaces. M. Ruthenburg, London. Eng. Pat. 28.126 of 1910: date of appl., May 30, 1911.

An electric furnace is described in which metals or ores may be melted under pressure in a closed chamber, the pressure being due to the gases evolved by the material under treatment. The current is conveyed to the furnace by rods passing through glands and stuffing-boxes in the lid of the furnace and ending in electrodes in a crucible containing the materials to be melted.—A. H. C.

Crucible-furnace. D. R. Steele, Curtis Bay, Md., Assignor to H. D. Harvey, Baltimore, Md. U.S. Pat. 1.029,090 June 11, 1912.

The furnace, which is provided with trunnions and mounted in bearings, comprises a cylindrical furnace-chamber into the lower end of which a passage-way opens tangentially. A main air pipe, swiveled at one end to the pivotal axis of the furnace, delivers a blast longitudinally through the passage-way, which acts as a combustion chamber. A branch air pipe and a fuel feed pipe lead to a burner, from which burning gases are directed transversely into the combustion chamber. The main and branch air pipes are both provided with valves, so that the flow of air through them can be independently controlled.—A. S.

Roasting furnace; Mechanical —— with one, or several superposed circular hearths. Erzröst Ges. m. b. H. Ger. Pats. 246,067 and 246,535, Oct. 18 and Nov. 19, 1910.

(1) Circular partitions project upwards from the hearth between the teeth or blades of the device for turning and moving forward the ore, in order to prevent its movement in a radial direction. Openings are provided in the partitions to allow of the gradual transference of the ore from the inlet to the discharge end of the furnace. (2) The annular channels or paths between the said partitions, are arranged in steps, at different levels.—A. S.

Zinc, Alloys of ——. T. A. Bayliss, Warwick, and B. G. Clark, London. Eng. Pat. 12,457, May 23, 1911.

A malleable alloy consists of zinc 99·1 to 99·9, aluminium 0·001 to 0·9, and lead 0·01 to 0·9 per cent. In practice a good mixture has been found to be zinc 99·85, aluminum 0·1, and lead 0·05 per cent. The zinc and lead are melted together in a closed pot or furnace, the temperature being maintained between 350° and 450° C. The aluminium is then added and when the alloy is ready for pouring, it is fluxed, skimmed and poured into moulds. When the temperature has fallen to about 150° to 200° C., the slabs of alloy are submitted to their first rolling. The sheets thus made are annealed at a temperature of 200° to 250° C. The rolling and annealing are repeated until sheets of the desired thickness, etc., are obtained.—T. St.

Zinc-smelting furnace; Recuperative ——. J. Zellweger, St. Louis, Mo. U.S. Pat. 1,028,417, June 4, 1912.

A retort furnace is provided with a number of regenerator sections, in each of which the hot gases issuing from a given part of the furnace chamber are caused to heat the air admitted to that part.—W. E. F. P.

Zinc: Process for the extraction of metallic —— contained in zinc dust (blue powder, etc.). C. V. Thierry. Fr. Pat. 439,143, Mar. 30, 1911.

The material is treated with a limited quantity of dilute hydrochloric acid to remove the oxidised products from the surfaces of the metallic particles, the cleaned metallic residue being subsequently compressed or fused.—W.E.F.P.

Zinc distillation furnace. Schlesische A.-G. für Bergbau und Zinkhüttenbetrieb. Ger. Pat. 246,155, July 29, 1910.

In order to remove the gases evolved whilst emptying the muffles or retorts, conduits are constructed in the masonry of the furnace, in such a manner that the gases from the lower muffles are drawn off below and the gases from the upper muffles are drawn off above. The conduits communicate with a common collecting main.—A. S.

Metals; Compound for hardening or preserving, or modifying the magnetic or electric properties of ——. J. Vigneault and J. A. H. Hebert, Montreal, Canada. Eng. Pat. 13,483, June 6, 1911.

Horse dung, hops, potatoes and salt are mixed with water, and the mixture, after standing for about 70 hours, is distilled. The distillate is sprayed on the metal to be treated, after the latter has assumed its shape but while yet in a semi-molten state. A preservative for metals, particularly against moisture, is made by boiling 20 lb. of tallow, 10 lb. of white lead, and 3 lb. of plumbago with half a pint of the above liquor.—T. St.

Tin and iron: Recovering —— from scrap. H. C. Woltereck, London. Eng. Pat. 21,762, Oct. 3, 1911.

Tin scrap is subjected to the action of steam, superheated to about 400° to 500° C., in a suitable vessel or retort, when the iron becomes superficially oxidised, whilst the tin coating peels off and melts and may be recovered from the bottom of the vessel.—A. H. C.

Tin-oxidising furnace. K. von Olszewski, Dresden. U.S. Pat. 1,028,595, June 4, 1912.

The fire chamber of the furnace is divided into two independent parts by a vertical partition, the two parts being stoked alternately. Between the melting pan and the chimney an air chamber is situated, the supply of air to which is so regulated during stoking that the furnace is maintained at a uniform temperature.—W. E. F. P.

Ores; Reduction of refractory ——. F. J. Tone, Niagara Falls, N.Y. U.S. Pat. 1,028,151, June 4, 1912.

A metallic or other (*e.g.*, silicon) compound subject to loss by volatilisation during reduction by ordinary means is mixed with a reducing agent and heated in an electric arc furnace to a temperature sufficient to effect volatilisation and reduction of the material, the gases within the reduction zone being maintained under a pressure which, without entirely preventing volatilisation of the compound, is sufficient to promote condensation of the reduced product and minimise loss.—W. E. F. P.

Pickling bath; Hot ——. F. F. Farnham, McKeesport, Pa., Assignor to American Sheet and Tin Plate Co., Pittsburgh, Pa. U.S. Pat. 1,029,351, June 11, 1912.

A cleaning and fluxing bath consisting of molten lead chloride and stannous chloride, the latter not exceeding 25 per cent. of the mixture.—A. S.

Aluminium or its alloys; Process of and composition for coating —— for soldering, etc. B. D. Avis, jun., Clarkaburg, W. Va. U.S. Pat. 1,029,522, June 11, 1912.

The surfaces to be soldered are treated with a mixture of stannous chloride, zinc chloride, and comminuted tin, and heated until a coating of tin is produced.—A. S.

Aluminium sheets; Process for making very thin ——. E. R. Lauber and R. V. Neher. First Addition, dated Dec. 27, 1911, to Fr. Pat. 434,400, Aug. 30, 1911 (this J., 1912, 288).

Instead of heating the foil for the purpose of removing the oil from the metal before pressing the sheets together for further lamination, the oil is eliminated by washing the metal with a solvent, the washing being accompanied by mechanical treatment if necessary.—W. E. F. P.

Aluminium; Process and apparatus for the manufacture of ——. N. Lecesne. Fr. Pat. 438,207, Mar. 8, 1911.

In a continuous process for the manufacture of aluminium, a mixture of alumina (bauxite, etc.) and carbon (coal, or solid or gaseous hydrocarbons) is maintained at a high temperature in a vertical column upon a bath of molten aluminium, sulphur being introduced at the zone of contact of the mixture with the molten metal. The aluminium sulphide thus formed in the column is decomposed by contact with the molten bath, the reduced metal mixing with the latter and the sulphur being recovered and utilised for the conversion of a further quantity of alumina into aluminium sulphide.—W. E. F. P.

Calcium: Process and means for refining ——. Soc. d'Électro-Chimie. Fr. Pat. 438,772, Mar. 22, 1911.

The crude metal is placed in a vessel of truncated conical shape which is then filled to the top with fused calcium chloride and inverted in a second, similar vessel also containing fused calcium chloride. By maintaining the charge in a molten condition for some time, the metal, out of contact with air, is subjected to the refining action of the calcium chloride. The charge is allowed to cool in the apparatus, and is then withdrawn, being prevented from adhering to the sides of the vessels by previously rubbing the latter with chalk or similar material.—W. E. F. P.

Metal; Special ——, for use in the manufacture of apparatus for chemical and other industries. O. Dellosse. Fr. Pat. 439,004, Jan. 15, 1912.

Claim is made for a product composed of ferrosilicon (94 parts of the 16 per cent. alloy), pure hæmatite cast iron (5 parts), ferro-manganese (1 part), and zinc chloride ($\frac{1}{2}$ part). In the preparation of the material—which is stated to be resistant to acids and alkalis as well as to high temperatures—the zinc chloride is stirred into the molten mixture of the remaining constituents.—W. E. F. P.

Alloys ; Pyrophoric metal ——. Elektrochemische Werke G.m.b.H. Fr. Pat. 439,058, Jan. 17, 1912. Under Int. Conv., Mar. 28, 1911.

The alloys are composed of one or more of the rare-earth metals and one or more of the metals zinc, cadmium, tin and lead, together with a metal such as magnesium, aluminium or calcium, the latter constituent being selected according to the character of the spark required. As examples, alloys containing (*a*) 60 per cent. of cerium and 40 of cadmium, and (*b*) 70 per cent. of cerium and 30 of zinc, tin or lead, are quoted.—W. E. F. P.

Metals non-volatile at the temperature of reduction ; Process for the direct production of —— from oxide or oxidised ores. P. Schmidt und Desgraz Ges. m.b.H. Ger. Pat. 246,183, May 21, 1911.

The process is for the production of the metals by means of solid carbon and reducing gases without fusing or slagging the gangue. The ore is mixed with a carbonaceous substance and briquetted, the briquettes are preheated by waste gases to a temperature at which reduction just begins, and then the reduction is completed by the action of a current of reducing gases, but without the direct action of a flame. The reduced metal is cooled in an atmosphere of reducing gases, and may then be treated in a Martin furnace in the usual way. The furnace used is divided into three portions, the middle portion, forming the reduction chamber, being in the form of an open muffle surrounded by a heating chamber heated by gas. The waste gases from the heating chamber and from the reduction chamber serve to preheat the briquettes in the first compartment of the furnace. The third compartment of the furnace serves as a cooling chamber, through which a current of reducing gases is drawn continuously.—A. S.

Copper ; Production of chemically pure —— by nascent hydrogen. H. Stübe. Ger. Pat. 246,561, June 28, 1910.

Acid copper liquors are treated with metals, in the form of the finest powder, which produce hydrogen when treated with acids. The process is carried out in a tank or vat provided with cocks at different heights for running off the spent liquor, whilst at the apex of the conical bottom is a valve through which the precipitated copper is discharged.—A. S.

Iron and steel ; Rust-proofing ——. G. W. Johnson, London. From Bontempi Rust Proofing Co., New York. Eng. Pat. 19,868, Sept. 6, 1911.

See Fr. Pat. 434,780 of 1911 ; this J., 1912, 341.—T. F. B.

Iron and the like ; Process of coating —— with other metals. C. Penner, Bielefeld, Germany. Eng. Pat. 23,716, Oct. 26, 1911.

See Fr. Pat. 435,445 of 1911 ; this J., 1912, 394.—T. F. B.

Steel castings ; Method of manufacturing electric ——. G. Fischer and B. Schudel, Schaffhausen, Switzerland. Eng. Pat. 27,377, Dec. 6, 1911. Under Int. Conv., Dec. 7, 1910.

See Fr. Pat. 436,937 of 1911 ; this J., 1912, 496.—T. F. B.

Cementation furnaces. Soc. Anon. Italiana Gio. Ansaldo, Armstrong and Co., Genoa, Italy. Eng. Pat. 24,635, Nov. 6, 1911. Under Int. Conv., Aug. 30, 1911.

See Fr. Pat. 435,970 of 1911 ; this J., 1912, 393.—T. F. B

Metals from their ores ; Processes and apparatus for extracting ——. H. S. Mackay, Riverside, Cal., U.S.A. Eng. Pat. 13,499, June 6, 1911.

See Fr. Pats. 437,481 and 437,841 of 1911 ; this J., 1912, 542.—T. F. B.

Gold and silver ; Process for the recovery of —— from antimonial, arsenical, and other gold bearing ores. J. Gitsham, Moonee Ponds, Victoria. Eng. Pat. 13,621, June 7, 1911.

See Fr. Pat. 430,852 of 1911 ; this J., 1911, 1392.—T. F. B.

Roasting ore ; Process of —— and apparatus therefor. R. Scherfenberg, Berlin. Eng. Pat. 25,443, Nov. 15, 1911.

See Fr. Pat. 437,565 of 1911 ; this J., 1912, 543.—T. F. B.

Metals and alloys ; Process for the production of porous ——. H. I. Hannover, Copenhagen. Eng. Pat. 25,702, Nov. 17, 1911.

See Fr. Pat. 437,816 of 1911 ; this J., 1912, 543.—T. F. B.

Magnesium and alloys thereof ; Melting and casting ——. B. Hoffmann and R. Suchy, Griesheim, Assignors to Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. U.S. Pat. 1,028,216, June 4, 1912.

See Fr. Pat. 416,534 of 1910 ; this J., 1910, 1460.—T. F. B.

Metals [of the vanadium group] ; Process of extracting ——. A. H. Perret, Paris. U.S. Pat. 1,028,774, June 4, 1912.

See Fr. Pat. 412,641 of 1910 ; this J., 1910, 1016.—T. F. B.

Electroplating apparatus. M. Reid, Cleveland, Ohio. U.S. Pat. 1,028,786, June 4, 1912.

See Fr. Pat. 424,126 of 1910 ; this J., 1911, 811.—T. F. B.

Metals ; Electrolytic deposition of ——. P. Marino, London. U.S. Pat. 1,028,895, June 11, 1912.

See Eng. Pat. 22,141 of 1911 ; this J., 1912, 394.—T. F. B.

Agglomerating process [for zinc-furnace residues]. A. Folliet, Brussels. U.S. Pat. 1,029,182, June 11, 1912.

See Fr. Pat. 428,570 of 1911 ; this J., 1911, 1167.—T. F. B.

Metals ; Preparation for regenerating ——. B. Türke, Munich, Germany. U.S. Pat. 1,029,327, June 11, 1912.

See Eng. Pat. 1703 of 1911 ; this J., 1911, 1262.—T. F. B.

Uniting ceramic materials to metals. Eng. Pat. 23,730. *See* VIII.

XI.—ELECTRO-CHEMISTRY.

Electrical conductivity of cement raw materials. Dittler and Herold. *See* IX.

Patents.

Battery ; Galvanic ——. A. Heil, Frankfort on Maine, Germany. U.S. Pat. 1,028,354, June 4, 1912.

The dry battery cell is filled with an electrolytic paste, containing no mercury compound when the battery is first made. It has a zinc electrode and also a negative electrode, and a depolarising mass for the latter moistened with a mixture of mercuric oxide and dissolved salts of the electrolyte. The parts are so combined that the mercury compound is slowly dissolved by the electrolytic paste, and is diffused very gradually through the paste into amalgamating contact with the zinc during the operation of the cell.—B. N.

Electrodes ; Apparatus for graphitising ——. *Graphitising electrodes.* P. L. T. Héroult, La Praz, France, Assignor to Electrode Company of America, Niagara Falls, N.Y. U.S. Pats. 1,029,121 and 1,029,122, June 11, 1912.

(1) The furnace consists of a pair of chambers disposed side by side, in each of which a number of electrodes are

arranged end to end. At one end of each chamber is a stationary terminal block and at the other end a movable block. The blocks at either end are spaced apart a greater distance than the length of a single electrode and serve to make electrical connections with the endmost electrodes, so that a current can be passed endwise through the column of electrodes. While the current is passing, the movable blocks are pressed forwards. (2) Electrodes are arranged end to end, with an intervening resistant packing affording imperfect contact, and are subjected to longitudinal pressure, while a current is being passed, whereby the ends in contact are graphitised. In this way an electrode is obtained made up of sections joined together, the joined ends being graphitised, whilst the other parts are not graphitised to the same extent.—A. S.

Electro-osmotic processes; Mode of realisation of ——. Ges. für Elektro-Osmose m. b. H. Fr. Pat. 438,183, Dec. 22, 1911. Under Int. Conv., Sept. 28, 1911.

The electro-osmotic treatment is combined with a settling process, by treating the liquid containing the material in suspension at first by the latter process and afterwards by the former. The electro-osmotic treatment may be followed anew by a settling process, the liquid containing the suspended material being treated in a closed cycle, and passed through one perforated electrode to the second, being maintained in all cases in a high degree of concentration between the electrodes.—B. N.

Furnace; Electric resistance ——. L. Ubbelohde. Fr. Pat. 438,642, Jan. 4, 1912.

The furnace is provided with resistance wires of oxidisable metal, which are surrounded by a porous insulator made from asbestos, kaolin, argillaceous earth and water-glass, the mixture being made plastic by addition of a small quantity of caustic soda. This layer is covered by a layer of carbon, which by its reducing action protects the metal from oxidation. The heating tube, and the surrounding wires and insulating body, are protected against the external air by rings of asbestos, which are applied against the end walls of the furnace. In an alternative form the heating tube with the resistance wire is surrounded, leaving a little play, either by a strong clay tube surrounded by carbon, or by a carbon tube fixed to the walls closing the extremities of the furnace, and rendered tight to the outside air. The resistance wires are made of metallic alloys, such as steel or nickel, which possess a high temperature coefficient of electric conductivity.—B. N.

Arcs employed in electric furnaces; Rendering stable the ——. Le Nitrogène S.A. Fr. Pat. 438,783, Jan. 8, 1912. Under Int. Conv., Jan. 10, 1911.

A reaction bobbin, devoid of iron, is employed, *i.e.* a winding of copper without an iron core. This self-induction bobbin may be divided into two or into several bobbins, arranged in series, parallel, or parallel series, and disposed in series with one or several arcs, and by the form given to it may satisfy the known conditions giving the maximum of self-induction for the minimum weight of copper. The bobbins may be cooled by a current of air, or by cooled oil.—B. N.

Diaphragm for the electrolysis of metallic salt solutions and other applications. N. V. Hybinette. Fr. Pat. 438,846, Jan. 10, 1912. Under Int. Conv., Jan. 12, 1911.

The diaphragm comprises a layer of fibrous filtering material supported by a skeleton framework, *e.g.*, within appropriate screens of lead or material covered with lead. —B. N.

Storage battery electrode. W. Morrison, Des Moines, Iowa, U.S.A. Eng. Pat. 23,261, Oct. 21, 1911.

See U.S. Pats. 1,008,852 and 1,008,853 of 1911; this J., 1911, 1459.—T. F. B.

Electric arcs, Production of continuous —— and apparatus therefor. F. H. A. Wielgolaski and O. Schonherr, Christiania, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,028,516, June 4, 1912.

See Fr. Pat. 413,421 of 1910; this J., 1910, 1117.—T. F. B.

Neutralisation of alkali in the electrolytic manufacture of chlorates and perchlorates. Addition to Fr. Pat. 437,831. *See* VII.

Infusible insulating varnish for electric construction, the covering of wires, etc. Addition to Fr. Pat. 418,347. *See* XIII.

XII.—FATS; OILS; WAXES.

Beeswax and carnauba wax; Analysis of ——. *Determination of hydrocarbons.* A. Leys. J. Pharm. Chim., 1912, 5, 577—588.

Ten grms. of the wax are boiled for 20 minutes with 25 c.c. of alcoholic potassium hydroxide (45 grms. per litre of absolute alcohol) and 50 c.c. of crystallisable benzene, in a flask with a tube and tap at the side, so that it can also serve as a separating funnel. An addition of 50 c.c. of hot water is then made, and the heating continued for about 10 minutes under a reflux condenser, after which the contents of the flask are allowed to separate into layers, and the boiling lower alcoholic soap solution is drawn off. The benzene is heated with 50 c.c. of water beneath a reflux condenser, the water drawn off as before, and the benzene containing a mixture of alcohols and hydrocarbons is evaporated in a basin. The residue is now treated with 100 c.c. of hot amyl alcohol, added in several portions, each of which is transferred to a flask, and the whole is heated on an asbestos plate whilst 100 c.c. of concentrated hydrochloric acid are added with continual stirring until the mixture has become completely fluid. This mixture of acid and amyl alcohol effects a separation of wax alcohols and hydrocarbons, on cooling. The hard top layer which separates on cooling, is dissolved in a mixture of 25 c.c. of amyl alcohol and hydrochloric acid and the solution again cooled, the cake of hydrocarbons then being removed, pressed between filter paper, heated on the water-bath in a tared basin, and weighed. The alcohols remaining in the lower layer are heated with a large excess of water and cooled, the lower layer of diluted hydrochloric acid is drawn off, the amyl alcohol solution of the wax alcohols is evaporated on the water-bath, the residue taken up with benzene, the solution evaporated, and the final residue weighed. Two samples of pure beeswax thus examined yielded 10·44 and 13·03 per cent. of hydrocarbons and 39·21 and 39·60 per cent. of alcohols respectively, whilst a sample of carnauba wax gave 49·22 per cent. of alcohols, but no hydrocarbons. Further information may be obtained by determining the liquid fatty acids, separated by treatment of the lead salts with benzene. In the case of the two samples of beeswax mentioned, the amounts, calculated as oleic acid, were 8·40 and 8·52 per cent. respectively.—C. A. M.

Acid sodium palmitates; The crystallisation of ——. A. Reychler. Bull. Soc. Chim. Belg., 1912, 26, 193—198.

In extension of the work of Kraft (this J., 1896, 206) the author has found that in the case of aqueous solutions of sodium palmitate, the temperature at which crystallisation begins becomes progressively lower with decreasing concentration. Thus in solutions of $N/20$ to $N/40$ strength, crystals become visible at 47°—45° C. and there is a free separation at 43°—42° C. Solutions of $N/50$ strength become cloudy at 45° C. and exhibit crystals at 42·5° C. which separate readily at 40·5° C. At strengths between $N/50$ and $N/250$, the solutions become more or less opalescent at high temperatures, becoming iridescent at about 50° C. and forming extremely small crystals between 40° and 36° C. Solutions of N/400 strength are both opalescent and iridescent and tend to form granulations which separate as a crystalline deposit. The iridescence of solutions is destroyed by raising their temperature to about 50° C. On determining the electrical conductivity of the above solutions it was found that the temperature at which crystallisation had already been observed was indicated by a marked fall in the conductivity. Curves constructed from the conductivities found at different temperatures showed a marked confluence at the lower temperatures which suggests that after crystallisation has taken place the mother liquors are of similar composition.—J. A.

Detection of heavy petroleum in paints and vegetable oils. Pollard. *See* XIII.

Patents.

Wool washings ; Direct utilisation of —— in the manufacture of soap. E. Schott. Fr. Pat. 438,243. Dec. 26, 1911.

The washings from wool, with or without previous concentration, are mixed with alkali, and fats and fatty acids in suitable proportions to effect as complete saponification as possible, and the mixture is saponified and treated in the usual way to obtain soft or hard soaps. The lyes from the latter may be used for washing and degreasing wool. —C. A. M.

[Hydr]oxy-fatty acids and their glycerides ; Manufacture of ——. K. E. Markel, London, and J. Crosfield and Sons, Ltd., Warrington. Eng. Pat. 13,519, June 6, 1911.

See Fr. Pat. 433,294 of 1911 ; this J., 1912, 139.—T. F. B.

Lime soaps and other soaps insoluble in water ; Process of deglycerinising ——. P. Krebitz, Munich, Germany, and F. Vogt, Oderberg, Austro-Silesia. Eng. Pat. 27,297, Dec. 5, 1911. Under Int. Conv., Dec. 13, 1910.

See Fr. Pat. 437,414 of 1911 ; this J., 1912, 546.—T. F. B.

Soap manufacture ; Process for directly utilising wool washing waters for ——. E. Schott, Trieste. Eng. Pat. 29,297, Dec. 29, 1911.

See Fr. Pat. 438,243 of 1911 ; preceding.—T. F. B.

Producing mixtures, emulsions, and dispersions of substances. Eng. Pat. 12,037. *See* I.

Solutions of mercury salts in oils and fats. Ger. Pat. 246,507. *See* XX.

XIII.—PAINTS ; PIGMENTS ; VARNISHES ; RESINS.

Lithopone ; Analysis of ——. W. L. Austin and C. A. Keane. Analyst, 1912, 37, 238—242.

Various methods are mentioned for the analysis of lithopone, and the following process was adopted :—5·0 grms. of the finely powdered sample were treated with concentrated hydrochloric acid and a little potassium chlorate, evaporated to a small bulk on the water-bath, hot water added and the barium sulphate filtered off, washed, and weighed. The filtrate was made up to 250 c.c. and aliquot portions taken for the estimation of the total zinc by Voigt's method. The potassium ferrocyanide (46·0 grms. of the crystallized salt per litre) was standardised by a solution of zinc chloride containing 12·4476 grms. of pure zinc oxide per litre (1 c.c.=0·01 grm. of zinc). For the estimation 50 c.c. of the filtrate, 10 c.c. of a solution of tartaric acid (200 grms. per litre), and 10 c.c. of a solution of ferric chloride (60 grms. per litre) were taken and diluted to about 200 c.c., made just alkaline with ammonia and titrated, the completion of the reaction being determined by adding a drop of the solution to dilute acetic acid (1:3) on a pitted porcelain plate until a permanent blue colour was produced. For the estimation of sulphide sulphur, 0·5 grm. of the sample was oxidised by bromine after the addition of water, hydrochloric acid added, the residual barium sulphate filtered off, and the sulphuric acid in the filtrate precipitated by barium chloride. By calculating the sulphur thus found to zinc sulphide and subtracting its equivalent of zinc from the total zinc found volumetrically, the content of zinc other than sulphide was obtained by difference. The following results were obtained with three different samples.

	I.	II.	III.
Barium sulphate	64·36	67·59	72·80
Zinc sulphide	30·98	27·82	24·14
Zinc oxide	0·55	1·82	0·88
Lime, ferric oxide, barium carbonate, moisture	4·11	2·77	2·18

The above results were checked by other direct methods and the reliability of the indirect estimation confirmed. —A. H. C.

Petroleum ; Detection of heavy —— in paints and vegetable oils. W. B. Pollard. Analyst, 1912, 37, 247—249.

The following qualitative method is given for the detection of heavy petroleum in paints and saponifiable oils :—About 10 grms. of caustic soda are just fused in a nickel crucible of from 60 to 100 c.c. capacity, then about 5 c.c. of the oil or paint are quickly poured in, the contents well stirred with an iron rod, and when cool, about 50 c.c. of petroleum ether added and well stirred. The soap formed settles to the bottom of the crucible and an emulsion is never produced. The petroleum ether is decanted through a filter paper into a test-tube and evaporated, the vapour being conducted away by means of a cork and long tube fitting the test-tube. The residue is now further examined by the addition of about 3 c.c. of nitric acid, when any residue beyond a mere trace will be petroleum. The presence of rosin oil would be shown by the large amount of non-saponifiable matter which is however oxidised by the boiling nitric acid. If any paint is found to contain petroleum by this method, it must be absolutely condemned, as its drying power can never be satisfactory. Stearine candles can also be examined for petroleum by this method.—A. H. C.

Patents.

Ultramarine ; Multiple furnace for ——. A. E. Pain and R. Daudy. Fr. Pat. 438,403, March 15, 1911.

The furnace is constructed with a series of arches to receive the trays, etc., used in manufacturing ultramarine by oxidation in thin layers (see following abstract). Movable shelves, arranged in tiers, are placed within the arches.—C. A. M.

Ultramarine ; Methods of manufacturing ——. R. Daudy. Fr. Pat. 439,144, March 30, 1911.

The raw material is heated in thin layers on perforated trays, boxes, etc., made of asbestos or other non-combustible material. Or a bed may be made from a material by the combustion of which a porous layer of charcoal is left. The receptacles for the raw material may be arranged in layers in a containing vessel with perforated walls, and may be covered by a layer of asbestos or other porous material.—C. A. M.

Coloured lakes [for colouring foods, etc.] ; Manufacture of —— from vegetable substances containing dyestuffs in the form of glucosides. E. Hagen. Fr. Pat. 438,563, Dec. 30, 1911.

The glucoside is hydrolysed by means of a suitable enzyme, such as that existing in the seed capsules of Persian berries, or by other suitable agents, and the liberated dyestuff is converted into a lake by treatment with alkali- or metallic salts. The formation of the lake may also be effected during the hydrolysis. The coloured lakes thus obtained are free from the bitter and injurious principles which ordinarily prevent them from being used in food products, and are also stable in the presence of organic acids (*e.g.* citric acid, malic acid, etc.). —C. A. M.

Copal from waste gum copal; Extraction of ——. T. C. Tye, Singapore. Eng. Pat. 27,579, Dec. 8, 1911.

Waste gum copal is soaked in alcohol for about 15 days and the clear alcoholic extract is evaporated in a steam-jacketed or hot water chamber, connected with a condenser for the recovery of the alcohol.—G. W. McD.

Varnish; Infusible insulating —— *for electric construction, the covering of wires, conducting cables and other applications.* Debauge et Cie. First Addition, dated Dec. 23, 1911, to Fr. Pat. 418,347, Sept. 24, 1909 (this J., 1911, 96).

Cellulose acetate and hexachlorethane are associated in approximately equal parts for the formation of a plastic material, the absorption of the hexachlorethane by the cellulose acetate being produced by means of a common solvent, such as tetrachlorethane. The material may be used for covering electric wires, the manufacture of artificial silk, sheets, plates, and cinematograph films. Other solvents may be used, in addition to tetrachlorethane, such as alcohol, acetone, or a mixture of these.—B. N.

Enamel; Flexible painting —— *and method of applying it.* H. Gaillard. Fr. Pat. 438,967, Jan. 13, 1912.

Powdered white or coloured glass is incorporated with white or coloured paints or varnishes to form an enamel for painting. The glass may be mixed with the paint beforehand, or may be applied to the surface after painting, and the article heated in a furnace.—C. A. M.

Colour-lake and process of manufacturing same. E. Ulrichs, Elberfeld, Assignor to Wülfing, Dahl, und Co., A.-G., Barmen, Germany. U.S. Pat. 1,208,239, June 4, 1912.

See Eng. Pat. 18,379 of 1911; this J., 1912, 140.—T.F.B.

Monoazo dyestuffs and colour lakes therefrom. Eng. Pat. 6379. *See* IV.

[*Azo*] *colouring matter suitable for the production of lakes.* Eng. Pat. 23,791. *See* IV.

Manufacture of disazo dyes [*and lakes therefrom*]. Fr. Pat. 439,005. *See* IV.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Rubber; Chemistry of ——. *IV. Influence of low temperatures on the velocity of hot vulcanisation, and after-vulcanisation.* D. Spence. Z. Chem. Ind. Kolloide, 1912, **10**, 299—306.

Mixtures of raw rubber and sulphur and similar mixtures which had been respectively under-vulcanised, normally vulcanised, and over-vulcanised were kept for a long time at the ordinary temperature in the dark and also exposed to light, and at different temperatures in a thermostat, and the proportions of combined sulphur and total sulphur were determined at intervals. The results show that with properly proportioned mixtures, no vulcanisation takes place at temperatures up to 40° C., provided autoxidation and decomposition be prevented. The form of the curves representing the velocity of vulcanisation at different temperatures indicates that in the neighbourhood of 60° C. there is a "reaction-temperature," above which vulcanisation proceeds rapidly, whilst at lower temperatures practically no vulcanisation occurs. The results of some of the experiments show also that the widely held view that it is impossible to carry the vulcanisation of rubber mixing to completion, *i.e.*, till no free sulphur is left, is erroneous. In two different cases, after nine days at 140° C., the figures for total sulphur and combined sulphur proved to be practically identical. —A. S.

Sulphur in vulcanised rubber; Comparison of some methods for the determination of ——, *with special reference to electrolytic oxidation.* D. Spence and J. Young. J. Ind. Eng. Chem., 1912, **4**, 413—417.

The authors find that whilst accurate results can be obtained by the methods of Carius and Henriques, and modifications of these methods, a simpler and more rapid process is much to be desired. The method of electrolytic oxidation suggested by Gasparini (this J., 1904, 952; 1908, 340), if used without the complicated apparatus described by him, is stated to be not only the simplest but also the most reliable method. As used by the authors, 0·5 grm. (or more in the case of samples of very low sulphur content) of the rubber is covered with nitric acid of sp. gr. 1·4 in a Jena glass beaker, 100 mm. high and 55 mm. diam. The beaker is covered by a clock glass and warmed very gently on the steam bath until the reaction starts, when it is removed and after 2—3 minutes, when the solution of the rubber is complete, 30 c.c. of fuming nitric acid of sp. gr. 1·5 are added, the acid being used also to wash the clock glass. A current of 3 ampères is now passed through the solution between electrodes of platinum foil of 1 sq. in. area, the potential difference between the electrodes being 6—8 volts. After 2—3 hours in the case of soft-cured rubbers, or ¾—1 hour for hard rubbers, the electrodes are removed and washed with water, and about 1 grm. of sodium carbonate is added to the solution, which is then evaporated to dryness on the steam-bath. The residue is evaporated with hydrochloric acid to destroy nitrates, and the sulphur determined as barium sulphate. The authors generally carry out six determinations at a time, in a special stand. The foil electrodes are riveted to platinum wires, the free ends of which are fused into glass tubes filled with mercury, which slide in grooves in a cross-bar on the stand. Connections between the beakers are made by bridges of copper wire dipping into the mercury in the tubes. Preliminary experiments have indicated that for soft-cured rubbers, the barium chromate volumetric process (this J., 1904, 131) may be used for determining the sulphur after the electrolytic oxidation, provided the quantity of sulphur present does not vary within wide limits in different samples.—A. S.

Patents.

Vulcanized caoutchouc; Production of a product similar to ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 2312, Jan. 29, 1912. Under Int. Conv., Aug. 7, 1911.

The rubber-like product obtained by the action of basic compounds on the polymerisation product of β-γ-dimethylbutadiene (Kondakow, J. prakt. Chem., 64, 109—110; see also Eng. Pat. 2313 of 1912; this J., 1912, 547) is vulcanised by any process suitable for the vulcanisation of natural caoutchouc, as, for example, by mixing 20 parts of the product with 2 parts of sulphur, and heating for about 1 hour to 135° C. An elastic sheet of good firmness and tenacity is obtained.—E. W. L.

Rubber; Process for improving the quality of ——. G. Eichelbaum. Fr. Pat. 438,778, Jan. 8, 1912. Under Int. Conv., Jan. 11, 1911.

The deterioration of rubber and analogous substances caused by oxidation is prevented by adding to the latex, before or during coagulation, oxygenated reducing compounds of sulphur or their salts, especially hydrosulphites, sulphoxylates or their aldehydic or ketonic derivatives. Claim is also made for the new products of rubber, etc., thus obtained, and their industrial application.—C. A. M.

Lining of pipes and the like [for sea-water, etc.]. Eng. Pat. 16,111. *See* I.

Producing divinyl [erythrene]. U.S. Pat. 1,028,938. *See* XX.

XV.—LEATHER; BONE; HORN; GLUE.

Hides and skins; Preservation, cure and disinfection of ——. Collegium. Supplement. June 1912.

The report of the International Commission, under the chairmanship of A. Seymour-Jones, appointed by the International Association of Leather Trades Chemists at the Brussels Conference in 1908. The most effective cure consists in washing the hides well and salting heavily in piles or treating with sodium sulphate. No objection is raised to arsenic, naphthalene or tobacco juice as insecticides. The denaturising of salt used for curing has always been a source of difficulty to the tanner. Romana and Baldracco of Turin have found that if the salt is pure, the addition of 10 per cent. of borax and 1 per cent. of naphthalene effects a good denaturisation. A mixture of potassium bichromate, 0·017 per cent.: sodium sulphate, 10, and naphthalene 1 per cent. also gave a very satisfactory result and no discolouration. The methods suggested by the U.S. Government for the disinfection of hides and skins (this J., 1907, 978; 1908, 512; 1910, 1399) are disapproved of as being impracticable and ineffective. Yocum's mercuric chloride-salt process (this J., 1910, 1399) is considered probably effective when applied to wet hides but doubtful when dry hides, which are the most dangerous, are to be disinfected. The formic mercury process devised by Seymour-Jones (see this J., 1908, 909; 1912, 34) has been tested and found thoroughly effective as a sterilising treatment and to have no injurious effect on the hide or skin. It is suggested that the process be carried out at the foreign ports of shipment so that infection of ships could be prevented. Becker has found that a solution containing 0·05 per cent. of mustard oil is efficacious in killing the anthrax spore. The process of Schattenfroh and Kohnstein, using 2 per cent. hydrochloric acid and 10 per cent. salt (this J., 1911, 969, 1127) has not been found effective by other investigators. The cause of salt stains has been investigated by Abt. The stains which appear on the flesh side of raw salted skins have been found to occur only when sulphates are present in the salt used. Calcium sulphate has been found in the stained portion. Stained skins and leather contain calcium phosphate in the damaged portions, and sulphuric acid, probably as ammonium sulphate, in the surrounding parts. The calcium in stained skins is due to crystals of calcium sulphate and the phosphoric acid is due to the nucleic acid of the nuclei of epidermal cells. Any skin or salt contains sufficient iron to cause stains, but the iron is always in an insoluble form. The reactions, however, which take place around the crystals of calcium sulphate bring some iron into solution, thus causing stains. Preservation by drying is condemned, as is also the use of inorganic acids in pickling on account of injury to the pelt and the possibility of leaving free mineral acid in the tanned leather. All forms of earth cure are unsatisfactory and injurious to the skin and afford opportunities for fraud.—D. J. L.

Tannin. K. Feist. Ber., 1912, **45**, 1493—1495.

In connection with the recent work of Fischer and Freudenberg (this J., 1912, 503), the author points out that he showed in 1908, that Turkish gall-nuts contain a crystalline compound (glucogallic acid), which on hydrolysis yields one molecule each of gallic acid and glucose. The same compound was also isolated from commercial tannins of similar origin. The glucose-content of tannin is, however, not entirely due to glucogallic acid, for tannin which has been freed from the latter compound as far as possible, by extraction, still yields glucose on hydrolysis. In the hydrolysis of tannin the chief quantity of gallic acid is produced readily, but a smaller portion is obtained only with difficulty; possibly glucogallic acid is present in the tannin molecule, together with other molecules of gallic acid in ester-like combination. The failure of Nierenstein (Chem.-Zeit., 1909, 126) to obtain glucose on hydrolysis of tannin was probably due to the method employed, glucose being decomposed on boiling with alkaline solutions. The methods of purifying tannin used by Fischer and Freudenberg (*loc. cit.*) would not remove the whole of the glucogallic acid.—A. S.

Tannin; Constitution of ——. R. J. Manning and M. Nierenstein. Ber., 1912, **45**, 1546—1551.

Fischer and Freudenberg (this J., 1912, 503) found that carefully purified specimens of Kahlbaum's tannin and of Merck's tannin, yielded 7—8 per cent. of glucose on hydrolysis, and concluded that tannin is a pentadigalloylglucose. Manning (this J., 1910, 1261), using a specimen of Schering's tannin purified by Walden's method (this J., 1898, 190; 1899, 181), prepared therefrom a pentaethyl ester of pentagalloylglucoside, and concluded that tannin is a pentagalloylglucoside. The authors now confirm a previous statement of Nierenstein (Chem.-Zeit., 1909, **34**, 126) that *Tanninum levissimum purissimum* (Schering) yields no glucose on hydrolysis with alkali and consider that the general glucoside-character of tannin is not established. Experiments are described showing the diminution of the optical activity of tannin when its aqueous solution is boiled in a current of hydrogen. This is considered to be due to the transformation of a polydigalloyl-leucodigallic anhydride into the corresponding acid of weaker optical activity. In accord with this view is the fact that a diminution of optical activity is also observed on treating tannin solution with a drop of pyridine, for Nierenstein (Annalen, 1912, **388**, 252) has shown that polydigalloyl-leucodigallic anhydride is converted into the acid by pyridine.—A. S.

Patents.

Quebracho extracts; Manufacture of ——. A. Redlich and G. Deutsch, Vienna. Eng. Pat. 7698, Mar. 29, 1912. Addition to Eng. Pat. 7389 of 1912.

The method described in the main patent is now applied to quebracho liquors that have been subjected to a preliminary treatment for the purpose of clarification or in order to convert the insoluble constituents into a soluble form, or to tanning substances or to the mud precipitated during the clarification of such liquors, if desirable after addition of water for the purpose of obtaining extracts that are soluble to clear solutions at the particular temperatures required for tanning. The method consists in submitting the liquors to powerful centrifugal action.
—E. W. L.

Leather; Process for the production of a substitute for ——. J. F. Lipman, East Ham, Essex. Eng. Pat. 12,991, May 30, 1911.

A mixture of 50 parts of powdered leather waste, 25 of carbon bisulphide, 12½ of potassium permanganate, and 5 of lime, is heated "to about boiling point" and is kept stirred or agitated. The liquefied mass is then poured into suitable moulds and dried by artificial heat. When sufficiently dry it is pressed, rolled, smoothed and polished or otherwise treated. To cheapen the mixture, materials such as cocoa-nut fibre, papier-maché, etc., may be added.—E. W. L.

Bones, materials suitable for glue manufacture, and like substances: Process for the extraction of fat from ——. Conway, Baron von Girsewald, Halensee, Germany. Eng. Pat. 13,094, May 31, 1911. Under Int. Conv., Jan. 19, 1911.

See Fr. Pat. 430,015 of 1911; this J., 1911, 1324.—T. F. B.

XVI.—SOILS ; FERTILISERS.

Patents.

Soil or rocks ; Process for rendering —— impermeable or waterproof. A. Abraham, Liège, Belgium. Eng. Pat. 10,478, May 2, 1912.

Injections are made of two solutions (*e.g.*, of alkaline-earth, earthy, or heavy metals, on the one hand, and of soluble hydroxides, aluminates, carbonates, polysilicates, or fluosilicates on the other), such as will form, in the pores of the soil, an insoluble precipitate of large specific volume; special attention is drawn to the use of soluble polysilicates of the type, $M_2O,nSiO_2$.—F. Sodn.

Fertiliser ; Process for preparing a chemical ——. L. R. Coates. First Addition, dated Jan. 9, 1912, to Fr. Pat. 421,049, Oct. 4, 1910. (See this J., 1911, 438, and U.S. Pat. 971,830 of 1910, this J., 1910, 1262.)

The proportions of calcium carbonate and phosphate in the material to be burnt, and the temperature of calcination, are so chosen, that on slaking the product, both the lime and the calcium phosphate (other than the fossil phosphate) are converted into an impalpable powder. This powder and the ground fossil phosphate are mixed in such proportions (determined by analysis) as to yield a fertiliser of a certain standard composition.—L. E.

Fertilisers and processes of manufacturing the same. L. R. Coates, Baltimore, Md., U.S.A. Eng. Pat. 26,845, Nov. 30, 1911.

See Fr. Pat. 437,411 of 1911 ; this J., 1912, 549.—T. F. B.

Insecticides, sheep dips, vermifuges, and the like. Eng. Pat. 10,215. *See* XIXb.

Making a preparation of lime and copper salt for application in the form of powder to the vine. Fr. Pat. 438,470. *See* XIXb.

XVII.—SUGARS ; STARCHES ; GUMS.

Carbohydrates ; Photochemical synthesis of ——, under the influence of ultraviolet rays. J. Stoklasa, J. Sebor and W. Zdobnický. Biochem. Zeits., 1912, 41, 333—372. (See also this J., 1911, 300.)

When a solution of potassium hydroxide containing formaldehyde is exposed, in presence of air or oxygen, to rays from a quartz mercury vapour lamp, the formaldehyde undergoes oxidation, first to formic acid and then to carbon dioxide and water. These reactions are probably the reverse of those which occur in the assimilation of carbon dioxide in plants. Experiments described show also that by the influence of ultraviolet rays on carbon dioxide and potassium hydroxide (*i.e.*, on potassium bicarbonate), in presence of ferrous sulphate, sugars are formed of which the osazones melt at 204°—205° C. In one experiment a rapid current of carbon dioxide was passed for 8 hours through 300 c.c. of a 7 per cent. solution of potassium hydroxide to which was added, drop by drop throughout the experiment, 80 c.c. of a 15 per cent. solution of ferrous sulphate. The liquid was exposed all the time to rays from a mercury vapour lamp, and afterwards there was isolated 0·51 grm. of organic solid matter, of which the cupric-reducing power corresponded with 0·291 grm. of dextrose. No formation of formaldehyde was found to arise from the action of ultraviolet rays on mixtures of hydrogen peroxide with carbon dioxide or potassium bicarbonate. The carbohydrate produced from potassium bicarbonate by photo-synthesis, is optically inactive, not fermentable by *S. cerevisœ*, and contains a mixture of hexoses or their osones. The author supposes that in the synthesis of carbohydrates by plants, the carbon dioxide absorbed by the chlorophyll-containing cells, combines with potassium carbonate in the cells, and the bicarbonate thus formed is decomposed, under the influence of light into normal carbonate, formic acid and oxygen. The formic acid is further reduced to formaldehyde which, in presence of potash, condenses to carbohydrates.—J. H. L.

Polarimetric determination of starch. Lintner. *See* XVIII.

Saccharification of starch paste by hydrogen peroxide alone or in presence of vegetable and animal diastases. Gerber. *See* XVIII.

Patents,

Sugar ; Process for the refinement of ——. H. Wiese, Wallaceburg, Ontario. Eng. Pat. 12,642, May 25, 1911.

A solution of the raw sugar, of about 18—20° Bé., is heated above 70° C. and treated with lime at this temperature. The solution is then carbonated until neutral and afterwards re-heated above 80° C. and filtered. To secure complete decolourisation, the liquid may be treated a second time with lime, and carbonated until it possesses an alkalinity of 0·02 per cent. ; it is then heated to 90° C., filtered, and, if necessary, afterwards treated with an aqueous solution of sulphurous acid until neutral. The process is applicable both to cane and to beet sugars.
—J. H. L.

Sugar process. R. E. Pospisil, Menominee, Mich. U.S. Pat. 1,028,272, June 4, 1912.

For the production of white granulated sugar from waste molasses, the latter mixed with syrup from a later operation, is concentrated to 92°—93° Brix and crystallised. The crystals are dissolved in water and the solution, of about 33° Bé., is mixed with green syrup from a later operation, boiled down, and crystallised. The syrup drained from the crystals serves to raise the purity of the original molasses (see above), whilst the crystals are dissolved in water so as to form a solution of about 30° Bé. which is bleached, filtered, and boiled down together with wash syrup from the white sugar finally obtained. After crystallisation of the massecuite, the green syrup and the wash syrup drained from the crystals are used in earlier operations (see above), whilst the crystals after drying constitute white granulated sugar.—J. H. L.

XVIII.—FERMENTATION INDUSTRIES.

Starch [in barley]; Polarimetric determination of ——. C. J. Lintner. Z. angew. Chem., 1912, 25, 1177. (See also this J., 1907, 281.)

A modification of the polarimetric method of determining starch in barley has been proposed by Wenglein (see this J., 1908, 238 ; Z. ges. Brauw., 1912, 35, 80), in which the starch is dissolved by means of sulphuric acid of sp. gr. 1·7. In warm weather the temperature attained on mixing this acid with the moistened barley meal is frequently so high that the starch undergoes partial decomposition into substances of lower optical rotatory powers. The author recommends the following procedure by which a specific rotatory power of $[a]_D = 198°$ is obtained for pure barley starch :—2·5 grms. of the very finely ground barley are introduced into a 100 c.c. flask and thoroughly mixed with 5 c.c. of 96 per cent. alcohol. Fifty c.c. of sulphuric acid of sp. gr. 1·4 are next added, whilst the mixture is kept in motion, and the flask is afterwards maintained at 22° C. for an hour and shaken frequently. After addition of 10 c.c. of a 2 per cent. solution of phosphotungstic acid, the contents of the flask are made up to 100 c.c. with sulphuric acid of sp. gr. 1·3, shaken well, and filtered. The clear filtrate is read in a 200 mm.-tube in a half-shadow polarimeter with sodium light. The angular reading, in degrees, multiplied by 10·1, gives the percentage of starch in the air-dried barley.
—J. H. L.

Starch paste ; Saccharification of —— by hydrogen peroxide alone or in presence of vegetable and animal diastases. C. Gerber. Comptes rend., 1912, **154**, 1543—1545.

HYDROGEN peroxide readily hydrolyses starch paste with the production of maltose and dextrins, the action being accelerated by increase of temperature. In presence of a considerable quantity of hydrogen peroxide, the hydrolysis is followed by oxidation of the maltose and decomposition of the hydrogen peroxide with liberation of oxygen; this oxidation occurs more quickly if the temperature is increased. The hydrolysis of starch by small quantities of hydrogen peroxide is negligible during the time required to study the influence of this compound on diastatic saccharification at 40° C. ; this influence varies greatly with different kinds of diastase. Thus, a small quantity of hydrogen peroxide (*e.g.*, 0·0125—0·4 per cent. of Merck's perhydrol) greatly retards the action of the diastase of *Ficus carica*, L. but is insufficient to affect the action of the diastase of *Broussonetia papyrifera*, L., whilst the action of the diastase contained in trypsin (Merck) is slightly accelerated by very small quantities of hydrogen peroxide and slightly retarded by somewhat larger quantities. It is found that a quantity of hydrogen peroxide sufficient to destroy the diastase of *Ficus carica*, scarcely affects the diastase of *Broussonetia papyrifera* or trypsin.—L. E.

Worts ; Influence of the duration of malting and the mashing process on the composition of —— in respect of proteins, carbohydrates and salts [; also, determination of phytin]. W. Windisch and H. Reiser. Woch. Brau., 1912, **29**, 273—277, 288—290, 299—302, 313—316, 326—331.

THIS investigation was undertaken in order to ascertain whether the decoction mashing process could be so modified as to produce, from short-grown malts, worts of the same composition and giving the same extract-yield as those produced normally from long-grown malts. A satisfactory solution of the problem was attained by allowing the mash, in the case of short-grown malts, to remain for a suitable period (*e.g.*, for about half an hour before and after the heating of the thick mash) at 50° C., this temperature being the optimum for proteolysis and also for the decomposition of phytin by phytase. The advantage derived from keeping the mash at this temperature lies not so much in an increased extraction of nitrogenous matters from the malt, for this increase is often quite inconsiderable, but in the degradation of highly complex proteins into simpler bodies. As the result of the latter processes, the wort obtained contains the same classes of proteins, and in practically the same proportions, as worts prepared in the usual way from long-grown malts. For the differentiation of various groups of wort-proteins (albumins I and II, "denuclein," propeptone and peptone) use was made of Schjerning's method of precipitation by metallic salts (see this J., 1910, 583 ; 1906, 1109). By modifying the mashing process in the way indicated, the authors obtained, from a 4½-day malt, worts which, in respect of the quantity and nature of proteins, carbohydrates and phosphates, were practically identical with worts obtained normally from an 8-day malt, prepared from the same barley as the short-grown malt. For the determination of the phosphoric acid present in worts in the form of phytin, the following method was employed :—100 c.c. of wort are made alkaline with sodium hydroxide, heated to boiling, and treated with 20—30 c.c. of a boiling 10 per cent. solution of calcium chloride. A precipitate is formed which contains the whole of the phosphoric acid present in the wort, including the phytin, which is insoluble in hot water, but soluble in the cold. The precipitate is filtered at boiling temperature and washed with boiling water until free from alkali. It is then transferred, together with the filter paper, into 200 c.c. of cold water and allowed to stand for 24—48 hours with frequent stirring. After filtering, the filtrate, which contains all the phytin but no other phosphorus compounds, is evaporated. The residue is incinerated, moistened twice with hydrochloric acid and dried, and then extracted with hot water. The extract, after filtering, is evaporated with nitric acid, the phosphorus is precipitated with molybdate, and the precipitate is dissolved in ammonia and again thrown down by magnesia mixture. —J. H. L.

Yeast ; Formation of invertase in ——. H. Euler and H. Meyer. Z. physiol. Chem., 1912, **79**, 274—300. (See also this J., 1912, 245.)

A STUDY is being made of the rate of formation of invertase in yeast after preliminary treatments of various kinds. Thus after treatment for varying periods with dextrose or sucrose and nitrogenous material, the amount of invertase nearly trebled ; the nature of the sugar had little influence and in both cases the maximum of enzyme was reached after 25 hours' treatment. The three sources of nitrogen—asparagine, glycine and ammonium sulphate—used in conjunction with carbohydrate had the same effect on the enzyme formation. During treatment the yeast loses about 20 per cent. in weight, but the amount of nitrogen in the dry yeast increases by about 10 per cent. Evidently both carbohydrate and protein are lost during treatment. When the maximum amount of enzyme has been formed in the yeast as the result of treatment in a solution, a further increase takes place when the yeast is transferred to a fresh solution. Young yeast cells have a greater power of forming enzyme than old cells. A second transference to a new culture solution had no marked effect in increasing the amount of enzyme. The increase of enzyme takes place also during treatment with pure sugar solutions. The treatment has a general effect in accelerating the vital processes : it is shown that the velocity of the other enzymic changes effected by yeast are likewise accelerated though at different rates.—E. F. A.

Yeasts and moulds ; Results of recent experiments on assimilation by ——. P. Lindner. Z. angew. Chem., 1912, **25**, 1175—1176. (See also this J., 1910, 1221 ; 1911, 301, 1131, 1465.)

ZIKES and others have shown that certain yeasts and moulds possess in a slight degree a capacity for assimilating atmospheric nitrogen. Experiments carried out by the author with about 150 different organisms showed that in most cases distinct growth can occur at the expense of nitrogen from the air. The following is a summary of the results of further experiments on assimilation :—Ethyl alcohol and free ammonia can serve as materials for the synthesis of protoplasm by various yeasts and moulds. *S. acetethylicus* Beijerinck and *Blastoderma salminicolor* (a red yeast isolated from sea-water) assimilate the nitrogen of nitrates. Urea can serve as nitrogenous food for a number of yeasts, particularly if maltose is present. Tests with 184 micro-organisms showed that with few exceptions all were capable of assimilating ethyl alcohol. Methyl alcohol gave negative results (*cp.* this J., 1912, 454). Maltose forms the best source of carbon for most of these organisms. Many moulds assimilate maltose but not sucrose or dextrose, whereas they ferment only the last two sugars. Culture yeasts produce a flocculent growth in solutions of beer- and malt-dextrins ; wild yeasts, such as occur in cloudy beers, exhibit a more powdery growth. Melibiose and raffinose are readily assimilated by many yeasts, even by some which do not ferment them. *Sacch. farinosus* and *Oidium lactis*, in nutrient solutions containing mineral salts and ammonium sulphate, were exposed to the vapours of benzine, benzene, formaldehyde, ether, paraldehyde, acetone and formic, acetic and butyric acids. Both organisms showed vigorous growth in presence of paraldehyde and acetic acid. *Oidium lactis* grew well in presence of acetone, poorly in presence of butyric acid and very slightly, if at all, in presence of ether. In presence of benzine and benzene, there was a very slight growth. In all other cases negative results were obtained.—J. H. L.

Yeast ; Chemical composition of —— in relation to its behaviour during fermentation. F. Schönfeld. Z. angew. Chem., 1912, **25**, 1177—1179. (See also this J., 1911, 824, 1227.)

THE characters of yeast, such as its tendency to "break" well (*i.e.*, to flocculate and form compact masses), or on the other hand to remain for a long time as a powdery suspension in the fermenting liquid, show considerable variations from year to year, and are also influenced by the character of the malt and the conditions of cultivation of the yeast. Very vigorous growth, rapid multiplication, strong aeration and high temperatures favour the production of powdery yeasts, and *vice versa*. Some races are, however, more sensitive than others to changes in the conditions of growth. Flocculent yeasts are as a rule characterised by high contents of protein and ash, and also of phosphoric acid, which is mainly present as potassium salt. They are inclined to assimilate more magnesium than powdery yeasts, but less lime. Powdery yeasts of weak attenuating power are poor in protein, ash and phosphoric acid. They are inclined to secrete relatively large quantities of lime, which may constitute as much as 11 per cent. of the dry substance of the yeast. Such excessive secretion of lime leads to degeneration. Powdery yeasts of high attenuating power possess chemical characters intermediate between those of the two classes described above.—J. H. L.

Alcoholic fermentation ; Chemical mechanism of ——. P. E. Buchner and J. Meisenheimer. Ber., 1912, **45**. 1633—1643. (See also this J., 1910, 894.)

The authors refute Boysen-Jensen's assertions (see this J., 1909, 494) that dihydroxyacetone may be detected in "pure" dextrose and in fermented solutions of this sugar, and that it is decomposed in aqueous solutions by animal charcoal (*cp.* Chick, this J., 1912, 553). The conclusions of Slator (see this J., 1912, 198) respecting the non-fermentability of dihydroxyacetone by living yeast are also criticised. Slator's negative results were due to the short duration of his experiments (20 mins.). The authors have already shown that the fermentation of dihydroxyacetone proceeds very slowly at first, but ultimately the total amount of carbon dioxide evolved is about 80—90 per cent. of that produced from an equal quantity of sugar (*loc. cit.*). The rest of the paper is of a theoretical character and deals mainly with the probable formation of dihydroxyacetone as an intermediate product of fermentation.—J. H. L.

Fermentation ; Loss of alcohol by evaporation during ——. C. Mariller. Bull. Assoc. Chim. Sucr., 1912, **29**, 795—797.

In the ordinary fermentation processes, the amount of alcohol carried away in the form of vapour with the carbon dioxide does not exceed 1 per cent. of the quantity formed. The usual precautions being taken to prevent loss from other causes (faulty fermentation, spraying, frothing, etc.), the loss by evaporation does not appear to justify the provision of covers for the vats and the recovery of the vapourised alcohol, since the use of covered vats involves difficulty in respect of cleansing, and of control of the fermentation.—L. E.

Wine ; Influence of temperature of fermentation on the quality of red ——. L. Mathieu. Bull. Assoc. Chim. Sucr., 1912, **29**. 762—769. (Cp. Rosenstiehl, this J., 1908, 763).

The author has previously found that a low temperature of fermentation improves the bouquet of white wines, and that in the secondary fermentation of sparkling wines, a low temperature tends to prevent the production of a flavour of hydrogen sulphide (this J., 1907, 1209); he has now extended his investigations to the fermentation of red wine. Two portions of the same mixture of juice and marc were fermented, with periodical stirring. In one case the temperature was allowed to rise from 16·5° to 32° C. during fermentation, whilst in the other case the temperature was maintained at 15°—17·5° C. until most of the sugar had been fermented, the wine then being transferred to casks and left to ferment completely at the cellar temperature. The wine prepared by fermentation at the lower temperature possessed a finer and more distinct bouquet than the other, but it was evident that, despite longer stirring, the maceration of the marc had not been so complete at the lower temperature, since the wine was not so full-bodied, containing less extract and colouring matter than the wine prepared by fermentation at the higher temperature. Hence, with a low temperature of fermentation, special attention must be paid to the maceration, and it would be better to effect this operation before, rather than during the fermentation ; hot maceration has been found to give satisfactory results.—L. E.

Extract determination in wine ; Direct ——. C. von der Heide and E. Schwenk. Z. anal. Chem., 1912, **51**, 429—466.

The authors have further investigated the changes which occur in the direct method of extract determination in wine (compare von der Heide and Baragiola, this J., 1911, 566 ; Roettgen, this J., 1908, 349); they find that (*a*) acetic acid and its homologues, together with an indefinite proportion of the lactic acid, are volatilised, whilst tartaric acid is converted partly into metatartaric acid and malic acid into malomalic acid ; succinic acid remains unchanged ; (*b*) glycerol is lost only to a small extent, and the residual acids are largely converted into glycerol esters ; (*c*) sugar is in great part destroyed, and (*d*) the specific gravity of the solution made from the extract is lower than that of the wine from which the alcohol has been removed. These facts, especially in view of the variable composition of wines, combine to render the method unreliable, and the authors recommend that it be wholly abandoned in favour of the indirect method, for which the specific gravity of the wine (after removing alcohol) is to be determined by direct weighing, Tabarié's formula serving merely as a control.—F. Sodn.

Spirits ; Variation in the composition of —— *according to the method of storage.* L. Mathieu. Bull. Assoc. Chim. Sucr., 1912, **29**, 772—774.

Green glass bottles were filled or half filled with a spirit of 82·9 per cent. alcohol-content, and either corked and sealed or merely closed with cotton wool. The contents of the bottles were analysed (a) after 33 days' storage at 18° C. in a strong light, and (b) after 104 days' storage at 12° C. in a less intense light. The loss of alcohol on storage was *nil* in the corked bottles, but amounted to 0·5 to 2·1 per cent. in the bottles closed with cotton wool. The acidity of the spirit increased in every case, and by nearly one-half in one instance, the increase being accelerated by contact with air, higher temperature and more intense illumination ; the ester-content showed a similar increase, whilst the aldehyde-content showed a diminution which was more marked in proportion to the degree of contact with air.—L. E.

Fusel oil or amyl alcohol ; Duty-free importation of denatured —— *into Australia.* Board of Trade J., June 27, 1912. [T.R.]

An Australian By-Law (No. 219), dated 8th May, 1912, relates to the free importation of amyl alcohol and fusel oil under Heading No. 4 (a) of the Tariff, when denatured in accordance with the following provisions :—

(1) If for use in the manufacture of paint :—By the addition of 2 per cent. wood naphtha and ½ per cent. pyridine.

(2) If for use in the manufacture of pyroxylin varnish :—By the addition of an equal volume of (a) Commercial methyl alcohol, (b) wood naphtha, or (c) purified acetone.

(3) The methyl alcohol, wood naphtha, or acetone used in denaturating is to be of Australian production, and of a standard approved by the Department.

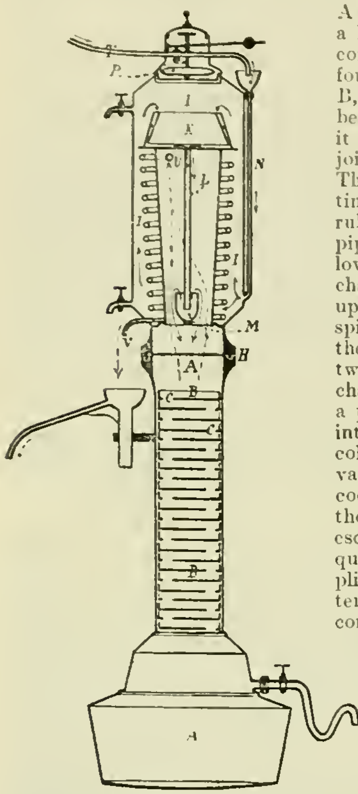
(4) The importer to declare on the face of the entry that the denaturated spirit will be used only for the manufacture of paint and varnish.

Patents.

Sour liquid. R. Wahl, Chicago, Ill. U.S. Pat. 1,028,508, June 4, 1912.

Mixtures of water with food-materials capable of promoting lactic fermentation, are inoculated with lactic acid bacteria, and maintained at a temperature (*e.g.*, 55° C.) favourable to the latter but unfavourable to other fermentative organisms, until an acidity of at least 1 per cent. is attained. The product, containing the unassimilated and unfermented matters of the orginal food-materials, may be concentrated until its acidity is sufficiently high to preserve it.—J. H. L.

Still [for distilling wine]. L. Delbru and J. Laboup. Fr. Pat. 438,527, Dec. 4, 1911.



A wine still comprises a heating chamber, A, containing twenty-four rectifying trays, B, and a cooling chamber, I, mounted above it with a water-sealed joint, H, between. The wine is fed continuously through a rubber pipe, T, and pipe, N, into the lower portion of the chamber, I, passes upwards round the spiral coil shown, and then downwards between the walls of a chamber, K, through a pipe, L, and cup, M, into the rectifying column. The spirit vapour enters the cooling coil at U, and the condensed spirit escapes at V. The quantity of wine supplied is regulated by a temperature regulator consisting of a flat metal box, P, containing alcohol, which is adapted to compress the rubber tube, T, when the temperature is high and to release it when the temperature falls. The still is also adapted for use with an intermittent supply of wine.—H. H.

Fermentation ; Process and apparatus for the continuous manufacture of aerated beverages by ——. Reihlen und Co. Sektkellerei, G. m. b. H. Fr. Pat. 438,585, Dec. 30, 1911.

The apparatus includes four vats, and pipes which are fitted with taps and connect the bottom of one vat with the top of the next. In preparing sparkling wine, yeast is introduced into the first vat, and the latter is filled with still wine to which sugar has been added. The vat is hermetically closed, and when a quarter of the sugar has been fermented, the second vat is similarly charged. When the wine in the second vat has begun to ferment vigorously, communication is made between the top of this vat and the bottom of the first. The third and fourth vats are charged at corresponding stages. When fermentation is complete in the first vat, a fresh charge of still wine is pumped from a collecting vessel into the fourth vat, the contents of the latter passing to the third vat and so on. The fermented wine passes from the first vat to a reservoir and thence through filters and a refrigerator to a bottling device, being maintained under pressure of carbon dioxide (produced in fermentation) throughout ; means are provided for maintaining this pressure constant. The bottling device includes a valve for preventing loss of wine or carbon dioxide if the bottle breaks, and it allows of the rotation of the bottle into an inverted position. The still wine in each fresh bottle is allowed to run into the collecting vessel above mentioned, the bottle being filled at the same time with carbon dioxide and subsequently with the sparkling wine. When the yeast in the first vat is exhausted, the vat is disconnected, emptied, cleaned, and re-charged, and then functions as the fourth vat.—L. E.

Wine ; Process for clarifying ——. Mme. Ornstein, née A. Kaufmann. Fr. Pat. 438,185, Dec. 23, 1911. Under Int. Conv., Dec. 24, 1910.

The wine is treated with ground soya beans.—L. E.

Distillery wash [vinasse] ; Method of treating ——. G. Meunier, Raab, Hungary. Eng. Pat. 12,207, May 20, 1911. Under Int. Conv., May 21, 1910.

In order to extract glycerin, succinic acid and other useful products from distillers' wash (vinasse), the latter is mixed with cellulose (preferably wood cellulose) which has been partially or completely carbonised, and the mixture is dried and extracted with suitable solvents, such as crude alcohol, aided by pressure or osmosis if necessary. The residue left after extraction may be moulded into briquettes and burnt, whereby alkali salts or crude pearl ash (potassium carbonate) is obtained ; or it may be subjected to dry distillation to obtain methyl alcohol, acetic acid and other products. The coke from the dry distillation contains oxalic acid and cyanides, and after extraction of these by lixiviation, the residue may be used as fuel or converted into a filtering material. The crude glycerin obtained by this process may be purified by a further treatment with carbonised cellulose, and subsequent extraction.—J. H. L.

Distillery [spent] wash ; Method of and apparatus for treating ——. G. Meunier, Raab, Hungary. Eng. Pat. 13,018, May 30, 1911. Addition to Eng. Pat. 12,207 of 1911, dated May 21, 1910 (see preceding abstract).

The distillery wash is mixed with carbonised cellulose, dried, and the glycerin is extracted by a solvent consisting of equal parts of alcohol and benzene. The portion of the solvent which remains in the mixture of wash and cellulose may be recovered by washing the latter with saturated aqueous solutions of the saline portions of the wash, with the concentrated wash freed from glycerin, or with petrol, this washing process being carried out in a centrifugal apparatus the walls of which act as filters. The whole method of treating the wash for the extraction of the glycerin may be performed in an apparatus comprising three closed chambers which are connected with one another and provided with conveyors, heating devices, and condensers. In the first chamber the mixture of wash and cellulose is heated, the glycerin is extracted in the second chamber, whilst the remaining solvent is recovered from the mass in the third chamber.—W. P. S.

Yeast ; Process of manufacturing dried ——. P. D. H. Ohlhaver, Sande, Germany. Eng. Pat. 27,572, Dec. 8, 1911. Under Int. Conv., March 1, 1911.

See U.S. Pat. 1,020,306 of 1912 ; this J., 1912, 404.—T.F.B.

Yeast ; Process of increasing the raising power of dried ——. P. D. H. Ohlhaver, Sande, Germany. Eng. Pat. 27,574, Dec. 8, 1911. Under Int. Conv., March 1, 1911.

See U.S. Pat. 1,021,700 of 1912 ; this J., 1912, 406.—T.F.B.

XIXa.—FOODS.

Wheat ; Distribution of the nitrogen of —— between the flour, bran and shorts. J. E. Greaves and R. Stewart. J. Agric. Sci., 1912, 4, 376—379.

As the result of a large number of milling tests made with a small experimental mill on 58 varieties of wheat, it is concluded that the percentage of nitrogen in a wheat is no direct index of the amount which its flour will contain. The proportion of the protein of the wheat recovered in the flour varied from 56·84 to 65·56 per cent., whilst that remaining in the bran varied between 25 and 32·77 per cent. The average of 222 determinations on 42 varieties

ndicates that the protein of the wheat is divided between he flour, bran, and shorts in the proportion of 61·87, 7·98 and 9·92 per cent. respectively. The wheats poorer n protein yielded just as high a proportion of their itrogen in the flour as did the wheats richer in protein.
—E. F. A.

Gluten; Partition of salts between the saturated aqueous solution and wet ——. A. J. J. Vandevelde and L. Bosmans. Bull. Soc. Chim. Belg., 1912, 26, 249—254.

When a piece of wet gluten is immersed in a saturated salt solution, salt passes into the wet gluten and water passes from the gluten to the solution. No protein decomposition takes place and the gluten does not disintegrate even after three weeks' exposure. Analyses of the solution and of the gluten after treatment until equilibrium had been attained, indicate that sulphates have the largest dehydrating effect on the gluten; the effect of chlorides and nitrates is about the same, the salts of the alkalis are more active as dehydrating agents than those of the alkaline-earths. Calculation of the partition constant between the aqueous solution and the wet gluten shows that the chlorides and nitrates of the alkali metals have a higher partition constant than those of the alkaline-earth metals, amounting to nearly twice as much in the case of the nitrates. In potassium salts the coefficient diminishes from chloride to nitrate and nitrate to sulphate; with sodium salts exactly the reverse holds. The partition constants for magnesium and ammonium sulphates, which are well known as protein precipitants, are large. The partition constants of the salt between the aqueous solution and the aqueous solution contained by the wet gluten is practically equal to 1 for the chlorides studied except potassium chloride. This shows that the concentration in and outside the gluten is the same. In other cases the partition constant is about 2. that is, the exterior concentration is twice that inside the gluten. This is apparently a real phenomenon, as experimental evidence is adduced to prove that equilibrium has been attained.—E. F. A.

Milk; Action of rennet on ——. M. Nierenstein and J. Stubbs. J. Agric. Sci., 1912, 4, 371—375.

In the manufacture of Cheddar cheese a retardation of the time of coagulation has often been noticed, though the acidity had reached the required strength before the rennet was added to the milk. It is shown that the acidity of milk is not due entirely to lactic acid, but in part to some product produced from caseinogen. The production of acidity from caseinogen by rennet is stimulated by the addition of lactic acid, but it was found that pure lactic acid cannot be used as a "starter." The retardation of the time of coagulation with rennet is not entirely dependent on the calcium salts.—E. F. A.

Cocoa; Determination of shell in ——. A. Schenk, F. Schmidt and J. Görbing. Z. öffentl. Chem., 1912, 11. 201—214.

An investigation of the method of A. Goske (this J., 1910, 369) using artificial mixtures of cocoa powder, derived from the pure nib, and cocoa shell in varying degrees of fineness, gave results which showed that the process is absolutely unreliable. The results obtained are dependent on the temperature at which the liquid is centrifuged and also on the speed of rotation of the centrifuge. As showing the effect of the condition of fineness of the material, it is stated that using very finely ground samples containing 25 and 50 per cent. of shell, the values found by Goske's method were only 5 and 7·4 per cent. respectively. (See also this J., 1910, 1129 and 1911, 643 and 1466.)
—B. G. McL.

Detection and determination of traces of fluorine in minerals, waters, and living tissues. Gautier and Clausmann. *See* XXIII.

Patents.

Flour tester [colourimeter]. F. Abramowsky, Lennenberg, and G. Hein, Rastenburg, Germany. Eng. Pat. 6469, Mar. 15, 1912.

A plate of metal, wood, or the like is provided with two longitudinal grooves between which a glass plate is fitted; this glass plate is flush with the edges of the grooves and is divided into a number of sections which are tinted to various depths of colour. The flour under examination is filled into the grooves and pressed down flush with the edges of the scale, the whole apparatus being then immersed in water and the colour of the flour compared with the differently tinted portions of the glass plate.—W. P. S.

Flour; Process and apparatus for bleaching ——. A. Renault. Fr. Pat. 438,481, Mar. 18, 1911.

The flour, as it leaves the mill, is passed through a closed channel, the lower part of which is surrounded by a steam or hot-air jacket; a screw conveyor causes the flour to pass along this channel at such a rate that the temperature of the flour is raised about 10° C. above that at which it leaves the mill.—W. P. S.

Baking powder. C. H. Boehringer Sohn, Nieder-Ingelheim-on-Rhine, Germany. Eng. Pat. 10,122, April 29, 1912. Under Int. Conv., May 19, 1911.

The powder consists of sodium carbonate or bicarbonate and an aluminium salt of lactic acid, preferably normal aluminium lactate, together with a filler.—W. P. S.

Coffee berries; Process for removing caffeine from ——. Kaffee-Patent Akt. Ges. Fr. Pat. 438,437, Mar. 16, 1911.

Raw coffee berries are steeped in water, formic acid or other suitable acid is added, and the mixture is heated by means of steam for 25 minutes. The liquid portion is separated, treated for the removal of the dissolved caffeine, and then evaporated under reduced pressure; the concentrated extract is mixed with the berries and the latter are dried and roasted.—W. P. S.

Baking-powder; Mixture suitable for ——. R. Grüter, Charlottenburg, Germany. U.S. Pat. 1,024,330, April 23, 1912.

See Eng. Pat. 26,592 of 1911; this J., 1912, 554.—T. F. B.

Fruits or vegetables; Process of preserving or cooking ——. F. and A. Blassneck, Seesen, Germany. U.S. Pat. 1,028,669, June 4, 1912.

See Eng. Pat. 27,017 of 1911; this J., 1912, 600.—T. F. B.

Apparatus for heating liquids. Eng. Pat. 18,050. *See* I.

Manufacture of coloured lakes [for colouring foods, etc.] from vegetable substances containing dyestuffs in the form of glucosides. Fr. Pat. 438,563. *See* XIII.

XIXb.—WATER PURIFICATION; SANITATION.

Erratum.

This Journal, June 29, 1912, page 600, col. 2, line 20 from top, *for* "sodium nitrite" *read* "nitrite-nitrogen."

Patents.

Water purifying by heating; Apparatus for ——. L. Savary-Carlier, Bapaume, France. Eng. Pat. 15,229, June 29, 1911. Addition to Eng. Pat. 30,378 of 1910 (this J., 1911, 645).

A tank is surmounted by a column, composed of sections superposed one upon another, and divided by a partition in each section so as to form two parallel ducts—a rising duct and a down duct, connected with each other at their upper ends. Water enters, as a spray, through a perforated plate near the bottom of the rising duct. At a lower point steam is admitted, and meeting the small drops of water, an emulsion is said to be formed, and the calcareous and foreign matter cohere to form a spongy mass which adheres to the sides of the rising duct. The purified water flows away by the falling duct and is collected in the tank below. The top section of the column is slightly inclined from the vertical in order to assist the flow of water.—G. W. McD.

Water; Process and apparatus for the purification of ——. E. Rouquette. Fr. Pat. 438,417. Dec. 23, 1911.

The water to be treated is passed into the upper part of a bell-shaped chamber fitted in a tank; regulated quantities of sodium peranhydrosulphate ($Na_2S_3O_9$) and sodium peroxychloride (Na_2O_2Cl) are also introduced through separate tubes into the bell-shaped vessel, where they mix with the water, and the latter then flows under the lower edge of the vessel into the tank, from which it is drawn off at the top.—W. P. S.

Water; Process of softening ——. A. Metz. Fr. Pat. 438,999, March 28, 1911.

The water is passed through a layer of natural silicates or hydrated silicates of aluminium in order to remove carbonates, bicarbonates, and sulphates of calcium, magnesium, etc. The silicates, when exhausted, may be regenerated by means of a solution of sodium chloride. —W. P. S.

Sewage disposal plant. A. H. Wehr, Mount Washington, Md. U.S. Pat. 1,027,948, May 28, 1912.

The plant consists of a number of communicating tanks having V-shaped bottoms and provided with an inlet and outlet to the first tank. The partition walls between the tanks terminate below the top, and a central wall, extending the full length of the tanks, projects downwards from the top and terminates in a flared portion above the bottom. This wall is partly cut away in the last tank of the series, and two other walls project downwards to the top of the partition walls and then converge towards the flared bottom of the central wall. A pipe extends upwards from the bottom of each tank and passes through the side wall near the top.—W. H. C.

Insecticides, sheep dips, vermifuges, and the like. I. S., L., and S. McDougall, Manchester. Eng. Pat. 10,215, April 24, 1911. Addition to Eng. Pat. 3204, Feb. 8, 1911 (this J., 1912, 601).

An extract, obtained from the root, bark, or other portions of plants known as derris (leguminosae order), is mixed with other ingredients such as soap, sulphur, etc., to produce the insecticide.—W. P. S.

Vine; Process of making a preparation of lime and copper salt for application, in the form of powder, to the ——. L. Malphettes. Fr. Pat. 438,470, Dec. 29, 1911.

Quicklime, in the form of lumps (80 kilos.), is slaked with a solution (20 litres) of 1 part of copper sulphate in 2 parts of water.—L. E.

Preventing or extinguishing fires or explosions in mines, buildings, ships, etc. J. Harger, Gateacre, Lancs. Eng. Pat. 28,075, Dec. 13, 1911.

The invention consists in ventilating mines and like places with air containing an amount of oxygen sufficient to support human life but insufficient to produce explosions. For this purpose effluent gases may be purified and mixed with fresh air to maintain the oxygen content at the desired amount. The gas may be tested by means of a series of lamps burning different hydrocarbons and fitted with acetylene by-passes. It is stated that lamps with wicks are extinguished by air containing from 18 to 15·5 per cent. of oxygen according to the volatility of the hydrocarbon used, that acetylene may be extinguished by air containing 9·5 per cent. of oxygen, and that air containing 10 per cent. of oxygen can be breathed with safety. In cases where fire has broken out, air or oth gas from which the oxygen has been almost entirel exhausted would be supplied at first, and gas such a referred to above would be supplied afterwards when th seat of the fire has to be visited. (See also this J., 191 413.)—H. H.

Filtering apparatus for purifying air and gases. W. F. I Beth, Lübeck, Germany. Eng. Pat. 1215, Jan. 1 1912. Under Int. Conv., Jan. 16, 1911.

In a filtering apparatus for purifying gases, in which th temperature must be maintained as high as possible, *e.g.* in order to prevent condensation, the passage whic distributes the gases to the filtering compartments i arranged in such a manner between the rows of filterin compartments that its external walls form the interna walls of these compartments, thus avoiding loss of hea by external radiation.—H. H.

Sterilising liquids by means of ultra-violet rays; Apparatu for ——. V. Henri, A. Helbronner, and M. von Reck linghausen, Paris. Eng. Pat. 13,687, June 8, 1911 Under Int. Conv., June 11, 1910. Addition to Eng Pat. 6178 of 1911, dated March 12, 1910.

See Addition of June 11, 1910, to Fr. Pat. 424,369 o 1910; this J., 1911, 1183.—T. F. B.

Sterilising fluids by means of rays of short wave length, Apparatus for ——. R. Renoncé, Quinville, France Eng. Pat. 27,366, Dec. 6, 1911. Under Int. Conv., Dec. 6, 1910.

See Fr. Pat. 434,784 of 1910; this J., 1912, 356.—T. F. B.

Water and sewage; Method and apparatus for purifying ——. C. R. Darnall, Washington, U.S.A. Eng. Pat. 15,430, July 3, 1911.

See U.S. Pats. 1,007,542 and 1,007,647 of 1911; this J., 1911, 1404.—T. F. B.

Filtering water; Method and apparatus for ——. G. W. Durbrow, Los Angeles, Cal., U.S.A. Eng. Pat. 20,150, Sept. 11, 1911.

See U.S. Pat. 1,006,070 and Fr. Pat. 434,973 of 1911; this J., 1911, 1331; 1912, 298.—T. F. B.

Treatment of ferruginous aluminium sulphate. Fr. Pat. 438,625. *See* VII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Medicinal plants; Cultivation of ——. W. Mitlacher. Chem. and Drug., 1912, 80, 96.

An account is given of some of the preliminary results obtained by experimental cultivation under the auspices of the Committee for the State Advancement of the Cultivation of Medicinal Plants in Austria. In the case of *Datura Stramonium* grown on a chalky soil (nitrogen, 0·22; phosphoric anhydride, 0·14; potassium oxide, 0·47; lime, 7·90 per cent.), treatment with stable manure had practically no influence on the alkaloidal content of the dried leaves, but the yield of the plant was considerably increased (6·56 kilos. of dried leaves as compared with 4·6 kilos. from an unmanured plot). The leaf-stalks are richer in alkaloid than the leaves, and it is therefore irrational to remove the stalks and mid-ribs of the leaves. The alkaloidal content of the leaves decreases gradually from the beginning of July until the beginning of September. Leaves dried in an oven at 30° C. were somewhat poorer in alkaloid than air-dried leaves. Treatment with stable manure also strikingly increased the yield of *Hyoscyamus niger*, 2 kilos. of dried leaves being obtained from a manured plot as compared with 0·8 kilo. from an unmanured plot. Leaves of *Datura metel* were found to yield 0·55 to 0·78 per cent. of scopolamine.—A. S.

Quinine; Transformation of —— by means of sulphuric acid. B. Böttcher and S. Horovitz. Monats. Chem., 1912, **33**, 567—582.

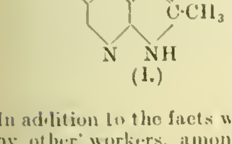
By heating quinine bisulphate with concentrated sulphuric acid, two isomeric bases are formed. The best yield is obtained by using 6 parts of sulphuric acid of sp. gr. 1·61 and heating for 3 hours to 100° C. When cold the mixture is carefully diluted with water, made alkaline with ammonia and extracted with ether. The ether on evaporation leaves a mixture of two bases, α- and β-isoquinine. The former gives a tartrate soluble in water with difficulty, whilst the β-base yields a readily soluble tartrate. The yield of the α-base amounted to 13·5 per cent., and that of the β-base to 11·4 per cent. After repeated crystallisations from benzene and light petroleum, α-isoquinine melts at 196·5° C. (corr.). It has the composition, $C_{20}H_{24}N_2O_2$, and has $[\alpha]_D$ —245° to —248° in absolute alcohol. β-Isoquinine melts at 189° C. (corr.) after repeated crystallisations from 50 per cent. alcohol. It crystallises in long white prisms. In alcohol of sp. gr. 0·80, it has $[\alpha]_D$ – 191·6° to – 195·35°. The hydrochloride melts at 220—230° C. with decomposition.—F. Shdn.

Cocaine; Distinction of —— from its substitutes. D. Scherbatschew. Apoth.-Zeit., 1912, **27**, 411.

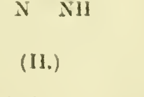
As a supplement to the microscopical test for cocaine and its substitutes by means of potassium permanganate (this J., 1911, 151), the following solutions may be used: 10 per cent. ammonium hydroxide, 10 per cent. potassium hydroxide and saturated sodium bicarbonate solution. Single drops of the alkaloidal solutions are tested with drops of the above. Stovaine and holocaine give precipitates with all three reagents. Nirvanine gives precipitates with ammonia and sodium bicarbonate, but none with potassium hydroxide. Alypine gives a precipitate with ammonia and potassium hydroxide, but none with sodium bicarbonate. β-Eucaine gives a slight precipitate with potassium hydroxide only. This alkaloid is therefore likely to be confused with novocaine, which also is precipitated by potassium hydroxide alone.
—F. Shdn.

Harmine; Constitution of ——. (Preliminary note.) W. H. Perkin, jun., and R. Robinson. Chem. Soc. Proc., 1912, **28**, 153—154.

The authors have commenced a series of experiments on the alkaloids of *Peganum harmala*, and are now in a position to suggest a formula (I) which readily affords an explanation of the reactions of harmine, and cannot be very far from the true representation of the constitution of this substance:



(I.)



(II.)

In addition to the facts which have already been observed by other workers, among whom O. Fischer is the most prominent, the following new observations have greatly contributed to the solution of the problem. Harmine contains an NH-group and a methyl group, which has the power of condensing with aldehydes, etc., characteristic of the methyl group in quinaldine. *Benzylideneharmine*, $C_{12}H_9ON_2 \cdot CH:CHC_6H_5$, is obtained by boiling harmine with excess of benzaldehyde, and is purified by conversion into the sparingly soluble, bright yellow, crystalline hydrochloride. The base separates from ethyl alcohol in pale yellow prisms melting at 191—192° C., and its solutions have a most intense violet fluorescence. p-*Nitrobenzylideneharmine*, $C_{12}H_9ON_2 \cdot CH:CH \cdot C_6H_4 \cdot NO_2$, prepared by heating together harmine and *p* nitrobenzaldehyde, separates from alcohol in red needles and melts at 266° C. C-*Benzylharmine*, $C_{12}H_9ON_2 \cdot CH_2 \cdot CH_2C_6H_5$, obtained by the reduction of benzylideneharmine with zinc dust and acetic acid, crystallises from methyl alcohol in rectangular prisms melting at 138° C. The sparingly soluble *hydrochloride* separates from water in colourless needles which, in dilute solution, exhibit a blue fluorescence. *Nor-harmine carboxylic acid*, $C_{12}H_9ON_2 \cdot CO_2H$, obtained by the oxidation of benzylideneharmine with potassium permanganate in acid solution, crystallises from acetic acid in the form of the acetate in yellow prisms. This substance loses acetic acid on heating at 100° C., or better by treatment with hot water, and furnishes the free acid as a pale yellow, crystalline powder, which is almost insoluble and could not be recrystallised. Its salts, both with acids and alkalis, are crystalline and sparingly soluble in water. With ferrous sulphate it develops a browish-red colouration, which again clearly indicates that the methyl group in harmine is in the α-position with respect to one of the nitrogen atoms. The formula of apo*harmine* (II) deduced from that suggested for harmine (I) is that of 2-methylindole, in which one of the methine groups of the benzene ring is displaced by a nitrogen atom.

Trimethyldiapoharmine, a new base obtained by applying the Hofmann reaction to apoharmine. V. Hasenfratz. Comptes rend., 1912, **154**, 1520—1523. (See this J., 1912, 357.)

When methyl iodide is allowed to act upon apoharmine and the product decomposed by means of potassium hydroxide, methylapoharmine, $C_8H_5N_2CH_3$, is formed. After crystallising from water and drying in a vacuum, it melts at 183° C. Iodomethylapoharmine is obtained by treating an aqueous solution of methylapoharmine with iodine dissolved in potassium iodide solution. The substance crystallises from alcohol in colourless needles, m.pt. 156° C. Potassium hydroxide has no action on the methiodide of methylapoharmine. The latter substance was treated with silver oxide and the methyl hydroxide thereby produced was distilled in a vacuum. In this way, trimethyldiapoharmine, $C_{16}H_{13}(CH_3)_3N_4$, was obtained, which crystallises from ether and melts at 74·5° C. This di-acid base has two methyl groups attached to the nitrogen, and one group attached to a carbon atom.
—F. Shdn.

Betaines of plants. III. E. Schulze and G. Trier. Z. physiol. Chem., 1912, **79**, 235—242.

Betonicine, the betaine of *Betonica officinalis*, is apparently accompanied by isomeric bases, and betaines of the betonicine class appear to be generally distributed in plants. They are easily separated from the normal betaines since, as free bases, they are insoluble in alcohol. The isolation of the separate constituents of the betonicine group is more difficult: betonicine itself affords a hydrochloride, which is very sparingly soluble in cold alcohol, and which can therefore be used for its isolation. A compound or mixture of compounds has been obtained from vetch seedlings (*Vicia sativa*) which has many points of resemblance with betonicine but differs in other respects from this: it is possibly an amino-acid containing a methyl group attached to nitrogen.—E. F. A.

Betaine: Occurrence of —— in green tobacco leaves. N. T. Deleano and G. Trier. Z. physiol. Chem., 1912, **79**, 243—246.

Previously the following bases have been obtained from tobacco:—nicotine, nicoteine, nicotimine, nicotelline, pyrrolidine, N-methylpyrrolidine and *iso*amylamine. Ordinary glycine-betaine has now been obtained from green tobacco leaves.—E. F. A.

Glucosides; Methylation of ——. J. Herzig and R. Schönbach. Monats. Chem., 1912, **33**, 673—681.

Certain glucosides have been methylated by means of diazomethane, and the methylated product subsequently hydrolysed in order to throw light upon the constitution of the substances in question. After several days treatment with diazomethane, pentamethyloquercitrin was obtained from quercitrin. When hydrolysed by warming with dilute sulphuric acid, tetramethylquercetin, $C_{15}H_6O_3(OCH_3)_4$, was formed, crystallising in nearly white needles from alcohol and melting at 195°—198° C. Strephanthin, which already contains a methoxyl grouping, was treated in the same way with the formation of tetramethylonorstrophanthin. This gave rise to strophanthidin and a methylated strophanthobiose on hydrolysis with dilute hydrochloric acid.—F. Shdn.

Emulsin; Synthetical action of ——. E. Bourquelot and M. Bridel. J. Pharm. Chim., 1912, **5**, 569—573.

The authors have previously shown (J. Pharm. Chim., 1912, **5**, 388) that in an aqueous solution the hydrolysis of salicin by emulsin ceases after the hydrolysis of 94·87 per cent. of the salicin, whilst in an alcoholic solution the reaction stops still sooner. Thus in 85 per cent. alcohol, 54·7 per cent. of salicin was left unhydrolysed. This suggested that if the enzymic action were reversible, from 51 to 55 per cent. of the components of salicin should be made to combine by emulsin in the presence of 85 per cent. alcohol. In the experiment 1·25 grm. of anhydrous dextrose and 0·875 grm. of saligenin were dissolved in 200 c.c. of the alcohol and treated with 0·4 grm. of emulsin at 17° to 20° C. The optical rotation of the mixture gradually changed from +37′ to —14′, corresponding to the formation of 1·1 grm. (=55 per cent.) of salicin. Attempts to isolate salicin from the reaction product, however failed, there being obtained instead, a colourless syrup which solidified to a hard amorphous very soluble substance, with an optical rotation of —30·02°. It is suggested that this substance may be the ethylglucoside-β of Koenigs and Knorr (this J., 1901, 626.)—C. A. M.

Saponin of the White Soapwort. II. L. Rosenthaler and K. T. Ström. Arch. Pharm., 1912, **250**, 290—297. (See this J., 1901, 502.)

The saponin of Gypsophila was heated with 3 per cent. sulphuric acid on the water-bath till a portion of the liquid gave no precipitate on further heating. The precipitate of pro-sapogenin was washed, taken up with ethyl acetate, and the latter solution washed, dried, and evaporated. The substance was crystallised from alcohol and then melted at 207° C. It has $[a]_D=+11{\cdot}92°$ in alcohol at 18° C. The semicarbazone melts at 241° C. When heated with 2 per cent. sulphuric acid at 120° C. under pressure, pro-sapogenin is converted into sapogenin, $C_{24}H_{34}O_5$. This crystallises from alcohol in rosettes of silky needles melting at 267°—268° C., and with $[a]_D=+90{\cdot}86°$ in alcohol at 18° C. The substance is insoluble in water, but soluble in most organic solvents. The sodium compound is easily soluble in alcohol, but soluble with difficulty in water. Methylsapogenin melts at 192° C., and diacetylsapogenin at 164°—165° C. Sapogenin semicarbazone, $C_{24}H_{34}O_4{\cdot}COH_3N_3$, melts at 259°—260° C. When oxidised in alkaline solution by means of permanganate, asymmetric dimethylsuccinic acid, m. pt. 130°—131° C., is formed.—F. Shdn.

Essential oils; Constituents of ——. *Chemical identity of natural and artificial cedrene.* F. W. Semmler and K. E. Spornitz. Ber., 1912, **45**, 1553—1557.

Artificial cedrene differs from natural cedrene in having a greater optical activity. The artificial cedrene was oxidised by means of ozone, and cedrenedicarboxylic acid, m. pt. 182·5° C., was finally obtained, identical with that obtained by a similar method from natural cedrene (see this J., 1912, 254). The natural cedrene therefore contains a body identical with artificial cedrene, and, in addition, isomeric sesquiterpenes.—F. Shdn.

Thymol, salicylates, and similar compounds: A new bromine method for the determination of ——. A. Seidell. Amer. Chem. J., 1912, **47**, 508—526.

After trials of several methods (see this J., 1909, 1166) the following has been found to give good results for the determination of thymol. The weighed sample of 0·1 to 0·5 grm. of thymol is placed in a 300 c.c. stoppered bottle with 1—2 c.c. of carbon tetrachloride and 100 c.c. of water. Bromine vapour is then poured into the mixture, till there is a considerable excess after shaking. After half-an-hour, 5 c.c. of carbon bisulphide and 5 c.c. of 20 per cent. potassium iodide solution are added, and the free iodine is titrated by means of $N/10$ thiosulphate solution. After adding a little more iodide, no further liberation of iodine should take place. 5 c.c. of 2 per cent. potassium iodate solution are then added, and the free iodine again titrated. The figures obtained in the second titration correspond to the hydrobromic acid formed by the action of bromine on the thymol, and the result is calculated assuming the formation of two molecules of hydrobromic acid to one molecule of thymol. The method can be applied to benzophenol (three molecules of acid corresponding to one molecule) and to sodium salicylate (two molecules of acid corresponding to one molecule). Fairly good results were obtained with acetanilide and β-naphthol.—F. Shdn.

Chloroform; Manufacture of —— *from bleaching powder and ethyl alcohol.* F. W. Frerichs. J. Ind. Eng. Chem., 1912, **4**, 345—352, 406—413.

In view of the interest attaching to the manufacture of chloroform from tax-free alcohol and bleaching powder, the author gives a detailed description of experiments made thirty years ago for improving the yield attainable by this process. It was found that the most favourable conditions are:—The concentration of alcohol in the charge should be about 10 per cent. There should be present not less than 100 c.c. of 94 per cent. alcohol for every 100 grms. of bleaching powder containing 35 per cent. of available chlorine. The alcohol and bleaching powder solutions should be brought together at a temperature as near the boiling point as possible. As finally developed, the process was as follows:—120 gallons of 94 per cent. alcohol were charged into a vertical still (6 ft. diam., 8 ft. high), together with sufficient water to dilute the alcohol to 20 per cent. strength. In a vessel, provided with an agitator, above the still, a quantity of bleaching powder equal to 1500 lb. of 35 per cent. strength was mixed with water, and after heating the diluted alcohol in the still to boiling by means of direct steam, the bleaching powder solution was introduced, in small quantities at a time, through a pipe reaching nearly to the bottom: the entire charge filled the still to less than three-quarters of its capacity. The reaction set in immediately: the chloroform was distilled off and then the excess of alcohol, the distillate being collected in a receiver, from which the lower layer of aqueous alcohol could be run off into a vessel of 400 gallons capacity, from which it could be returned to the still to be used in a new operation. The average yield obtained over an extensive period corresponded to 100 lb. of pure chloroform from 977 lb. of 35 per cent. bleaching powder and 11·22 gallons of 94 per cent. alcohol, with a consumption of 2 tons of steam of 80 lb. pressure.—A. S.

Ketones; The use of carbonates in the catalytic preparation of ——. J. B. Senderens. Comptes rend., 1912, **154**, 1518—1520.

Although a good yield of acetone can be obtained by the action of the carbonates of calcium, barium, strontium, cerium and zinc on acetic acid vapour at an elevated temperature, these carbonates do not have a corresponding action on the higher homologues of acetic acid. Similarly zinc dust converts acetic acid vapour catalytically into acetone, but has practically no action on propionic acid, and none at all on the higher homologues. Under suitable circumstances the oxides of thorium, zirconium and uranium can be applied generally to prepare aromatic or aliphatic ketones catalytically. (See this J., 1910, 173.) —F. Shdn.

Alcohols; Dehydration of —— by means of sulphonic acids and the influence of phenols on the reaction. H. Wuyts. Bull. Soc. Chim. Belg., 1912, **26**, 301—309.

When tertiary butyl or amyl alcohol is boiled with $\frac{1}{20}$ or $\frac{1}{30}$ of its weight of *p* toluene sulphonic acid as a catalyst, *iso*butylene or trimethylethylene respectively is readily formed. The reaction is still more rapid if carried out at a higher temperature in a suitable apparatus. Under similar conditions of boiling with the acid, *iso*propyl and secondary butyl alcohols do not form hydrocarbons, but when the temperature is raised and the proportion of acid is increased, a steady reaction sets in. Secondary octyl alcohol reacts at the boiling point to form an octylene, b. pt. 123°—125° C. The secondary cyclic alcohols react in a similar manner provided the temperature of reaction is sufficiently high. No decomposition of the sulphonic acid takes place even at 155° C. if it is dissolved in a sufficient quantity of alcohol (*cyclo*hexanol). When heated by itself some sulphur trioxide is formed. The addition of a little phenol or resorcinol greatly facilitates interaction and the liberation of the hydrocarbon. The yield of this however is lower when the operation is carried out in presence of phenol, and in the case of *cyclo*hexanol, *cyclo*hexylphenol, m. p. 128° C. was formed. When trimethylethylene, phenol and toluenesulphonic acid are heated in a sealed tube at 100° C., the reverse action takes place and tertiary amylphenol, m. p. 93° C., is formed. —E. F. A.

Radium emanation or radium D; Decomposition of monosodium urate by ——. J. Kerb and P. Lazarus. Biochem. Zeits., 1912, 42, 82—90.

Contrary to the statement of Gudzent, it is found that monosodium urate is not decomposed by radium emanation or radium D, an observation confirmed by von Knaffl-Lenz and Wiechowski (this J., 1912, 408). It is suggested that both the decomposition observed by Gudzent, and that said by Mesernitsky to be effected by the α-rays (*loc. cit.*), may have been due to the action of micro-organisms, to the action of alkali derived from the glass vessels employed, or to the action of light.—L. E.

Patents.

Pharmaceutical products [bornyl and isobornyl esters of bromohydrocinnamic or bromocinnamic acids]; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 19,366, Aug. 30, 1911.

The borneol or isoborneol esters of bromo derivatives of cinnamic or hydrocinnamic acid, containing the bromine in the side chain, are obtained (1) by esterifying with borneol or isoborneol the bromocinnamic or bromohydrocinnamic acids or their salts or homologues or substitution products; (2) by treating with bromine or hydrobromic acid the esters of borneol or isoborneol with cinnamic, hydrocinnamic, or phenylpropiolic acid or their homologues or substitution products; (3) by treating bromocinnamic acids or bromohydrocinnamic acids with camphene. The new esters are tasteless, odourless, crystalline compounds, possessing strong sedative properties.—T. F. B.

Therapeutic compound, New ——. [*dl-Nitrohydrastine*] H. S. Wellcome, London, and F. G. P. Remfry, Dartford. Eng. Pat. 27,100, Dec. 4, 1911.

By condensing hydrastinine with 6-nitromeconin, for example, by boiling a solution of the two substances in absolute alcohol, a new base *dl*-nitrohydrastine is formed. This has the composition, $C_{21}H_{20}O_8N_2$, and crystallises in small orange-brown prisms, melting at 167°—168° C. with decomposition. The hydrochloride, B,HCl, melts at 137°—138° C. with decomposition.—F. Shdn.

Esters of acidylsalicylic acids. R. Wolffenstein, Berlin. Eng. Pat. 27,562, Dec. 8, 1911.

The esters of acidylsalicylic acids are prepared by treating the halogenides of the acids with the necessary alcohol in presence of a tertiary base, calcium carbonate, or other substance adapted to combine with the hydrohalogen acid which is liberated; without the use of such a substance the ester is not obtained. The trichloroisobutyl ester (m. pt. 75° C.) and the trichloroisopropyl ester (m. pt. 62° C.) are claimed as new products. They are insoluble or sparingly soluble in water, and readily soluble in petroleum spirit, alcohol, etc. The following process for preparing acetylsalicyclic acid trichloroisobutyl ester is claimed:—Acetylsalicylic acid chloride and trichloroisobutyl alcohol are dissolved in benzene, in presence of calcium carbonate, the solution is heated (for about five hours) and allowed to cool, and the product is purified by dissolving in benzene, treating successively with dilute hydrochloric acid, sodium carbonate solution, and water, and recrystallisation.—T. F. B.

Acetone-chloroform acetylsalicylic acid ester; Process for preparing ——. R. Wolffenstein. Ger. Pats. 245,533, Nov. 29, 1910, and 246,383, March 8, 1911.

(1.) The acetone-chloroform ester of acetylsalicylic acid is obtained by the action of the chloride of acetylsalicylic acid on acetone-chloroform in presence of a tertiary base. It combines the lenitive properties due to acetone-chloroform with the antirheumatic properties of the acid. (2.) In place of the tertiary bases in the above process, other agents may be used which combine with hydrochloric acid, calcium carbonate being especially suitable. —T. F. B.

Glycerophosphates; Manufacture of ——. Southall Bros. and Barclay, Ltd., and C. S. Roy, Birmingham. Eng. Pat. 2881, Feb. 5, 1912.

The acid calcium, barium, strontium, iron, manganese, magnesium, aluminium, potassium, lithium and mercury salts of glycerophosphoric acid can be made by heating the oxides, hydroxides, carbonates or phosphates of the metals in question with aqueous syrupy phosphoric acid and heating the mixture so obtained with glycerin under reduced pressure. Normal glycerophosphates can be made by a similar process, also mixed or double glycerophosphates.—F. Shdn.

Divinyl [erythrene]; Process of producing ——. F. Hofmann and C. Coutelle, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,028,938, June 11, 1912.

Tetramethylenediamine is completely alkylated, and the product is converted into the corresponding quaternary ammonium base, which is converted into divinyl by means of alkali (compare U.S. Pat. 1,005,217 of 1911; this J., 1912, 91).—T. F. B.

Homopiperonalamine; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 245,523, July 5, 1910.

Homopiperonalamine is obtained by the reduction of the oxime of homopiperonal or of methylenedioxy-ω-nitrostyrole; in the reduction of homopiperonal-oxime by sodium amalgam, glacial acetic acid is added in greater quantity than is necessary to neutralise the sodium hydroxide formed.—T. F. B.

Mercury salts in oils and fats; Process for preparing solutions of ——. G. Glock. Ger. Pat. 246,507, Feb. 5, 1910.

Mercuric chloride or other mercury salt which is insoluble or very sparingly soluble in oils and fats, is dissolved in ether free from alcohol, or in anhydrous acetone; these solutions are then mixed with the necessary oil or fat and the solvent is removed by distillation.—T. F. B.

Cinnamic acid containing iodine in the side chain; Manufacture of derivatives of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 13,526, June 6, 1911.

See Ger. Pat. 246,165 of 1910; this J., 1912, 605.—T. F. B.

Glucoheptonic acid; Manufacture of ——. A. Liebrecht, Frankfort on Maine, and G. Rosenfeld, Breslau, Germany. Eng. Pat. 8495, April 10, 1912. Under Int. Conv., April 21, 1911.

See Ger. Pat. 245,267 of 1911; this J., 1912, 557.—T. F. B.

Diaminodi[hydr]oxyarsenobenzene; Derivatives of ——. G. Korndörfer, Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,024,993, April 30, 1912.

See Ger. Pat. 245,756 of 1911; this J., 1912, 594.—T. F. B.

Pharmaceutical products [borneol and isoborneol esters of dibromodihydrocinnamic acid]. W. Hiemenz and W. Kropp, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,026,913 and 1,026,914, May 21, 1912.

See Eng. Pat. 19,366 of 1911; preceding.—T. F. B.

Isourea; Alkyl ether of ——. M. Engelmann and B. Merkel, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,028,936, June 11, 1912.

See Ger. Pat. 240,353 of 1910; this J., 1911, 1409.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Development with diaminophenol in acid solution. G. Balagny. Bull. Soc. Franç. Phot., 1912, 58, 198—205.

In the course of some experiments in developing negatives by means of acid solutions of diaminophenol, it was found that in some cases development commenced from the surface of the emulsion in contact with the glass, and proceeded upwards, being complete when the first signs of an image appeared on the upper surface of the plate. Further investigations showed that this result (called development "*en profondeur*") was obtained with solutions containiog more than the normal quantity of diaminophenol: the following method is recommended for preparing such a solution: In 150 c.c. of water are dissolved, successively, 8 c.c. of a mixture of equal parts (by volume) of commercial sodium bisulphite solution and water, and 20 grms. of anhydrous sodium sulphite; 8 c.c. of this solution are diluted to 150 c.c., and 1·5 grms. of diaminophenol dissolved therein. In such solutions development is generally complete in about 20 minutes. The negatives produced appear as though they had been varnished, and are very soft in contrasts, the lights being very transparent: for this reason the method is especially suitable for developing photographs of subjects which contain very strong contrasts, or which are very strongly lighted, to produce soft results.—T. F. B.

Patent.

Developing photographic plates and films; Process of ——. H. M. Prindle, Boston, Assignor to A. H. Hildreth, Cambridge, Mass. U.S. Pats. 1,029,511 and 1,029,512, June 11, 1912.

(1) The plate or film is immersed whilst in subdued actinic light, in an aqueous solution containing mercuric chloride, sodium chloride, and a developing agent, washed, and fixed as usual. (2) The plate or film is treated before development with a solution of mercuric chloride and sodium chloride, whilst in subdued actinic light. —T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Thomson displacement process [for nitrocellulose]. M. Delpy. Z. ges. Schiess- und Sprengstoffw., 1912, 7, 237—240.

The author had unsatisfactory results, when using the Thomson displacement system (this J., 1909, 177) for the nitration of paper (10 to 11 per cent. of nitrogen) intended for the manufacture of celluloid. He claims that the nitrating centrifugal method possesses advantages in almost every respect over the displacement system. There is less firing of the charges, less maintenance, less labour required, and less trouble from fumes, and a greater output. MacDonald (this J. 1911, 251) has stated that the loss by drainage in the displacement system is only 0·4 per cent. of the total acid used, or about one-tenth of that obtained with nitrating centrifugals, but the author cannot agree, and considers that the loss in the displacement process is greater than in the nitrating centrifugal process. —G. W. McD.

Permissible explosives [in U.S.A.]; The use of ——. J. J. Rutledge and C. Hall. U.S. Dept. of Interior, Bureau of Mines, Bull. 10, 1912.

The use of permissible explosives in the United States has increased from 11,300 lb. in 1902 to 2,108,610 lb. in 1908, and 8,942,857 lb. in 1909. A large number of the coal mining States are restricting the use of black blasting powder in the more dangerous coal mines, and better regulations for the storage and handling of the explosives for use in coal mines are being adopted by many of the large mining companies. The quantity of explosive to be taken into a mine is rapidly being limited in many districts. Special men, known as shot firers, are employed in many mines for loading, stemming, and firing all explosives. The system of firing the shots from the surface by electricity, after all the men are out of the mines, is being introduced in many of the States. Coal dust or other combustible and therefore dangerous material for stemming is being replaced by clay or other incombustible material. The practice of wetting the coal dust in the mines by watering the sides and roofs of working places, and by moistening the air of the mines with steam jets and water sprays, is spreading rapidly. The measures taken for preventing explosions in coal mines are becoming nearly as effective as those adopted in Europe.—G. W. McD.

Experiments with coal dust in the Rossitz experimental gallery. Czaplinski and Jicinsky. *See* IIa.

Volumetric determination of chloric acid and chlorates. Kolb. *See* VII.

Patents.

Blasting purposes; Tamping for ——. E. Macaulay, Clynderwen, S. Wales. Eng. Pat. 23,021, Oct. 18, 1911.

The tamping consists of clay (48 parts), slaked lime (8·4), and potassium permanganate (1 part).—G. W. McD.

riming mixture. W. H. Buell, Assignor to Winchester Repeating Arms Co., New Haven, Conn. U.S. Pat. 1,027,811, May 28, 1912.

NON FULMINATE priming mixture is claimed consisting f antimony sulphide, lead thiocyanate, potassium chlorate, nd trinitrotoluene.—T. F. B.

mokeless powder ; Press for ——. Fortuna-Werke A. Hirth. Fr. Pat. 438,081, Nov. 8, 1911. Under Int. Conv., Jan. 23, 1911.

HE press is made with its agitator, and compressing cylin-er united in one apparatus. Thus the axis of the agitator ay traverse the compressing cylinder ; or several ylinders may be made to revolve and each to fulfil suc-essively the function of agitator and press.—C. A. M.

'mokeless nitrocellulose-nitroglycerine powders ; Method of manufacturing ——. C. Claessen, Berlin. Eng. Pat. 21,147, Sept. 25, 1911. Under Int. Conv., May 26, 1911.

EE Fr. Pat. 434,112 of 1911 ; this J., 1912, 258.—T. F. B.

Explosives ; Method of making unfreezable ——. V. Vender, Milan, Italy. U.S. Pat. 1,029,519, June 11, 1912.

SEE Fr. Pat. 372,267 of 1906 ; this J., 1907, 553.—T. F. B.

Detonating composition. E. Goodwin, Stamford Hill, Assignor to Eley Bros., Ltd., Edmonton. U.S. Pat. 1,029,287, June 11, 1912.

SEE Eng. Pat. 2682 of 1911 ; this J., 1911, 1089. T. F. B

Preventing or extinguishing fires or explosions. Eng. Pat. 28,075. *See* XIXB.

XXIII.—ANALYTICAL PROCESSES

Methylene blue ; Use of —— as an indicator in iodometric titrations. F. S. Sinnatt. Analyst, 1912, **37**, 252—254.

IT has been shown previously (this J., 1910, 979) that a solution of pure methylene blue in water (0·05 grm. per litre) can be used instead of starch in iodometric determinations. It is now shown that the ordinary commercial forms of methylene blue can be used, that it may be introduced at the beginning of the titration, and that neutral salts and acetic, nitric, and sulphuric acids do not affect the colour change. The results of experiments in the presence of alcohol, carbon tetrachloride, and chloroform are tabulated and shown to be identical with those obtained by the use of starch.—A. H. C.

Fluorine ; Detection and determination of traces of —— in minerals, waters, and living tissues. A. Gautier and P. Clausmann. Comptes rend., 1912, **154**, 1469—1475.

FOR the determination of traces of fluorine, the following methods of concentrating the fluorine in the soluble form in a very small bulk of liquid, are described :—(*a*) *Potable or mineral waters and other liquids.*—To effect the separation of a very small quantity of fluorine (0·25—1 mgrm. or less, per litre), the liquid (1 litre) is made very slightly alkaline with potassium hydroxide, and treated with 0·3 to 0·4 grm. of crystallised sodium sulphate, a slight excess of barium chloride then being added. The whole is heated to 100° C., and evaporated to dryness ; the residue is treated with just enough water to dissolve the soluble salts and then with an equal volume of 96 per cent. alcohol, being finally washed by centrifuging with 65 per cent. alcohol until free from chlorides. Besides sulphate and fluoride, the washed and dried residue may contain silicate, phosphate and borate of barium ; it is heated with sulphuric acid in a gold crucible of special construction, the vapours of hydrofluoric and hydrofluosilicic acids set free being collected in a solution of potassium hydroxide. If the water contains much sulphate, the quantity of barium sulphate thrown down renders the above method unsuitable ; in such cases, the water is treated with magnesium chloride (but not if it already contains magnesium salts), ammonium phosphate and ammonia, the whole is evaporated nearly to dryness and extracted with the minimum quantity of ammoniacal water, the dried residue of fluoride and ammonium magnesium phosphate being distilled with sulphuric acid as in the former case. (*b*) *Minerals.*—If the mineral can be completely decomposed by concentrated sulphuric acid, it is ground to impalpable powder and distilled with the acid as above described. Otherwise, the ground mineral is fused with 6 parts of alkali carbonates and 2 parts of pure silica in a platinum crucible ; the melt is dissolved in boiling water, the solution being filtered, freed from silicic acid by addition of ammonium carbonate, filtered again, and concentrated. (*c*) *Plant or animal tissues.* The dried material is ground with 1—1·5 per cent. of lime that has been previously slaked and moistened, and the mixture is calcined in a nickel or porcelain muffle at 550°—600° C. The residue is dissolved in the minimum quantity of hydrochloric acid, made slightly alkaline, and treated with a small quantity of sodium sulphate and a slight excess of barium chloride, the further treatment being similar to that described in (*a*). The authors propose to describe later the method used for the determination of the fluorine in the solutions of alkali fluoride or fluosilicate obtained as above described.—L. E.

Arsenic ; Separation of —— from antimony and other metals, with some applications to toxicological work. S. W. Collins. Analyst, 1912, **37**, 229—238.

2·0 GRMS. of antimony oxide, 0·1 grm. of arsenious oxide, 15 c.c. of sulphuric acid (sp. gr. 1·84) and 50 c.c. of methyl alcohol were mixed in a distilling flask which was heated on a water-bath, a stream of hydrogen chloride being passed through the apparatus for some time before commencing the heating and continued during the distillation. The distillation was repeated twice with 50 c.c., and twice with 20 c.c. of methyl alcohol, when the distillate gave no precipitate with hydrogen sulphide. The arsenic in the distillate was estimated by diluting with an equal volume of water, passing hydrogen sulphide, washing the precipitated arsenic sulphide with hot water, alcohol, a mixture of carbon bisulphide and alcohol, alcohol, and again hot water. It was then washed from the filter paper into a weighed dish, dried over a water bath, and finally at 105° to 110° C., and then weighed. 0·1002 grm. calculated as arsenious oxide was obtained and it was free from antimony. The precipitate was always tested for antimony by digesting with concentrated hydrochloric acid, filtering, diluting, and saturating with hydrogen sulphide. The antimony sulphide was dissolved in hydrochloric acid with a little potassium chlorate and the antimony obtained from the solution by the action of pure iron wire. When the arsenic was present as arsenic pentoxide, it could be completely separated from antimony and bismuth oxides, and mercuric chloride, if distilled in the presence of a reducing agent such as ferrous chloride. It was found that pure methyl alcohol and dry materials should be employed, and that 10 c.c. of sulphuric acid (sp. gr. 1·84) was a convenient quantity to retain all the antimony if not more than 1·0 grm. of its oxide be present. In one experiment on the influence of organic matter, 20 grms. of powdered biscuit material was mixed with 0·1 grm. of arsenious oxide and 0·1 grm. of antimony oxide, and after distillation, 0·0986 grm. of arsenious oxide was found. The method is suitable for use in toxicological work. Attempts to confirm the statement of Friedheim and Michaelis, that arsenic is distilled as a methyl arsenious ester were unsuccessful.—A. H. C.

Nickel and palladium ; Separation of —— by dimethylglyoxime. M. Wunder and V. Thuringer. Ann. Chim. Analyt., 1912, 17, 201—202.

THE solution is slightly acidified, preferably with hydrochloric acid, and treated with an excess of a 1 per cent.

solution of dimethylglyoxime in 2 per cent. hydrochloric acid, when a bulky orange-yellow precipitate, containing all the palladium as the compound, $C_8H_{14}N_4O_4Pd$, is deposited, and this, after digestion for half-an-hour on the water-bath, is filtered off, washed with boiling water, dried, ignited, and weighed as the metal. The filtrate is heated to boiling and rendered slightly alkaline by ammonia, so as to precipitate the nickel as nickel-dimethylglyoxime, which is filtered off through a Gooch crucible, washed with boiling water and with 20 per cent. alcohol, and dried at 100° C. to constant weight, the corresponding weight of nickel being obtained by multiplying by the factor 0·2031.—F. Sodn.

Tungsten and molybdenum; Potassium iodide and mercurous nitrate as a sensitive reagent for ——. E. Kafka. Z. anal. Chem., 1912, **51**, 482.

A drop of a saturated solution of mercurous nitrate, followed by 1—1·5 c.c. of concentrated hydrochloric acid and an excess of potassium iodide, is added to the solution to be tested, and the mixture is well shaken, until the mercurous iodide at first formed is completely dissolved; in the presence of tungstic or molybdic acid, a blue colour is thus produced, either at once or after a short time, 0·2 mgrm. of sodium tungstate being clearly indicated. In the case of molybdenum, the blue colour may be changed to a deep blood red by the addition of potassium thiocyanate, and, even with solutions too dilute to give the blue colour, an orange colour (which may be extracted with ether) is produced on adding this reagent.—F. Sodn.

Beryllia and alumina [and ferric and chromic oxides]; Separation of ——. M. Wunder and P. Wenger. Z. anal. Chem., 1912, **51**, 470—473.

Beryllia is separated quantitatively from alumina and chromic oxide by converting these latter into sodium aluminate and chromate respectively, by fusion for 2—3 hours with sodium carbonate; the beryllia remains insoluble and may be subsequently separated from iron, when such is present, by fusing with sodium bisulphate, dissolving in water, precipitating the iron with potassium hydroxide, filtering, acidifying the filtrate with sulphuric or hydrochloric acid, and precipitating with ammonia. The filtrate, containing aluminium and chromium, may then be treated by the method of Tcharviani and Wunder (this J., 1911, 156).—F. Sodn.

Thorium; New reagent for ——. M. Koss. Chem.-Zeit., 1912, **36**, 686—687.

Kaufmann in 1899 described a thorium hypophosphate, insoluble even in strong acids. The author has found that the corresponding salts of cerium and of the yttrium metals are soluble in acids, and that by making use of this reaction thorium can be detected; he finds, too, that the precipitate of thorium hypophosphate is quite free from co-precipitated salts of the other metals. The solution to be tested is strongly acidified with hydrochloric acid, and a few drops of a solution of sodium hypophosphate are added. A flocculent white precipitate falls—in the case of very small amounts of thorium, only after heating or long standing. In this way 0·01 mgrm. of thoria per c.c. can be detected. The precipitate has the composition corresponding to $Th(PO_3)_2,11H_2O$. Titanium and zirconium are both similarly precipitated. If titanium be present, it must be completely peroxidised by hydrogen peroxide before adding the hypophosphate, when it is no longer precipitable. Zirconium must be precipitated with the thorium, the washed precipitate converted into phosphate by strong sulphuric acid and a few drops of nitric acid, the thorium then precipitated by oxalic acid and thus separated from the zirconium; the oxalate precipitate under these circumstances must indicate thorium. This forms a promising method for the determination as well as the detection of thorium. The sodium hypophosphate is best prepared by the anodic oxidation of copper phosphide (Rosenheim and Pinsker, Ber., 1910, **43**, 2003).—J. T. D.

Colourimeter; Colourimetric determinations by means of a new ——. W. Autenrieth and J. Koenigsberger. Z. angew. Chem., 1912, **25**, 1168—1171.

The liquid to be examined is introduced into a glass trough, and its colour is compared with that of a standard solution, contained in an adjoining wedge-shaped cell, which may be raised or lowered so as to match the tints of the two solutions; the cells are backed by a sheet of milk glass and the apparatus held towards the light, observations being made through a slit in the wooden cover, and a Helmholtz bi-plate arranged behind the slit, so that there may be no dividing line between the bands of colour to be matched. The standard cell is filled with a suitable stable inorganic solution and is calibrated before use, so that, its position being read on a scale attached to the apparatus, the strength of the solution to be determined may be at once obtained from a previously constructed curve. Among determinations for which the apparatus has been found specially suitable are those of milk sugar in milk, iodine in thyroid gland preparations, ammonia, etc., in water, and morphine in opium.—F. Sodn.

Methods of analysing coal and coke. Stanton and Fieldner. *See* IIa.

Net calorific power of fuels calculated from the results obtained by the bomb calorimeter and the proximate analysis. Lucion. *See* IIa.

Volumetric determination of chloric acid and chlorates. Kolb. *See* VII.

Reaction for coal-tar products (pyridine) in ammonia and ammonium salts. Wöhlk. *See* VII.

Detection of chromium sesquioxide insoluble in acids. Jankowitsch. *See* VII.

Decomposition of chrome iron ore. St. Warunis. *See* X.

Analysis of ferro-nickel containing zinc, aluminium, and manganese. Carron. *See* X.

Determination of oxygen and occluded gases in copper, and a correction to the electrolytic assay in the complete analysis of copper. Heath. *See* X.

Assay of zinc ores; separation of iron by ammonia. De Koninck and Von Winiwarter. *See* X.

Effect of lime on the ammonium molybdate method of lead assay. Bannister and McNamara. *See* X.

Analysis of beeswax and carnauba wax. Determination of hydrocarbons. Leys. *See* XII.

Analysis of lithopone. Austin and Keane. *See* XIII.

Detection of heavy petroleum in paints and vegetable oils. Pollard. *See* XIII.

Comparison of some methods for the determination of sulphur in vulcanised rubber, with special reference to electrolytic oxidation. Spence and Young. *See* XIV.

Polarimetric determination of starch. Lintner. *See* XVIII.

Determination of phytin.] *Influence of the duration of malting and the mashing process on the composition of worts.* Windisch and Reiser. *See* XVIII.

Direct extract determination in wine. Von der Heide and Schwenk. *See* XVIII.

Determination of shell in cocoa. Schenk, Schmidt and Görbing. *See* XIXA.

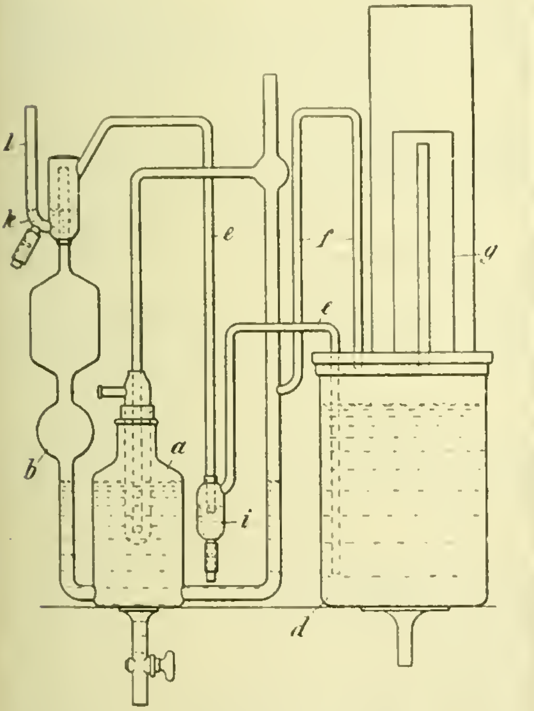
Distinction of cocaine from its substitutes. Scherbatschew. *See* XX.

New bromine method for the determination of thymol, salicylates and similar compounds. Seidell. *See* XX.

Patents.

Gas analysis; Apparatus for ——. Ingeniörsfirma F. Egnell. Fr. Pat. 438,390, Dec. 28, 1911. Under Int. Conv., Dec. 29, 1910.

The apparatus is of the kind described in Fr. Pat. 401,800 (see Eng. Pat. 18,829 of 1908; this J., 1909, 1065) comprising a measuring vessel, *b*, and an absorption vessel, *d*, and the arrangement is such that the connecting tube, *c*, between the two has no branches. The apparatus is worked by the rise and fall of liquid in the vessel, *a*. When the liquid level falls, a sample of gas is drawn into *b*, from a pipe, *l*, through a seal, *k*. The liquid level then rises and the gas is expelled from *b*, through the tube, *e*, mercury seal, *i*, absorption vessel, *d*, and tube, *f*, to the atmosphere, until the lower end of the tube, *f*, is sealed, after which the gas not absorbed passes into the bell, *g*, and is measured.
—A. T. L.



Gas calorimeter. A. Macklow-Smith and W. W. F. Pullen, London. Eng. Pat. 19,051, Aug. 25, 1911.

A gas calorimeter comprises a braided heat-absorbing coil situated between the outside of a chimney and the inside of an annular water chamber, a central chimney in which the fuel is burnt, and means for compelling the hot products to pass over the heat-absorbing surface and thence through an outer annular jacket for minimising radiation. Baffles are placed round the burner beneath the flame, to prevent radiation downwards, and an adjustable inlet opening is fitted at the bottom to regulate the air supply. The arrangement is such that condensation of the combustion products only occurs in the annular space containing the heat-absorbing coil, so that the condensed water of combustion can readily be collected and measured. The water flowing through the calorimeter passes first through the annular water chamber and then through the coil, and the flow is made more uniform by the interposition of a diaphragm, near the bottom of the annular chamber, containing apertures of different dimensions.
—H. H.

Recording gaseous volumes or other quantities; Apparatus for ——. Ingeniörsfirma F. Egnell, Stockholm. Eng. Pat. 28,616, Dec. 19, 1911. Under Int. Conv., Dec. 21, 1910.

See Fr. Pat. 438,390 of 1911; preceding.—T. F. B.

Flour tester. [*Colourimeter*]. Eng. Pat. 6469. *See* XIXA.

XXIV.—MISCELLANEOUS ABSTRACTS.

Chemical processes at high pressures; Investigations on ——. F. Bergius. Z. angew. Chem., 1912, 25, 1171—1173.

The author has succeeded in constructing apparatus in which pressures of more than 150 atmos., at a temperature of 300°—400° C., can be maintained for several weeks, this having been rendered possible by adopting conical joints for all connections, in which no packing is employed. With this apparatus, carbon and water have been found to interact at 350° C., in the presence of a catalyst, giving hydrogen and carbon dioxide, and hydroxyl derivatives of aromatic hydrocarbons, such as phenol and naphthol have been prepared by the action of aqueous alkali solutions on the corresponding chlorine derivatives, at a pressure of 100 atmos.; calcium peroxide also has been synthesised from calcium oxide and oxygen (compare Fischer and Ploetze, this J., 1912, 498), and its dissociation pressure has been measured at various temperatures. By heating peat or cellulose to about 340° C., in the presence of water, it has been found possible to prepare artificial coal resembling natural coal in composition, and the effect of temperature on its speed of formation has been investigated.
—F. Sodn.

Books Received.

The Puering, Bating, and Drenching of Skins. By Joseph T. Wood. E. and F. N. Spon, Ltd., 57, Haymarket, London. 1912. Price 12s. 6d. net; post free in the U.K. 12s. 10d.

8vo volume, containing 293 pages of subject matter, with 33 illustrations, and alphabetical indexes of authors and subjects. There is also a bibliography of articles and works on tanning and the bacteriology of leather manufacture, filling 8 pages. The subject matter is arranged under the following heads:—I. Description of the puering and bating process. II. The chemistry of bating. III. The physics of bating. IV. The bacteriology of the bate. V. Action of enzymes. VI. Original papers on bating. VII. Artificial bates. VIII. Patents. IX. Drenching. X. Original papers on drenching.

THE POLYTECHNIC ENGINEER. Published annually by the Undergraduates of the Polytechnic Institute of Brooklyn. Vol. xii. 1912.

8vo volume, containing 132 pages of subject matter, with numerous illustrations, frontispiece, and table of contents. The work is at once a college calendar and a record of researches, essays, etc., by students and others. The following are some of the papers, etc., given :—I. Delicacy of flame reactions (Fay and Cole). II. Testing and manufacture of smokeless powder at the United States Naval Proving Ground (Olsen). III. Pollution of New York Harbour by sewage disposal (Oxley). IV. Preparation of selenium dyes (Lee). V. Problems in the manufacture of C. P. acids (Baker).

DIE AROMATISCHEN ARSENVERBINDUNGEN. Ihre Chemie nebst einem Ueberblick über ihre therapeutische Verwendung. Von DR. HANS SCHMIDT. Julius Springer's Verlag. Berlin. 1912. Price M. 2.80 ; bound M. 3.40.

8vo volume, containing 92 pages of subject matter which is classified as follows :—I. Introduction. II. Synthetic methods (introducing arsenic into the benzene-ring). III. The aromatic arsenic compounds, arranged according to degree of oxidation. IV. Aromatic arsenic compounds containing halogens. V. Aromatic arsenic compounds containing sulphur. VI. Aromatic arsenic compounds with further substitutions in the benzene ring. VII. Benzyl-, Indole-, and Camphor-arsenic compounds. Arsenic trichloride-aniline. Arseno-aniline tartar-emetic. Esters of arsenious and arsenic acids. VIII. Analytical. IX. Therapeutic uses. X. Bibliography and patents.

THE TARIFF COMMISSION : The Economic Position of Ireland and its Relation to Tariff Reform. Published for the Tariff Commission by P. S. King and Son, 2 and 4, Great Smith Street, Westminster, S.W. Price 3d.

4TO pamphlet, containing 43 pages of subject matter, and issued by the Tariff Commission, 7, Victoria Street, S.W. The subject is treated under the following heads :—*A.* Range of Irish industry. *B.* External trade of Ireland. *C.* Course of Irish agriculture in the last fifty years. *D.* Irish linen and shipbuilding industries. *E.* Economic interdependence of England and Ireland. *F.* Fiscal provisions of the Irish Home Rule Bill, 1912.

THE PASTEURIZATION OF MILK. U.S. Department of Agriculture. Bureau of Animal Industry. Circular 184. Issued April 23, 1912. By S. HENRY AYERS. Government Printing Office, Washington, U.S. America. 1912.

PAMPHLET, 8vo size, containing 44 pages, with 32 illustrations. The following subjects are treated of :—I. Meaning and value of pasteurisation. II. Methods and apparatus. III. Construction and arrangement of pasteurising plants. IV. Controlling the process of pasteurisation. V. Temperatures and methods to be used. VI. Handling and delivery of pasteurised milk.

INVESTIGATIONS RELATIVE TO ARSENICAL DIPS AS REMEDIES FOR CATTLE TICKS. U.S. Department of Agriculture. Bureau of Animal Industry. Bulletin 144. By B. H. RANSOM, Ph.D., and H. W. GRAYBILL, D.V.M., Government Printing Office, Washington, U.S. America. 1912.

PAMPHLET, 8vo size, containing 65 pages of subject matter, with 11 illustrations, 10 being photolithographs. The following subjects are treated of :—I. Composition of dips used in experimental work. II. Details of experiments (*a.* Arsenic, soda, and pine-tar dips. *b.* Arsenic and zinc sulphate dip, etc.). III. Discussion of results. (Effects of arsenical dips on cattle ; also on the ticks). IV. The protective action of arsenical dips. V. Composition of the dip. VI. Method of application. VII. Number and frequency of applications.

*New Books.

[The Roman numerals in thick type, here and under "Dissertations," refer to the similar classification of abstracts under "Journal and Patent Literature" and in the "List of Patent Applications."]

I. *Archbutt*, L., and R. M. *Deeley* : Lubrication and Lubricants. 3rd Ed. Thoroughly revised and enlarged. 8vo., pp. 636. C. Griffin. London. 1912. Net 25s.

Hort, H. : Untersuchung v. Flüssigkeiten, die als vermittelnde Körper im oberen Prozess e. Mehrstoffdampfmaschine Verwendung finden können. Hrsg. vom Ver. deutscher Ingenieure. Lex. 8°. Berlin, J. Springer. 1912. M. 2.

Kirschke, A. : Gas and Oil Engines : a Concise Account of the most Important Types. Cr. 8vo., pp. 168. Scott, Greenwood. London. 1912. Net 3s.

Marks, L. S. : Tables and Diagrams of the Thermal Properties of Saturated and Superheated Steam. 8vo. Longmans. London. 1912. Net 4s. 6d.

IIA. *Bucher*, Dr. W. : Untersuchung üb. die Verbrennung methanhaltiger Gasgemische. Hrsg. vom Verein deutscher Ingenieure. Lex. 8°. Berlin, J. Springer. 1912. M. 2.

Power, F. D. : Coalfields and Collieries of Australia. Cr. 8vo., pp. 412. Critchley Parker. 1912. Net 25s.

IIB. *Barham*, G. B. : The Development of the Incandescent Electric Lamp. 8vo, pp. 206. Scott, Greenwood. London. 1912. Net 5s.

VII. *Arrhenius*, S. : Zur Physik der Salzlagerstätten. (25 S. m. 4 Fig.) 8°. Uppsala. Berlin, R. Friedländer und Sohn. 1912. M. 1.

Böhm, Dr. C. R. : Die Dissertationen üb. seltene Erden. Eine Bibliographie. (16 S.) 8°. Charlottenburg, G. Heydenreich. 1912. 75 Pf.

Dittrich, M. u. W. *Eitel* : Ueber die Bestimmung des Wassers u. der Kohlensäure in Mineralien u. Gesteinen. (15 S. m. 1 Fig.). Gr. 8°. Heidelberg. C. Winter. 1912. 60 Pf.

Jellinek, Dr. K. : Der Hydrosulfit. 2. Tl. Anorganische. organ. u. techn. Chemie des Hydrosulfits. [Aus. "Sammlg. chem. u. chem.-techn. Vorträge.") (VIII, 230 S. m. 2 eingedr. Kurven) Lex. 8°. Stuttgart, F. Enke. 1912. M. 9.

Lemberg, H. : Jahrbuch der deutschen Kaliwerke. Nach zuverläss. Quellen bearb. u. hrsg. 3. Ausg. Jahrg. 1912. Mit den Beteiligungsziffern, Lieferungsbedinggn. usw. des Kalisyndikates u. dem Gesetz üb. den Absatz v. Kalisalzen. (108 S.) 8°. Hannover, Dr. M. Jänecke. 1912. M. 1.

VIII. *Gary*, Prof. M. : Ueber die Prüfung feuerfeste Steine nach den Vorschriften der kaiserl. Marine, insbesondere auf Raumbeständigkeit in der Hitze. (III. 56 S. m. Fig. u. eingedr. Kurven). Hrsg. vom Ver. deutscher Ingenieure. Lex. 8°. Berlin, J. Springer. 1912. M. 2.

X. *Kobell*, F. v. : Tafeln zur Bestimmung der Mineralien mittelst einfacher chemischer Versuche auf trockenem u. nassem Weg. 16. neu bearb. u. verm. Aufl. v. Prof. K. Oebbeke. (XXX, 128 S.) 8°. München, L. Lindauer. 1912. M. 2.50 ; cloth M. 3.

Le Chatelier, H. : Le chauffage industriel, introduction à l'étude de la métallurgie, 96 fig., in-8°. Paris. 1912. Dunod et Pinat. 12 fr.

Lederer, E. L. : Kapillaritätserscheinungen an schmelzenden Metallen. (7 S. m. 1 Fig.) gr. 8°. Wien, A. Hölder. 1912. 34 Pf.

Rengade, Jolibois et *Broniewsky* : Conférences sur les lliages (Publ. de la société de chimie physique. T. III), 4 l., in-18. Paris. 1912. A. Hermann et fils. 2 fr.

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Stokes, R., J. E. *Thomas*, and Others : A Text-Book of Rand Metallurgical Practice. Vol. i. With 128 Illustrajons. (Scientific Text Books.) 8vo., pp. xix—468. ', Griffin. London. 1912. Net 21s.

Wang, C. Y. : Bibliography of the Mineral Wealth and Geology of China. Cr. 8vo. C. Griffin. London. 1912. Net 3s.

Zeys, P. : Mines, carrières et phosphates en Tunisie, egislation et industrie. Préface de M. Stéphen Pichon. Avec une carte, in-8°. Berger-Levrault. Paris. 1912. 4 fr.

XII. *Brannt*, W. : The soap maker's handbook of materials, processes and receipts for every description of soap, including fats, fat oils, and fatty acids ; examination of fats and oils ; alkalies ; testing soda and potash : machines and utensils ; essential oils and other perfuming materials. Ill. by 54 engravings. Phil., Hs. C. Baird and Co. 23+512 p. 8°. 1912. $6.

XVII. *Hanle*, Dr. O. : Die Chemie des Honigs. Chemisch-analytische Prufungs-Methode zur Erkenng. v. echten u. m. Invertzucker u. Glykose od. Rohrzucker (Rübenzucker) verfälschten Honigen. Ein Beitrag zur Nahrungsmittel-Chemie. 5. u. verb. Aufl. (79 S.) gr. 8°. Strassburg. P. Schweikhardt. 1912. M. 5.

XVIII. *Kusserow*, Dr. R. : Mitteilungen f. Brennerei u. Presshefefabrikation. Nebst Anh. : Adressbuch der Lieferanten f. das Brennereigewerbe. Nr. 43. Marz., 1912. (12 S.) 8°. Sachsenhausen (Mark, Chausseestr. 8). Selbstverlag. 50 Pf.

XIX A. *Beltzer*, F. J. G. : Les industries du lactose et de la caséine végétale du sojà. 34 fig., in-8°. B. Tignol. Paris. 1912. 5 fr.

Hausner, A. : The Manufacture of Preserved Foods and Sweetmeats. 2nd English Ed. Cr. 8vo., pp. 246. Scott. Greenwood. London. 1912. Net 7s. 6d.

Johnson, W. H. : Cocoa : Its Cultivation and Preparation. 8vo., pp. 196. J. Murray. Net 5s.

Kossel, A., u. F. *Weiss* : Ein Betrag zur Kenntnis der einfachsten Proteine. (12 S.). gr. 8°. Heidelberg. C. Winter. 1912. 50 Pf.

XIX B. *Fuller*, G. W. : Sewage Disposal. Roy. 8vo. Hill Publishing Co. London. 1912. Net 25s.

Ogden, H. N., and H. *Cleveland* : Practical methods of sewage disposal for residences, hotels and institutions. N.Y., Wiley. 6+132 p. figs. 8°. 1912. $1.50.

Haldane, J. S. : Methods of Air Analysis. 12mo., pp. 130. C. Griffin. London. 1912. Net 5s.

Leymann, Dr. : Unfälle u. Erkrankungen in der chemischen Industrie. (28 S.) 31 × 23,5 cm. Berlin, A. Seydel. 1912. 60 Pf.

Poerschke, Dr. : Der Gesundheitsschutz in den Metallbeizereien (Metallbrennen). (27 S. m. Abbildgn.) 8°. Berlin. A. Seydel. 1912. M. 1.

Rupp, Prof. E. : Kurzgefasster Gang der chemischen Trinkwasser- u. Harn-Analyse. 2. Aufl. (29 S.) 8°. Stuttgart (Stähle und Friedel). 1912. 60 Pf.

XX. *Fresenius*, Prof. H. : Chemische Untersuchung der neuen Quelle zu Brambach im Vogtlande, sowie Untersuchung derselben auf Radioaktivität. Ausgeführt im chem. Laboratorium Fresenius. (23 S.) gr. 8°. Wiesbaden, C. W. Kreidel. 1912. 80 Pf.

Grafe, V., u. O. *Richter* : Ueber den Einfluss der Narkotika auf die chemische Zusammensetzung v. Pflanzen. 1. Das chem. Verhalten pflanzl. Objekte in e. Acetylenatmosphäre. [Aus : "Sitzungsber. d. k. Akad. d. Wiss."] (43 S.) gr. 8°. Wien, A. Hölder. 1911. M. 1.30.

Curtius, T., u. H. *Franzen* : Ueber die Bestandteile gruner Pflanzen. 2 Mitteilung. Ueber die flucht. Sauren der Buchenblatter. (9 S.) gr. 8°. Heidelberg, C. Winter 1912. 60 Pf.

Peche, K. : Mikrochemischer Nachweis der Cyanwasserstoffsaure in Prunus Laurocerasus L. (23 S. m. 1 Fig. u. 1 Taf.) gr. 8°. Wien, A. Hölder. 1912. 95 Pf.

Mann, H. : Die Schule des modernen Parfumeurs. Eine Einfuhrg. in die Fabrikation der Parfumerien u. Kosmetika. Unter Mitwirkg. v. Fachkollegen hrsg. (VI, 370 S. m. 156 Abbildgn. im Text u. auf 1 Taf.) gr. 8°. Augsburg. Verlag f. chem. Industrie. 1912. Cloth M. 10.

Scholtz, Prof. M. : Lehrbuch der pharmazeutischen Chemie 2. Bd. Organischer Teil (XI, 513 S. m. 26 Abbildungen) gr. 8°. Heidelberg, Carl Winter, 1912. M. 12.40 ; cloth M. 13.60.

Pharmazie. Schule der : Hrsg. v. Prof. H. Thoms, E. Mylius. Proff. E. Gilg, K. F. Jordan. III, Physikalischer Tl. Bearbeitet v. Prof. K. F. Jordan 4. verm. u. verb. Aufl. (VII, 253 S. m. 153 Abbildgn.) gr. 8°. Berlin. J. Springer. 1912. Cloth M. 5.

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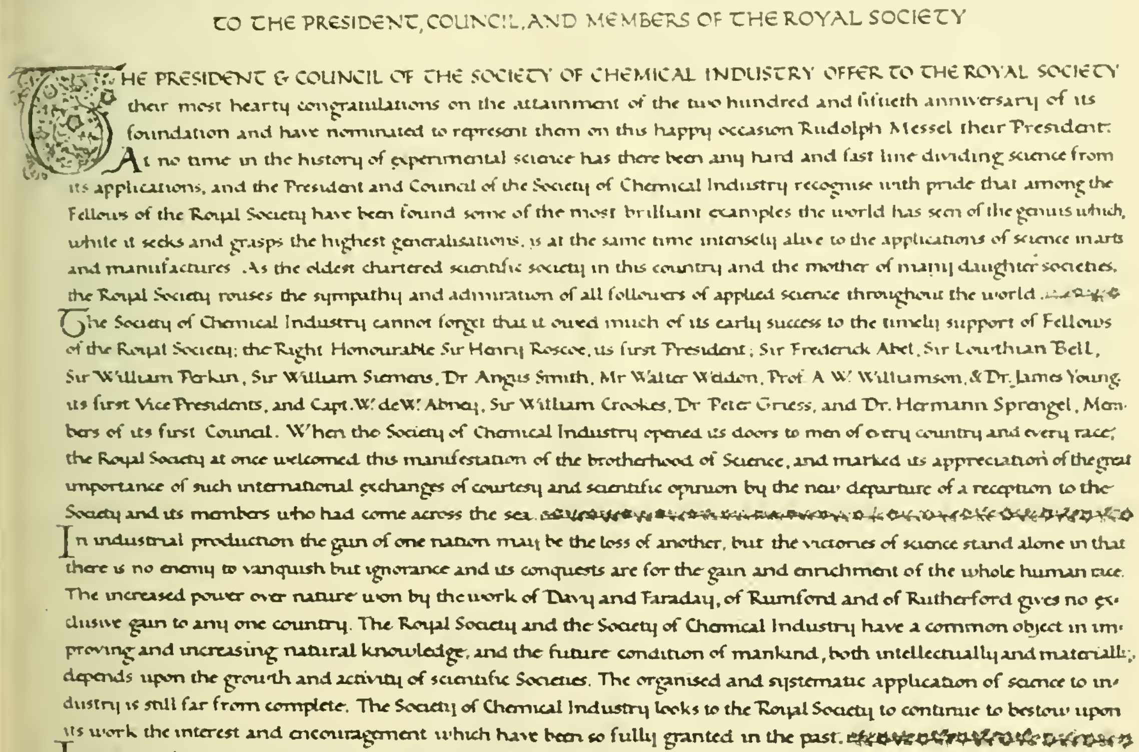
ELEBRATION OF THE 250TH ANNIVERSARY OF THE FOUNDATION OF THE ROYAL SOCIETY.

The celebrations commemorating the 250th Anniversary of the Royal Society opened on Monday, July 15th, with an evening reception of the Delegates from British, Colonial and Foreign Universities and Learned Societies.

On Tuesday, July 16th, after a commemorative service in Westminster Abbey, Sir Archibald Geikie, President of the Royal Society, formally received addresses from the Delegates in the Great Library of the Royal Society. The address from this Society, a photograph of the text of which appears below, was presented by he President, Dr. Rudolph Messel, F.R.S. In the evening a banquet was given in the Guildhall. Sir Archibald Geikie in the chair. The toast of the Royal Society was proposed by Mr. Asquith, the Prime Minister. Sir Archibald Geikie replied. Lord Morley proposed "Universities at Home and Abroad." The toast was responded to by Professors Emile Picard Paris), W. Waldeyer (Berlin), and C. Winkler (Amsterdam).



TO THE PRESIDENT, COUNCIL, AND MEMBERS OF THE ROYAL SOCIETY

THE PRESIDENT & COUNCIL OF THE SOCIETY OF CHEMICAL INDUSTRY OFFER TO THE ROYAL SOCIETY their most hearty congratulations on the attainment of the two hundred and fiftieth anniversary of its foundation and have nominated to represent them on this happy occasion Rudolph Messel their President.

At no time in the history of experimental science has there been any hard and fast line dividing science from its applications, and the President and Council of the Society of Chemical Industry recognise with pride that among the Fellows of the Royal Society have been found some of the most brilliant examples the world has seen of the genius which, while it seeks and grasps the highest generalisations, is at the same time intensely alive to the applications of science in arts and manufactures. As the oldest chartered scientific society in this country and the mother of many daughter societies, the Royal Society rouses the sympathy and admiration of all followers of applied science throughout the world.

The Society of Chemical Industry cannot forget that it owed much of its early success to the timely support of Fellows of the Royal Society; the Right Honourable Sir Henry Roscoe, its first President; Sir Frederick Abel, Sir Lowthian Bell, Sir William Perkin, Sir William Siemens, Dr Angus Smith, Mr Walter Weldon, Prof. A. W. Williamson, & Dr. James Young, its first Vice Presidents, and Capt. W. de W. Abney, Sir William Crookes, Dr Peter Griess, and Dr. Hermann Sprengel, Members of its first Council. When the Society of Chemical Industry opened its doors to men of every country and every race, the Royal Society at once welcomed this manifestation of the brotherhood of Science, and marked its appreciation of the great importance of such international exchanges of courtesy and scientific opinion by the new departure of a reception to the Society and its members who had come across the sea.

In industrial production the gain of one nation may be the loss of another, but the victories of science stand alone in that there is no enemy to vanquish but ignorance and its conquests are for the gain and enrichment of the whole human race. The increased power over nature won by the work of Davy and Faraday, of Rumford and of Rutherford gives no exclusive gain to any one country. The Royal Society and the Society of Chemical Industry have a common object in improving and increasing natural knowledge, and the future condition of mankind, both intellectually and materially, depends upon the growth and activity of scientific Societies. The organised and systematic application of science to industry is still far from complete. The Society of Chemical Industry looks to the Royal Society to continue to bestow upon its work the interest and encouragement which have been so fully granted in the past.

In wishing for the Royal Society continued & increasing prosperity, the President & Council trust that the cordial relations existing between the Societies may be maintained and result in a more extended cooperation.

The Archbishop of Canterbury proposed "Learned Societies in the Old World and the New." Marchese E. Paterno di Sessa responded for Italy, Prince Boris Galitzin for Russia, and Dr. Woodward for America.

On Wednesday, July 17th, the Duchess of Northumberland gave a garden party at Syon House, Isleworth, and in the evening there was a Reception at the Royal Society at which the same interesting historical instruments were on exhibition as were shown at the Reception given to the American members of this Society in 1905 (see this J., 1905, 829).

On Thursday, July 18th, Their Majesties the King and Queen received the Delegates at Windsor Castle. Sir Archibald Geikie, the President, Sir Alfred Bray Kempe, Treasurer and Vice-President, Sir Joseph Larmor and Sir John Rose Bradford, Secretaries, and Sir William Crookes, Foreign Secretary, were presented by the Lord Chamberlain. Sir Archibald Geikie presented other Members of Council and the Delegates, among whom was Dr. Rudolph Messel, President of the Society of Chemical Industry. The Delegates and the Fellows of the Royal Society with their wives and daughters then attended a garden party given by Their Majesties.

This concluded the celebrations, at all of which the Society was officially represented by its President.

London Section.

SOME PRESENT-DAY ASPECTS OF THE MATCH INDUSTRY.

BY E. G. CLAYTON.

(This Journal, 1912, 568—572.)

ADDENDUM.

Since the publication of the above paper, a law has been passed prohibiting the importation of white phosphorus matches into the United States after January 1st, 1913, and their export after January 1st, 1914. A tax, at the rate of 2 cents per 100 matches, upon white phosphorus matches made in the States, will be levied after July 1st, 1913.

Meeting held on May 6th, 1912.

A NEW APPARATUS FOR THE COKING TEST OF COAL.

BY R. LESSING, PH.D.

(This J., 1912, 466.)

ERRATUM.

In col. 2, last line but one, *for* "approximate" *read* "proximate."

Scottish Section.

Meeting held at Glasgow on Tuesday, 30th April, 1912.

PROF. THOMAS GRAY IN THE CHAIR.

THE EFFECT OF FREE FATTY ACID ON THE SPECIFIC GRAVITY OF SOME FATTY OILS.

BY A. OSWALD RANSOME.

The sample of menhaden oil used contained 4·03 per cent. of glycerol; the other constants are shown in the table below. The free fatty acids were isolated by neutralising the oil with potash and extracting with ether. The residual soap solution was acidified with hydrochloric acid, and the acids taken up with ether. After distilling off the ether, the residues were heated to 260° F. for 5 minutes to remove water and lessen the liability to oxidation. A blank test, using the original sample, showed that no alteration in specific gravity took place.

The analysis of sample, glycerides, and acids are given below. The acids contained about 7 per cent. of glyceride calculated on the difference between the neutralisation and saponification values. The figures for acids were corrected on this basis.

	Sample.	Glycerides.	Acids.	Corrected acids.
Sp. gravity at 15·5° C.	0·9257	0·9309	0·9161	0·9149
Iodine value (Wijs) ..	185·27	180·39	192·02	192·9
Free fatty acids = Oleic %	47·99	0·22		
Acid value			187·42	
Saponification value..		192·9	200·80	

Apart from the percentage of glycerol present in original sample, the presence of mono- or di-glycerides in the neutral glyceride is not compatible with the iodine and saponification values shown. The specific gravity and iodine value of the neutral glyceride are those of a normal menhaden oil.

In the above sample, a comparison was made between the free fatty acids and the acids liberated from the neutral glyceride by saponification. The difference in specific gravity taken at 40° C. was found to be 0·00247, the free fatty acids having a higher gravity.

Two other samples of menhaden oil gave the following figures when examined on the above lines:

	Sample 1.	Glyceride.	Sample 2.	Glyceride.
Sp. gravity at 15·5° C. ...	0·9294	0·9313	0·9303	0·9317
Free fatty acid = Oleic %	11·27	0·11	11·11	0·17
Decrease in sp. gravity due to acids	0·0019		0·0014	

These three menhaden oils show a decrease in specific gravity for each 5 per cent. of free fatty acid, of 0·00054, 0·00084, and 0·00063, respectively.

As, however, the free fatty acids have a different specific gravity from those combined as glyceride, it is obvious that no definite ratio can be expected, as the gravity of the free acids will vary according to the amount present, and also according to their composition. As their molecular weights will probably also vary, this may account for the somewhat low percentage of glycerol found.

The above figures may be held to show that the analysis of the neutral portion of the oil is no guide to that of the original glyceride before hydrolysis and separation of free fatty acid, but if, from the data before us, we reconstruct that glyceride, we find the difference in sp. gravity to be as between 0·9309 and 0·9321 in the oil examined. This is still well within the accepted limits for a pure menhaden oil.

Six samples of olive oil, of undoubted purity, obtained specially direct from their respective sources, gave the following figures. Samples 5 and 6 were separated in the same way as the menhaden oils and the sp. gravity of neutral portion and variation due to 5 per cent. free acid are given below.

Sample.	At 15·5° C. sp. gravity.	Neutral sp. gr. at 15·5° C.	Free acid =oleic %	Decrease due to 5 % free acid.
1. Olive oil Malaga No. 1	0·91572		2·24	
2. ,, ,, ,, No. 2	0·91554		2·79	
3. ,, ,, ,, No. 5	0·91528		3·22	
4. Olive oil Calabria fino ..	0·91654		1·38	
5. ,, ,, ,, Aino verde	0·91374	0·91800	25·87	0·000820
6. ,, ,, ,, Aino giallo	0·91280	0·91872	36·38	0·000825

In samples 5 and 6 the ratios for 5 per cent. free acid are in agreement. All the samples show a decrease in specific gravity in accordance with the percentage of free acid present. Here we should expect to find a definite ratio, as in this case the glyceride, consisting as it does principally of olein, may naturally be supposed to yield a free fatty acid of constant composition, no matter how large the percentage may be.

In examining the results of a number of observers, I find that in the figures given, the specific gravity of the insoluble fatty acids is always less than that of the corresponding glyceride, the difference ranging from 0·003 to 0·0258 for a large number of different oils.

It would be natural to assume from this alone, that, given no disturbing factor, the effect of free fatty acid would be to cause a lowering of the specific gravity, and I think that the results shown above prove that no such factor exists and that such decrease does, in fact, occur more or less regularly at any rate in the samples examined.

Also in the first of above samples, it is shown that the iodine absorption is increased, and it seems reasonable to assume that all the constants of an oil will vary progressively in accordance with the percentage of free acid present.

From this I draw the conclusion, that in the case of an oil containing sufficient free fatty acid to vitiate the normal constants, it is preferable to isolate the fatty acids and make an analysis of them, thereby eliminating a serious source of error.

My figures for olive oil are very nearly in agreement with those given by Allen (Commercial Organic Analysis Vol. II., part I., pp. 126–7). The statement of Thomson and Ballantyne criticising Allen's contention (this J., 1890, 588 I do not consider sufficiently substantiated by the data given.

Lewkowitsch (Chemical Technology and Analysis of Oils Fats, and Waxes, vol. I., 237) quotes a number of figures for olive oil as showing that the specific gravity is raised by presence of free acid. I do not consider that these figures are sufficiently in agreement to be conclusive and I hold that many of them show a lowering of sp. gravity. As the results compared are on various oils from many sources and probably prepared by different methods, it may be that inherent differences in analysis are responsible for any apparent rise in gravity.

From the figures I have given above I am inclined to support Allen's statement as being correct.

Journal and Patent Literature.

PATENT SPECIFICATIONS may be obtained by post by remitting as follows:—

English.—8*d.* each, to the Comptroller of the Patent Office, W. Temple Franks, Esq., Southampton Buildings, Chancery Lane, London, W.C.

United States.—1*s.* each, to the Secretary of the Society.

French.—1 fr. 05 c. each, as follows: Patents dated 1902 to 1907 inclusive, Belin et Cie., 56, Rue des Francs Bourgeois, Paris (3e.); Patents from 1908 to date, L'Imprimerie Nationale, 87, Rue Vieille du Temple, Paris.

German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

Cleaning evaporator tubes; Experiments in ——. L. W. Thurlow. Intern. Sugar J., 1912, 14, 328—331.

It is pointed out by the author that at present there is much lack of system in the selection of suitable reagents to be used in removing the scale from the evaporator tubes of multiple effect apparatus used in cane sugar factories. In the case of scale consisting principally of calcium oxalate, sulphate, and carbonate, caustic soda proved of little or no assistance, the surface of the incrustation remaining quite hard; and apparently hydrochloric acid alone had but a slight effect, only the outer part being slightly disintegrated. The best result was obtained by treating first with boiling sodium carbonate solution, and then with dilute hydrochloric acid. The most satisfactory results were obtained with a 3 per cent. solution of sodium carbonate, and a 1 per cent. solution of hydrochloric acid. The evaporator should be filled with the 3 per cent. solution of sodium carbonate, and the temperature raised to boiling point. Every half-hour a sample of the contents of the evaporator is titrated against standard acid, and boiling must be continued until the figures are constant, at which stage the transformation from oxalate and sulphate into carbonate is complete. At this point the liquid in the evaporator is run off, the evaporator filled with water, and then charged with the 1 per cent. solution of hydrochloric acid. After again heating to boiling, titrations are made with standard alkali, although the reaction is generally complete within one hour. Lastly, it is pointed out that there is no object in boiling under vacuum when cleaning the tubes in this way, as high a temperature as possible being desirable.
—J. P. O.

Use of fermenting molasses for cleaning evaporating apparatus. Pellet. *See* XVII.

PATENTS.

Purifying or filtering lubricating oils and similar articles; Apparatus for ——. G. Reggio, Milan, Italy. Eng. Pat. 22,734, Oct. 16, 1911.

The apparatus consists of an upper circular container for the impure oil made with a dished bottom to allow any water that settles out to collect at the lowest point and be withdrawn. The container rests on the oil filter proper, which is also circular and rests on a reservoir for the filtered oil. The oil enters the filter from the upper container through a valve operated by a float in the filter chamber, so that the level of the oil in the latter is kept constant. Two annular upright partitions stand up from the bottom of the filter; these are not continued to form a complete circle but are connected by cross walls at the ends where the circle is broken. The object of this arrangement is to keep the level of the oil on both sides of the annular space the same. Filter wicks are arranged on each of the annular walls and form the filtering medium. The oil passes up that part of the wick which dips into the impure oil by capillary action and drops from that part which hangs in the annular space. The purified oil flows from the annular space into the reservoir.—W. H. C.

Separating apparatus for liquids. [*Separating water from transformer oils*]. K. C. Randall, Edgewood Park, and C. B. Gibson, Wilkinsburg, Pa., Assignors to Westinghouse Electric and Manufacturing Co. U.S. Pat. 1,024,598, Apr. 30, 1912.

A SEPARATOR intended especially for separating water from oil used for insulating electrical apparatus consists of a casing formed in two parts, with a plaster of Paris diaphragm clamped between them, one side communicating with the bottom of the receptacle containing the electrical apparatus and the other side communicating with a discharge pipe delivering at a level such as to maintain a substantial equilibrium of pressure on opposite sides of the diaphragm. It is necessary to soak the plaster of Paris with water before allowing oil to come into contact with it.—H. H.

Filter apparatus. B. W. Traylor, New York. U.S. Pat. 1,029,155, June 11, 1912.

A SERIES of filter-pans are flexibly mounted on an endless band, so that they travel forward in an approximately horizontal path and return in a path practically parallel to the former. The material is fed on to the pans at the front end of the upper path and the liquid portion is drawn through the filters by suitable flexible connections. When each pan arrives at the other end of its upper path, a scraper is provided to discharge the deposited solids. Pressure is then applied to the interior of the pan through the flexible connections and the pans on their return path pass through a tank of water to wash the filtering medium.
—W. H. C.

Extinguishing fires; Process for ——. Fabrik Explosionssicherer Gefässe, G.m.b.H., Salzkotten, Germany. Eng. Pat. 6327, March 14, 1912. Under Int. Conv., March 17, 1911.

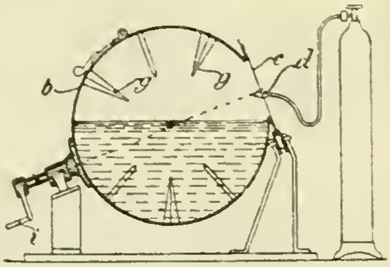
THE process consists in extinguishing fires by means of a foam formed from solid materials by the addition of a solvent. As examples, aluminium sulphate and sodium bicarbonate, or oxalic acid and sodium bicarbonate, together with a foam-forming material such as liquorice root extract or Panama wood, are mentioned. The materials may be placed in tanks for the storage of combustible fluids, so that upon addition of water the foam produced rises to the surface and so extinguishes the fire.
—H. H.

Distilling; Process of and apparatus for ——. C. T. Hanna, Philadelphia, Pa. U.S. Pat. 1,029,363, June 11, 1912.

THE cylindrical column in which the products of different boiling point are separated is divided into a number of chambers, by hollow "foraminous" bodies which are so disposed that the vapour in passing into or out of the chambers, referred to above, is compelled to pass through the "foraminous" bodies, and the condensation and separation is rendered more perfect.—W. H. C.

Melting, boiling, and mixing of materials in a rotary receptacle. N. and T. Udelhoven. Ger. Pat. 246,870, May 28, 1910.

THE apparatus (see fig.) is intended for such materials as asphaltum, tar, resins, and oils. The surface of the material in the receptacle, *b*, is heated by means of a small flame jet, *d*, whereby combustible vapours are evolved and burn within the receptacle, the products of combustion escaping through the opening, *c*. The receptacle is slowly rotated by means of the handle, *i*, so that gradually the material becomes heated throughout, the blades, *g*, assisting in bringing fresh surfaces of the material in contact with the burning gases. When the desired temperature is attained, the flame jet, *d*, is removed, whereupon the burning of the gases ceases.—A. S.



Chemical reactions between solid matters and gases or gas mixtures; Method of effecting ——. J. R. C. Rudolphs, Nacka, and A. G. Thisell, Stockholm. Eng. Pat. 13,720, June 8, 1911.

See Fr. Pat. 430,388 of 1911; this J., 1911, 1301.—T. F. B.

Evaporation of liquid; Apparatus for the ——. M. J. Trumble, Los Angeles, Cal., U.S.A. Eng. Pat. 14,161, June 14, 1911.

See U.S. Pat. 999,736 of 1911; this J., 1911, 1005.—T. F. B.

Dryer; Rotary ——. R., W. G., and F. R. Simon, Basford, Nottingham. U.S. Pat. 1,030,210, June 18, 1912.

See Eng. Pat. 23,180 of 1910; this J., 1911, 1298.—T. F. B.

Separators; Feed and distributing means for ——. A. J. Arbuckle, Johannesburg, Transvaal. U.S. Pat. 1,030,271, June 25, 1912.

See Eng. Pat. 2307 of 1910; this J., 1910, 804.—T. F. B.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Spitzbergen coal. W. H. Patterson. Chem. News, June 14, 1912, 277.

Attention having been called to the good properties of Spitzbergen coal for steam-raising purposes, a chemical examination of it has been made. The coal was hard, and gave the following figures per cent. on analysis:—Total moisture, 1·99; ash, 2·52; carbon, 79·79; hydrogen, 5·45; sulphur, 0·76; nitrogen, 1·08; oxygen, 8·41. It yielded 65·20 per cent. of coke; volatile matter, 32·81 per cent., and fixed carbon, 62·68 per cent. The calorific value is 13,865 B.Th.U., which agrees with the value calculated from the analysis. The author describes Spitzbergen coal as being a very pure coal.

Coal; Determination of ash in ——. F. Weisser. Chem.-Zeit., 1912, **36**, 757—759.

In determining the ash of a coal the most correct results are given by igniting the coal in an open platinum or quartz dish over the Bunsen flame, as the carbonates present are thus only slowly decomposed. If the heating be continued after the coal is burnt, the weight of the ash increased by the conversion of carbonates into sulphates by the sulphur trioxide in the products of combustion of the gas flame. Ignition of coal in the muffle or in a stream of oxygen gives low results owing to the decomposition of carbonates. The ash of a carbonate-bearing coal always contains sulphates. The amount of the latter is proportional primarily to the carbonate content, and in a secondary degree to the pyrites content of the coal. The true ash of a coal is given by the formula:—Ash on ignition in muffle — total Fe_2O_3 — total SO_3 in ash + SO_3 in the coal + CO_2 in the coal + pyrites (FeS_2) + soluble ferrous oxide in the coal. The author found no sulphates in any of the unignited coals examined by him. The carbonates in the coal are best determined by treating the ground sample with dilute hydrochloric acid, absorbing the carbon dioxide in baryta water and titrating the excess of baryta with oxalic acid. Occluded carbon dioxide, if present, must first be driven off by warming the sample for a few minutes with water. The determination of the pyrites is based on the insolubility of this material in dilute sulphuric acid and hydrofluoric acid, the ferrous oxide in the coal being easily soluble. The soluble iron and the total iron are determined and the difference is calculated to pyrites. The difference between the total sulphur and the pyrites sulphur gives the organic sulphur. —T. St.

Coking properties of coal; Laboratory method for the comparison of the ——. R. Lessing. J. Gas Lighting, 1912, **118**, 855—860.

For the purpose of showing the value of the author's apparatus for studying the carbonisation of coal (see this J., 1912, 465), tests were made with samples of Derbyshire and Yorkshire coals which had been previously used by Davidson (J. Gas Lighting, **117**, 664, 880; **118**, 43, 99, 213) in the large-scale coal-testing plant of the Birmingham gas works. It is shown that the results obtained in the laboratory tests and in the large scale trials with regard to yield and composition of gas agree remarkably well, and though the necessity of recognising and taking into consideration the limitations of laboratory tests is strongly emphasised, it is considered that the apparatus will prove useful for elucidating individual factors attending the carbonisation of certain coals, for studying the effect of varying conditions on carbonisation, and for the comparative testing of coals.—A. S.

Naphthalene in [*coal*] *gas; Determination of* —— *at the Paris gas-works.* M. Laurain. J. Gas Lighting, 1912, **118**, 984—986.

Two new methods of determining the amount of naphthalene in coal gas are described, both depending on direct cooling and condensation. (1) The gas is passed through a "naphthalene trap" consisting of a glass vessel containing a number of shelves, each formed of a spiral of copper tubing with metal gauze above. Water at 2° or 3° C. is circulated through the tubes, and coal gas is passed downwards through the vessel for eight or ten hours, using 3 to 4 cubic metres of gas. The condensed naphthalene is then removed from the apparatus by alcohol, precipitated by water, filtered, dried, and weighed. This method determines the amount of naphthalene in excess of that saturating the gas at the temperature of the cooling water, and the total naphthalene is calculated from known data as to the quantities of naphthalene saturating coal gas at different temperatures. The method is open to the objections that the time taken for a test is so long that temperature conditions may vary considerably, and also that the close attention of the operator is required during the whole period. (2) The second method depends upon the determination of the temperature at which condensation of the naphthalene commences. The gas is caused to pass through a very fine passage at a pressure shown by a differential manometer. The passage is slowly cooled and as soon as the naphthalene begins to condense, the manometer indicates an increase in pressure. When this increase reaches 15 to 20 mm. of water, the passage is allowed to warm slowly, and as soon as the pressure commences to fall again, the temperature is observed and taken as the saturation temperature of the naphthalene. The quantity of naphthalene present can then be calculated from known data as before.—H. H.

[Coal] gas; Pollution of —— in holders and the removal of carbon bisulphide. M. Guillet. J. Gas Lighting, 1912, **118**, 986—989.

The formation of hydrogen sulphide in purified coal gas upon storing in a gas holder is shown to be mainly due to electrolytic action, and it is suggested that when rust flakes off from the interior of the holder so as to expose a metallic iron surface to the gas, iron-carbon couples set up electrolysis in the presence of moisture and carbon dioxide and give rise to the formation of hydrogen sulphide in accordance with the equation—

$$CS_2+2H_2O=CO_2+2H_2S.$$

The action of iron on carbon bisulphide vapour in the presence of water and carbon dioxide is completely prevented if zinc is soldered to the iron so as to render it electro-positive relatively to carbon, and it is suggested that the pollution of gas might be prevented on the large scale by attaching zinc plates to the interior walls of gas holders. The action becomes very marked at raised temperatures, and it is therefore proposed as an alternative method of preventing pollution to remove the carbon bisulphide from coal gas before it is stored in a holder by encouraging the above action in a heated tube or purifier containing iron oxide to absorb the hydrogen sulphide generated. An apparatus is described for determining the amount of sulphur in coal gas by combustion in a silica tube containing quartz granules.—H. H.

Hydrogen sulphide; Formation of —— in iron service pipes [for coal gas]. J. G. Taplay. J. Gas Lighting, 1912, **118**, 971—973.

When coal gas passes through wrought iron pipes at temperatures from 90° to 160° F., it is found that appreciable quantities of hydrogen sulphide are generated. This effect appears to be due essentially to the presence of carbon bisulphide and water vapour in the gas, as a similar result is obtained when these gases are carried through the tube by pure hydrogen or pure carbon dioxide. Rust is formed in the pipe, and the production of hydrogen sulphide is diminished when the interior of the pipe is covered with rust. The author considers that electrolysis of the water vapour is set up by local electric currents due to the varying composition of the wrought iron at different points, and that the hydrogen and oxygen react with the carbon bisulphide according to the following equation—

$$CS_2+2H_2+O_2=2H_2S+CO_2.$$

As supporting this view it was found (1) that hydrogen sulphide was produced both when coal gas was passed over a thermo-electric couple made of cast iron and wrought iron, and also when passed between two terminals at a potential difference of 12 volts; (2) that when moist carbon dioxide was passed very slowly through a wrought iron tube at 158° F. for 50 hours, 12·4 c.c. of hydrogen were formed.—H. H.

Acetylene; Uses of ——. Twenty years' progress. V. B. Lewes. Times Eng. Suppl., July 3, 1912.

Steel cylinders filled with porous briquettes soaked with acetone and then charged with acetylene under pressure (see this J., 1903, 288; 1905, 1101) form a safe means of storing large quantities of acetylene. This dissolved acetylene has been largely used abroad for railway lighting, and it possesses many advantages over other illuminants for lighting motor vehicles, for buoys and for coast lighting. An important development is the use of acetylene in oxy-acetylene burners for autogenous welding, and another application which promises to increase considerably the demand is the use of acetylene in self-starting devices for motor-vehicles.—A. S.

Patents.

Fuel briquettes; Production of ——. N. Testrup, London, and T. Rigby, Dumfries. Eng. Pat. 11,554, May 12, 1911.

In making briquettes from wet-carbonised peat as in Ekenberg's process (see Eng. Pat. 12,010 of 1909; this J., 1909, 1026), it has been thought necessary to dry the material before briquetting, so that it contains not more than 2 per cent. of moisture. According to the invention, wet-carbonised peat is treated in a filter-press and then dried until it contains 8 to 10 per cent. of moisture, and the material is then briquetted in an open die-press. Experiments show that the treatment in the filter-press forms minute water-channels in the mass of the material, and that these become filled with air during the subsequent drying. The material is then very porous and the sudden impact of the die heats the air in the pores sufficiently to bring the bituminous constituents of the peat into a suitable condition for binding. (See also Eng. Pats. 6011 of 1910 and 4684 of 1911; this J., 1911, 883; 1912, 323.)—A. T. L.

Fuel-briquettes; Process of making ——. A. M. Mitchell, Flushing, N.Y., Assignor to K. M. Widmer, New York. U.S. Pat. 1,029,022, June 11, 1912.

The carbonaceous material is mixed with a liquid binding agent, preferably a suitable colloidal solution, and formed into a "row of successive briquettes," which are pushed through the apparatus and hardened by introducing a suitable hardening agent in a liquid state, preferably a crystalloidal solution, between the briquettes.—W. H. C.

Combustibles [fire-lighters]. F. H. Nixon, London. Eng. Pat. 20,641, Sept. 18, 1911.

Dry peat, or a similar substance, is treated with an inflammable substance such as petroleum, and is then coated with resin, and the invention consists in depositing these substances on the peat in definite quantities. This may be done by means of sprays which deliver petroleum and resin at a constant rate, the peat blocks being fed forward at a constant rate on a moving band, or on a rotating table having a spiral guideway.—A. T. L.

Gas retorts; Means for charging ——. R. Dempster and Sons, Ltd., and H. J. Toogood, Elland, Yorks. Eng. Pat. 13,912, Dec. 9, 1911.

The mouthpiece of each vertical retort carries a fixed vertical shoot, the upper end of which is enlarged and contains an oscillating valve. In its mid-position this valve is beneath the mouth of the charging hopper and closes it. The charging hopper is divided by a partition into right- and left-hand compartments, the smaller compartment containing coke-breeze, and the larger containing coal. These are filled from separate overhead bins. In charging the retort, the valve is moved first to one side to admit a layer of coke breeze, then to the other side to admit coal, and again to the opposite side to admit a top layer of breeze. The retort is discharged with the top lid closed, by admitting excess steam to expel gases, and then opening the anti-dip and the bottom lid. The charging device may be used with the charging shoots described in Eng. Pats. 19,437 and 20,851 of 1908 (this J., 1909, 1116). —A. T. L.

Coal; Vertical retorts for the carbonisation of ——. A. M. Duckham, Little Bookham, Surrey. Eng. Pat. 28,852, Dec. 21, 1911.

In a vertical retort setting having a regenerator for heating the air for combustion, the heat of the lower part of the retorts, below the level of the heating flues, is used for heating the air supply for the gas producer. For this purpose, the air for the producer is drawn through horizontal flues running alongside the lower part of the retorts, and thence through horizontal flues beneath the producer, where the hot air is saturated with moisture by means of water troughs in these flues. The moist air is delivered downwards towards the surface of water in the ash-pit beneath the producer grate.—A. T. L.

Illuminating gas; Apparatus for preventing the formation of thick tar in the manufacture of ——. Berlin Anhaltische Maschinenbau A.-G. Ger. Pat. 246,303, Feb. 18, 1911.

Between the ascension pipe and the hydraulic main a washer is interposed in which the higher-boiling hydrocarbons are removed from the gas by washing with water, tar, or gas-liquor. A closing device is provided which can be used as desired for controlling communication between the washer and the retort, or for opening or closing an opening through which air may be introduced into the retort or through which access can be gained for cleaning the pipes connecting the washer and the retort. —A. S.

Sulphite and sulphate of ammonia; Production of —— in the manufacture of gas. K. Burkheiser, Hamburg. Eng. Pat. 6471, Mar. 15, 1912. Under Int. Conv., Sept. 26, 1911.

The process described in Eng. Pat. 21,763 of 1908 (see Fr. Pat. 394,926 of 1908; this J., 1909, 359) is simplified by the use of a single washing liquid, containing a mixture of primary and normal ammonium sulphite, both for the ammonia and sulphur dioxide scrubbers, the lye from these scrubbers being collected together and again used for sprinkling, so that it becomes continuously richer in the normal sulphite until saturated. The absorption of ammonia also may take place in two stages; firstly in a saturator, where the greater part of the ammonia is absorbed and the deposition of salt takes place, and secondly in a scrubber in which the remainder of the ammonia is washed out.—F. Sodn.

Gas generators. W. Hoeller, Cöln-Ehrenfeld, Germany. Eng. Pat. 27,547, Dec. 8, 1911. Under Int. Conv., Dec. 23, 1910.

An annular cast-iron chamber forms the wall of the lower part of the furnace chamber and serves either for the introduction of air and steam through nozzles in the inner wall, or simply for preventing the adhesion of clinker to the producer lining, the chamber being cooled by the passage of steam through it. The chamber is built up of hollow segmental sections, any one of which can be replaced whilst working. To prevent fracture owing to expansion, the ends, top and back walls of each section are formed with elongated openings. The openings in the end walls form a passage between adjacent sections, which are bolted together by flanges around these openings. The openings in the top and back walls are closed by thin metal plates. The sections are only in contact near the outer walls, the spaces being filled in with asbestos.—A. T. L.

Gases; Process and apparatus for generating rich ——. R. Lahaussois, Paris. Eng. Pat. 3113, Feb. 7, 1912. Under Int. Conv., Feb. 15, 1911.

Liquid fuel, such as a mixture of naphtha and tar, and water are forced separately by pumps through atomising nozzles which direct the mixed spray on to the arc in an electric furnace. The gases leaving the furnace pass through a bed of incandescent coal and thence through coolers to a holder. The gas is rich in carbon monoxide and is suitable for use in gas engines.—A. T. L.

Gas producers and the like; Revolving grates for ——. Deutsche Hüttenbau-Ges. m. b. H., Düsseldorf, Germany. Eng. Pats. 6907 and 6908, Mar. 20, 1912. Under Int. Conv., May 20 and July 8, 1911.

(1) The conical grate consists of a number of inclined segmental plates arranged after the manner of a circular fan. The leading edge of each plate, in the direction of rotation, is lower than the rear edge, leaving wedge-shaped slots for the admission of air. The area of these slots increases towards the circumference of the grate, so that air is distributed uniformly over the area of the fuel bed. Inclined ribs on the plates force the ashes outwards as the grate revolves. (2) The cylindrical body of the grate which carries the conical grate portion is formed with three projecting vertical flanges, to which are fixed eccentric arc-shaped members serving to break up the clinker. In order to equalise the wear by breaking up the clinker gradually, and to facilitate replacement, these ash-breakers project to different extents, and are subdivided vertically and made interchangeable.—A. T. L.

Gas producer with two air inlets. W. Franzen. Ger. Pat. 246,217, July 21, 1910.

In the lower part of the producer is a moving chain grate, which carries the fuel through a side chamber and over the second air inlet. A free space is left above the layer of fuel on the chain grate, in order that the carbon dioxide produced by the combustion of the fuel, and the excess of oxygen, may pass over a layer of incandescent fuel and thus be reduced to carbon monoxide.—A. S.

Lubricating-oil; Non-inflammable ——. Non-inflammable lubricant and process of preparing the same. J. W. Aylsworth, East Orange, N.J., Assignor to F. L. Dyer, Montclair, N.J. U.S. Pats. 1,029,254 and 1,028,926, June 11, 1912.

(1.) A mixture of a lubricating oil with a halogen substitution product of a "carbocyclic" compound having a waxy texture. (2.) A mixture of liquid and solid chloronaphthalene with finely divided graphite and a small quantity of india-rubber.—W. H. C.

Coking coal and the like; Method of ——. E. Enke, Breslau, Germany. Eng. Pat. 22,696, Oct. 14, 1911.

See Fr. Pat. 436,081 of 1911; this J., 1912, 377.—T. F. B.

Gas producers. A. von Kerpely, Vienna. Eng. Pat. 20,633, Sept. 18, 1911.

See Fr. Pat. 434,322 of 1911; this J., 1912, 323.—T. F. B.

Gas producers. E. Ragot, Bettain-Court, and P. Pierre-Hervotte, Joinville, France. Eng. Pat. 24,461, Nov. 3, 1911.

See Fr. Pat. 435,691 of 1911; this J., 1912, 377.—T. F. B.

Gases; Generator for rich ——. R. Lahaussois. Fr. Pat. 439,530, Jan. 30, 1912. Under Int. Conv., Feb. 15, 1911.

See Eng. Pat. 3113 of 1912; preceding.—T. F. B.

Gas washer. G. Aminoff, Baltimore, U.S.A. Eng. Pat. 126, Jan. 2, 1912.

See U.S. Pat. 1,019,003 of 1912; this J., 1912, 321.—T.F.B.

Gas; Apparatus for washing and purifying ——. E. D. Holmes. Fr. Pat. 439,589, Jan. 31, 1912. Under Int. Conv., Feb. 1, 1911.

See Eng. Pat. 2581 of 1911; this J., 1911, 1005.—T. F. B.

Apparatus for purifying or filtering lubricating oils, etc. Eng. Pat. 22,734. *See* I.

Separating apparatus for liquids. [Separating water from transformer oils.] U.S. Pat. 1,024,598. *See* I.

Melting, boiling, and mixing of materials in a rotary receptacle. Ger. Pat. 246,870. See I.

Apparatus for measuring the density of smoke from factory and other chimneys. Eng. Pat. 16,256. *See* XXIII.

Calorimeters. Eng. Pat. 25,587. *See* XXIII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Mercury lamp for quantitative investigations with ultraviolet radiation. F. Weigert. Z. physik. Chem., 1912, 80, 67—77.

The quantitative study of photochemical gas reactions under the influence of ultraviolet radiation is rendered difficult by the temperature effect produced when the lamp is in action. Attempts to avoid this by water cooling usually involve the passage of the radiation through a layer of water where it is largely absorbed. In the author's apparatus which is water-cooled, the reaction takes place in a vessel outside the lamp itself, but the reaction vessel receives radiation which has only passed through such non-absorbing media as quartz and hydrogen. If the reaction is only to be studied qualitatively, and temperature effects need not be considered, it is possible to circulate the gas so that it comes into actual contact with the discharge tube of the lamp itself without any intervening water.—W. H. P.

PATENTS.

Cleaning the inside of rotating tubes or similar elements [of wet carbonising apparatus]. N. Testrup and O. Söderlund, London. Eng. Pat. 5467, Mar. 4, 1911.

THE formation of a deposit in the rotating tubes of wet carbonising apparatus for peat such as described in Eng. Pats. 10,834 of 1903 and 6041 of 1910 (see this J., 1911, 883) or similar apparatus is prevented by providing therein one or more loosely lying elements, such as iron rods, which scrape the interior of the tube as it rotates.—H. H.

Wet carbonising apparatus and the like. Supply of heat in wet carbonising installations. T. Rigby, Dumfries, and N. Testrup, London. Eng. Pats. 9105, Apr. 12, 1911, and 14,131, June 14, 1911.

(1.) IN apparatus for the wet carbonisation of peat such as described in Eng. Pat. 6041 of 1910 (this J., 1911, 883), deposits of solid material in the carbonising tubes are removed, and their formation is prevented, by periodically subjecting the material in the tubes to abnormally rapid and sudden motion. This may be effected by bringing about a sudden reduction of pressure at a point of the apparatus where the pressure is relatively high. (2) The carbonising tubes are heated by the furnace gases from the flue of the steam boiler or other heating device of the installation, additional fuel being supplied to such furnace to provide the necessary additional amount of heat in the flue gases. The heating of the tubes is thus more uniform than with apparatus in which the tubes are heated by a smaller volume of gas at a higher temperature.—H. H.

Distilling wood : Apparatus and method for ——. F. Pope, New York, and G. M. Pope, Mount Pleasant, Ga. ; G. M. Pope, Assignor to E. M. Pope, Boston, Mass. U.S. Pat. 1,030 011, June 18, 1912.

AN apparatus for obtaining products from wood comprises a vessel in which the wood is heated in a suitable bath, this vessel being provided with an inlet for the liquid at the bottom, an outlet for it near the top, and an outlet for the products above the outlet for the liquid, and perforated steam pipes located in the vessel above the level of the wood and below the level of the bath therein ; the perforations may direct the steam upwards, and circulating and heating means may be provided for the bath. A condenser with an exhauster may be connected to the outlet for the distillation products.—H. E. P.

Incandescence gas light ; Production of ——. R. Schnabel. Ger. Pat. 245,659, July 5, 1910.

A MIXTURE of a combustible gas and air is caused to burn within a permeable mass of material of high light-emitting power contained in a receptacle of material having similar properties. For example the receptacle may be of fused quartz, and this may be filled with a mass of granulated quartz. The mixture of gas and air is led into the middle of the mass of granulated quartz through a tube of quartz glass, or silicon carbide under such conditions that flameless combustion takes place, whereby the granular material and also the surrounding receptacle are heated to incandescence.—A. S.

Electric incandescence lamps ; Process for the continuous baking of filaments for ——. Lichtwerke Ges. m. b. H. in Konkurs. Ger. Pat. 246,911, Feb. 19, 1910.

THE heating of the filaments is effected in a long tube through which a suitable gas is passed, and which is heated to the highest temperature in the middle portion and kept cool at the ends. Bundles of the filaments contained in small boats are introduced at one end, at definite intervals, and are moved progressively through the tube.—A. S.

Incandescent mantles ; Process for the manufacture of ——. W. Bruno, Berlin. Eng. Pat. 27,834 Dec. 11, 1911. Under Int. Conv., Jan. 5, 1911.

SEE Fr. Pat. 438,260 of 1911 ; this J., 1912, 633.—T. F. B.

Tungsten wire especially suitable for use as incandescence body or filament for incandescent electric lamps. O. Krause, Berlin. Eng. Pat. 27,360, Dec. 6, 1911. Under Int. Conv., March 2, 1911.

SEE Fr. Pat. 433,596 of 1911 ; this J., 1912, 221.—T. F. B.

Incandescent-lamp filaments ; Process of manufacturing ——. H. Kuzel, Baden Germany, Assignor to General Electric Co., New York. U.S. Pat. 1,030,666, June 25, 1912.

SEE Eng. Pat. 28,154 of 1904 ; this J., 1906, 115.—T F. B.

III.—TAR AND TAR PRODUCTS.

PATENTS.

Meta-cresol ; Process for making pure ——. F. Hoffmann-La Roche und Co. Fr. Pat. 439,643, Feb. 2, 1912. Under Int. Conv., April 24 and 26, 1911.

SEE U.S. Pat. 1,025,616 of 1912 ; this J., 1912, 528.—T. F. B.

2-Aminoanthracene and its derivatives ; Process for preparing ——. Chem. Fabr. Griesheim-Elektron. Fr. Pat. 440,129, Feb. 13, 1912.

SEE Eng. Pat. 3513 of 1912 ; this J., 1912, 528.—T. F B.

Melting, boiling, and mixing of materials in a rotary receptacle. Ger. Pat. 246,870. *See* I.

Non-inflammable lubricating oil and lubricant. U.S. Pats. 1,029,254 and 1,028,926. *See* IIA.

IV.—COLOURING MATTERS AND DYES.

Sulphide dyestuffs ; Manufacture of —— and their purification. O. Lange. Chem.-Zeit., 1912, 36, 683—685, 709—710 714—715.

THE most important raw materials for the manufacture of sulphide dyestuffs are derivatives of *p*-amino-(nitro- or nitroso-) phenol (or amino-naphthol), in which one or more hydrogen atoms of the nucleus have been replaced by NO_2, NH_2, OH, CH_3, Cl, SO_3H, or COOH, or in which one of the hydrogen atoms of the amino-group has been replaced by a substituted phenyl group, leading to the formation of derivatives of the diphenylamine or indophenol series, or in certain cases, owing to ring formation, to phenazine derivatives. Compounds of the types mentioned, either as such, or in the form of their urea-, thiourea-, acetyl-, oxalyl-, etc., derivatives, or azo dyestuffs derived from such compounds, are all used for the manufacture of sulphide dyestuffs. Sulphide dyestuffs of commercial importance, so far as they are obtained from individual substances, may be classified, according to their colour, as follows :—Black dyes are obtained preferably from *p*-aminophenol and 1.2.4-dinitrophenol and their derivatives, nitro-compounds of diphenylamine derivatives, and naphthalene derivatives of analogous constitution. The black dyes are also frequently obtained by further sulphurisation of blue sulphide dyes. Blue and green dyes are preferably obtained by sulphurisation of diphenylamine derivatives of the leuco-indophenol type at a relatively low temperature. Yellow, orange, and brown dyes, and dyes giving " khaki " shades, are prepared from compounds of the type of *m*-toluylenediamine, its derivatives, and allied substances, preferably by fusion with sulphur without alkali. Dyestuffs giving reddish to violet shades are obtained from phenazine derivatives, *e.g.*, from safranines, by fusion with polysulphides ; apparently the azine ring remains intact and imparts a reddish tone to the sulphide dyes produced. In the fusion process, a polysulphide of the composition, Na_2S_4, is usually most suitable, 2 parts by weight to 1 part of the organic compound being the normal proportion. Especially in the case of nitro-compounds it is necessary to introduce the raw material gradually into the polysulphide solution, while the latter is at a relatively low temperature, in order to obtain satisfactory results. In certain cases it is advantageous to introduce a nitro-compound into sodium sulphide solution, and add sulphur at a later stage. With regard to the influence of the temperature and duration of the fusion process, in general, a high temperature leads to the formation of darker dyestuffs of better fastness than those formed at a relatively low temperature. A general description of the apparatus employed, the different fusion methods, and the methods of drying and purifying the dyestuffs is given.—A. S.

Azo dyestuffs ; New —— from aminodiphenylene oxide. A. Mailhe. Comptes rend., 1912, **154**, 1815—1817.

Aminodiphenylene oxide, $NH_2.C_6H_3.O.C_6H_4$, prepared by the reduction of nitrophenylene oxide with iron and hydrochloric acid, can be readily diazotised, and the diazo-compound combines in the usual way with amines and phenols to yield azo dyestuffs. Aniline yields yellow crystals, m. pt. 93° C., which dye silk in an acid bath, golden yellow shades fast to soaping. Dimethylaniline gives greenish yellow crystals, m. pt. 71° C., which dye silk greenish yellow and wool a dull yellow. With crocein acid (2.8-naphtholsulphonic acid), orange red crystals are obtained, which dye silk a fast orange yellow shade in an acid bath. With R-acid (2.3.6-naphtholdisulphonic acid) a scarlet dyestuff is produced, giving a bright red on silk in an acid bath. The dyestuff from salicylic acid forms yellow crystals and gives an orange yellow colour on a chrome mordant. The azo dyestuffs from aminodiphenylene oxide differ from those obtained from aniline by giving brighter shades.—A. S.

3·6-Diaminoacridine. L. Benda. Ber., 1912. **45**, 1787—1799.

For the preparation of 3·6-diaminoacridine (see Ger. Pat. 230,412 ; this J., 1911, 352), *p,p*-diaminodiphenylmethane was nitrated, the nitro-product was reduced with tin and hydrochloric acid, and the reaction product, without isolating the resulting *p.p,o,o*-tetra-aminodiphenylmethane, was heated under pressure in an autoclave at 135° C., whereby ring formation took place and a crystalline tin double salt was produced, from which 3·6-diaminoacridine was readily isolated. 3·6-Diaminoacridine has properties similar to those of its homologue, Acridine Yellow. It is tolerably easily soluble in hot water, and its hydrochloride is soluble in cold water. It gives pure yellow shades on tannin-mordanted cotton and leather. It yields dihydroxyacridine when heated with 45 per cent. sulphuric acid in a sealed tube at 195° C. When heated on the water-bath with formaldehyde and aromatic bases (primary amines, diamines, etc.), it yields dyestuffs, which dye tannin-mordanted cotton and leather in shades ranging from yellow and orange to brown, according to the organic base used. 3·6-Diamino-10-methylacridinium chloride, which dyes tannin-mordanted cotton and leather in pure yellow shades fast to soaping and sodium carbonate (see U.S. Pat. 1,005,176 ; this J., 1911, 1306) is obtained by converting 3·6-diaminoacridine into the corresponding acetamino-compound, alkylating the latter by means of methyl-*p*-toluenesulphonate, and then hydrolysing the resulting 3·6-diacetamino-10-methylacridinium salt. 3·6-Diamino-10-methylacridinium hydrochloride exhibits very strong trypanocidal power, relatively small doses having a considerable effect on the parasites of sleeping sickness.—A. S.

"*Selenium-indigo*" (*bis-selenonaphthene-indigo*) *and aromatic compounds containing selenium. I.* R. Lesser and R. Weiss. Ber., 1912, **45**, 1835—1841.

By the action of diazotised anthranilic acid on potassium hydroselenide, diselenosalicylic acid (diphenyldiselenidedi-*o*-carboxylic acid) is formed, and this can be converted into "selenium-indigo" (2·2-bis-selenonaphthene-indigo) in exactly the same way as dithiosalicylic acid is converte into thioindigo. "Selenium-indigo" has properties resembling those of thioindigo ; it gives violet red shade which are bluer than those furnished by the latter. 2-Selenonaphthene-3-indoleindigo, from oxyselenonaphthene and isatin, gives somewhat bluer shades tha Thioindigo Scarlet. Acenaphthene-selenonaphthene-indigo, from oxyselenonaphthene and acenaphthenequinone was also prepared : like the preceding dyestuffs it gives yellow vat with alkali and hydrosulphite. "Selenosaccharin" (benzoic acid-selenonimide), $C_6H_4\left\langle\begin{matrix}CO\\SeO_2\end{matrix}\right\rangle NH$ prepared by the action of potassium permanganate on th diamide of diselenosalicylic acid has similar chemica properties to saccharin, but has a faint astringent taste. —A. S.

Action of light on colouring matters. Harrison. *See* VI

Patents.

Compounds suitable for the production of [azo] dyes on th fibre ; Manufacture of ——. P. A. Newton, London From Farbenfabr. vorm. F. Bayer und Co., Elberfeld Germany. Eng. Pat. 18,205, Aug. 11, 1911.

When one or two mols. of a nitrobenzoyl halide are condensed with the aminobenzoylamino acids described i Eng. Pat. 1441 of 1911 (see Fr. Pat. 426,201 of 1911 ; thi J., 1911, 948), and the products are reduced, compound are obtained which have even greater affinity for the fibr than the products described in Eng. Pat. 1441 of 1911 when diazotised on the fibre and combined with suitabl azo components, fast shades are produced. The preparation of the new compound derived from diaminostilbene disulphonic acid is described in detail.—T. F B.

Anthraquinone derivatives ; Process for preparing —— Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 247,246 June 4, 1911. Addition to Ger. Pat. 238,982, July 28 1910.

In the process described in the principal patent (see thi J., 1911, 1372), the benzaldehyde and its derivatives ma be replaced by toluene chlorinated in the side-chain an derivatives of the same.—T. F. B.

Vat dyestuffs ; Process for preparing ——. Farbenfabr vorm. F. Bayer und Co. Ger. Pat. 247,321, July 8 1911.

Dyestuffs which produce fast red to violet shades b the ordinary processes of vat-dyeing, are obtained by th action of easily-reacting *a*-derivatives of isatin or it analogues or homologues, on carbazole, its homologues o derivatives.—T. F. B.

Compounds of the anthraquinone series ; Manufactur of ——. J. Y. Johnson, London. From Badisch Anilin und Soda Fabrik, Ludwigshafen on Rhine Germany. Eng. Pat. 18,240, Aug. 11, 1911.

The new compounds are produced by reacting on a 1·2 dihalogen-anthraquinone with an anthraquinone derivativ which contains, in the positions 1 and 2, either two mercapto (SH) groups, or one mercapto and one amino group the products are regarded as being diphthaloyl-thianthrene and thio-dianthraquinonylamines, respectively. The product obtained from 2-aminoanthraquinone-1-mercaptar and 1·2-dichloroanthraquinone dyes cotton fast violet-blu shades from the hydrosulphite vat, whilst the product from anthraquinone-1·2-dimercaptan and 1·2-dichloroanthraquinone dyes brick-red shades.—T. F. B.

Disazo dyestuffs ; Black —— *and process of making same.* F. Scholl. Assignor to Farbwerke vorm. Meister, Lucius und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,029,639, June 18, 1912.

When diazotised trimethylammoniumphenyl-azo-*m*-toluidine is combined with heteronuclear *aa*-aminohydroxy naphthalenes, dyestuffs are obtained which are readily soluble in water, soluble in alcohol, and insoluble in ether benzene, and petroleum spirit. They dye artificial silk black shades.—T. F. B.

Vat [indigo] dyestuff; Process for preparing a yellow ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 247,154, April 20, 1911.

The product containing chlorine, of m. pt. 212° C., obtained by the action of benzoyl chloride on indigo, is treated with concentrated sulphuric acid, and the resulting substance is heated alone or with a suitable solvent or diluent, to a high temperature. The product thus produced gives a deep blue-violet vat, dyeing yellow shades (compare Ger. Pat. 244,226 of 1911; this J., 1912, 483).—T. F. B.

Vat dyestuffs obtained by condensing benzoyl chloride with indigo, its homologues or substitution products; Process for producing preparations, soluble in alkali, from the yellow ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 247,155, June 23, 1911.

The yellow vat dyestuffs obtained by the action of benzoyl chloride on indigo, its homologues or substitution products (see this J., 1912, 483, and also preceding abstract), may be converted into the alkali-soluble form by warming with alkalis until solution is effected. The dyestuffs may be fixed on the fibre by aid of these solutions without the necessity for preparing vats.—T. F. B.

Induline dyestuffs; Process for preparing green ——. Kalle und Co. Ger. Pat. 246,721, Feb. 21, 1911.

The basic dyestuffs obtained by the action of diamines on indulines, especially those containing sulphonic groups, are condensed with dinitrochlorobenzene. Dyestuffs are produced by means of which pure green shades may be obtained. The dyestuff prepared by the use of *p*-phenylenediamine, for instance, produces level shades of considerable fastness, making it of value in silk dyeing. —T. F. B.

Vat colouring matters of the anthracene series; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 25,677, Nov. 17, 1911.

See Addition of Jan. 31, 1912, to Fr. Pat. 425,859 of 1911; preceding.—T. F. B.

Vat dyestuffs; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 25,875, Nov. 20, 1911.

See Ger. Pat. 247,321 of 1911; preceding.—T. F. B.

Dyestuff of the anthraquinone series; Process for producing a ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 439,669, Feb. 2, 1912. Under Int. Conv., Feb. 6, 1911.

See Eng. Pat. 14,499 of 1911; this J., 1912, 529.—T. F. B.

Diazotisable dyestuffs; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 440,000, Feb. 10, 1912. Under Int. Conv., Feb. 18, 1911.

See Eng. Pat. 5955 of 1911; this J., 1912, 182.—T. F. B.

Indigoid dyestuffs containing chlorine; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 440,224, Feb. 15, 1912. Under Int. Conv., March 2, 1911.

See Eng. Pat. 8203 of 1911; this J., 1911, 1305.—T. F. B.

Azo dyestuffs and pigments derived therefrom. Act.-Ges. f. Anilinfabr. Fr. Pat. 439,265, Jan. 22, 1912. Under Int. Conv., Feb. 11, 1911.

See Eng. Pat. 2425 of 1912; this J., 1912, 529.—T. F. B.

Converting sulphide dyestuffs obtained from the indophenols from carbazole and its substitution products into stable bisulphite compounds. Ger. Pat. 247,443. *See* VI.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Loaded silks: Difficulties arising during the conditioning of ——. G. Colombo and G. Baroni. Rev. Gen. Mat. Col., 1912, **16**, 169—172.

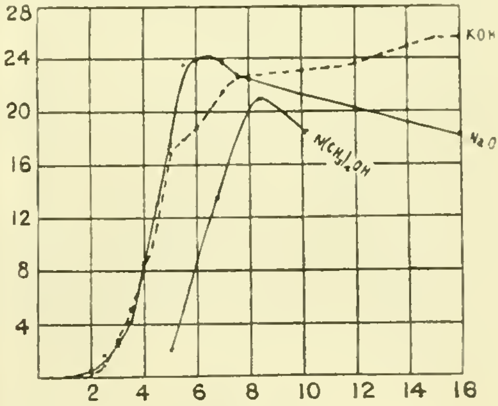
The aldehydic character of glucose (with which raw silk is often treated in order to facilitate opening during subsequent operations) causes it to react with the sericin of silk at such high temperatures (140° C.) as are attained during the conditioning of the fibre. The sericin is thus rendered insoluble and the ordinary boiling-off process is afterwards insufficient for its complete removal. The fixation of the sericin also gives rise to coffee-coloured stains. Other compounds of an aldehydic nature such as milk sugar (lactose) produce the same effect as glucose though to different degrees.—P. F. C.

Weighted silk; Analysis of ——. F. J. Farrell and J. N. Goldsmith. J. Soc. Dyers and Col., 1912, **28**, 236—237.

The usual methods for determining the weighting in silk by extraction require modification in the case of black silk containing Prussian blue. For such materials the authors have worked out the following method:—About 0·5 grm. of the silk is boiled in 2 per cent. sodium carbonate solution, changing the solution after boiling a few minutes, and observing the removal of the cyanide by acidifying the decanted liquor and testing it with ferric chloride. When the Prussian blue is entirely decomposed, the silk residue is finally subjected to the Kjeldahl-Gunning process. The treatment with sodium carbonate solution partly removes any tannic acid contained in the silk.—P. F. C.

Cotton; Comparative action of solutions of certain hydroxides on ——. E. Knecht and W. Harrison. J. Soc. Dyers and Col., 1912, **28**, 224—225.

The curves given show the relation between the concentration of solutions of sodium and potassium hydroxides and tetramethyl ammonium hydroxide expressed in terms of normality and the shrinking effect they produce on cotton at 16° C. Results are also given expressing the effect of temperature on the shrinking action. Solutions of lithium hydroxide up to 3*N* concentration have greater shrinking effect than sodium or potassium hydroxide in equivalent concentrations, whilst on the other hand solutions of calcium, barium, and ammonium hydroxide and hydrazine hydrate produce no shrinking effect. —P. F. C.



Cellulose; Action of sulphuric acid on ——. W. Harrison. J. Soc. Dyers and Col., 1912, **28**, 238—239.

From a series of experiments the author concludes that:—(1) Dilute sulphuric acid, when dried on cotton, causes it to take up more Methylene Blue and less of direct dyestuffs, this property being usually regarded as characteristic of oxycellulose. (2) The product formed by the action of sulphuric acid is not oxycellulose nor a sulphuric ester of cellulose, but is most probably a colloidal form of hydrocellulose.—P. F. C.

Starches for use in cotton mills; Determining the value of commercial ——. G. M. MacNider. J. Ind. Eng. Chem., 1912, 4, 417—422.

The author uses the following method for determining the viscosity of starch "solutions" under conditions similar to those obtaining when the starch is used in cotton mills. 12 grms. of the pulverised starch are treated with 300 c.c. of distilled water in a 600 c.c. aluminium beaker, and heated to boiling with constant stirring the boiling being then continued for a definite period. 200 c.c. of the "solution" thus obtained are poured into the cup of a Scott viscosimeter, surrounded by water which is kept boiling during the determination. After the temperature of the starch "solution" has become constant (92·5° C. in the case of rice starch; about 94° C. for other starches), 50 c.c. are allowed to run out, the time required in seconds being taken as a measure of the viscosity, with the time required for 50 c.c. of boiling water as unit. The results obtained with different starches are shown in the following table:—

	Viscosity after boiling starch "solution" for:				
	0 mins.	5 mins.	10 mins.	20 mins.	30 mias.
Maize (cora)	—	—	2·49	—	—
Maize	—	—	2·86	—	—
Maize	2·15	—	2·73	4·26	7·0
Potato	16·37	19·51	14·31	—	6·33
Cassava	9·93	4·53	3·88	3·91	4·17
Cassava	—	—	3·97	—	—
Wheat	1·20	1·22	1·26	1·24	1·33
Wheat	—	—	1·24	—	—
Rice	1·00	—	1·00	—	1·08

In using the determination of the viscosity as a method of control in cotton mills, the author recommends boiling for 10 minutes. The increase of viscosity in the case of certain of the starches is due to the concentration of the "solution" by evaporation of water more than counteracting the decrease of viscosity due to the conversion of the starch into soluble starch. The formation of soluble starch on boiling proceeds most readily in the case of starch from tubers (potatoes, cassava) developed underground. Experiments on the effect of different reagents on the viscosity of maize starch showed that small amounts of borax (0·08 grm. per 12 grms. of starch) and of sodium hydroxide (0·06 grm. per 12 grms. of starch) reduce the viscosity, whilst larger amounts (*e.g.*, 1 grm. of borax per 12 grms. of starch) increase it. The viscosity is also reduced by a very small quantity of boric acid (less than 1 grm. per 12 grms. of starch) but with larger quantities the reduction of viscosity is not so great.—A. S.

Patents.

Cellulose or its derivatives; Process for rendering pliant layers, masses or threads made of ——. L. Lilienfeld, Vienna. Eng. Pat. 14,142, June 14th, 1911. Under Int. Conv., June 15, 1910.

Layers, masses, or threads of cellulose or its derivatives, such as nitrocellulose, acetylcellulose, viscose, etc., are rendered pliant by the addition of poly-fatty acids, such as polyricinoleic acid, with or without pigments, filling materials, binding agents or adhesives, or other softening agents. Suitable poly-fatty acids can be obtained from the ammonium or alkali compounds of sulphonated fatty acids, such as Turkey-red oil or the like, by extracting them with ether or other suitable solvent, in which the poly-fatty acids are soluble, or by diluting them with so much water, that the poly-fatty acids separate and float on the surface of the emulsion.—A. S.

Finishing and waterproofing hats of straw, chip, and similar materials; Process for ——. Pearson's Patents Ltd., London. Eng. Pat. 5323, March 2, 1912. Under Int. Conv., May 9, 1911.

The hat is soaked in a gelatin solution containing the usual bleaching materials and then shaped by pressure and the application of heat. It is next evenly coated with a suitable wax, such as paraffin wax, then baked in an oven at a temperature higher than the melting point of the wax and finally treated with a waterproof varnish such as a solution of nitrocellulose in acetone. Or, alternatively, after shaping, the hat is treated with a solution containing both wax and nitrocellulose.—P. F. C.

Pulp from waste news print and other grades of paper; Process for the recovery of ——. J. M. Burby, Astoria, N.Y. U.S. Pat. 1,029,848, June 18, 1912.

The material is pulped and treated with an aqueous solution of borax, then drained and washed, and finally separated from impurities.—P. F. C.

Sewage matter, effluents, waste waters, town refuse, and like residues; Utilisation of the scum and sediment of —— for the manufacture of pulp for making paper or card. A. G. G. Mathieu. Fr. Pat. 438,400, March 15, 1911.

The cellulose in the residues mentioned in the title is utilised for the manufacture of paper pulp by any method, such as heating under pressure with dilute alkali after mechanical purification.—T. F. B.

Flax, hemp, cotton, and similar fibres, and products composed of these materials; Treatment of ——. Soc. Anon. Wolokno Schewelin. Fr. Pat. 439,485, Jan. 29, 1912.

See Eng. Pat. 17,898 of 1910; this J., 1911, 678.—T. F. B.

Cellulose products; Process for producing ——. E. Bronnert, Niedermorschweiler, and M. Fremery, Oberbruch, Germany. U.S. Pat. 1,030,251, June 18, 1912.

See Eng. Pat. 9268 of 1908: this J., 1908, 897.—T. F. B.

Cellulosic materials; Acetylation of ——. J. Koetschet and M. Theumann, Lyons, Assignor to Soc. Chimique des Usines du Rhône, ancien. Gilliard, P. Monnet et Cartier, Paris. U.S. Pat. 1,030,311, June 25, 1912.

See Eng. Pat. 25,893 of 1911; this J., 1912, 279.—T.F.B.

Plastic masses from cellulose xanthate; Process for obtaining ——. Chem. Fabrik Heidenau G. m. b. H. (Dr. O. Eberhard). Fr. Pat. 439,332, Jan. 24, 1912. Under Int. Conv., Feb. 13, 1911.

See Eng. Pat. 3042 of 1912; this J., 1912, 636.—T. F. B.

Cellulosic compounds and process of making them. G. Koller. Fr. Pat. 440,133, Feb. 13, 1912. Under Int. Conv., Feb. 25, 1911.

See Eng. Pat. 4744 of 1911; this J., 1912, 328.—T. F. B.

Wood pulp; Process for bleaching cellulose ——. F. W. Dobson. Fr. Pat. 439,286, Jan. 23, 1912. Under Int. Conv., Feb. 8, 1911.

See Eng. Pat. 3181 of 1911; this J., 1912, 225.—T. F. B.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Indigo; Reduction of ——. K. Reinking. Z. angew. Chem., 1912, 25, 1291.

The author holds that the processes involved in the reduction of indigo require further investigation with a view to increasing economy in indigo dyeing. He emphasises the importance of reducing in acid solution, and states that during reduction the indigo molecule may yield two molecules of indoxyl, only part of which is reconverted to indigo, the remainder giving with warm alkali a red substance of unknown composition which also occurs in natural indigo. The vat-mud also contains considerable quantities of a yellow decomposition product. To avoid loss when using hydrosulphite, the quantity of alkali present should not be more than is required to give the monosodium salt of indigo-white.—W. H. P.

Light on colouring matters ; Action of ——. W. Harrison. J. Soc. Dyers and Col., 1912, **28**, 225—236.

The author experimentally proves that :—(1) Light from the mercury arc lamp does not act relatively the same as sunlight on all colours. (2) A mercury light of high intensity does not act relatively the same as one of low intensity. (3) Cellulose is decomposed by the action of light and air, with the formation of reducing substances. (4) In a vacuum under the influence of light from a mercury lamp, cellulose acts as a reducing agent, but in a vacuum under the influence of sunlight, cellulose has little reducing power. This explains why direct dyestuffs do not fade in a vacuum under the influence of sunlight. (5) Most dyestuffs do not fade in the absence of fibre and air ; direct dyestuffs do not fade in the absence of fibre ; basic dyestuffs do not fade in absence of air. (6) Basic dyestuffs usually fade owing to oxidation. (7) Under the influence of mercury light, wool is not so powerful a reducing agent as cellulose. (8) Radium emanation has a powerful destructive action on cellulose and on many direct and basic dyestuffs and on Indigo : Indanthrene and Para Red on the contrary are only slightly affected. (9) Light from a mercury lamp browns and tenders both wool and silk. (10) Many substances affect the rate of fading of dyestuffs ; oils for example assist the fading of vat dyestuffs, through oxidation, whilst dextrin appears to protect all colours. The author advances a theory based on Drude's explanation of colour absorption (Drude's Annalen, 1904, 14, 677) to explain his observations. —P. F. C.

Patents.

Hair, furs, feathers or like articles ; Dyeing ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Hoechst on Maine, Germany. Eng. Pat. 7245, Mar. 25, 1912.

Aminoalkyloxydiphenylamine salts produce valuable light- to dark-grey shades on furs, feathers and the like, if applied in the presence of an oxidising agent such as hydrogen peroxide.—P. F. C.

Warp dyeing machine. W. F. Haskell, Westbrook, Me. U.S. Pat. 1,029,866, June 18, 1912.

The warp travels through a continuous coil, through which the dye liquor is caused to flow. Guide rollers for the yarn are fitted inside hollow "heads" connecting the tubes which form the coil. The machine is also provided with supply and overflow tanks and with suitable squeezing arrangements.—P. F. C.

Sulphide dyestuffs obtained from the indophenols from carbazole and its substitution products ; Process for converting —— *into stable bisulphite compounds.* L. Cassella und Co. Ger. Pat. 247,443, Dec. 10, 1910.

Dyestuffs obtained as described in Eng. Pats. 9689 and 14,143 of 1909, Ger. Pat. 218,371, and Fr. Pat. 427,900 (see this J., 1910, 481 and 482 : 1911, 1153), and by similar means, are converted into stable bisulphite compounds by treatment with alkali bisulphites. These compounds are especially suitable for use in textile printing, since by their aid pure grey to bluish grey shades fast to washing, light, and chlorine are obtainable.—T. F. B.

Dyeing ; Apparatus and process for shifting hanks of yarn in ——. J. Schlumpf, jun., Brugg, Switzerland. Eng. Pat. 13,982, June 12, 1911. Under Int. Conv., June 13, 1910.

See Fr. Pat. 421,183 of 1910 ; this J., 1911, 486.—T. F. B.

Dyeing, scouring, or washing machines. C. Frohlich, Amsterdam, N.Y., U.S.A. Eng. Pat. 16,071, July 11, 1911. Under Int. Conv., July 16, 1910.

See U.S. Pat. 999,301 of 1911 ; this J., 1911, 1052.—T. F. B.

Fabrics or tissues ; Process and apparatus for decorating —— *in several colours.* M. Ratignier, and H. Pervilhac et Cie. Fr. Pat. 440,221, April 28, 1911.

See Eng. Pat. 10,673 of 1911 ; this J., 1911, 1378.—T. F. B.

Fabrics ; Process for producing multicolour effects on —— L. Cassella und Co. Fr. Pat. 440,257, April 29, 1911.

See Eng. Pat. 10,836 of 1911 ; this J., 1912, 486.—T. F. B.

VII.—ACIDS ; ALKALIS ; SALTS ; NON-METALLIC ELEMENTS.

Sulphur trioxide ; Decomposition of —— *on a quartz glass surface.* M. Bodenstein and F. Kranendieck. Z. physik. Chem., 1912, **80**, 148—158.

The rate of decomposition of sulphur trioxide in a quartz glass vessel at temperatures of 809°, 843° and 859° C., is not capable of being represented by any of the ordinary equations. At the beginning the reaction is apparently monomolecular, but the products of the decomposition exercise a retarding effect much greater than would be explained by approach to the point of equilibrium. This effect is not produced by either oxygen or sulphur dioxide alone. If a mixture of oxygen and sulphur dioxide be added to the sulphur trioxide before the reaction, there is a period of induction during which no decomposition takes place and which may last for some minutes. The same phenomena are exhibited by the velocity data at the various temperatures, although the actual velocities differ widely owing to a large temperature coefficient. The irregularity of the results is probably due to the rate of physical changes (diffusion, etc.), being of the same order as, though not proportional to, the rate of chemical change, so that the effects of each cannot be identified.—W. H. P.

Pyrosulphuryl chloride and chlorosulphonic acid. C. R. Sanger and E. R. Riegel. Z. anorg. Chem., 1912, **76**, 79—129.

The paper opens with a review and tabulated summary of the results obtained by the numerous previous workers who have investigated the reactions between sulphuric anhydride and various chlorides. Pyrosulphuryl chloride is best prepared by Schützenberger's reaction between sulphuric anhydride and carbon tetrachloride. If the sulphur trioxide is used in the form of fuming sulphuric acid, which is the most convenient method, chlorosulphonic acid is also formed, the proportions of the two substances depending on the extent of the hydration of the sulphur trioxide. When this reaches the stage $2SO_3,H_2O$, only chlorosulphonic acid is formed. This is what would be expected from the equations :—

$$(1)\ 2SO_3+CCl_4=S_2O_5Cl_2+COCl_2 : \text{and}$$
$$(2)\ 2SO_3+H_2O+CCl_4=2SO_3HCl+COCl_2.$$

It would be expected that some chlorosulphonic acid would still be obtained until the hydration had reached the stage $2SO_3,3H_2O$, corresponding to the equation :—

$$2SO_3+3H_2O+CCl_4=2H_2SO_4+2HCl+COCl_2.$$

It is found, however, that the decomposition of the chlorosulphonic acid by the increasing quantity of water, appears to progress more rapidly than the above equation suggests, and it ceases to be formed before the ratio $2SO_3,3H_2O$ has been reached. To obtain pyrosulphuryl chloride the fuming acid is used with as little water as convenient and excess of carbon tetrachloride. After distilling off hydrogen chloride and carbonyl chloride, the chlorosulphonic acid is converted into the sodium salt by treatment with dry fused sodium chloride. After removing the hydrogen chloride thus produced, the pyrosulphuryl chloride can be distilled off. After another treatment with sodium chloride it is obtained quite pure. The chlorosulphonic acid can if required be regenerated from the sodium salt obtained as above by distilling with fuming sulphuric acid. It is difficult to obtain it pure by this method, however, and Williamson's reaction between hydrogen chloride and sulphur trioxide is preferred for the preparation of chlorosulphonic acid alone. In this case the action of the hydrogen chloride on the sulphuric anhydride in fuming sulphuric acid continues till the hydrate $SO_3.H_2O$ is left, no pyrosulphuryl chloride being formed. Chlorosulphonic acid fumes strongly in moist air and reacts violently with water, forming chlorine and sulphur dioxide in small quantities, as well as hydrochloric and sulphuric acids. It decomposes on boiling in two ways :—

$$(1)\ SO_3HCl=SO_3+HCl\ ;\ \text{and}$$
$$(2)\ 2SO_3HCl=H_2SO_4+SO_2Cl_2.$$

The products of the first reaction undergo further change to some extent as follows :—

$$2SO_3+2HCl=SO_2+Cl_2+H_2SO_4.$$

and those of the second reaction as follows :—

$$SO_2Cl_2+H_2SO_4=SO_2+Cl_2+H_2SO_4.$$

In the presence of certain catalysts the reaction (2) may be caused to predominate very considerably at the boiling point (151°—152° C. at 765 mm.). At a pressure of 19 mm. the chlorosulphonic acid boils at 74°—75° C., but under such reduced pressure dissociation according to equation (1) is greatly increased. To obtain the acid pure, therefore, it is necessary to recrystallise it. On cooling to —120° or —130° C. the crude acid becomes viscous and then crystallises. The pure crystals after separation melt at —80° to —81° C.; sp. gr. 20°/4°=1·753, 0°/4°=1·784. Chlorosulphonic acid gives a sherry red colouration with powdered tellurium which gradually becomes purple and then disappears. With selenium it gives a green colouration which gradually turns yellow and disappears. Pyrosulphuryl chloride fumes only slightly in moist air and only attacks water gradually. It boils at 152·5° to 150° C. without decomposition, and crystallises at —37·5 to —37° C.; sp. gr. 20°/4°=1·837, 0°/4° 1·872. It gives no colouration with selenium or tellurium. Pyrosulphuryl chloride reacts much less readily with water than does chlorosulphonic acid. The authors tabulate in their paper the physical properties and the behaviour with water, tellurium, and selenium of various mixtures of the two substances.—W. H. P.

Ammonia and formic acid : Preparation of —— from calcium cyanamide. H. Sulzer. Z. angew. Chem., 1912, **25**, 1268—1273.

CALCIUM cyanamide can be converted into cyanide by heating with charcoal and a flux to lower the melting point of the mixture. The most convenient fluxes are sodium chloride and sodium carbonate, the latter having the advantage that it forms an insoluble precipitate with the calcium when the melt is extracted with water, while the former gives a solution containing chloride which is inconvenient in the subsequent hydrolysis. The most suitable proportions are 20 parts of charcoal and 75—90 parts of anhydrous sodium carbonate to 100 parts of calcium cyanamide. This mixture is heated in an iron crucible for 15 to 20 minutes to a white heat, stirred once or twice and allowed to cool. On hydrolysis of the cyanide, ammonia is evolved and a formate left in solution. A quantity of the melt corresponding to 100 grms. of hydrogen cyanide is pulverised, mixed with 50 to 60 times as much water and placed in an iron autoclave enamelled inside. After closing the autoclave the contents are heated to 190° C. and one-third of the liquid is distilled off. The autoclave is again closed, heated for another 10 minutes to restore the temperature to 190° C. and another third distilled off. Most of the ammonia is now expelled and can be recovered from the distillate in the usual way. The residue is evaporated and the formic acid obtained by distilling with acid. It is at this point that the absence of chloride is advantageous, as a mixture of hydrochloric and formic acids would be difficult to separate. The author believes that by this method ammonia and formic acid can be obtained profitably on a large scale. To test for formic acid in the presence of chlorides when the silver test is inapplicable, the author uses a solution of chromic acid which is reduced by formates but not by chlorides.—W. H. P.

Alkali bicarbonate [in normal carbonate] ; Detection of ——. R. T. Haslam. J. Amer. Chem. Soc., 1912, **34**, 822—823.

As little as 0·1 per cent. of sodium bicarbonate in normal sodium carbonate can be detected by the following method. The carbonate is dissolved in water free from carbon dioxide, excess of calcium chloride is added, and the precipitate filtered after standing a few minutes. If a few drops of ammonia be now added, a precipitate of calcium carbonate indicates the presence of bicarbonate in the original substance. If the amount of bicarbonate is small, the precipitation will take some minutes, but a perfect "blank" can be obtained in the absence of bicarbonate.—W. H. P.

Pacific kelps ; Composition of the ——. J. W. Turrentine. J. Ind. Eng. Chem., 1912, **4**, 431—435. (See also this J., 1910, 150.)

THE author gives the results of the analysis of 81 specimens of various kelps collected from certain parts of the coast of Alaska, from Puget Sound (San Juan Co.), Wash., and from the regions of Monterey Bay and San Diego, Cal. The specimens comprised about thirty different varieties of kelps and included specimens of the same varieties from different localities, of the same variety at different ages, and of different parts of the same plant. The analytical results are tabulated, figures being given for the contents of potassium oxide, iodine, nitrogen, soluble salts, sodium salts, organic matter, ash of lixiviated plant, and potassium chloride ; in certain cases, also, the content of phosphorus and of sulphur is given. The results obtained indicate that on the whole the kelps from the northern regions are richer in potassium salts but poorer in iodine than kelps from the southern regions. The average contents of potassium chloride and iodine of the three so-called giant kelps are shown in the following table :—

	Potassium chloride.	Iodine.
	Per cent.	Per cent.
Nereocystis........	32·6 (aver. of 6)	0·14 (aver. of 6).
Macrocystis	22·2 (aver. of 27)	0·27 (aver. of 29)
Pelagophycus	31·3 (aver. of 5)	0·36 (aver. of 5)

—A. S.

Iodides ; Note on the determination of —— by direct titration. J. W. Turrentine. J. Ind. Eng. Chem., 1912, **4**, 435—436.

FOR the determination of small quantities of iodide in presence of chlorides and bromides, *e.g.*, in kelp, the author titrates directly with permanganate. The permanganate is standardised by adding to a known volume of a standard solution of potassium iodide (1 grm. to 1000 c.c. of water), 15 c.c. of sulphuric acid (1 : 9), and 15 c.c. of purified carbon tetrachloride, and then running in the permanganate. During the titration the liberated iodine is transferred from the aqueous solution to the carbon tetrachloride by shaking, and the end point is considered to be attained when a pink colour persists for 1 minute. A blank determination is carried out in presence of carbon tetrachloride without the iodide. The actual determination is carried out in a similar manner.—A. S.

Iodine ; Determination of —— in iodides, and in particular in kelp. V. Auger. Bull. Soc. Chim., 1912, **11**, 615—617.

BY the following method iodides can be determined rapidly in solutions containing not only chlorides and bromides but sulphides, cyanides, thiocyanates, ammonium salts and nitrites. The solution, which should contain bout 0·05 grm. of iodine, is made alkaline with 5 c.c. f sodium hydroxide solution of 36° Bé., and heated on a ater-bath. A concentrated solution of potassium ermanganate is added, little by little, until in excess, nd after heating for 5 minutes, the coloured liquid is iluted to about 250 c.c., acidified with acetic acid, and reated with hydrogen peroxide until the manganese ioxide has disappeared. The excess of hydrogen eroxide is decomposed by adding a weak permanganate olution until the appearance of a reddish brown tint, hich is in turn removed by careful addition of a dilute olution of hydrogen peroxide. The liquid is then treated ith 1 grm. of potassium iodide and 5 c.c. of hydrochloric cid, and the liberated iodine is titrated with sodium hiosulphate.—J. H. L.

Hypoiodites; Stability of ——. V. Auger. Comptes rend., 1912, **154**, 1806—1807.

Stability of calcium hypoiodite. According to Lunge and Schoch (this J., 1882, 407), a solution of calcium hypoiodite containing 9·5 per cent. of available iodine still contains 4 per cent. after being boiled for 7 hours. The author points out that by the method used by Lunge and Schoch (treatment of iodine by excess of milk of lime at the ordinary temperature), what is obtained is not calcium hypoiodite but a mixture of iodide and iodate with excess of lime. The decolourisation of indigo carmine used by Lunge and Schoch as a measure of the available iodine was actually caused by the free lime (see Gros Renaud, Bull. Soc. ind. Mulhouse, **24**, 343).

Action of alkali bicarbonates on hypoiodites. Förster and Gyr (see this J., 1903, 144) found that when a large excess of potassium bicarbonate is added to a solution of iodine in an iodide, then on subsequent titration with thiosulphate, considerably less iodine is found than the original quantity, indicating, in their opinion, a formation of hypoiodite, which reacts with the thiosulphate, with formation of sulphate. The author finds, however, that if the solution be diluted before titration, so as to approach more closely the ordinary conditions prevailing in iodometric titrations, quite different results are obtained. For example an undiluted solution (1 atom of iodine to 100 mols. of potassium bicarbonate at 25 per cent. concentration) showed a deficit of 31 per cent. of iodine, but after diluting strongly with water, the deficit was only 5 per cent., and after diluting with water saturated with carbonic acid, only 1·5 per cent. It is concluded that there is no formation of hypoiodite from iodine and alkali bicarbonate, if a sufficient quantity of free carbonic acid be present to prevent hydrolysis of the bicarbonate with formation of the normal carbonate.—A. S.

Alkali periodates. V. Auger. Comptes rend., 1912, **154**, 1699—1700.

The author has been unable to detect the formation of periodate in the oxidation of alkali iodide solutions by ozone and criticises the results obtained by Garzarolli-Thurnlackh (this J., 1902, 143). He points out, moreover, that the work of this investigator and of Péchard (this J., 1900, 767), on the action of iodides on periodates, is vitiated by the presence, in their experiments, of atmospheric carbon dioxide which acts rapidly on the basic periodate formed; in the absence of carbon dioxide, the reactions occurring are: (*a*) $3NaIO_4+2NaI+3H_2O=2Na_2H_3IO_6+NaIO_3+2I$, and (*b*) $2Na_2H_3IO_6+I_2=3NaIO_3+NaI+3H_2O$, but, in the presence of this gas, further reactions take place, in accordance with the equations (c) $Na_2H_3IO_6+CO_2=NaHCO_3+H_2O+NaIO_4$, and (*d*) $NaIO_4+2NaI+H_2O+2CO_2=NaIO_3+I_2+2NaHCO_3$, so that the iodine does not entirely disappear.—F. Sodn.

Perchlorates; Determination of ——. A. B. Lamb and J. W. Marden. J. Amer. Chem. Soc., 1912, **34**, 812—817.

A simple method of estimating perchlorates is to heat with sodium carbonate till there is no further change and then to estimate the chloride in the residue. If this is carried out in a crucible, there is always a considerable error due to mechanical loss of chloride. The authors therefore use a Jena glass test-tube with two plugs of asbestos wool. If blank tests are made with the sodium carbonate and asbestos, the results attainable are of the same order of accuracy as that of the chloride determination itself. If this is made volumetrically the process is a very rapid one.—W. H. P.

Arsenious acid [sodium arsenite]; Oxidation of —— by atmospheric oxygen. F. Reinthaler. Chem.-Zeit., 1912, **36**, 713. (See this J., 1911, 771.)

According to Mohr, the oxidation which occurs on warming a solution of ordinary arsenious acid in sodium hydroxide in presence of air, is due to impurities (sulphur compounds), a solution of the pure acid being unaffected. The author (Reinthaler) finds, however, that a solution prepared by dissolving pure arsenious oxide in a solution of pure sodium hydroxide and then saturating with pure carbon dioxide, is appreciably oxidised on warming in presence of air; the solution is stable at the ordinary temperature.—L. E.

Hypophosphites; Catalytic oxidation of —— in aqueous solution. A. Sieverts and F. Loessner. Z. anorg. Chem., 1912, **76**, 1—29.

When copper hydride (CuH) is warmed with aqueous hypophosphorous acid, metallic copper is produced, and not the hydride CuH_2 as was stated by Bartlett and Merrill (Amer. Chem. J., 1895, **17**, 185). The copper produced in this way possesses the property, which was supposed to be characteristic of the dihydride, of inducing the oxidation of aqueous hypophosphorous acid with the evolution of hydrogen: $H_3PO_2+H_2O=H_3PO_3+H_2$. The reaction between silver nitrate and hypophosphorous acid produces metallic silver and not silver hydride (Bartlett and Rice, Amer. Chem. J., 1897, **19**, 51). The above conclusions are reached by analyses of the precipitates as well as by stoichiometric investigation of the reactions which produce them. If a solution of a palladium salt is treated with a less than equivalent quantity of hypophosphite solution, metallic palladium results without any evolution of hydrogen. With excess of hypophosphite the precipitate is probably also metallic palladium, although the formation of a hydride is not impossible. Spongy palladium saturated with hydrogen precipitates more palladium from a solution of a palladium salt. The catalytic effect of metallic palladium in bringing about the autoxidation of hypophosphite solutions is not connected with its hydrogen content, since palladium precipitated by carbon monoxide is also active. Spongy platinum is not a catalyst for the oxidation of hypophosphite. Any oxygen which it contains is reduced, but there is no further action. When a hypophosphite solution is warmed with sodium or potassium hydroxide, hydrogen is evolved and alkali phosphite formed. This reaction is monomolecular and has a normal temperature coefficient. The velocity of the reaction increases much more rapidly than the alkali added. Equivalent quantities of potassium and sodium hydroxides have the same effect on the velocity.—W. H. P.

Potassium cyanate; Oxidation of —— by hydrogen peroxide. A. P. Lidoff. J. Russ. Phys.-Chem. Soc., 1912, **44**, 527—528.

In neutral solution, the oxidation of potassium cyanate by hydrogen peroxide gives rise to a gas, oxycyanogen, resembling carbon dioxide in properties but lighter than it: $2KCNO+H_2O_2=K_2CNO_2+CNO+H_2O$. In presence of sodium hydroxide free from carbonate, the reaction proceeds very readily, no gas being evolved: $2KCNO+2NaOH+H_2O_2=K_2CNO_2+Na_2CNO_2+2H_2O$.—T. H. P.

Oxycyanate; Formation of —— by heating potassium cyanate with copper oxide. A. P. Lidoff. J. Russ. Phys.-Chem. Soc., 1912, **44**, 529—532.

Potassium cyanate, which is comparatively stable towards heat, undergoes energetic decomposition when heated with a small quantity of an oxide or of a finely divided metal (in particular, copper), the principal reaction being expressed by the equation: $2KCNO+CuO=K_2CNO_2+CNO+Cu$ or $2KCNO+Cu=K_2CNO_2+CN+Cu$. The results obtained on heating potassium cyanate in oxygen appear to indicate the existence of cyanogen oxides of the compositions, CNO_2 and CNO_3.—T. H. P.

Copper sulphate for agricultural purposes; Analysis of ——. M. Zecchini. L'Ind. Chim., 1912, **12**, 182—184.

THE following simple and rapid method is proposed for determining the amount of copper sulphate in the commercial salt. 50 c.c. of a solution of the sample are treated with 60 c.c. of a solution containing 19·878 grms. of sodium thiosulphate and 8 grms. of ammonium thiocyanate per litre. The copper sulphate is reduced by the thiosulphate ($2CuSO_4+2Na_2S_2O_3=Na_2S_4O_6+Cu_2SO_4+Na_2SO_4$), and the cuprous salt produced is precipitated as thiocyanate. The excess of thiosulphate is then determined by titration with iodine solution (5·089 grms. per litre). The solution of thiosulphate and thiocyanate is standardised by carrying out a determination with pure copper sulphate under exactly similar conditions.—A. S.

Silicate minerals; Formation of —— from aqueous solutions at high temperatures. W. J. Müller and J. Königsberger. Z. angew. Chem., 1912, **25**, 1273—1277. (See also Baur, this J., 1911, 1209.)

THE crystalline minerals which are found in fissures in the rocks of the Alps are generally assumed to have been formed by the action of water on the material of the original rock. To elucidate this formation the authors have performed experiments in a platinum-lined bomb tube at 420° C., in which water containing dissolved salts and carbon dioxide was allowed to act on various sources of amorphous silica. The bomb was heated in an electrical resistance furnace and contained a filter-tube by means of which the solution could be separated from solid matter before cooling, so that the crystals obtained from the liquid during cooling should be obtained separately from those already formed at 420° C. The action of pure water on Thuringian glass gave a solution which after cooling still contained alkali and silica, and which had deposited quartz and amorphous silica on cooling. The solid outside the filter-tube consisted of silica in the form of chalcedony, tridymite and quartz, together with small crystals of a potash felspar containing also much sodium. Obsidian yielded similar products except that instead of felspar a silicate containing iron (aegirite-augite) was obtained. Both on glass and on obsidian the action was greatly diminished by the presence of carbon dioxide. It is noteworthy that in these experiments stable and labile modifications of quartz are found side by side, and that since no true equilibrium is obtained the phase rule cannot be applied. Further experiments were performed by heating a mixture of potassium aluminate, potassium water glass, and gelatinous aluminium hydroxide in the proportions required for the formation of orthoclase. Heated to 100° C. in a silver crucible, such a mixture yielded an extremely fine subcrystalline deposit, while at 400° C., in the absence of carbon dioxide or dissolved salts, a mineral which was either potash analcime or leucite was formed. The filter-tube contained no crystals but only a solution containing potassium, silica and alumina. In the presence of carbon dioxide or dissolved salts, a distinct separation of orthoclase was obtained outside the filter-tube. The authors conclude that the quartz in the cavities has deposited during the cooling of the solution, while the felspar has been formed at 400° C. or upwards by the inward diffusion of carbon dioxide.—W. H. P.

Rare earths; Separation of the ——. C. James. J. Amer. Chem. Soc., 1912, **34**, 757—771.

SINCE 1908, when the author published a scheme for the separation of the rare earths (see this J., 1908, 518), many new methods have been introduced and others modified, and hence, in the present paper, the scheme of separation is brought up to date. For the separation of cerium from the precipitate of double sodium sulphates (precipitate A, *loc. cit.*), the bromate method (this J., 1911, 1055) is employed; in the filtrate from the bromate precipitate, the earths are precipitated by oxalic acid in the cold, or the solution is heated to boiling, and the earths precipitated as hydroxides by adding an exce of sodium hydroxide. For the removal of traces of ceriu from the praseodymium, the almost neutral nitra solution may be boiled with potassium bromate an marble. For the separation of pure neodymium salt in addition to the fractions containing magnesiu neodymium nitrate, the mother liquor and the mo soluble crystals from the fractionation of the doub manganese nitrates may also be employed: indee although less convenient, the fractionation of the doub manganese nitrates from nitric acid sometimes giv better results than the fractionation of the double ma nesium nitrates from water. For the preparation of th ethyl sulphates for the separation of dysprosium, th following method has been found much more satisfactor than the interaction of the rare earth sulphates wit barium ethylsulphate. The fractions rich in dysprosiu are precipitated with oxalic acid, the oxalates are converted into oxides, and dissolved in hydrochloric aci The solution is rendered very slightly basic by additio of a further quantity of the oxides, and is then evaporate to such a degree that it would solidify on cooling, whereupo after cooling considerably but whilst still liquid, it i poured into 95 per cent. alcohol. Hydrochloric acid is no added, drop by drop, until the alcoholic solution is clea and a hot concentrated alcoholic solution of sodiu ethylsulphate is poured in and well stirred. After heatin on the water-bath, the precipitated sodium chloride i filtered off and washed with hot alcohol, and the solutio allowed to crystallise, the crystals being then systematicall fractionated. Terbium separates in the first few fraction together with some dysprosium; pure dysprosium an dysprosium and holmium separate in the intermediat fractions; and holmium and yttrium in the most solubl portion. For the purification of yttrium, the old metho of fusing the nitrates is the best for large quantities, but white yttrium oxide cannot be obtained if terbium b present. In such cases, Muthmann and Böhm's chromat method (this J., 1900, 267) may be employed. For th methods employed for separating europium and thulium see this J., 1911, 1055. Scandium can be freed from thorium by means of sodium carbonate. A concentrated solution of the chloride is poured into a 20 per cent solution of sodium carbonate, 1 litre of the latter bein used for every 10 grms. of scandium oxide. The solutio is boiled rapidly for 1 hour, the volume being kept constant and the precipitated crystalline double carbonate is allowe to settle, the supernatant liquid poured off, and the residu washed three times in succession by boiling for 15 minute with a 20 per cent. solution of sodium carbonate. The precipitate of double carbonate is then dissolved in col water, with which it is stirred constantly for 4 hours the solution is filtered, acidified with hydrochloric acid and the scandium precipitated as hydroxide. If necessary the process is repeated.—A. S.

Thorium and the rare earths. F. Wirth. Z. anorg. Chem., 1912, **76**, 174—200.

THE author has investigated the solubilities of the oxalates and sulphates of thorium, and the rare earth metals, in sulphuric acid of varied concentration. The solubilities of the sulphates are all considerably less in moderately strong acid (5 N) than in water, in some cases a pronounced maximum being reached in more dilute acid; but the order of solubility in acid is very different from that in water, lanthanum sulphate, for instance, being less soluble in water than the sulphates of gadolinium, samarium, erbium, or cerium, but more soluble than any of these in 12·6 N sulphuric acid. In the separation of the earths as sulphates, therefore, it is important, in order to obtain the best results, that the proper proportion of free acid be employed in each particular case, and, in the separation of erbium, for example, from gadolinium, etc., free acid should be carefully avoided since it greatly reduces the solubility of erbium sulphate. Precipitation of thorium with oxalic acid is best carried out in the presence of 5 N sulphuric acid, the solubilities of thorium oxalate and those of the cerium earths being then sufficiently different to allow of an approximate separation; with stronger acid than about 10 N, partial

transformation to sulphate occurs, and this, although precipitated, is, in an analytical operation, lost in the process of washing. The oxalates of the trivalent earths are converted into sulphates if the acid be above 5·5 N strength, and the solubility of the oxalates is much diminished by the presence of an excess of oxalic acid. In separating thorium by the "sulphate method," the supernatant acid should not exceed 1—2 per cent. strength, on account of the rapid decline in the solubility of the sulphates of the trivalent earths as the concentration of the acid increases, and phosphoric acid should be completely removed before the sulphate precipitation. Also, when the solution of a rare earth mineral, which has been decomposed by sulphuric acid is boiled, to separate titanic acid, etc., as often recommended, the earths themselves are liable to be precipitated as sulphates, since the solubility of these in the acid decreases with rise of temperature. The precipitation of thorium, at 25° C., as the readily filtered sulphate-9-hydrate, is ensured by keeping the strength of the supernatant acid below about 30 per cent., and allowing sufficient time.
—F. SODN.

Radioactive elements; Existence of chemical compounds of ——. H. Schrader. Phil. Mag., 1912, **24**, 125—134.

IF a platinum wire on which actinium B has been deposited be heated in a high vacuum (0·003 mm. of air), volatilisation of the radioactive deposit takes place between 600° and 900° C. The volatility of the deposit is increased by previous treatment with chlorine, bromine, hydrobromic acid, and hydriodic acid. The B and C products of the active deposits of radium, thorium, and actinium condense in air at a temperature several hundred degrees higher than in hydrogen. These differences are considered to be due to the formation of chemical compounds.—A. S.

Radium C; Volatility of ——. A. S. Russell. Phil. Mag., 1912, **24**, 134—137.

THE results obtained by Schrader (see preceding abstract) afford a simple explanation of the discrepancy between the observations of Makower (Manchester Memoirs, 1909, **53**, [7]) on the volatilisation of radium A, B, and C, in air, and those of the author (Roy. Soc. Proc., 1912, **86**, **A**, 244) on the volatilisation of the same products in hydrogen. Further experiments have now shown that in presence of oxygen, radium A, B, and C are all non-volatile from a surface of quartz below 700° C.; the volatilisation point of radium C is higher than 1200° C. In presence of hydrogen, radium C volatilises from a quartz surface at about 360° C., and radium A and B are volatile below 650° C.
—A. S.

Nitrogen oxides; Formation of ——, *by the electric spark discharge in liquid air.* E. Müller. Z. anorg. Chem., 1912, **76**, 324—346.

ON passing induction sparks of a certain voltage and frequency between terminals immersed in liquid air, a green solid substance, a compound of nitrogen and oxygen, was formed. With too high a voltage and a certain great rapidity of sparking, ozone alone was produced. The analysis of the above compound gave the molecular ratio of nitrogen to oxygen $N:O_3$. Raschig's so called "NO_3" (this J., 1911, 1208) was also prepared, by leading nitric oxide into liquid air, and appeared to be identical with the other substance. It gave the same ratio of nitrogen to oxygen as the other. The difficulty of separating the substance from the liquid air for analysis is, however, very great, and the author considers that at very low temperatures and with excess of oxygen present a higher oxide of nitrogen may yet exist.—J. T. D.

Phosphorus; Red ——. A. Stock, H. Schrader, and E. Stamm. Ber., 1912, **45**, 1514—1528. (See also this J., 1910, 86.)

EXPERIMENTS were made on the conversion of ordinary into red phosphorus by radiation (sunlight, diffused daylight, quartz-mercury-vapour lamp, induction spark). The action of the red rays and the ultra-violet rays was found to be very slight; the maximum of action was in the visible violet. The temperature has but little influence on the action of light. Radiation produces no effect on phosphorus vapour at 200° C. Under the action of radiation the phosphorus first turns yellow, then red, and afterwards loses its transparency; no doubt colloidal solutions are first formed and afterwards flocculate. The ignition-temperature of the red phosphorus thus formed is 430°—440° C.—probably conversion into ordinary phosphorus precedes ignition. Different specimens showed great differences in appearance, and in their degree of ease of attack by oxygen and other substances; and their densities varied from 1·95 to 2·25, the darker coloured being usually the denser. They were all probably amorphous, though some of them showed light between crossed Nicols in the polariscope, indicating possibly crystalline, but possibly only cellular structure. Amorphous phosphorus was also produced by heating phosphorus vapour to high temperatures (900°—1175° C.) and suddenly cooling it. The P_4 molecules are no doubt dissociated at the high temperature, and the smaller molecules combine with one another or with P_4 molecules to form red phosphorus. If the cooling be gradual, no red phosphorus is formed. This red phosphorus is yellowish red to blood red and transparent in thin layers; in compact pieces it is black with a slight violet sheen. When powdered it looks like ordinary red phosphorus, but is less dense (at most 2·115, against 2·14—2·17). Its behaviour with crossed Nicols indicates crystalline structure. It is very permanent in air, and is only slowly attacked by a boiling solution of sodium hydroxide.—J. T. D.

Calcium carbide; Production of —— *in* 1911. V. B. Lewes. Times, Eng. Suppl., July 3, 1912. [T.R.]

THE following table shows the amount of calcium carbide manufactured and used in, and exported from the principal countries in 1911:—

	Made tons.	Used tons.	Exported tons.
Sweden and Norway	52,000	4,000	48,000
United States	50,000	37,000	13,000
France	32,000	31,500	500
Switzerland	30,000	4,000	26,000
Italy	28,000	23,000	5,000
Austria and Hungary	22,500	17,000	5,500
Canada	12,000	8,000	4,000
Spain	18,000	16,000	2,000
Germany	7,000	36,230	—
England	2,000	16,000	—
Other countries	5,200	63,800	—

Sodium nitrate. Shipments and consumption from 1910 *to* 1912. W. Montgomery and Co., June 29, 1912. [T.R.]

		1910.	1911.	1912.
Shipments from South American Ports to all parts for the six months ending 30th June	Tons	958,000	980,000	1,016,000
Do. do. do. for the twelve months ending 30th June	,,	2,291,000	2,322,000	2,448,000
Consumption in U.K. for the six months ending 30th June	,,	77,000	86,000	86,000
Do. in U.K. for the 12 months do.	,,	118,000	129,000	132,000
Do. in Continent do. do.	,,	1,530,000	1,575,000	1,711,000
Do. in United States do. do.	,,	516,000	535,000	503,000
Do. in other Countries do. do.	,,	78,000	85,000	114,000
Do. in the World do. do.	,,	2,212,000	2,321,000	2,460,000

Nitrates from the atmosphere in Germany. Oil, Paint, and Drug Rep., June 24, 1912. [T.R.]

Nitrate manufactured from the air by the Norwegian and Swedish plants is slowly finding its way to the German market. It is expected that in the near future the Norwegian saltpetre will be shipped in large quantities to the centres of consumption. At present the artificial nitrate is selling at 8 to 9 pfennigs more per kilo. than Chile saltpetre, but it is thought that the prices will soon be equalised. In 1911 there were only 493·3 metric tons of sodium nitrate imported from Norway, as against 730,939 tons received from Chile. There were also imported in 1911 473·4 tons of ammonium nitrate from Norway and 139·2 tons from Sweden, and 14,494 tons of calcium nitrate from Norway and 1,033·6 tons from Sweden. Not only in Sweden and Norway are new plants in course of construction for extracting nitrogen from the air, but also in Upper Bavaria, in the Tyrol, in Switzerland, and in the Valley of the Rhine.

Patents.

Sulphuric acid; Apparatus for making ——. C. C. Meigs, Woodbury, N.J. U.S. Pat. 1,022,493, April 9, 1912.

The yield of a sulphuric acid chamber can be increased if the density of the gases therein be varied, for example by compression and expansion. This is effected according to the present patent by disposing in the chamber a hollow baffle or deflector, of approximately diamond-shaped cross-section, extending from the top to the bottom, but spaced apart from the side walls of the chamber. The sides of the deflector facing the inlet end of the chamber are concave. The gases on entering the chamber in the usual way, expand; then on passing through the narrow spaces between the deflector and the walls of the chamber, they are compressed, and expand again on the other side of the deflector. The compression and admixture of the gases is assisted by the concave form of the sides of the deflector facing the inlet end of the chamber.
—A. S.

Sulphuric anhydride; Process of making ——. H. Howard, Boston, Mass. U.S. Pat. 1,028,880, June 11, 1912.

Gases containing sulphur dioxide are cooled sufficiently to remove substantially all the moisture (or so as to remove the greater part of the moisture, further drying being effected by means of concentrated sulphuric acid), and the dried sulphur dioxide is converted into sulphuric anhydride by the contact process.—F. Sodn.

Hygroscopic material [calcium chloride or caustic soda]; Porous granular ——. E. N. Trump, Syracuse, and J. D. Pennock, Solvay, N.Y., Assignors to Solvay Process Co., Syracuse, N.Y. U.S. Pat. 1,026,724, May 21, 1912.

In order to obtain such substances as calcium chloride and caustic soda in the form of small, rounded, porous granules, concentrated solutions of the same are cooled rapidly by a blast of air. The solution flows into the granulating chamber from a trough, immediately below the end of which is a flat nozzle through which a blast of air issues.
—A. S.

Chlorides of tin; Method of producing ——. R. J. McNitt, Niagara Falls, Assignor to The Chlorine Products Co., New York. U.S. Pat. 1,030,110, June 18, 1912.

Chlorine is passed into a concentrated solution of chlorides of tin, in the presence of metallic tin, at a temperature above about 80° C., the current of gas being continued until all the metal is dissolved and water admitted in such proportion as to give a solution of stannic chloride of the desired strength, free from anhydrous stannic chloride.
—F. Sodn.

Silica, alumina, and potash from felspar; Process for the recovery of ——. S. Peacock, Assignor to American Acid Co., Baltimore, Md. U.S. Pat. 1,030,122, June 18, 1912.

Felspar is converted into the amorphous form and a solution of an alkali added (not more than two equivalents of alkali, nor less than one, for each equivalent of silica); the mixture is then treated with superheated steam, and the soluble alkali silicates formed are separated from the insoluble alumina, after which the latter is treated with carbon dioxide, so as to convert any alkali present into carbonate, and the alumina (now practically pure) is dehydrated. Finally, the soluble silicates are submitted to the action of carbon dioxide and the alkali carbonates produced are separated from the silica.—F. Sodn.

Alkali-aluminium silicates, e.g., felspar; Process for the treatment of natural ——. A. Hambloch and S. Gelléri. Ger. Pat. 247,496, Jan. 4, 1911.

The natural silicate is heated with an oxide or carbonate of an alkaline-earth metal or of magnesium and then treated, in a closed chamber, with ammonium carbonate vapour under high pressure. After the treatment the alkali carbonates formed are removed by lixiviation, and the residual mass, if lime has been used in the first stage of the process, may be burned so as to yield Portland cement.—A. S.

Hydrogen mixture [hydrogen and carbon monoxide]; Process of manufacturing a ——. R. P. Pictet, Wilmersdorf, Berlin. Eng. Pat. 14,703, June 21, 1911. Under Int. Conv., June 22, 1910. Addition to Eng. Pat. 13,397 of 1911 (under Int. Conv., June 4, 1910).

The process described in the principal patent is modified in such a way that the carbon, instead of being deposited in the form of soot, is converted into carbon monoxide by interaction with water vapour. External heat (39·36 units for every 18 grms. of water) is applied for decomposing the water vapour, in addition to that required to decompose the hydrocarbon vapours, for which the temperature is raised substantially to the melting point of iron. Water and hydrocarbon are fed, for example, into an iron tube, which is of sufficient length (say 3—4 m.) to enable the supplementary heat to be imparted without damage, and these being vapourised on entry, react in the further end of the tube, which is the more strongly heated; the gas produced is then cooled and passes through a filter to a gas-holder, there being a soot chamber and also arrangements for the removal of soot from the tube and filter. Ten litres of petroleum, mixed with 3—3·5 litres of water, may be thus decomposed per hour, in the apparatus described, the mixture furnishing approximately 3000 litres of gas for every litre of hydrocarbon, with a calorific value of 3000–3600 heat units per cubic metre. By regulating the supply of water, any desired proportion of carbon can be converted into carbon monoxide.
—F. Sodn.

Oxygen; Process of generating ——. A. Gutensohn, London. Eng. Pat. 6888, March 20, 1912.

For the generation of oxygen from hydrogen peroxide, claim is made for the use, singly or in combination, of the permanganates of potassium, calcium, and barium, which have been calcined to such a degree that they form a slightly reddish solution in water. The hydrogen peroxide is fed into the generating vessel by a pump, which continues to force it into the vessel whilst the oxygen is being withdrawn.—A. S.

"Oxone" [from sodium peroxide]; Apparatus for preparing ——. G. F. Brindley, San Francisco, Cal., Assignor to The Roessler and Hasslacher Chem. Co., New York. U.S. Pat. 1,028,857, June 11, 1912.

The apparatus comprises a melting pot, into which depend electrodes, connected by a resistance, and a hopper which may be turned from a position above the melting pot into one beyond it, the pot being pivoted so that its contents ay be poured out. A pot is described consisting of an ner bowl of copper and an outer casing, forming a water cket, a covered lip on the bowl projecting beyond the sing; a removable conductor connects the electrodes, hich are supported on the casing in such a manner that ey may be shifted vertically, projecting downwards into he bowl of the pot, and sodium peroxide is fed from the opper by means of a shaft and feed screw.—F. Sodn.

ulphuric acid free from arsenic and iron; Process for manufacturing clear, light coloured —— by the lead chamber method. F. Girod, Grevenbrück, Germany. Eng. Pat. 17,157, July 26, 1911. Under Int. Conv., Aug. 13, 1910.

ee Fr. Pat. 432,874 of 1911; this J., 1912, 127.—T. F. B.

ontact chamber [sulphuric acid manufacture]. G. Eschellmann and A. Harmuth, St. Petersburg, Assignors to General Chemical Co., New York. U.S. Pat. 1,030,508, June 25, 1912.

ee Eng. Pat. 23,419 of 1909; this J., 1910, 422.—T. F. B.

Brine; Treatment of ——. G. W. Malcolm, Davenham, and F. T. Munton, Winsford, Assignors to The Salt Union, Ltd., Liverpool. U.S. Pat. 1,030,103, June 18, 1912.

See Eng. Pat. 19,302 of 1908; this J., 1909, 1197.—T. F. B.

Aluminium formate, Method of producing water-soluble crystalline —— and product obtained thereby. F. Quade, Assignor to J. A. Wülfing, Berlin. U.S. Pat. 1,030,747, June 25, 1912.

See Ger. Pat. 224,074 of 1909; this J., 1910, 976.—T. F. B.

Nitrogen compounds of silicon and aluminium; Process for making ——. Soc. Générale des Nitrures. First Addition, dated April 10, 1911, to Fr. Pat. 438.209, March 8, 1911.

See Eng. Pat. 25,141 of 1911; this J., 1912, 127.—T. F. B.

Production of sulphite and sulphate of ammonia in the manufacture of gas. Eng. Pat. 6471. *See* IIa.

VIII.—GLASS; CERAMICS.

Formation of silicate minerals from aqueous solutions at high temperatures. Müller and Königsberger. *See* VII.

Patents.

Glass in continuous sheets; Apparatus for the mechanical manufacture of ——. E. Rowart, Auvelais, Belgium. U.S. Pat. 1,030,018, June 18, 1912.

See Fr. Pat. 397,505 of 1908; this J., 1909, 795.—T. F. B.

Ceramic ware; Process for producing designs and pictures on ——. Keramische Druckwerke G. m. b. H. Fr. Pat. 439,738, Feb. 5, 1912. Under Int. Conv., Sept. 30, 1911.

See Eng. Pat. 2919 of 1912; this J., 1912, 643.—T. F. B.

IX.—BUILDING MATERIALS.

Asphaltum residues; Utilisation of ——. Oil, Paint, and Drug Rep., June 24, 1912. [T.R.]

The chief feature of the asphaltum industry in 1911, as shown by an advance chapter from Mineral Resources, published by the Geological Survey, is the great extension of the use of residues from the asphaltic varieties of petroleum as binders in the surfaces of macadam roads in order to prevent deterioration. The asphaltum used for this purpose showed a gain in quantity from 159,424 tons in 1910 to 234,951 tons in 1911. The importation of soft asphaltum from Venezuela, which is admirably suited for this purpose, is increasing. A by-product of the oil industry is fast supplying the demands for asphaltum in the United States. The petroleum from California and Texas has furnished, in the course of their utilisation, large supplies of asphaltic residue, which when treated with air becomes sticky and even elastic to a certain extent. Elastic material for roofing and substitutes for rubber in automobile tyres have been obtained from asphaltic residues by this blowing process or by treating with sulphur. This sulphurisation of asphaltum has been applied with good effect to elaterite and similar hard asphaltums from Eastern Utah.

Patents.

Portland cement; Waterproof —— and process of making it. M. Toch, Assignor to H. M. Toch, New York. U.S. Pat. 1,029,643, June 18, 1912.

An ingredient for waterproofing Portland cement consists of a fatty acid amide, together with a finely-divided mineral "carrier" therefor, *e.g.*, aluminium silicate.
—T. F. B.

Cementitious material. H. S. Spackman, Ardmore, Pa., and E. W. Lazell, Wilmington, Del. U.S. Pats. 1,029,953 and 1,029,954, June 18, 1912.

Claim is made (1) for "a slow-setting, hydraulic, highly-cementitious material containing large proportions of cementitious, composite, strength-accelerating, earthy alkali compounds rich in alumina-like material"; and (2) for "a hydraulic, quick-setting, highly-cementitious material capable of developing and accelerating the cementitious properties and early strengths" of other cements containing available lime. The second product is obtained by calcining a mixture of lime and bauxite in which the proportion of lime is slightly in excess of that required to combine "in dicalcic proportions" with the alumina in addition to combining with any silica present.
—W. E. F. P.

Binder or cementing material. J. M. Neil, Assignor to A. M. Hay, Toronto, Canada. U.S. Pat. 1,030,114, June 18, 1912.

A mixture of sodium silicate and glucose, with or without the addition of a calcium compound.—W. E. F. P.

Concrete; Composition similar to —— for building and like purposes. A. G. Harris. Fr. Pat. 439,773, Jan. 17, 1912.

See Eng. Pat. 26,544 of 1911; this J., 1912, 491.—T. F. B.

Treatment of natural alkali-aluminium silicates, e.g., felspar. Ger. Pat. 247,496. *See* VII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron dicarbide. N. N. Ljubavin. J. Russ. Phys.-Chem. Soc., 1912, 44, 609—613.

Wittorff (this J., 1912, 388) has pointed out the probability of the existence of the compound, FeC_2, and the results of experiments made by the author with Zorin and Bunzen confirm this conclusion. When heated, ammonium ferrocyanide or its double compound with ammonium chloride, $(NH_4)_4Fe(CN)_6+2NH_4Cl+3H_2O$, yields a fine black powder which is attracted by a magnet and is sometimes accompanied by a brown substance, which is not magnetic. When ignited in air, the black compound is converted into ferric oxide without change of weight, its composition being hence FeC_2; the ferric oxide obtained in this way seems to be magnetic.—T. H. P.

Thomas slag; Constitution of ——. Hartleb. Z. öffentl. Chem., 1912, **18**, 221—225.

The author replies in this paper to opinions published by Blohme (this J., 1910, 1467). Tricalcium phosphate when heated to 1100° C. largely loses its solubility in citric acid, but regains it almost entirely after being melted. Tetracalcium phosphate is only very slightly soluble in citric acid. When then an amount of lime is added in the Thomas process as nearly as possible just sufficient to form tricalcium phosphate, the most soluble product will be obtained. Any excess of lime forms tetracalcium phosphate with corresponding diminution of the soluble portion. This may be corrected by the addition of silica, which combines with the excess lime forming calcium orthosilicate and converting the tetra- to tri-calcium phosphate. The calcium silicate often dissolves metallic oxides and assumes in consequence different colours at different times.—T. St.

Ferro-alloys; Use of oxygen under pressure for the determination of the total carbon in ——. P. Mahler and E. Goutal. Comptes rend., 1912, **154**, 1702—1705.

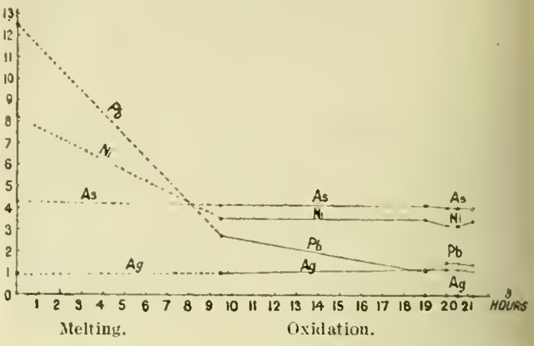
Combustion in the calorimetric bomb, as previously described for steels (this J., 1911, 1162), may be applied to the determination of carbon in ferro-alloys, even the most refractory, but it is recommended that metallic iron of known carbon content be added, as an auxiliary combustible material (compare De Nolly, this J., 1911, 1216), in addition to the flux already specified. The weight of iron added should be 2—3 times that of the alloy, the weight of lead or copper oxide being one-half that of the total charge, and the mass to be burnt being at least 3 grms. Combustion is effected under a pressure of 5—10 atmos., and, after carrying out a second determination under identical conditions, omitting only the ferro-alloy itself, the difference between the weights of carbon found is taken as that present in the sample; standard sodium hydroxide is employed for absorption of the carbon dioxide, and sulphuric acid, in the presence of phenolphthalein, for the titration.—F. Sodn.

Gold; Influence of oxidising agents on the rate of solution of —— *in potassium cyanide.* Y. I. Michailenko and M. I. Meshtscherjakoff. J. Russ. Phys.-Chem. Soc., 1912, **44**, 567—570.

The solution of gold by potassium cyanide solution requires the presence of an oxidising agent and is retarded or entirely prevented by the introduction of hydrogen ions into the liquid. Hydroxyl ions do not favour the solution and in excess may exert a retarding influence. In a neutral medium (*i.e.*, one to which neither acid nor alkali has been added), the solution of the metal is not appreciably affected by the following oxidising agents: quinone, sodium stannate, potassium bromate, iodate, and chlorate, mercuric cyanide, and cupric chloride, but is accelerated by potassium perchlorate, permanganate, and periodate, ammonium sulphate, sodium peroxide, potassium sulphate, sodium sulphate, bromine, potassium ferricyanide, and potassium carbonate. The relative accelerations produced by these substances in *N*/100 solutions are as follows: potassium perchlorate, 1; potassium periodate, 2; potassium carbonate, 2; ammonium sulphate, 3; potassium sulphate, 4; sodium sulphate, 4; sodium peroxide, 4; potassium ferricyanide, 5. The velocity of solution of the gold is increased by increase of the concentration of the oxidising agent to a certain limit and may be diminished by further addition. The combined action of two oxidising agents present together is less than that of the more effective of them. The addition to potassium cyanide of sodium chloride, mercuric cyanide, cupric chloride, or cobalt chloride has either no influence or a retarding one on the rate of solution of gold.—T. H. P.

Copper; Removal or slagging off of impurities in —— *during refining.* W. Stahl. Metallurgie, 1912, **9**, 362—367, 377—384.

The complete analyses of the raw copper, and of the metal in the various stages of refining are given, and it is concluded that the formation of silicates is accompanied by that of ferrites and other oxygen compounds, the latter playing an important part in the refining. Diagrams, which were compiled from the tabulated results of the analyses, are given, and show the rates and amounts of the impurities removed from the copper, with the mean temperature of the furnace at the various stages, under the special conditions and proportions of the materials used in the furnace, which are given. In the annexed diagram (see fig.) showing the rate of removal of the impurities, unity represents 0·01 per cent. of silver and arsenic, 0·10 of lead, and nickel respectively. It is shown that zinc, iron, cobalt, and tin are removed mainly at the beginning of the roasting, the sulphur a little later, whilst the nickel, lead, and arsenic are removed during the whole process, silver and bismuth being only eliminated in minute traces; the removal of silver is probably due to volatisation.—A. H. C.



Blister-copper; Refining of ——. H. H. Emrich. Trans. Amer. Inst. Min. Eng., 1912, 611—632.

A leady blister copper, from lead blast-furnace matte, was refined in a magnesia-lined reverberatory furnace built to cast 150 tons per charge. Complete analyses were made of the slag at each slagging and the following results were obtained:—

	Copper.	Lead.	Arsenic.	Antimony.
	Per cent.	Per cent.	Per cent.	Per cent.
Average analysis of the copper	93·1	1·27	1·37	0·42
Average analysis of the slag	32·3	16·6	2·3	1·9
Impurities removed in the slag	1·5	58·8	7·6	19·8
Impurities removed in the fume	—	21·5	12·1	7·4
Extracted in furnace refining	1·5	80·4	19·6	27·5
Analysis of the cast anodes	96·0	0·26	1·15	1·32

A comparison of the slagging ratios showed a decrease as the proportion of impurities decreased and that more slagging would have given a greater extraction of lead but not sufficient to warrant the extra working costs. A further series of experiments was carried out in the electrolytic refining of the above copper, a complete analysis of the slimes obtained in the tank and at various points in the circulation tanks and filters and known as float slime being given. The slime that had settled in the return solution launders, just outside the tanks, contained 54·93 oz. of gold, and 6,130 oz. of silver per ton, and 5·3 per cent. of arsenic, and 13·0 of antimony, with a ratio of 1 oz. of gold to 112 oz. silver, and 1 oz. of silver to 0·277 of arsenic, and 0·680 of antimony. The average analysis of the wire-bar cast during a period of three weeks showed 0·0116 oz. of gold, and 1·833 of silver per ton, and 0·00162 per cent. of arsenic, and 0·00171 of antimony, with a ratio of 1 oz. of gold to 110 oz. of silver, and 1 oz. of silver to 0·282 of arsenic and 0·298 of antimony. It is concluded:—(1) That the impurities in cast electrolytic copper being present in the same proportion as they ust in the heaviest float-slime are there because of the oat, and hence the copper must have been deposited s pure copper mechanically entangling the float. This as confirmed by the fact that a hard drawn wire from e anodes gave a conductivity of 99 per cent. Mathiessen andard, while the same anodes gave on melting only a 5 per cent. conductivity. (2) That the conductivity f copper cast from cathodes deposited in a solution ontaining up to 17 grms. of arsenic per litre is as good s the copper cast from cathodes deposited from the same rade of anodes in a solution containing not more than grms. of arsenic per litre. (3) That all the lead, antimony, nd nickel and 26·7 per cent. of the arsenic present in the nodes went to the slimes, the nickel and the arsenic robably forming an insoluble nickel speiss.—A. H. C.

hromium; Determination of —— in bronzes containing tin and antimony. H. Schilling. Chem.-Zeit., 1912, **36**, 697.

he volumetric method of von Knorre (this J., 1903, 1309), hen carried out in the following way, can be used for the apid determination of chromium in bronzes. Two grms. of very fine cuttings of the alloy are dissolved in 5 c.c. of *aqua regia* (1 part of nitric and 4 parts of ydrochloric acid), the solution is treated with 40 c.c. f sulphuric acid (1 : 1), and evaporated till white fumes ppear, and the nitric and hydrochloric acids have been ompletely expelled. After cooling, 200 c.c. of water re added, and the separated sulphates dissolved by igorous boiling. (The insoluble lead sulphate may be isregarded.) The copper and antimony are now precipitated as metals by means of 2 grms. of iron wire, the olution is filtered, diluted to about 500 c.c., heated to oiling, treated with a few drops of silver nitrate solution 1 : 20) to act as a catalyser, and 10 c.c. of a cold-saturated solution of ammonium persulphate added. The chromium s converted into chromic acid by vigorous boiling, any ndecomposed persulphate and any permanganic acid ormed are destroyed by adding 5 c.c. of hydrochloric cid of sp. gr. 1·12, and again boiling for a short time, nd then after cooling, the chromium is titrated in the usual way after addition of ferrous sulphate.—A. S.

Lead in tin-lined-leads: Determination of —— as lead chloride. E. Crato. Veröffentl. a. d. Gebiete des Militärsanitätswesens, 1912 [52]. Chem. Zentr., 1912, 1, 1927—1928.

At least 1 grm. of the sample is dissolved in 20 c.c. of 25 per cent. hydrochloric acid, with addition of nitric acid, by heating on the water-bath, and replacing the hydrochloric acid lost by evaporation. After cooling, the solution is treated with 60 c.c. of 95—96 per cent. alcohol, and the containing vessel is covered and placed in an ice-chest. If, after 20—24 hours, no separation has occurred, or only a few isolated, usually needle-shaped, crystals of lead chloride have separated, the tin coating certainly contained less than 1 per cent. of lead, and may be accepted as safe. With larger proportions of lead, the solution is kept in the ice-chest for a further 1—2 days, the crystals are separated, washed with not more than 40 c.c. of 96 per cent. alcohol, dissolved in boiling water, and the hot solution poured through the filter into a platinum dish, in which the solution is evaporated, and the lead chloride dried for 1 hour at 90°—100° C. and weighed. The precipitation of lead as chloride is much more complete in presence than in absence of tin: in presence of 1 grm. of tin, under the conditions described, 0·009 grm. of lead (as chloride) is recovered from 0·01 grm., 0·019 grm. from 0·02 grm., and 0·099 grm. from 0·1 grm. Not too large quantities of iron, zinc, and copper have no influence on the results; antimony and bismuth interfere, but are not likely to be present in tin-lined-leads in sufficient quantities to vitiate the results.—A. S.

Aluminium "activated" by mercury; Action of water on ——. E. Kohn-Abrest. Bull. Soc. Chim., 1912, **11**, 570—576. (See this J., 1911, 836.)

The precipitate of hydrated alumina, produced by the action of water on aluminium which has been previously immersed in a solution of mercuric chloride, is dark in colour when first formed, probably owing to the presence of impurities such as iron, etc. After a time, varying from a few hours to several days, the precipitate becomes white, and this occurs much more rapidly on heating. Immersion in solutions of mercuric chloride was found to have no "activating" influence on aluminium containing 0·4 per cent. of copper, or on alloys of aluminium and silicon (see also this J., 1912, 615).—J. H. L.

Mercury; British imports and exports. A. S. Pickering. July, 1911. [T.R.]

	1912.	1911.	1910.
Imports.			
January—June .... Bottles	42,654	37,781	40,573
Exports.			
January—June .... Bottles	13,383	18,036	8,063

Mercury production of the United States in 1911. Oil, Paint, and Drug Rep., June 24, 1912. [T.R.]

The production of mercury in the United States in 1911 was the greatest since 1907, the total output being 21,256 flasks of 75 lb. each, valued at $927,989, against a production of 20,601 flasks, valued at $958,153, in 1910. California was the greatest producer in 1911, with 18,860 flasks, valued at $867,749, and the remainder of the mercury came from Nevada and Texas. While there was an increase in the output last year, the amount produced was over 5,000 flasks below the average annual output of 26,609·6 flasks for the decade ending with 1911. The annual domestic consumption appears to have been in recent years from 18,000 to 21,000 flasks, or about equal to the domestic production. The decrease of domestic stocks and higher prices in 1911, however, caused an increased importation of mercury—the heaviest in many years—from 667 lb., valued at $381, in 1910, to 471,914 lb., or 6,293 flasks, valued at $251,386, in 1911. On the other hand, exports of mercury decreased from 1,923 flasks, valued at $91,007, in 1910, to 291 flasks, valued at $13,995, in 1911.

PATENTS.

Iron or steel sheets; Method of rolling ——. A. J. Maskrey, Assignor to J. E. Carnahan, Canton, Ohio. U.S. Pat. 1,029,936, June 18, 1912.

To facilitate the hot rolling of iron or steel sheets in packs, the sheets are separately coated with ferric oxide by immersion in a solution of an iron salt and subsequent heating.—W. E. F. P.

Iron, Production of —— direct from its ores. E. Servais. Ger. Pat. 247,011, Jan. 10, 1911.

The ore is reduced by means of reducing gases free from nitrogen. A solid fuel is burned in a producer by means of oxygen: another gas, free from nitrogen, is also introduced into the producer, whereby the temperature is so moderated that the reducing gases produced have only a temperature sufficient for the smelting and reduction of the ore.—A. S.

Flue-dust and other products containing iron; Manufacture of briquettes from ——. W. Schwarz. Ger. Pat. 247,261, May 11, 1907.

In the manufacture of briquettes from flue-dust, etc., by addition of lime and treatment with steam under pressure, a preliminary treatment with steam under high pressure is given, before the addition of slaked lime, in order to slake any lime, magnesia, or the like present in the flue-dust.—A. S.

Spathic iron ore ; Treatment of ——. E. Menne. Ger. Pat. 247,269, Dec. 21, 1909.

The ore is heated in closed vessels, and the mixture of carbon dioxide and carbon monoxide evolved is either collected, or is allowed to act on the heated ore (iron oxide) to convert the carbon monoxide into dioxide. In this way the ore is rendered more suitable for the subsequent smelting, and carbon dioxide of a high degree of purity is recovered.—A. S.

Pig-iron yielding dense castings ; Manufacture of —— by mixing molten pig iron with steel. C. Henning. Ger. Pat. 247.317, Nov. 1, 1910. Addition to Ger. Pat. 179.739, Nov. 18, 1904 (see Eng. Pat. 23,592, Nov. 16, 1905 ; this J., 1906, 319).

The pig-iron is kept just above its melting point for a sufficient time to produce a reduction of its content of sulphur and carbon, without appreciably affecting the manganese and silicon, and then after quickly raising the temperature, the desired quantity of wrought iron or steel is added.—A. S.

Gas heated furnaces and the like [for annealing, hardening, etc.]. J. King and J. R. Burnett, Warrington. Eng. Pat. 14,277, June 16, 1911.

In a gas-heated furnace for annealing or hardening, or for heating muffles or crucibles, the gas and air enter through a number of inclined tubes opening into a passage formed below the hearth or floor of the furnace, and one or more secondary air-admission passages, opening into the same central passage, are formed horizontally in the base of the furnace. The main air and gas supply pipes and the secondary air supply pipes are provided with separate control valves.—H. H.

Furnace ; Mechanical —— for roasting ores. G. Lüttgen. Ger. Pats. 247,002, July 31, 1910, and 247,400, March 14, 1911.

(1) The furnace is of annular form, with a series of superposed muffles disposed around a central hollow shaft, from which stirring arms project into the muffles. The stirring arms are removable and are attached loosely to the shaft. The products of combustion instead of passing along in the same direction as, or the opposite direction to, the moving ore, are led off directly, towards the centre, through the openings provided in the masonry for the stirring arms. The heating gases pass through flues disposed between the muffles in the opposite direction to the movement of the ore through the muffles. The teeth on the stirring arms are inclined to the latter at a greater angle, and hence have a smaller working surface, the nearer they are to the central shaft. The number of stirring arms in the muffles increases progressively from the top of the furnace downwards. The central shaft may have a square or other non-circular cross-section, or may be provided with projecting ribs. A conduit leading from the gas-collecting chamber is connected directly with the mechanical discharging device for the roasted ore. (2) The stirring arms are hollow and are in the form of levers, and the two parts at which the levers engage are open and serve as inlet and outlet passages through which a cooling medium passes to conduits leading to the central shaft.—A. S.

Metal ; Method and material for coating —— with metal [zinc-iron alloy]. C. F. Burgess, Madison, Wis., U.S.A. Eng. Pat 14,537, June 20, 1911.

See U.S. Pat 1,014,751 of 1912 : this J., 1912, 193. The alloy is periodically enriched during the coating process by the addition of zinc dross.—T. F. B.

Electroplating ; Process of ——. J. W. Aylsworth, East Orange, N.J., Assignor to T. A. Edison, West Orange, N.J. U.S. Pat. 1,029,965, June 18, 1912.

Finely-divided wood pulp, or like cellular material, is treated with caustic alkali and with acid solution, and a considerable quantity of the purified pulp is suspended in a suitable electrolytic bath, the object to be plated being immersed in the bath. An electrolytic deposit of metal is formed on the object, whilst the bath is agitated so as to cause relative movement between the object and the suspended pulp, thus causing continual burnishing or rubbing of the pulp on the object, bubbles formed on the latter being at the same time removed.—B. N.

Zinc-bearing ore ; Process of treating ——. J. O. Johnstone, Buffalo, N.Y. U.S. Pat. 1.029.932, June 18, 1912.

The removal of barytes from zinc ores is effected by heating the material to redness in the presence of a carbonaceous reducing agent (to convert the barium sulphate to sulphide) and leaching the product with water ; barium carbonate —if present—is removed by treating the leached residue with dilute acid.—W. E. F. P.

Aluminium ; Process for improving —— by alloying with cerite metals. W. Borchers and O. Barth. Ger. Pat. 246,484, Oct. 21, 1911.

The mechanical properties of aluminium are greatly improved by alloying it with up to 0·2 per cent. of metals of the cerium group. The alloying may be effected by adding a small quantity of the anhydrous fluorides of metals of the cerium group to the fused electrolyte used in the electrolytic manufacture of aluminium, or by fusing crude aluminium with such anhydrous fluorides at a temperature between the melting point of aluminium and 1000° C.—A. S.

Steel ; Open-hearth process of refining ——. G. Barbanson and M. Lepersonne, Brussels. U.S. Pat. 1,030,152, June 18, 1912.

See Eng. Pat. 5916 of 1910 ; this J., 1910, 1113.—T. F. B.

Zinc ; Metallurgy of ——. C. V. Thierry, Paris. Eng. Pat. 21,014, Sept. 22, 1911.

See Fr. Pat. 439,143 of 1911 ; this J., 1912, 547.—T. F. B.

Zinc ; Metallurgy of ——. C. V. Thierry, Paris. U.S. Pat. 1,030,349, June 25, 1912.

See Eng. Pat. 19,973 of 1911 ; this J., 1912, 542.—T. F. B.

Zinc distillation. J. C. Moulden and H. W. Webster, Assignors to Central Zinc Co., Ltd., Seaton Carew. U.S. Pat. 1,030,676, June 25, 1912.

See Fr. Pat. 423,912 of 1910 ; this J., 1911, 630.—T. F. B.

Alloy. C. E. P. Gabriel. Fr. Pat. 439,561, Jan. 31, 1912.

See Eng. Pat. 19.518 of 1910 ; this J., 1911, 1068.—T. F. B.

Metals ; Electrolytic deposition of ——, especially on the surface of iron and steel articles. P. and Q. Marino. Fr. Pat. 440,165, Feb. 14, 1912. Under Int. Conv., Oct. 7, 1911.

See Eng. Pat. 22,141 of 1911 ; this J., 1912, 394.—T. F. B.

XI.—ELECTRO-CHEMISTRY.

Negative accumulator plates. P. Askenasy and L. von Putnoky. Z. Elektrochem., 1912, 18, 493—500.

Numerous patents have been obtained for the addition to the active mass of the negative plates of lead accumulators, of some indifferent substance such as barium sulphate or charcoal, more or less finely divided, the object being to increase the efficient life of the plate. The authors have prepared a series of plates for comparison and submitted them to a large number of half-hour charges and discharges. The first effect was a gradual increase in the capacity of all the plates up to about 500 discharges, the increase being very slightly greater in the case of the plates to which the indifferent substance was added. The next 250 discharges produced a diminution in the capacity of all the plates, which was greatest (about 80 per cent. loss from the original value) in those without ed material, the others losing only about 60 per cent. plates were at this stage "renewed" by a prolonged rging in the reverse direction with a small current, owed by a still more prolonged charge in the original ection. After this treatment 250 more half-hour rges and discharges were made, and it was at this stage t the favourable effect of the addition was most noticee. After another renewal the untreated plates had y retained 61—67 per cent. of the original capacity, ile the treated ones had 83—95 per cent.—W. H. P.

mation of nitrogen oxides by the electric spark discharge in liquid air. Müller. *See* VII.

Patents.

ctrodes for electric furnaces ; Means for connecting ——. obr. Siemens und Co., Berlin. Eng. Pat. 6248, March 3, 1912. Under Int. Conv., March 28, 1911.

e two parts of each electrode are provided with internal w threads, and with threaded nipples, to connect m together, so that the working part may be entirely sumed. The nipples are given a little play, and treing devices are therefore employed, one part of the trode being provided with a conical, cylindrical. other suitable projection, which fits into a corresponding ess in the other part, or both parts of the electrode y be provided with recesses in which a separate fitting ce on the nipple is inserted.—B. N.

ctrode for producing gas reactions by means of the electric rc. H. Pauling, Gelsenkirchen, Assignor to Salpetersaüre-Ind.-Ges. m. b. H., Cologne, Germany. U.S. Pat. ,029,885, June 18, 1912.

e water-cooled electrode, which is of the diverging type the production of a horn-shaped arc, comprises several ts, with clamping devices to connect them together. e part of the electrode which is most exposed to the t of the flame is so arranged that it may be turned out its longitudinal axis.—B. N.

rnace ; Electric —— for producing gas reactions. H. Pauling, Gelsenkirchen, Assignor to Salpetersaüre-Ind. es. m. b. H., Cologne, Germany. U.S. Pat. 1,029,886, June 18, 1912.

e main electrodes, of the diverging type, are hollow, that a cooling fluid, such as water, may be passed rough them. One arm of each electrode is waterketed, a tube being arranged within the jacket. Each be carries a secondary igniting electrode, adjustable gitudinally within the tube, the igniting electrodes eting at the point where the diverging electrodes are arest together, for the purpose of starting the arc. —B. N.

ectrolysis of aqueous solutions of metallic salts ; Process and apparatus for the ——. R. Carl, Schmargendorf, Germany. Eng. Pat. 24.238, Nov. 1, 1911. Under Int. Conv., Nov. 3, 1910.

e Fr. Pat. 435,890 of 1911 ; this J., 1912, 396.—T. F. B.

ectrolytic apparatus. L. H. A. B. M. Hazard-Flamand, Boulogne-sur-Seine, France. Eng. Pat. 2124, Jan. 26, 1912. Under Int. Conv., Feb. 6, 1911.

e U.S. Pat 1,003,456 of 1911 ; this J., 1911, 1222. —T. F. B.

efractory blocks and bricks [for lining electric furnaces]. Soc. Générale des Nitrures, Paris. Eng. Pat. 1961, Jan. 24, 1912. Under Int. Conv., Jan. 26, 1911.

e Fr. Pat. 436,596 of 1911 ; this J., 1912, 499.—T. F. B.

ectric battery. H. de Martis, London. U.S. Pat. 1,030,650, June 25, 1912.

e Eng. Pat. 26,285 of 1908 ; this J., 1909, 988.—T.F.B.

Separating apparatus for liquids. [Separating water from transformer oils]. U.S. Pat. 1,024,598. *See* I.

Apparatus for preparing "ozone" [from sodium peroxide]. U.S. Pat. 1,028,857. *See* VII.

XII.—FATS ; OILS ; WAXES.

Fats ; Chromogenic and nitrogenous substances in ——. G. Bouchard. Comptes rend., 1912, **154**, 1620—1622.

If after saponifying a fat with soda lye, excess of the latter be added, and then, after removing the soap, the clear brownish yellow alkaline solution be neutralised, a brown gelatinous substance separates. When this is freed from mineral matter by means of dilute hydrochloric acid and from fatty acids by means of petroleum ether, a very small quantity of a chromogenic substance is left. This is partly soluble in ether, and the soluble portion after purification by repeated solution in ether and precipitation with petroleum ether, has a composition corresponding approximately with the formula, $C_{18}H_{28}O_4$. It has a brown colour, an acid reaction, is easily soluble in alcohol, acetone, and acetic acid, and probably contains a carbonyl group, for it forms a compound with phenylhydrazine. The portion of the original substance insoluble in ether, dissolves almost completely in alcohol. When dried in a current of carbon dioxide, it forms a brittle black resin, apparently a mixture of acid nitrogenous substances and acids richer in oxygen than those described above ; in different samples the nitrogen content ranged from 0·5 to 3·8 per cent. Examination of 100 different fats showed that they all contained small quantities of nitrogen. The animal fats are richer in nitrogen than the vegetable fats, but the amount seems never to exceed 0·0005 in the former, nor to fall much below 0·0001 in the latter.—A. S.

Serger's reaction for vegetable oils. Utz. Chem. Rev. Fett Ind., 1912, **19**, 128—131, 151—153.

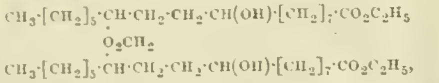
Serger's reagent (0·1 grm. of sodium molybdate in 10 c.c. of concentrated sulphuric acid, gives colourations ranging from yellow to green or blue with vegetable oils (in ethereal solution), whilst animal fats give no such colourations until after 30 to 40 minutes. According to the author's experiments, however, described in detail, Bellier's test is more rapid and about equally sensitive. Rancid and bleached fats, no longer give Serger's reaction, whilst heating and treatment with chemical agents such as "lucidol" (benzoyl peroxide) also interfere with the test. In the case of lard adulterated with vegetable oils giving only a faint reaction, large amounts of the latter may be added without risk of detection by this test and recourse must be had to the phytosterol test to obtain definite information.—C. A. M.

Earth nut oil (arachis oil) ; Detection and determination of —— in olive oil. L. Adler. Z. Unters. Nahr.- u. Genussm., 1912, 23, 676—679. (See also this J., 1899, 303.)

An extension of Franz's research (*Beiträge zum Nachweis und zur Kenntnis des Erdnussöles*, Diss., München, 1910). The author claims that 5 per cent. of arachis oil can be rapidly and easily detected in edible olive oil. One c.c. of the oil is treated with 5 c.c. of an 8 per cent. alcoholic potassium hydroxide solution in a 100 c.c. Erlenmeyer flask provided with a reflux condenser. The mixture is boiled for 4 minutes on the water-bath, cooled to 25° C., 1·5 c.c. of diluted acetic acid (1 : 2) added, then 50 c.c. of 70 per cent. alcohol. After shaking, the flask is rapidly cooled to 16° C. and kept at this temperature for 5 minutes. If no turbidity appears (due to the fatty acids crystallising out) there is certainly less than 5 per cent. of arachis oil present. By determining the exact temperature at which turbidity appears—called the "crystallisation temperature"—the amount of arachis oil present can be determined. Following are the "crystallisation temperatures" for mixtures of pure olive oil with different proportions of arachis oil : pure olive oil, 13·5° C. ; with 5 per cent. of arachis oil, 16·9° C. ; with 10 per cent., 19·8° C. ; 20, 25·7° C. ; 30, 29·2° C. ; 40, 31·5° C. ; 50, 33·8° C. ; 60, 35·3° C. ; 70, 36·6° C. ; 80, 38·0° C. ; with 90 per cent. of arachis oil, 39·3° C. ; pure arachis oil, 40·3° C.—G. M.

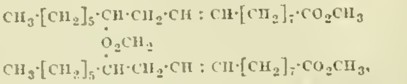
Ricinoleic acid : New derivatives of ——. M. Tschilikin. J. Russ. Phys.-Chem. Soc., 1912, **44**, 515—526.

The passage of dry hydrogen chloride through a mixture of ricinoleic acid, formaldehyde and alcohol yields ethyl oxymethylenestearate,



$$\begin{array}{l} CH_3\cdot[CH_2]_5\cdot CH\cdot CH_2\cdot CH_2\cdot CH(OH)\cdot[CH_2]_7\cdot CO_2C_2H_5 \\ \qquad\qquad\quad O_2CH_2 \\ CH_3\cdot[CH_2]_5\cdot CH\cdot CH_2\cdot CH_2\cdot CH(OH)\cdot[CH_2]_7\cdot CO_2C_2H_5, \end{array}$$

with the saponification value, 164·86, and the acid value, 0. The corresponding free acid could not be isolated, its liberation being followed by condensation of the carboxyl group of one stearic acid residue with the CH(OH) group of the other, with loss of water. Under other experimental conditions, it was found possible to avoid the destruction of the double linkage, the dimethyl ester,



$$\begin{array}{l} CH_3\cdot[CH_2]_5\cdot CH\cdot CH_2\cdot CH : CH\cdot[CH_2]_7\cdot CO_2CH_3 \\ \qquad\qquad\quad O_2CH_2 \\ CH_3\cdot[CH_2]_5\cdot CH\cdot CH_2\cdot CH : CH\cdot[CH_2]_7\cdot CO_2CH_3, \end{array}$$

with the saponification value, 184·24—184·85, being obtained.—T. H. P.

New oils, fats and waxes. Ch. of Comm. J. Suppl., July, 1912. [T.R.]

Candelilla wax derived from the Mexican plant *Euphorbia cerifera*, has been exported to the Hamburg market, where it realized about 77s. per cwt. in comparison with carnauba wax at 130s. to 140s. per cwt. The supply is practically inexhaustible. There are now four factories at Monterey extracting the wax, two of which are said to be shipping the product to the United Kingdom.

Amongst the useful plants which occur in the Sudan, Uganda and the Northern Congo, are a number of resin-yielding plants, including various species of *Commiphora*, *e.g.*, *C. africana*, which furnishes African bdellium, *C. pedunculata*, yielding a variety of frankincense, and *C. opobalsamum*, from which the so-called "Mecca balsam" is procured. *Daniella thurifera* occurs in the Bahr-el-Ghazal, but its oleo-resin does not appear to be used medicinally by the natives, as it is in Northern Nigeria. The reddish-brown resin of *Haronga madagascariensis* is said to be used for fixing arrow heads to shafts. *Boswellia papyrifera* furnishes a frankincense. The chief gum-yielding trees of the Sudan, Uganda and Northern Congo are the acacias, of which *Acacia Senegal* yields the better qualities of Sudan and Senegal gum. Other interesting species are *Sterculia tomentasa* and *S. cinerea*, both of which yield gums of the tragacanth type, and *Astragalus prolixus*, also yielding a kind of tragacanth.

The nut of the *cohune palm*, which occurs in great abundance in British Honduras, yields a useful oil. This product has not yet been commercially exploited owing to the difficulty of extracting the kernels from the hard nut. A machine is required which will crack the nuts without injuring the kernels. The cost of collecting the nuts is heavy, but it is sought to meet this difficulty by devising a portable machine which can be brought within easy reach of the cohune palms. The cost of transporting the kernels to the coast for shipment would not be great.

Mafoureira nuts which yield a solid fat suitable for soapmaking are a comparatively new product, which, however, is already being largely imported at Marseilles from East Africa. The cake is bitter and cannot be used for stock-feeding ; it is therefore sold as a manure.

The seeds of the *Para rubber tree* yield a drying oil similar in properties to linseed oil. No considerable exportation either of the seeds or the oil appears yet to have been made from the rubber-planting countries.

An oilseed of commercial value, named senat, has recently been discovered in the Sudan : it yields an oil resembling that obtained from sesame. The senat plant grows more or less as a weed.

The seeds of *Telfairia pedata*, a plant which appears to l abundant in East and South East Africa, contain abo 60 per cent. of an oil which would be suitable for soa making, or if expressed from the shelled kernels for edib purposes. The husks of this seed contain some bitt substance which passes into the oil when the whole seed crushed. To obtain an edible oil the kernels wou have to be separated and pressed alone. For the sa reason, only the cake obtained in pressing the kerne would be suitable for feeding to stock. The shelling of t seeds is very difficult, and a machine is required which capable of shelling them efficiently and rapidly.

It has been discovered recently that the waste from ca sugar manufacture contains about 10 per cent. of a w which, when purified, resembles carnauba wax in i physical properties, and could probably be used for t same purposes as those to which carnauba wax is applie It is stated that the extraction of the wax on a commerc scale has been undertaken in Java.

Chinese wood oil production. Oil, Paint, and Drug Re June 24, 1912. [T.R.]

In a report to the U.S. Department of Commerce and Lab from the Consul-General at Hankow, on the subject Chinese wood oil it is stated that Szechwan wood oil preferred in Hankow, as it is lighter in colour than th produced elsewhere. About 30 per cent. of the outp is said to be manufactured in Szechwan, 50 per cent. Hunan and Kweichow Provinces, and 20 per cent. Hupei Province, mostly in the region about Ichang. The are no statistics of production, but the customs retur give the following figures for shipments to foreign a Chinese ports for the past two years from Hankow, whi is the principal shipping point :—To foreign countries 1910, 15,889,600 lb. ; 1911, 12,285,733 lb. To Chine ports—1910, 84,804,666 lb. ; 1911, 65,682,266 The oil is produced in small quantities by individua collected by Chinese middlemen, and sold to forei merchants at Hankow who clarify the oil (by allowi it to settle) and pack it for shipment. Primitive nati methods are used for extracting the oil, and under prese conditions it is not felt that a modern crushing pla could be successfully established for producing wood o though a suitable decorticating machine would be w comed. Prices during the last two years have vari between about 16s. and 28s. per 100 lb.

Patents.

Catalysts [for use in hydrogenising fats, etc.] ; Process manufacturing ——. M. Wilbuschewitsch, Nischnino gorod, Russia. U.S. Pat. 1,029,901, June 18, 1912.

See Fr. Pat. 426,343 of 1910 ; this J., 1911, 966.—T. F.

Apparatus for purifying or filtering lubricating oils, e Eng. Pat. 22,734. *See* I.

Melting, boiling, and mixing of materials in a rota receptacle. Ger. Pat. 246,870. *See* I.

Non-inflammable lubricating oil and lubricant. U.S. Pa 1,029,254 and 1,028,926. *See* IIa.

Manufacture of edible products from Bassia seeds. U. Pat. 1,030,674. *See* XIXa.

XIII.—PAINTS ; PIGMENTS ; VARNISHE RESINS.

Oil of turpentine ; Examination and valuation of — H. Wolff. Farbenzeit., 1912, **17**, 1492—1493. Che Zentr., 1912, **1**, 1930—1931.

Adulteration of turpentine oil with waste turpent products ("first runnings" and "after-running obtained in the fractionation of oil of turpentine for t purpose of enriching the chief fraction in pinene) is diffic etect. When mixed with oil of turpentine, these ucts distil over more easily than when distilled alone; on the other hand, when the method of polymerisation oxidation) by sulphuric acid is applied, the amount sidue is considerably larger than corresponds with actual adulteration, the action of sulphuric acid being intense in the presence of considerable quantities of -boiling constituents of oil of turpentine. If, in unction with a relatively large residue after the treat- t with sulphuric acid, there is no notable increase in evaporation residue of the sample, adulteration with e turpentine products may be suspected.—A. S.

an turpentine industry. Ch. of Comm. J., July, 1912. [T.R.]

a report on Forest Administration in the United Pro- es of India during the year 1910-11, it is stated that in Naini Tal division the financial results of the turpentine stry were remarkable, the profit of the year being 85,195 as compared with Rs. 38,705 in the previous . These results are due to the great rise in price, pentine having reached Rs. 3-5 per gallon in March, l, at Calcutta, and rosin Rs. 7-2 per maund of 82$\frac{2}{7}$ lb., vered at Cawnpore. The sale of the whole output of n for the year ended March 31st, 1912, was assured at 7-2 per maund, and 25,000 gallons of turpentine were l at an estimated price of Rs. 2-8 per gallon, delivered Kathgodam. The same purchaser had agreed to take whole output of turpentine up to March 31st, 1914, at s based on current London prices for best American oil. angements are being made to considerably extend this ustry. All the chir forests of the division have been ught under revised tapping scheme on a 15-year rotation reby from next year onward 250,000 trees will be tapped ry year. In the Almora and Naini Tal district protected sts, a commencement has also been made with about 000 trees which are now under tapping. This operation l be extended in these forests, the possibilities of which enormous.

Patents.

ints for metal surfaces; Protective ——. Continental Caoutchouc und Gutta Percha Co., Hanover, Germany. Eng. Pat. 15,886, July 8, 1911. Under Int. Conv., July 22, 1910.

tal surfaces adapted to come in contact with sea-water, ecially the metal surfaces of sea-going vessels, are otected by one or more elastic coats of a solution of tta-percha or rubber in a suitable solvent, to which bituminous substance has been added (*e.g.*, 25 per cent. American asphaltum). One or more coats of the tta-percha or rubber solution, without addition of bituminous substance, may be applied to the coated rface.—A. S.

enol resin; Fusible —— and method of forming same J. W. Aylsworth, East Orange, N.J. U.S. Pat. 1,029,737, June 18, 1912.

hard fusible phenol resin is formed by heating phenol its equivalent in a closed chamber, forcing compressed maldehyde gas into the liquid phenol as fast as it mbines therewith (if desired carrying off the excess heat) d discontinuing the operation when only very little the phenol is uncombined: the chamber may be opened d the contents heated till completely dehydrated and e dehydrated product removed; the phenol may be aintained at a temperature between 280° and 340° F.; mperature and proportions may be so regulated that hilst all the formaldehyde is combined, a little uncom- ned phenol is left, and no infusible product results. —H. E. P.

utty; Wood-oil ——. C. Ellis, Larchmont, N.Y., Assignor to Ellis-Foster Co. U.S. Pat. 1,029,800. June 18, 1912.

mixture of whiting, mineral oil and wood-oil in the proximate proportions of 400, 80 and 20, respectively, ith or without the addition of rosin.—W. E. F. P.

Sulphide ores; Treatment of —— for the removal of sulphur therefrom and the production of sublimed white lead and oxide of zinc. E. E. Banes, Strathfield, New South Wales. Eng. Pat. 13,988, June 12, 1911.

See Fr. Pat. 431,280 of 1911; this J., 1911, 1397.—T. F. B.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Caoutchouc; Determination of —— as tetrabromide by Hübener's process. R. Becker. Gummi-Zeit., 1912, 26, 1503. (See also this J., 1911, 142.)

The author has observed that prolonged contact of the brominated product obtained from rubber by Hubener's method with the excess of warm bromine used in the process, results in the formation of a product insoluble in chloroform, the amount of this product increasing with the time of contact. He suggests that this product is a higher brominated derivative of caoutchouc, from which, in the case of vulcanised rubber, part of the sulphur has been oxidised away and its place taken by bromine; and that this fact may in part account for the inaccuracy of the method. He proposes to isolate either the bromine or the ground rubber by placing one or other of them (preferably the former) in a separate vessel with sides perforated at a distance of 5 to 10 mm. above the bottom. —E. W. L.

Synthetic rubber from the technical point of view. F. Hofmann. Gummi-Zeit., 1912, 26, 1458—1462.

After describing the work which has been done on the synthesis of rubber for six years at Elberfeld, Germany, the author showed samples of articles made from synthetic rubber and concluded that although scientific success had been attained, it would be some time, perhaps a long time, before big commercial developments took place: he laid special emphasis on the difficulties of securing a raw material in sufficient quantity and of disposing of the by-products.—H. E. P.

"Fish" rubber. F. Frank and E. Marckwald. Gummi-Zeit., 1912, 26, 1498—1499. (See also this J., 1912, 595.)

The authors have examined two samples of mixings said to contain 43 per cent. of mineral matter and 50 per cent. of a mixture of Guayule rubber and so-called "fish" rubber containing 75 per cent. of the latter. The mixing was so imperfect that the particles of "fish" rubber could be seen with the naked eye, and under the microscope appeared like fragments of rosin. When warmed in water these particles swelled up, and it was found possible to extract gelatinous material to the extent of 9 per cent. of the total mixing. The product is stated to be obviously a gelatin which has been imperfectly hardened by means of formaldehyde.—E. W. L.

Patents.

Indiarubber; Curing of ——. S. Ingrams, Walton-on-the-Naze, and F. E. S. Lindley, Godstone. Eng. Pats. 13,823 and 13,824, June 9, 1911.

(1) Apparatus for treating latex essentially comprises the combination, with a latex chamber having a smoke entrance and exit, of a vacuum-effect apparatus whereby smoke is drawn through the latex. Means for agitating or heating the latex may be provided. Or, a latex chamber may be heated and "negative pressure" employed for drying. A spraying device for the latex or a rotatable smoke chamber may be employed. (2) Apparatus for curing latex by smoke comprises essentially a smoke chamber, a number of carriers adapted to receive latex successively (*e.g.*, arranged as an endless conveyor), and means to move the carriers through the chamber and to apply latex thereto. An endless chain may be combined with rollers as latex carriers and a roller or band may dip into the latex to apply the same to the carriers.—H. E. P.

Hard rubber, celluloid, vulcanite, ebonite, glass, wood, and the like: Manufacture of articles usually made from ——. F. E. Matthews, London. Eng. Pat. 16,278, July 14, 1911.

Cinnamene (styrolene), $C_6H_5.CH:CH_2$, is polymerised, say at 100° to 200° C. or in contact with a metal such as sodium. The polymerised substance is made into articles of the required shape by carefully softening by heat. It may be vulcanised by sulphur or used alone, or in combination with rubber.—H. E. P.

Caoutchouc; Filling substance for ——. S. Blok, The Hague, and S. Benima, Amsterdam. Eng. Pat. 12,233, May 23, 1912. Under Int. Conv., May 27, 1911.

The flesh of fish and the like is boiled in water, the soluble constituents are drawn off and the insoluble residue is dried and disintegrated after being treated with suitable preserving agents.—H. E. P.

India-rubber; Curing of ——. R. Derry, Singapore. U.S. Pat. 1,030,651, June 25, 1912.

See Eng. Pat. 6858 of 1911; this J., 1911, 817.—T. F. B.

Protective paints for metal surfaces. Eng. Pat. 15,886. *See* XIII.

Manufacture of erythrene and isoprene. Eng. Pat. 19,919. *See* XX.

Manufacture of isoprene and its homologues. Eng. Pat. 21,519. *See* XX.

XV.—LEATHER; BONE; HORN; GLUE.

Tanning process; Applications of the law of mass action to some of the reactions of the ——. E. Stiasny. J. Amer. Leather Chem. Assoc., 1912, 7, 301—306.

Deliming of hides. Proctor has shown that the limit of swelling power of acid solutions lies at a concentration of hydrogen ions of $C_{H^{\cdot}} = 10^{-5}$ to 10^{-4}, and since the hydrogen ion concentration of a mixture of a weak acid with an equivalent quantity of one of its salts, is equal to the dissociation constant of the acid, it follows that hides can be delimed without any danger of acid plumping by the use of any acid which forms soluble calcium salts and of which the dissociation constant is not materially above 10^{-5}, if an equivalent quantity of one of its soluble salts be added to the acid. In practice, for wet pelts containing 0·6 per cent. of lime, 100 kilos. of the "white weight" are treated in a paddle with 1·28 kilos. of acetic acid, 1·76 kilos. of sodium acetate, and 400 litres of water until the absence of free lime is indicated by the failure of a cross-section of the hide to give a red colour with phenolphthalein. After removing the hides, the dissolved lime is separated from the liquor by precipitation with oxalic acid, and the solution is made up to its original strength by addition of acetic acid and sodium acetate, and used again. A mixture of butyric acid and sodium butyrate may be used in a similar way. This is best prepared by adding to the butyric acid a quantity of sodium carbonate solution sufficient to neutralise one-half of the acid, and stirring until the carbon dioxide has escaped. By using an ammonium instead of a sodium salt, a preliminary bating is produced. The mixture of the acid and its salt may also be produced by deliming the hides by successive small portions of the acid so long as the solution reacts alkaline to phenolphthalein, the calcium salt formed acting as the soluble salt. In this case the hides are slightly acid after the treatment, and are treated for a short time in a clearing bath prepared by adding 1 per cent. of magnesium carbonate (on the pelt weight) to the old bate, before subjecting them to the bating process.

Neutralisation of chrome leather. Starting from similar physico-chemical considerations to those applied to the deliming of hides, the author shows that a suitable solution for neutralising free acid in chrome leather, without danger of injurious secondary effects, is a mixture of equal parts of ammonium sulphate and crystallised sodium carbonate (each 2 per cent. of the weight of the leather): should this not be sufficient for complete neutralisation, a further quantity of a mixture of 1 per cent. of ammonium sulphate and 2 per cent. of sodium carbonate is added. A mixture of equal parts of ammonium sulphate and sodium carbonate is also preferable to sodium carbonate, borax, etc., for the partial de-tannisation of vegetable-tanned leather which is subsequently to receive a one-bath chrome tannage.—A. S.

Patents.

Leather; Treatment of ——. A. Junghans, Schramberg, Germany. Eng. Pat. 10,971, May 8, 1912. Under Int. Conv., Feb. 13, 1912.

In the production of a glazed surface on patent leather by exposure to light, the treatment is effected by exposure to artificial light in closed chambers, the formation of ozone being prevented, or the ozone produced, eliminated by ventilation and regulation of the temperature.—H. E. P.

Patent leather or the like; Baking or curing ——. W. R. Smith, Buffalo, N.Y., U.S.A. Eng. Pat. 1464, Jan. 18, 1912.

Patent-leather or the like is baked by the action of a hot open flame, avoiding a soot-like deposit from incomplete combustion. Means are provided for obtaining a constant circulation of primarily heated air, for practically equalising the temperature in the oven and for retarding the escape of hot air: the burners are supplied with outer air and their flames secondarily heat the circulating air and direct "high actinic rays" upon the surfaces of the material. —H. E. P.

Leather-board; Impermeable —— *and process of manufacturing it.* Hide-Ite Leather Co. Fr. Pat. 439,686, Feb. 3, 1912.

See U.S. Pat. 1,021,660 of 1912; this J., 1912, 447.—T. F. B.

Patent leather; Process and apparatus for making —— W. R. Smith. Fr. Pat. 439,718, Feb. 5, 1912.

See Eng. Pat. 1464 of 1912; preceding.—T. F. B.

Detanning vegetable-tanned or chrome-tanned leather, Process for ——. S. R. Trotman. Fr. Pat. 439,960, Feb. 10, 1912.

See Eng. Pats. 5676 and 12,393 of 1911; this J., 1911, 1462.—T. F. B.

XVI.—SOILS; FERTILISERS.

Soils; Nitrogen enrichment of ——. F. T. Shutt and A. T. Charron. Chem. News, 1912, **105**, 301—302.

Rich productive soils are characterised by a high nitrogen and humus content. Humus-forming material must be constantly added to cultivated soils if their nitrogen content is to be maintained. A rich prairie soil during 22 years cultivation, with 9 summer fallows during the last 17 seasons, lost nitrogen to a depth of 8 in. amounting to 2206 lb. per acre. Of this, approximately, 700 lb. had been removed in crops. This means that 68 per cent. of the total nitrogen had been dissipated through cultural operations, fallowing, etc. The nitrogen content of a soil sown with clover, which was dug in every second year, increased from 533 lb. to 1005 lb. in 9 years, despite the losses from various causes. Legumes require the aid of specific bacteria in order to avail themselves of the nitrogen of the air. Such are widely distributed in Canada and elsewhere: they can be added to the soil in he form of cultures, but the action of the latter is more r less uncertain. Inoculation with the soil from the urface of a field bearing a luxurious crop of the specific egumes gives much more satisfactory results. The soil s applied at the rate of 100 to 300 lb. per acre.—E. F. A.

Humus; Determination of —— especially in heavy clay soils. W. Beam. Cairo Scientific J., 1912, 6, 93—103.

Analytically humus is usually taken to mean that portion of the soil which is extracted by ammonia after removal of the calcium and magnesium by treatment with dilute hydrochloric acid. In the case of heavy clay soils the excess of acid remaining after extraction of the calcium cannot be removed by washing with water until the filtrate is neutral. For the complete removal of the acid and extraction of the humus by ammonia, a Buchner funnel with a layer of asbestos as well as a supporting disc of paper is used. The soil is mixed with sand and the mixture covered by a layer of sand. To remove the acid without puddling the clay, a cold solution of carbon dioxide is used for washing. Repeated treatment with the ammonia solution is required to extract the humus completely. The removal of clay from suspension in humus solution is readily accomplished by the use of ammonium carbonate, but precautions are required to prevent the clay carrying with it a portion of the humus. The modified official method suggested by Rather (this J., 1911, 1175) may, for the above reasons, give very low results in the case of soils poor in humus. The humus of Nile soils can be estimated by a rapid colourimetric method; after extraction with acid, the soil is boiled with 5 per cent. sodium carbonate solution, made up to volume, and the clear liquid matched with a standard after standing over night.—E. F. A.

Nutritive elements of the soil; Relations of the plant to the ——. The law of the minimum and the law of physiological balance. P. Mazé. Comptes rend., 1912, 154, 1711—1714.

The relations of a plant to its nutritive substrate are controlled by a variety of conditions which together follow the law of physiological balance. Maize plants were grown in a solution containing all the element required for nutrition until they attained a weight of 10 grms., they were then transferred to a solution provided with one constituent only. The plant draws on its reserve of the other constituents, but the presence of the one element in excess disturbs the physiological balance and in consequence the increase in weight was in no case so great as when growth was allowed to continue in distilled water. Better results were obtained in ammonium nitrate solution than in ammonium chloride or sulphate. *Aspergillus niger* grown in Raulin's solution of concentrations, ¼, ½, 1, 2, 4, 8, 16 of the normal gave the maximum of growth in the solution of normal concentration. Nitrogen was added to a solution of ½ the normal concentration so as to bring the concentration of this element up to what it would be in a concentration of 16 normal, and the growth of mould in the three solutions was compared: the amount was smallest in that containing the excess of nitrogen salt. It is the physiological balance and not the law of minimum proportions which regulates plant growth.—E. F. A.

Nutritive solutions; Influence of the concentration of —— on their absorption by plants. I. Pouget and D. Chouchak. Comptes rend., 1912, 154, 1709—1711.

When plant roots are immersed in solutions of nutritive salts the rate of absorption is regulated by the rate at which the nutritive substances are used up; in very dilute solutions, however, it is the concentration of the salt which acts as the limiting factor. Experiments have been made with young wheat plants to test the absorption in solutions of varying concentration of the usual plant nutrients. In very dilute solutions there is no absorption; on the contrary the plant tends to excrete the substances which it has previously taken up. As the concentration is increased, the absorption increases more quickly than the concentration until a certain limit is reached, when the two are proportional, but this is not maintained indefinitely, as at a second limit the absorption increases less quickly than the concentration and finally, it becomes independent of the concentration. In dilute solutions the absorption of the nutritive substances is more rapid than that of water. If the soil solution contains the minimum quantity of all the elements necessary for growth, the crop is dependent only on climatic conditions. If however it is deficient in any one of these, the concentration of this element becomes the limiting factor influencing the crop.—E. F. A.

Organic nitrogen; Note on the neutral permanganate method for [determining] the availability of ——. J. P. Street. J. Ind. Eng. Chem., 1912, 4, 437—438.

In mixed fertilisers containing acid phosphate, the neutral permanganate method as originally devised (this J., 1901, 751) sometimes gives unreliable results, but is quite satisfactory if 1 grm. of sodium carbonate be added just before introducing the permanganate solution. A quantity of the fertiliser containing 45 mgrms. of organic nitrogen insoluble in water, is washed on a filter with water until the washings amount to 250 c.c. The insoluble residue is transferred to a 300 c.c. beaker by means of 25 c.c. of tepid water and treated with 1 grm. of sodium carbonate and 100 c.c. of a 2 per cent. solution of permanganate. After digesting the mixture for 30 mins. on the water-bath, the beaker being covered, and the contents stirred at intervals of ten minutes, 100 c.c. of cold water are added, the insoluble residue is collected on a filter, washed with 400 c.c. of cold water, in small quantities at a time, and its nitrogen content determined. By this method such materials as blood, "tankage," ground bone, dried fish, cottonseed meal, and castor pomace rarely show an availability less than 90, whilst lower-grade materials, as leather, "mora meal," tobacco stems, peat, sheep manure, "garbage tankage," tartar pomace, beet root manure, and "fillerine" show availabilities from 17 to 69.—A. S.

Organic nitrogen; Activity of —— as measured by the alkaline permanganate method. C. H. Jones. J. Ind. Eng. Chem., 1912, 4, 438—441.

For the determination of the active or available organic nitrogen insoluble in water, a quantity of the fertiliser containing 50 mgrms. of organic nitrogen insoluble in water is well mixed in a mortar with 2 grms. of powdered rock phosphate and then washed on a filter with 250 c.c. of water. The residue is dried at a temperature not above 80° C., transferred to a 500 c.c. Kjeldahl flask, treated with 20 c.c. of water, a few beads to prevent bumping, and 100 c.c. of alkaline permanganate (25 grms. of permanganate and 150 grms. of sodium hydroxide, separately dissolved in water, mixed, and made up to 1 litre). The flask is fitted with an upright condenser connected with a receiver containing standard acid, and after digesting the mixture below the distillation point for at least 30 mins., 95 c.c. are distilled over, and then the excess of acid titrated. The nitrogen thus obtained is termed the active organic nitrogen insoluble in water. Determinations are also made of the nitrate-nitrogen, ammonia-nitrogen, organic nitrogen soluble in water, total nitrogen and inactive organic nitrogen insoluble in water. The results obtained by the alkaline permanganate method with regard to the availability of the organic nitrogen have been confirmed by vegetation trials, and acid phosphate and other ingredients of mixed fertilisers do not affect the results (compare preceding abstract). It may be stated that organic nitrogen is derived from high-grade material in proportion as the percentage of active is greater than that of inactive organic nitrogen insoluble in water, and that the class to which the nitrogenous material belongs can be inferred from the relative content of organic nitrogen soluble in water.—A. S.

Nitrogenous materials; Effect of the "wet process" on the availability of low-grade ——. B. L. Hartwell and F. R. Pember. J. Ind. Eng. Chem., 1912, 4, 441—443.

The results of vegetation trials with Japanese millet, oats, and buckwheat, in pots, showed that the availability of certain low-grade nitrogenous fertilisers (roasted leather, "garbage tankage," peat) is materially increased by the so-called "wet process" treatment, *i.e.*, digestion with phosphate rock and sulphuric acid.—A. S.

Analysis of copper sulphate for agricultural purposes. Zecchini. *See* VII.

Constitution of Thomas slag. Hartleb. *See* X.

Phytin and phosphoric esters of inositol. Anderson. *See* XX.

Measurement of oxydase content of plant juices. Bunzel. *See* XXIII.

Photochemical lecture experiments of vegetable physiological interest. Baudisch and Mayer. *See* XXIV.

Patents.

Fertilisers ; Process of rendering [alkalis, phosphates, and silica in] mineral substances available as —— by aid of fermentation. C. F. Lawton, Assignor to F. W. Huestis, New York. U.S. Pat. 1,029,378, June 11, 1912.

The finely powdered mineral is mixed with a suitable quantity of fermentable organic matter, in the presence of water, and, the temperature having been raised sufficiently, fermentation is maintained by allowing access of air, the temperature, moisture, and air supply being occasionally regulated, so as to promote the most rapid decomposition both of the organic matter and the mineral. Alkalis, phosphates, and silica are thereby rendered soluble.—F. Sodn.

Manure from waste sulphite liquor ; Process for the manufacture of a ——. P. A. Newton, London. From Hoesch und Co., Pirna on Elbe, Germany. Eng. Pat. 21,994, Oct. 5, 1911.

See Fr. Pat. 434,943 of 1911 ; this J., 1912, 351.—T. F. B.

Insecticide. U.S. Pat. 1,026,361. *See* XIXb.

XVII.—SUGARS ; STARCHES ; GUMS.

Sorghum syrup manufacture. A. H. Bryan. U.S. Dept. Agric., Farmers' Bulletin 477, Feb. 9, 1912.

Recently the manufacture of sorghum syrup in the United States has been revived to some extent, owing to the depletion of the maple forests, to the scarcity of cane syrup and molasses, and further to the fact that now a light-coloured well-flavoured product can be obtained by the use of patent evaporators. Sorghum should be harvested during the time when the seed is in the milk stage, or until it is just becoming hard and dry. A good variety may yield as much as 15 tons of sorghum per acre, but the average is 8—10 tons per acre. The amount of finished syrup obtainable varies between 8 and 30 gallons per ton of sorghum, according to the plant used, the care exercised in manufacture, and the variety and ripeness of the cane. As to the actual manufacture of the syrup, for the greater part the apparatus used is simple, although in some parts large, well-equipped plants are in use. In extracting the juice, either vertical or horizontal iron 2-roller mills driven by horse-power are employed. Horizontal 3-roller mills driven by steam or water power are, however, found in the larger factories, at least 50—60 per cent. of the weight of sorghum being then obtained in the form of juice. After milling, the juice is passed through a sieve to remove particles of fibre and dirt, and from thence into a tank in which the impurities are allowed to subside. Sometimes previously heating the juice to facilitate settling is practised, but it is preferable first to heat the juice and then to add a suitable clay to it. Lime is also sometimes added, especially if the juice be very acid, but sufficient should not be added to impart an alkaline reaction to litmus paper. Phosphoric acid is stated to change adversely the flavour of the resulting syrup, while calcium carbonate causes a better and quicker deposition of the suspended matter. For the evaporation of the clarified juice, a "Jamaica train" is sometimes used, and now one or other form of patent evaporator, ensuring a rapid concentration without danger of burning, is coming into vogue. Evaporation is continued until the syrup has a density of 38° Bé., corresponding to 30 per cent. of water. Regarding the by-products, the bagasse or crushed residuum is generally used as fuel or as a mixing for fodder, while the leaves, blades, and seed heads make good cattle food. Analyses of juice from different sorghums are given, the figures, in the case of the Sumac variety, for example, being as follow :—

Variety and locality.	Degrees Bé.	Sucrose.	Invert sugar.	Total sugars.
		Per cent.	Per cent.	Per cent.
Biloxi, Missouri..........	8·1	4·07	7·37	11·44
,, ,, ...	10·1	10·93	8·21	14·14
Dalhart, Texas	10·6	11·34	3·49	14·83
,, ,, ...	8·6	2·88	10·90	13·78
Brownsville, Texas	8·0	4·26	6·70	10·96

According to U.S. census reports, during 1900 the total amount of sorghum syrup produced was 16.972.783 gallons.—J. P. O.

Cleaning evaporating apparatus ; Use of fermenting molasses for ——. L. Pellet. Intern. Sugar J., 1912, **14**, 338.

In reference to the recent article by Hartmann on the use of fermenting solutions of sugar or molasses for removing the scale from evaporating apparatus (this J., 1912, 196), it is remarked that the same method may be used for removing the layer of burnt sugar and oil formed on the exterior parts of the tubes. By introducing a solution of sugar or of molasses, and allowing it to ferment, a perfect cleaning of the exterior part of the tubes may be effected. This operation is especially of value in the case of effects heated by exhaust steam, on account of the presence of oil in the steam, often in spite of an oil-separating apparatus.—J. P. O.

Cleaning evaporator tubes. Thurlow. *See* I.

Determining the value of commercial starches for use in cotton mills. MacNider. *See* V.

Detecting sucrose in presence of other sugars. Rothenfusser. *See* XVIII.

Measurement of oxydase content of plant juices. Bunzel. *See* XXIII.

XVIII.—FERMENTATION INDUSTRIES.

Yeast ; Drying of —— without destruction of its vital and enzymic powers. F. Hayduck. Z. angew. Chem., 1912, 25, 1179.

For the preservation and transport of pitching yeast and also for therapeutic purposes, the production of dried yeast preparations in which all or nearly all the cells remain alive, is a matter of considerable importance. Most of the processes hitherto proposed for drying yeasts, have yielded products containing only a small percentage of living cells. Recently, however, two methods have been discovered by which preparations of high working power, and containing 90 per cent. of their cells living, have been obtained. The first process is conducted by the Dauerhefe-Gesellschaft, Berlin, and consists in aerating the yeast, suspended in water, for a long period (up to 3 days). By this treatment the yeast proteins are so modified that the cells can be subsequently dried without injury. The second process has been carried out at the Institut für Gärungsgewerbe, Berlin ; it consists in treating pressed yeast with sugar and drying the mixture at about 50° C.

This process can be applied to beer yeast which must, however, first be suspended in a sugar solution and aerated, in order to reduce its protein-content. J. H. L.

Beer; Organic and inorganic phosphoric acid in ——, and its relation to barley and malt. L. Adler. Z. ges. Brauw., 1912, **35**, 181—184, 193—197, 210—213, 246—250, 277—282, 293—298.

About four-fifths of the total phosphoric acid contained in beers is directly precipitable by magnesia mixture (or can be determined by titration with uranyl solutions under suitable conditions), and is therefore present in the form of inorganic phosphates. Of this inorganic phosphorus, about one-half is precipitated from beers by addition of ammonia, and is assumed to correspond to the amount of alkaline-earth phosphates present, the remainder representing the phosphates of the alkali-metals. Beers of different types show no striking differences in these relations. Of the organically combined phosphorus, about one-half is precipitated by basic lead acetate, and is therefore combined with proteins, whilst the remainder is probably in combination with carbohydrates. The organically combined phosphoric acid is not readily liberated by hydrolysis. After 2 hours' boiling with 3 per cent. hydrochloric acid, only 7·3 per cent., and after 15 hours boiling, only 21·5 per cent. was converted into the inorganic form precipitable by magnesia mixture. Complete hydrolysis was effected, however, by heating for 6 hours, under a pressure of 5 atms. with 3 per cent. hydrochloric acid. Neither lecithin nor phytin is present in beer. The ratio of inorganic to organic phosphorus in unfermented worts is practically the same as in beers. The inorganic phosphorus content of beers is slightly lower than that of worts owing to assimilation by the yeast. The quantity of organically combined phosphorus, on the other hand, is not altered as the result of fermentation under practical conditions, but it may increase slightly if the fermentation is carried out at higher temperatures or with larger proportions of yeast, for when stimulated to great activity yeast excretes organic compounds of phosphorus as products of metabolism. Inorganic phosphoric acid alone serves as nutriment for the yeast. When ground barley is extracted with cold water, most of the phosphorus which dissolves is in the inorganic form. It has been asserted, however, that barley contains no ready-formed inorganic phosphates. The author found that whatever means may be taken to obtain extracts of ground barley without allowing any opportunity for enzymic decomposition of organic compounds containing phosphorus, the extracts produced always contain a certain amount of inorganic phosphates which must therefore pre-exist as such in the barley. This phosphorus is combined only with alkali-metals, for if enzymic action is eliminated the extracts contain no alkaline-earth phosphates. The phytin of barley and malt appears to be contained only in the husk. Malt contains inorganic phosphates, both of the alkali- and alkaline-earth metals. About 20 per cent. of the phosphorus extracted from malt during mashing is organically combined. The rootlets of malt, as they are detached on kilning, possess a high phosphorus-content, a very large proportion of which represents alkali- and alkaline-earth phosphates. On extracting the ground rootlets with cold water almost the whole of their phosphorus passes into the extract.—J. H. L.

Sucrose; Detection of —— in presence of other sugars with special reference to must and wine. S. Rothenfusser. Chem.-Zeit., 1912, **36**, 716.

The sample is heated with hydrogen peroxide and alkali; all monoses, lactose and maltose are thereby oxidised to compounds (chiefly lactic, acetic and formic acids, and carbon dioxide) which do not react with the diphenylamine reagent (this J., 1909, 956; 1910, 584, 712), whereas if the sample contains sucrose, the blue colour is still obtained. Since natural must and wine do not give the reaction after the above-described treatment, the method serves for the detection of added sucrose. Probably also, the oxidation process may be utilised for the polarimetric determination of sucrose in mixtures of sugars.—L. E.

Glycerol in wines; New method for the determination of ——. C. Reis. Bull. Soc. Chim., 1912, **11**, 618—623.

This method is substantially the same as one already described (this J., 1910, 969), but differs from it in the following details of procedure: The volume taken for analysis is 100 c.c. in the case of dry wines, 50 c.c. in the case of sweet wines, or 25 c.c. if the sp. gr. exceeds 5° Bé. In extracting, for the first time, the residue from the evaporation of the wine, such a quantity of acetone is used that its strength is not reduced below 95 per cent. by admixture with the syrupy residue; in subsequent extractions 40—50 c.c. of acetone are used. The quantity of barium hydroxide added to the residue from the acetone extract (*loc. cit.*) should be, (1) a few mgrms. in excess of, (2) equal to, or (3) four-fifths of the weight of sugar present, according as the latter is (1) less than 0·05 grm., (2) between 0·05 and 0·3 grm., or (3) between 0·3 and 0·5 grm. The subsequent extraction is made, first with about 10 c.c. of acetone, and then 2 or 3 times with 25 c.c.—J. H. L.

Determination of lactic acid in presence of β-hydroxybutyric acid. Determination of lactic acid in presence of proteins. Mondschein. *See* XXIII.

PATENT.

Beverages; Method of finishing and preparing ——. J. F. Wittemann, Lakewood, N.J. U.S. Pat. 1,029,838, June 18, 1912.

Definite proportions of the beverage and of natural fermentation gas are pumped under pressure through a cooling device and then delivered into storage vessels while still under pressure. W. P. S.

XIXa.—FOODS.

Protein substances. Nutritive value of the products of hydrolysis of ——. J. Effront. Monit. Scient., 1912, **77**, 425—443.

A summary of recent work on the amino-acids, particularly of Abderhalden's investigations on the assimilation of nitrogenous substances. The preparation of a food containing the degradation products of various proteins and medical experience with this food are described. Following are the conclusions drawn: Proteins are composed of mono- and diamino-acids united owing to the elimination of water between them. Enzymes cause successive hydration, setting free tyrosine, leucine, tryptophane, alanine and polypeptides of high molecular weight. These polypeptides are degraded in turn by enzymes specifically related to them. The products resulting from complete hydrolysis are directly assimilable, possess a high nutritive value, and are capable of maintaining the nitrogen balance. Some of them may be replaced in the diet by others; some again, such as tyrosine, tryptophane, proline are indispensable. In building up synthetic protein from its elements, these groupings must be present and be arranged in such a manner that the digestive enzymes can act on them; synthetic proteins of any other type have no physiological interest.—E. F. A.

Determination of lactic acid in presence of β-hydroxybutyric acid. Determination of lactic acid in presence of proteins. Mondschein. *See* XXIII.

PATENTS.

Edible products from Bassia seeds; Process for the manufacture of ——. M. Monhaupt, Altona-Ottensen, Germany. U.S. Pat. 1,030,674, June 25, 1912.

Bassia seeds, from which a portion of the oil has been extracted, are treated with "strong hot spirits," the extract, after removing the spirit by distillation, is immersed in hot water, then acidulated with acid, heated, neutralised, and concentrated.—A. S.

Milk; Process of testing the freshness of ——. A. Faitelowitz. Halensee, Germany. U.S. Pat. 1,030,171, June 18, 1912.

See Eng. Pat. 26,264 of 1910; this J., 1912, 42.—T. F. B

Pasteurising apparatus. C. Paulsen, Copenhagen. U.S. Pat. 1,030,203, June 18, 1912.

See Eng. Pat. 18,050 of 1911; this J., 1912 627.—T. F. B.

Baking powders; Process for making ——. Chem. Werke vorm. Dr. H. Byk. Fr. Pat. 438,525, Dec. 2, 1911.

See Eng. Pat. 26,952 of 1911; this J. 1912, 554.—T. F. B.

XIXb.—WATER PURIFICATION; SANITATION.

Disinfectants containing tar oils; Chemical and bacteriological examination of —— with proposals for a new standard bacteriological method. H. Schneider. Desinfektion, 1912, **5**, 89—103, 121—145. Chem. Zentr., 1912, **2**, 50—51.

The author criticises the acetone-baryta method of the Lancet-Commission (see Woodhead and others, this J., 1910, 1077), pointing out that the barium soaps are not completely insoluble in acetone, and that all phenols do not form easily soluble barium salts. He recommends a distillation method, the water being collected separately as far as possible, and the phenols, tar oils, and pyridine bases in the distillate determined. In the residue of soap in the distillation flask, the fatty and resin acids are determined. It is stated that in "creolin" the soap contains a mixture of fatty and resin acids, in "*Creolin puriss.*," the soap is free from resin acids, and in "cyllin" the soap is essentially a resin soap. The Rideal-Walker bacteriological method (see Winter Blyth, this J., 1906, 1183; Kingzett, this J., 1910, 1032; and Woodhead and Ponder, this J., 1910, 1078) is also subjected to criticism. Of the test-organisms tried, the lowest "carbolic acid coefficients" were always obtained with *Bac. pyocyaneus*, and the author describes and recommends a method with the use of this organism as a standard method.—A. S.

Carbon monoxide; Physiological effects of ——. A. S. Munroe. School of Mines Quarterly, 1912, **33**, 340—344.

One of the most serious dangers from the presence of carbon monoxide in the air of mines is the effect upon the health of workmen who are daily exposed to the inhalation of small amounts of this gas. The blood when partly saturated is thereby rendered less able to perform its proper functions, so that the patient suffers from anæmia and all the complications resulting from this weakened condition. According to Edsall, miners' phthisis has been shown to be due chiefly to carbon monoxide poisoning. Recent observations have shown that for some hours after a blast, under ordinary mining conditions, carbon monoxide may be present in the air in dangerous amounts, and undoubtedly men engaged in sinking, drifting, and stoping, where the circulation of air is deficient, have their blood partially saturated with carbon monoxide the greater part of the time. It is quite certain that dissociation of carbon monoxide from the blood is slow, and that those whose blood is partly saturated will sooner fall victims where larger quantities of the gas are breathed, than those whose blood is free from it. Men who have repeatedly suffered, become very sensitive to the gas, and in most cases are compelled to abandon work in which they must inhale air containing it. The fact that the affinity of carbon monoxide for hæmoglobin is over 200 times greater than that of oxygen, will give an idea of the slowness of its dissociation from blood containing it, and the liability to accumulation.

Annual Report of the Chief Inspector of Factories and Workshops for 1911. Wyman and Sons, Ltd., Fetter Lane, London, E.C., and 32, Abingdon Street, S.W.; Oliver and Boyd, Tweeddale Court, Edinburgh; E. Ponsonby, Ltd., 116, Grafton Street, Dublin. 1912. Price 2s. 6d.

As regards the chemical and allied trades, the points of chief interest are the following:—

Regulations for dangerous trades.—In the smelting of lead material and also the manufacture of red, orange and yellow lead, subject to certain exemptions for materials containing only minute quantities of lead, the code requires the suppression or removal of dangerous dust or fumes; the provision of overalls and respirators in processes requiring them; the exclusion of persons under 16, and females, from lead processes; the restriction of duration of work in flues and condensing chambers; the provision of meal rooms, etc., and the periodical medical examination of workers in lead processes.

Chemical works.—The Swansea inspector complains that in cases where acid fumes exist, the respirators provided in pursuance of Rule 9, and which should be moist, are often quite dry, and difficulty is still found in getting respirators used in connection with sulphate of ammonia plants in gasworks. The Stockton inspector, owing to two fatalities in the case of waste liquor settling-tanks of sulphate of ammonia plants, had them fenced in, more especially the tank containing or to receive the boiling waste liquor.

Basic slag grinding.—Although mechanical exhaust ventilation has been adopted and fitted up at great cost, the Wolverhampton inspector reports that the grinders neglect primary precautions, often preferring to eat amongst the dust rather than betake themselves to an excellent mess-room.

Benzene derivatives.—The Huddersfield inspector reports that though last year (1910) there was only one case of *dinitrobenzene* poisoning, there has been an extraordinary increase this year, (1911), 23 cases being reported. The explanation is that in such an exceptionally hot summer, the pores of the skin are more open, and thus more ready to absorb the poisonous substance. A more efficient plant was pressed for; and in particular with regard to the breaking up of the caked material, the enclosing of the apparatus, and the provision of a much stronger exhaust. The inspector claims as essential, more automatic working in places laid with impervious washable floors. The Manchester inspector reports in the case of a factory making *dinitrochlorobenzene*, one case of dermatitis, and one of eczema. Near Huddersfield, in a factory making dinitro-compounds on a considerable scale, the frequency of illness amongst the workers, necessitated constant supervision. Since June, 1911, 17 cases of poisoning have been reported. At a cotton cloth dyeworks, a man employed in mixing aniline in the open air, and a second man employed as an ager, both showed symptoms of aniline poisoning.

Fumes. *Ammonia.*—The Wrexham inspector reports on a works where ammonia is largely used, and fumes are given off during manufacture. Although most of the ammonia is removed by exhaust ventilation, some escapes and causes discomfort. Quantitative tests of the ammonia present in the rooms close to the machines, showed (1) 0·0093; (2) 0·012; and (3) 0·0085 per cent. Dr. K. B. Lehmann of Munich, in an exhaustive inquiry on the physiological action of ammonia vapour, exposed himself for half an hour in atmospheres containing 0·20; 0·30, and 0·33 per 1000 of ammonia. He also found at the purifier house of a gasworks, when the purifiers were being emptied, 0·07 and 0·011 per cent. of ammonia. Lehmann states that with a little practice, 0·3 to 0·5 per cent. of ammonia in the air can be borne for a considerable time without sensible injury. Of course, the employées are at work in a room for periods of four hours—conditions somewhat different.

Pitch fumes.—The Walsall inspector in the case of a brush factory, found the fumes objectionable in the case of respiratory troubles, and exhaust ventilation was installed with good results.

Brass-casting shops.—The Sheffield inspector states that several effective methods are now in use. Fans connected with large hoods over the casting pit have been erected, and are acknowledged to be better than older methods.

Galvanising works.—Ammonium chloride and hydrochloric acid fumes, only seemed to be injurious as regards the teeth. A large percentage of the men employed showed marked attrition of the teeth. Analyses of the air of the shop showed that the limit assigned as injurious by Lehmann (*viz.*, 0·5 part of HCl per 10,000 of air) was approximated.

Arsenic poisoning.—The East London inspector reports of an emerald green (arsenite of copper) works, that to avoid handling by women, several of whom had suffered, an automatic process is now adopted. Only three cases of poisoning were reported from white arsenic works in the Swansea neighbourhood. The Manchester inspector, with reference to a sheep-dip factory reports one case of poisoning. The workers are exposed to much dust, but they are careful to use respirators. Mechanical conveyors are contemplated, and these would prevent dust exposure.

Carbon bisulphide and vulcanising indiarubber (North-Western Division).—Women are employed, and it is reported that exhaust ventilation is now much better arranged than formerly for the removal of fumes from the dipping troughs. Some processes escaping the special rules, however, have yet to be arranged for.

Carbonic oxide poisoning.—Several cases occurred, according to the Glasgow inspector, due to coke fires used for heating rivets, etc., in confined places on board ships under construction.

Cement works.—In making Portland cement the fuel used in the rotary kilns, is coal dust, blown under pressure into the combustion chamber of the kiln. The danger of explosions from such dried, and finely ground dust, is now recognised at all cement works, and at many of the coal-grinding mills—notices of warning being posted up prohibiting smoking, naked lights, etc.

Lead poisoning.—The Lincoln inspector mentions several lead cases in an engineering works where the fitters use a paste composed of red lead and oil for smearing joints. A leadless substitute is now used. From Wolverhampton the report is a disquieting one as to the increase of lead cases among power-stamp operatives. In Birmingham, leadless jointing materials are being largely used instead of white lead paste, for gas fittings. The Stoke inspector states that there is an increase of lead poisoning cases in potteries over the previous two years; totals, 78 for 1911, as against 62 in 1910, and 52 in 1909. On the other hand, trade is much brisker (1911), than previously. Glaze samples taken in connection with each poisoning case, show 11·2 per cent. of lead as the minimum. It is suggested that glaze samples should be taken at intervals at each of the potteries, whether lead cases existed or not, as then some fair comparison might be made. The percentage of lead in the jet and rockingham trade averages about 50 per cent., and the danger is correspondingly greater. The majolica painters in the tile trade run a similar risk. The Wrexham inspector refers to the case of workers cleaning out boiler flues, into which the waste gases from the litharge refinery furnaces were passed and utilised for generating steam in a Cornish boiler. The boiler flues thus became condensing chambers, and the two men who cleared out the lead dust once a week and in very confined spaces, fell victims to lead poisoning. Additional doors in the brickwork seating and the use of scrapers, and brushes with long handles, have now removed the need of entering the flues. This method of utilising furnace gases in steam boilers is referred to as a further likely source of danger to boiler inspectors when making the annual internal examinations.

Mercury poisoning.—Cases were reported from Birmingham and Walsall, the first in the process of gun browning, a liquid being used on the barrels which usually contains mercuric chloride (corrosive sublimate); the second (Walsall) in the process of drying fulminate of mercury used for charging detonators (dermatitis of hands and face).

Dust explosions.—In the following table the different classes of works are arranged according to the nature of the dusts liable to be present. Explosions have been recorded in works marked with an asterisk.

Works containing farinaceous, saccharine and starchy dusts. (1.)	Works containing carbonaceous dusts, *e.g.*, charcoal, coal, coke, graphite, etc. (2.)	Works containing dusts of vegetable origin, *e.g.*, cork, wood, etc. (3.)	Works containing dusts of animal origin, *e.g.*, bones, hoofs, horn, etc. (4.)
*Breweries Cattle food works. Confectionery works. Cocoa works. *Distilleries. *Flour mills. Food mills (corn flour). *Grist mills. *Maltings. Mustard mills. *Oak husk grinding. Rice mills. Saccharine works. *Seed crushing. Spice mills. *Starch and gum works.	*Briquette works. *Cement works. Charcoal grinding. Coal washing. Coke ovens. Electric carbon works. Foundry blacking works. Gasworks. Lampblack works. Mineral and ivory black works. *Phonograph record works. *Rag carbonising works.	*Cork grinding (linoleum). *Saw mills (sandpapering). Sawdust grinding and wood-flour mills. Snuff mills. Tea factories (sifting).	Bone grinding works. *Refuse hoof and horn grinding works.

Explosions were generally found to be due to the following causes:—(1.) Falls of accumulated dust from beams, rafters, and ledges upon naked lights. (2.) Falls of accumulated dust upon burning plant or machinery during a fire on the premises. (3.) Introduction of naked lights, *e.g.*, candles, oil lamps or defective safety lamps inside elevator casings, mills, dust collecting chambers, or other confined spaces. (4.) Production of sparks in a dusty atmosphere, owing to presence of particles of grit, flint, or metal in the mills or other machinery. The provision of effective exhaust ventilation, increased use of electric lighting, avoidance of use of naked lights, prohibition of smoking and carrying of matches, and frequent cleansing of floors, beams, rafters, and other ledges on which dust could collect, appeared to be important factors in preventing explosions in many works, and in eliminating risk of explosions in factories where dust explosions had occurred in the past.

PATENTS.

Waste waters; Apparatus for clarifying ——. R. Schilling and Ges. f. Abwässerklärung m. b. H., Berlin. Eng. Pat. 2741, Feb. 2, 1912.

THE waste water is delivered into a tank the inlet end of which is broad and shallow, whilst the outlet end is narrow and deep. Baffle-plates of increasing depth are suspended across the inlet end, and a pipe extending nearly to the bottom of the deep end of the tank allows the water and heavy suspended solids to escape from the tank at the same level as the inlet pipe. The light solids float on the surface of the liquid behind the last baffle-plate at the inlet end and are removed as required.—W. P. S.

Insecticide. W. Newell, College Station, Tex. U.S. Pat. 1,026,361, May 14, 1912.

LEAD arsenate, in the form of an impalpable powder, is employed as an insecticide, chiefly for the destruction of the cotton boll weevil. The lead arsenate employed may be either the ortho-, pyro-, or meta-salt, or mixtures of the same.—W. P. S.

Disinfecting and other purposes; Composition for ——. L. H. Reuter, Tompkinsville, N.Y. U.S. Pat. 1,027,000, May 21, 1912.

The composition may be prepared by digesting together, at 40° C., about 30 lb. of rosin, 30 lb. of formaldehyde, 90 lb. of soap, and 150 pints of water; this mixture is then added to a solution of 150 lb. of borax, 90 lb. of soap, and 60 lb. of formaldehyde, in 150 pints of water, and the digestion is continued for 1 hours. The composition is miscible with water in all proportions and, when cooled to 0° C., deposits a semi-liquid, transparent mass which is insoluble in water but which re-dissolves in the liquid from which it has been separated when the latter is warmed.—W. P. S.

Sterilising liquids by means of ultra-violet rays; Apparatus for ——. P. G. Triquet, Paris. U.S. Pat. 1,030,692, June 25, 1912.

See Eng. Pat. 9047 of 1911; this J., 1912, 43.—T. F. B.

Water; Process for softening ——. Water Softeners (France), Ltd. Fr. Pat. 439,600, Jan. 31, 1912. Under Int. Conv., Feb. 15, 1911.

See Eng. Pat. 3870 of 1911; this J., 1912, 356.—T. F. B.

Water; Treatment of —— [*with aluminium*]. Water Softeners (France), Ltd. Fr. Pats. 439,881, 439,882, 439,883, and 439,884, Feb. 8, 1912.

See Eng. Pats. 26,878 of 1910; 25,633 and 25,632 of 1911, and 26,877 of 1910; this J., 1912, 356.—T. F. B.

Sewage and waste waters; Process for treating ——. The Peat Coal Investment Co., Ltd. Fr. Pat. 439,754, Feb. 6, 1912. Under Int. Conv., Feb. 8, 1911.

See Eng. Pat. 3247 of 1911; this J., 1912, 601.—T. F. B.

Sewage matter, effluents, waste waters, town refuse, and like residues; Utilisation of the scum and sediment of —— for the manufacture of pulp for making paper or card. Fr. Pat. 438,400. *See* V.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Narcotine in opium; Pharmacodynamic action of ——. W. Straub. Biochem. Zeits., 1912, 41, 419—430.

It is known that opium is more active therapeutically than its morphine content would indicate. Experiments are now described indicating that this is due to the narcotine contained in the opium. The effect is not of an additive character, but apparently the narcotine strengthens the narcotic and toxic action of the morphine and lessens the injurious action of the latter on the respiratory centre. The most effective mixture appears to be one of equimolecular quantities of the two alkaloids.—A. S.

Chloral hydrate with urotropine and caffeine; Combinations of ——. A. Leulier. J. Pharm. Chim., 1912, 6, 18—21.

When aqueous solutions of chloral hydrate and urotropine are mixed, combination takes place, one molecule of urotropine combining with one or two molecules of chloral hydrate according to the circumstances. Both compounds volatilise towards 100° C. without melting. Salts of urotropine are formed by adding mineral acids to the cold alcoholic solutions. The aqueous solutions are decomposed by alkalis in the cold with the formation of chloroform. Similarly caffeine can be made to combine with chloral hydrate. Monochloral-caffeine is more stable in aqueous solution than the dichloral-caffeine. The former can be recovered unchanged from its solution in ether or alcohol. The monochloral-compound melts at at 92°—93° C., and when heated at 100° C., the chloral is driven off, leaving the caffeine.—F. Shdn.

Satinwood; Constituents of West Indian ——. S. J. M. Auld and S. S. Pickles. Chem. Soc. Trans., 1912, **101**, 1052—1060.

West Indian satinwood (*Zanthoxylum flavum*, Vahl.) was reduced to sawdust and extracted with light petroleum. After evaporation, a crystalline residue was obtained, which separated from methyl alcohol in prismatic needles, m. pt. 124°—126° C. The substance was almost colourless, had the composition, $C_{11}H_{10}O_3$, and was unsaturated and lactonic in character. The wood was then extracted with alcohol and the latter distilled. The resinous residue was treated with dilute hydrochloric acid, and redissolved in alcohol. After standing, pale yellow crystals were deposited, which were recrystallised from alcohol and ethyl acetate. In this way large translucent rhombic prisms were obtained, melting at 133° C. The composition was $C_{14}H_{12}O_4$, and the substance dissolved readily in chloroform, but was nearly insoluble in boiling water or light petroleum. It was concluded to be an ether-lactone from its behaviour. It formed a dibromide, which was colourless and melted at 125° C. The dibromide is decomposed by the action of water, yielding a monobromohydroxy-compound, m. pt. 152° C. When oxidised with permanganate, the substance melting at 133° C. gives a yellow crystalline saturated compound melting at 212°—213° C. The resins had no action on the skin (see this J., 1909, 624). —F. Shdn.

Cubebs; Adulterated ——. E. M. Holmes. Perfum. and Essent. Oil Rec., 1912, 3, 125—126.

Within recent times cubebs has been adulterated with a poisonous variety known in Java as *Rinoe badak*. This variety may be recognised in that it has a distinct odour and flavour of mace. Also, when the fruit is crushed and sulphuric acid of sp. gr. 1·843 dropped on, a yellowish-brown colour is produced. The genuine cubebs gives a rosy crimson colour under these circumstances. The sizes, external appearance, and microscopic appearance of several varieties of the genuine and false cubebs are given.—F. Shdn.

Copaiba: Examination of ——. Deussen and Eger. Chem.-Zeit., 1912, 36, 561. Perfum. and Essent. Oil Rec., 1912, 3, 127.

The African oil of copaiba contains much more cadinene than Para copaiba oil. The dihydrochloride of cadinene melts at 117°—118° C., and that of caryophyllene at 69°—70° C. The oil can be fractionated, the dihydrochloride prepared from suitable fractions, and the melting points of the crude products determined. The dihydrochloride is made by saturating the ethereal solution with dry hydrochloric acid gas. Pure Para copaiba oil was mixed with 10 per cent. of African oil, and crude dihydrochlorides melting at 110°—112° C., and 115° C. were obtained from two fractions, boiling at 122°—129° C. and 129°—132° C. respectively at 9 mm. When caryophyllene is treated with nitrogen peroxide in ethereal solution, nitro-caryophyllene, $C_{12}H_{19}N_3O_6$, is obtained, which melts at 159°—160° C. Para oil yields 9·5—16 per cent. of this compound, whilst Maracaibo oil and Para oil adulterated with gurjun oil yield considerably less.—F. Shdn.

Southern cypress; Oil of the ——. A. F. Odell. J. Amer. Chem. Soc., 1912, 34, 824—826.

The oil from the cones of the Southern cypress has approximately the following composition: *d*-Pinene, 85 per cent.; *d*-limonene, 5; a pseudo terpene alcohol (sabinol), 2; carvone, 3, and a tricyclic sesquiterpene, 3 per cent., the remainder being composed of substances which boil above 275° C. No aldehydes were found in the oil. (See also this J., 1911, 710.)—W. H. P.

Java citronella oil; The acetification of ——. T. H. Durrans. Perfum. and Essent. Oil Rec., 1912, **3**, 123—124. (See this J., 1911, 1184.)

When Java citronella oil was boiled with twice its volume of acetic anhydride, 72·7 per cent. of "geraniol" was found. Additions of gradually increasing amounts of anhydrous sodium acetate increased the percentage of "geraniol" found. With 2 grms. of sodium acetate to 10 c.c. of oil and 20 c.c. of anhydride, 89·1 per cent. of "geraniol" was found, whilst with 5 grms. of acetate, the percentage of "geraniol" was 91·1. Dehydrating agents such as sodium sulphate or calcium chloride have no accelerating effect on the reaction. A mixture of 10 c.c. of oil with 20 c.c. of acetic anhydride and 0·1 grm. of acetate was boiled, and a maximum of acetylation, about 80 per cent., was found after 5—6 hours boiling. When 10 c.c. of the oil were boiled with 10 c.c. of anhydride and no acetate for 2 hours, the "geraniol" content found was 69 per cent. Using 40 c.c. of anhydride under the same conditions; 76·7 per cent. of "geraniol" was found. It is probable that anhydrous sodium acetate acts as a dehydrating agent rather than a catalytic agent.—F. Sodn.

Essential oils; Notes on ——. IV. Oil of Mespilodaphne pretiosa. G. Lalone. Bull. Soc. Chim., 1912, **11**, 602—606.

The author has investigated essential oils obtained from *Mespilodaphne pretiosa* Nees, var. *γ-angustifolia*, a tree of the order *Lauraceæ* growing in various districts of S. America. The leaves and twigs yielded on distillation in steam, about 0·5 per cent. of a mobile, fragrant oil which appeared to consist mainly of linalol. The wood of the tree yielded 0·693 per cent. of an oil which was separated into two fractions, one lighter and the other heavier than water. The former, constituting about 72 per cent. of the mixture, possessed an odour resembling that of linaloe or rose-wood, and somewhat reminiscent of cinnamyl alcohol. The heavier fraction of the oil from the wood was of a clear brown tint. It consisted principally of an ester which, expressed as linalyl acetate, would constitute 71 per cent.; but a benzoic ester was present in considerable amount. The author concludes that this tree, which has hitherto been comparatively unknown in Europe, contains in all its parts an oil suitable for use as a perfume. The oil obtained from the leaves and twigs possesses organoleptic properties, which would enable it, if it should be procurable cheaply, to replace linaloe oil in most of the applications of the latter. J. H. L.

Camphor; Determination of the density of —— with the help of the densities of its solutions in various liquids. H. Malosse. Comptes rend., 1912, **154**, 1697—1698.

The curves representing the relation between density and percentage concentration for solutions of camphor in various solvents are found to be straight lines which, by extrapolation, pass through a common point (within the limits of experimental error) on the ordinate corresponding to 100 per cent. of camphor. The value thus indicated for the density of solid camphor is approximately 0·963.
—F. Sodn.

Ketones; New [synthetic] ——. Michiels. Bull. Acad. Roy. Belg., 1912, 10. Perfum. and Essent. Oil Rec., 1912, **3**, 129.

The interaction of magnesium isoamyl bromide and cyclopropane-carboxylonitrile leads to the formation of cyclopropyl-isoamyl ketone. It boils at 183°—185° C. at 755 mm., has the sp. gr. 0·87408 at 20° C. and a refractive index of 1·44604. The semicarbazone melts at 140°—141° C. Cyclo-propyl-isohexyl ketone results from the interaction of magnesium isohexyl bromide and ethylene-acetonitrile. It boils at 200°—202° C. at 739 mm., and has a sp. gr. of 0·8631 and a refractive index of 1·44325. Both ketones are liquids with a mint-like odour, and the corresponding alcohols have a lemon odour.—F. Shdn.

Antipyrine and pyramidone [dimethylaminoantipyrine]; Compounds of silicotungstic acid with ——. M. Javillier. Bull. Sci. Pharmacol., 1912, **19**, 70—72. Chem. Zentr., 1912, **2**, 36.

In a solution of antipyrine containing 0·7 per cent. of hydrochloric acid, silicotungstic acid produces a white precipitate of the composition

$$SiO_2,12WO_3,2H_2O,4C_{11}H_{12}ON_2+7H_2O,$$

which loses 3½ mols. of water at 120° C. A visible precipitate is produced in a solution containing only 1 part of antipyrine in 10,000. Under similar conditions in pyramidone solutions containing 0·35 per cent. of hydrochloric acid, a yellow amorphous precipitate of the composition, $SiO_2,12WO_3,2H_2O,3C_{13}H_{17}ON_3+8H_2O$, is produced, which loses the whole of its 8 mols. of water at 120° C.—A. S.

Phytin and phosphoric esters of inositol. R. J. Anderson. New York Agric. Expt. Stat., Bull. No. 19, April, 1912. Pp. 17. J. Biolog. Chem., 1912, **11**, 471—488.

The salts of phytic acid (inositolphosphoric acid) have hitherto been only imperfectly characterised. The barium salt obtained from very dilute hydrochloric acid solution has the formula, $C_6H_{18}O_{27}P_6Ba_3$; the same composition holds for salts of other divalent metals. Salts prepared from neutral or alkaline solutions have the general formula, $C_6H_{12}O_{27}P_6M_6$, whilst salts of intermediate composition are obtained from very dilute acetic acid solutions. Phytin was obtained from several different sources, but in each case it yielded the same acid. Phytic acid could not be synthesised by acting on inositol with dry phosphoric acid in a vacuum at 140°—160° C.; a tetraphosphoric acid ester of inositol was produced, which was found to be very similar to phytic acid. The barium salt obtained from acid solution has the composition,

$$C_6H_6(OH)_2O_4[(HPO_3)_2Ba]_2.$$—E. F. A.

3·6-*Diaminoacridine.* Benda. *See* IV.

Drying of yeast without destruction of its vital and enzymic powers. Hayduck. *See* XVIII.

Patents.

Pharmaceutical compounds [amides and ureides of higher bromo- or iodo-fatty acids]; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 18,813, Aug. 21, 1911.

Bromine- or iodine-substituted higher saturated or unsaturated fatty acids or their derivatives are converted into amides (other than the anilides) or ureides by the usual methods, or the amides (other than anilides) or ureides of unsaturated higher fatty acids are treated with bromine, iodine, hydrobromic acid, or hydriodic acid. The compounds thus produced are tasteless and liberate bromine or iodine in the organism. The amide of diiodobrassidic acid melts at 93° C., that of iodobehenic acid at 78° C., and that of dibromobehenic acid at 78° C., whilst the ureide of dibromobehenic acid melts at 149° C.
—T. F. B.

Erythrene and isoprene; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 19,919, Sept. 7, 1911.

Erythrene and isoprene can be obtained by distilling with alkali or alkaline-earth hydroxides the halogen ammonium halogenides of the formula,

$$X{\cdot}CH_2{\cdot}CH_2{\cdot}CH(CH_3){\cdot}NR_3X,$$
$$X{\cdot}CH_2{\cdot}CH(CH_3){\cdot}CH(CH_3){\cdot}NR_3X,$$
$$CH_3{\cdot}CHX{\cdot}CH_2{\cdot}CH_2{\cdot}NR_3X, \text{ or}$$
$$CH_3{\cdot}CHX{\cdot}CH(CH_3){\cdot}CH_2{\cdot}NR_3X,$$

where X represents halogen and R alkyl. These substances may be obtained by heating with halogen hydrides the quaternary ammonium halogenides of the necessary amino-alcohols; *e.g.*, the alcohol, $CH_3{\cdot}CH(NH_2){\cdot}CH_2{\cdot}CH_2OH$, is the starting point for the first-mentioned compound (see Eng. Pat. 18,935 of 1911; this J., 1912, 604). The quaternary ammonium chloride from this amino-alcohol is dissolved in water, saturated, whilst being cooled, with hydrobromic acid, and boiled to remove the excess of acid; the brown syrupy liquid formed is then heated on an oil-bath with about three times its weight of alkali or alkaline-earth hydroxide; a mixture of isoprene and trimethylamine distils over, from which the latter is removed by washing with dilute sulphuric acid. The yield of isoprene is stated to be nearly quantitative.—T. F. B.

Isoprene and its homologues; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 21,519, Sept. 29, 1911.

In the manufacture of caoutchouc or caoutchouc-like bodies from isoprene or its homologues, a certain amount of by-products is obtained, consisting of "dipolymerised" or more highly polymerised products of isoprene, etc.; this is preferably separated from any unchanged initial product, and then heated in the form of vapour, whilst in a state of dilution, whereupon it is converted into isoprene or a homologue. *Example:* The oil which is obtained as a by-product in making caoutchouc from 2·3-dimethyl-1·3-butadiene is separated from any unaltered initial product, and then distilled with steam. Its vapour is then passed at the rate of about 60—70 grms. per hour through a tube 50 c.m. long containing a platinum wire 3 metres long and 0·5 mm. diameter, heated by a current of 400 volt-amperes; the pressure employed is 20 mm. and the temperature from 500° to 700° C. The distillate consists chiefly of 2·3-dimethyl-1·3-butadiene with a small quantity of hydrocarbons of higher boiling-point.—T. F. B.

Carbonates of glycerine: Process for the production of ——. Chem. Fabr. Dr. R. Scheuble und Dr. A. Hochstetter, Tribuswinkel, Austria. Eng. Pat. 19,924, Sept. 7, 1911. Under Int. Conv., Sept. 7, 1910.

The carbonic acid esters of glycerol may be prepared by heating glycerol with a carbonic ester, such as phenyl carbonate, either alone, whilst stirring, or in presence of quinoline or other indifferent solvent of glycerol and the ester. The mixture is only heated to the temperature necessary to complete the reaction in a few hours (*e.g.*, 140° C.), and the alcohol or phenol eliminated is distilled off *in vacuo* either continuously or at the end of the reaction. Glycerol tricarbonate is obtained as a crystalline substance of m. pt. 138° C. by heating 2 kilos. of glycerol with 7 kilos. of phenyl carbonate, whilst by using smaller quantities of phenyl carbonate, lower carbonates, or mixtures of lower carbonates with the tricarbonate are, obtained. An alternative process for preparing glycerol carbonates consists in treating glycerol with the requisite amount of phosgene in presence of a substance which will unite with hydrochloric acid, such as pyridine, quinoline, or tri-ethylamine, as well as a suitable diluent, such as acetone, ethyl acetate, ether, or benzene; or pyridine may serve both as acid-binding agent and as diluent. —T. F. B.

Glucoheptonic acid; Manufacture of ——. A. Liebrecht, Frankfort on Maine, and G. Rosenfeld, Breslau, Germany. Eng. Pat. 8503, April 10, 1912. Under Int. Conv., Feb. 3, 1912. Addition to Eng. Pat. 8495 of 1912, date of appl., April 24, 1911 (see Ger. Pat. 245,267 of 1911; this J., 1912, 557).

The precipitate from which glucoheptonic acid is prepared, and which is produced by boiling with barium hydroxide the product of the action of hydrocyanic acid on dextrose, can be obtained in a state of greater purity by causing the barium hydroxide to act at lower temperatures (*e.g.*, 60° C.), and even at the ordinary temperature: the purer product thus formed is said to be more readily converted into glucoheptonic acid, and in better yield. A further modification of the process consists in treating with a mineral acid the product of the action of hydrocyanic acid on dextrose, expelling the hydrocyanic acid from the liquid, and adding barium hydroxide or a mixture of barium carbonate and hydroxide.—T. F. B.

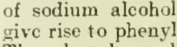
Bromiodophenyl-2·3-dimethyl-5-pyrazolones; Manufacture of ——. Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 10,538, May 3, 1912. Under Int. Conv., May 17, 1911.

The above compounds are obtained either by treating with iodine a 1-bromophenyl-2·3-dimethyl-5-pyrazolone, or by treating with bromine a 1-iodophenyl-2·3-dimethyl-5-pyrazolone. The products are stated to be of great therapeutic value. 1-*p*-Bromiodophenyl-2·3-dimethyl-5-pyrazolone, the preparation of which is described in detail, forms colourless crystals of m. pt. 163° C.; it is scarcely soluble in water, with difficulty in dilute hydrochloric acid, and readily soluble in hot alcohol and benzene. —T. F. B.

6-Methyl-2-phenylquinoline-4-carboxylic acid and 8-methoxy-2-phenylquinoline-4-carboxylic acid; Manufacture of derivatives of ——. A. Zimmermann, London. From Chem. Fabr. auf Actien, vorm. E. Schering. Eng. Pat. 12,053, May 21, 1912.

The methyl and ethyl esters of the acids named in the title are prepared by the usual processes of esterification from the acids; they may be utilised as remedies for gout and articular rheumatism. The methyl ester of 6-methyl-2-phenylquinoline-4-carboxylic acid melts at 91° C., and the ethyl ester at 82° C.; the methyl and ethyl esters of 8-methoxy-2-phenylquinoline-4-carboxylic acid melt at 102° C. and 109° C. respectively. All the esters are soluble in alcohol, ether, and benzene.—T. F. B.

Arylalkylbarbituric acid. Phenylethylbarbituric acid. H. Hoerlein, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,025,526 and 1,025,872, May 7, 1912.

(1.) Arylalkylbarbituric acids of the formula,  $\begin{array}{l}\mathrm{R.C(R').CO.NH,}\\ \quad \mathrm{\dot{C}O.NH—\dot{C}O}\end{array}$ when R represents an aryl and R′ a hydrogen or alkyl radical, are obtained by the condensation of suitably substituted malonic esters with urea in presence of sodium alcoholate. Phenylmethylmalonic acid esters give rise to phenylmethylbarbituric acid, of m. pt. 220° C. The phenylpropylbarbituric acid melts at 190° C., the *p*-methoxyphenylethylbarbituric acid at 202° C., the phenylbenzylbarbituric acid at 235° C., and the phenylbarbituric acid at 250° C. All are soluble in water and form salts with certain metals, the hydrogen of the imino group being replaced. They possess hypnotic properties when used in doses of 0·25 to 0·5 grm. (2.) The phenylethylbarbituric acid, of analogous constitution to the acids described above, and prepared by condensing phenylethylmalonic esters with urea, crystallises from water in white leaflets, of m. pt. 170°—172° C. Its properties are similar to those of its homologues.—T. F. B.

Ketones of high boiling-points; Process of producing —— *from acetone and homologues thereof.* J. Hertkorn, Hattershiem, Germany. U.S. Pat. 1,030,177, June 18, 1912.

Acetone or one of its homologues is treated with an alkaline-earth oxide, the liquid being kept in constant circulation throughout the process; the resulting condensation product is separated from the mixture before, and at a lower temperature than that at which, the formation of undesired by-products occurs. Thus, mesityl oxide is prepared by treating two mols. of acetone in the above manner with about one mol. of lime.—T. F. B.

Flowers; Process for extracting the natural essences from ——. L. Manescau. Fr. Pat. 439,022, Jan. 16, 1912.

The flowers are macerated in an "ether" (sulphuric ether or ethyl acetate), and the liquid is filtered and evaporated (compare Fr. Pat. 437,582 of 1911; this J., 1912, 557). —T. F. B.

Camphene; Process of manufacturing ——. J. Schmitz and G. Stalmann, Dusseldorf, Germany, Assignors to Dr. Schmitz und Co. U.S Pat. 1,030,334, June 25, 1912.

See Fr. Pat. 384,955 of 1907; this J., 1908, 522.—T. F. B.

Erythrene and isoprene; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pats. 439,381, Jan. 25, 1912, and 439,416, Jan. 26, 1912. Under Int. Conv., Feb. 1, 1911.

See Eng. Pat. 19,919 of 1911; preceding.—T. F. B.

Hydro-cinchona alkaloids; Process for making ——. Verein. Chininfabriken Zimmer und Co. Fr. Pat. 440,210, Feb. 15, 1912. Under Int. Conv., April 26, 1911.

See Eng. Pat. 3948 of 1912; this J., 1912, 601.—T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Explosives; Thirty-sixth Annual Report of H.M. Inspectors of —— for 1911. [Cd. 6240.]

Factories and magazines.—There were 33 factories under continuing certificate, and 103 under licence, and 211 visits were paid to these factories during the year. There were 87 magazines under continuing certificate and 356 under licence, and 444 visits were paid to these magazines during the course of the year.

Accidents. The total number of accidents of which the department had cognizance was 515, divided as follows: In manufacture (29), causing 13 deaths and 10 injuries, and 40 in which there was no loss of life or injury. In keeping (4) causing 5 deaths and injuries to 5 persons. In conveyance (nil). In use and miscellaneous (442), causing 38 deaths and injuries to 503 persons. The number of deaths (13) from accidents by fire or explosion in the manufacture of explosives was above the average for the decade (7·3). The number of accidents in manufacture during the year was the highest ever recorded. It had been suggested that the abnormal heat of the summer may have been the cause, but in the Inspectors' opinion there was little foundation for this, since other recent summers have been as hot, though perhaps not so persistently fine, and in the year 1904 when the same relatively large number of deaths in manufacture occurred, all the fatal accidents took place in January and February.

Importations.—The importations were as follows:—

	1910.	1911.
Nitroglycerin explosives .... lb.	1,098,625	876,850
Non-nitroglycerin explosives .... lb.	3,265	15,434
Detonators .... number	1,060,000	—
,, ... lb.	81,274	139,456
Fireworks .... tons	370	485
,, ... cases	20	—

Of the total weight of detonators imported, 22,438 lb. were immediately transhipped to other countries.

Chemical Advisers' report.—Messrs. Dupré examined 452 samples during the year, of which 58 were rejected for the following reasons: Heat test (20), incorrect composition (33), exudation (5).

Amount of explosives used in 1910.—The following amounts of explosives were used at mines under the Coal Mines Regulation Act, the Metalliferous Mines Act, and the Quarries Act:—

	Quantity used.	Percentage of total.
	lb.	
Permitted explosives..............	8,607,882	28·2
Gunpowder	17,664,483	57·8
Gelignite	3,039,256	10·0
Gelatin dynamite..................	494,560	1·6
Blasting gelatin	257,756	0·9
Blastine	165,456	0·5
Cheddite	123,584	0·4
Saxonite..........................	118,886	0·4
Various	66,258	0·2
	30,538,121	100·0

Testing station.—Owing to the erection of the new testing station at Rotherham and the necessity for the removal of some of the plant from Woolwich, the old testing station was closed on February 1st, 1911. Experimental work in connection with the new test was commenced at Rotherham on June 28th, and continued throughout the year. Unavoidable delay in formulating conditions of the new test was caused by damage done to the gallery by the firing. The gallery was strengthened and some modifications made which proved satisfactory.
—G. W. McD.

Red phosphorus. Stock and others. *See* VII.

Patents.

Perchlorate explosive. O. Silberrad, Buckhurst Hill, Essex. Eng. Pat. 13,442, June 6, 1911.

Potassium or ammonium perchlorate or a mixture (60 to 70 parts), mononitrobenzene or mononitrotoluene or a mixture (12 to 13), dinitrotoluene (6 to 7), mononitronaphthalene (6 to 7), wood meal (5 to 6), and soluble nitrocellulose (0·5 to 2·5 parts).—G. W. McD.

Chlorate explosive. O. Silberrad, Buckhurst Hill, Essex. Eng. Pat. 13,443, June 6, 1911.

Potassium chlorate (60 to 70 parts), mononitrobenzene or mononitrotoluene or a mixture (12 to 13), dinitrotoluene (6 to 7), mononitronaphthalene (6 to 7), wood meal (5 to 6), and soluble nitrocellulose (0·5 to 2·5 parts.)—G. W. McD.

Explosives. J. F. O'Brien, Chicago. U.S. Pats. 1,028,950, 1,028,951, and 1,028,952, June 11, 1912.

(1) The explosive consists of a mixture of potassium chlorate (3 parts), a carbohydrate (1 part), and a substance containing a silico-aluminous compound. (2) The explosive consists of an alkali chlorate, a carbohydrate, and an insulating coating consisting of carbon (2 parts), manganese dioxide (2), and milk sugar (1 part). (3) The explosive is composed of a mixture of potassium chlorate, wheat flour, starch, and burned clay.—G. W. McD.

Signal-fusees; Compound for railway time ——. I. Niditch, Dorchester, Mass. U.S. Pat. 1,029,884, June 18, 1912.

The compound comprises a metallic nitrate, a carbohydrate, sulphur, a perchlorate, and a small quantity of potassium chlorate, the percentage of the latter being less than that of either the nitrate, sulphur, or perchlorate. This produces a free-burning fusee, readily ignited, and burning with brilliancy and "force of flame," but which is not subject to spontaneous combustion.—B. N.

Nitroglycerin explosives; Method and apparatus for reducing or neutralising the noxious fumes resulting from the combustion of ——. E. Macaulay. Fr. Pat. 440,085, Feb. 3, 1912. Under Int. Conv., Feb. 3, 1911.

See Eng. Pat. 2820 of 1911; this J., 1911, 925.—T. F. B.

XXIII.—ANALYTICAL PROCESSES.

Fluorine; Detection and colourimetric determination of very small quantities of ——. A. Gautier and P. Clausmann. Comptes rend., 1912, 154, 1670—1677.

When all the fluorine in the substance to be examined has been concentrated, as already described (this J., 1912, 663), in a small quantity of barium sulphate, which still generally contains a little silicate, carbonate, and chloride, the complete separation of the fluorine is effected as follows:—The barium precipitate having been washed with a little water (containing alcohol), dried, and weighed, a weighed portion is introduced into a gold crucible (50—55 c.c. capacity) of special construction, which is so arranged that a little cup holding 1—1·5 c.c. of pure concentrated sulphuric acid (free from fluorine) is supported above the precipitate and a small platinum or gold basket, containing 0·5—0·6 grm. of pure caustic potash, moistened with water, is suspended in the upper part. The crucible is closed (hermetically, with the help of screws and a rubber ring) by a lid, which has a central hemispherical depression, and the acid is then upset on to the material below, thus causing the evolution of hydrogen fluoride and silicofluoric acid, which are absorbed by the alkali: the reaction is completed by heating the crucible, which is partly sunk in a block of bronze, for 2 hours at 180°—185° C., the lid, meanwhile, being kept cool by a stream of water which runs through a metal tube exactly fitting the concavity in the lid, so that the acid vapours are condensed and the condensed liquid continuously falls on to the potassium hydroxide below, the whole of the fluorine being separated as alkali fluoride and fluosilicate, free from all impurity, except perhaps a trace of chloride. The contents of the basket are dissolved in water, the solution heated to boiling, almost neutralised by hydrochloric acid, and ammonium chloride added until the liquid is persistently neutral (when hot) towards phenolphthalein; 3—4 grms. of ammonium carbonate are then added, the solution is evaporated to dryness, the residue taken up with water, silica is filtered off, and 1—2 c.c. of $N/1$ solution of sodium sulphate (which is sufficient for 2—3 mgrms. of fluorine) are added to the filtrate, which is precipitated, boiling, by barium nitrate in slight excess. The mixture is evaporated to dryness, the residue suspended in water, an equal volume of 95 per cent. alcohol added, the precipitate separated, washed with 65 per cent. alcohol, until quite free from chloride or nitrate, dried, and weighed. A weighed portion is then placed in a platinum crucible (9—10 c.c. capacity) similar in construction to the gold crucible already mentioned, 2·5—3 grms. of coarsely powdered flint glass, moistened with water, are introduced (in place of the alkali) into the basket and 0·2—0·3 grm. of sulphuric acid into the cup: after upsetting the acid, the whole is heated to 140° C., for 5 hours, and the lead fluoride formed is dissolved by washing the glass on the water-bath with a saturated solution of potassium chlorate diluted with 4 volumes of water; then the solution is diluted to 25 c.c., 2—3 drops of gelatin (1 per cent.) are added, and a little hydrogen sulphide is passed through the solution, after which the colloidal lead sulphide is compared colourimetrically with a solution similarly prepared from a standard solution of lead nitrate. Finally, the weight of fluorine corresponding to that of the lead found, is ascertained by determining the value of the coefficient Pb/F for the glass employed. This is done by repeating the above process in the platinum crucible with a known weight of pure calcium fluoride (mixed with barium sulphate). The coefficient is not a constant, even for the same kind of glass, with quantities of fluorine below 1 mgrm.—F. Sodn.

Copper arsenic group; Precipitation of —— and separation of its divisions. J. J. D. Hinds. J. Amer. Chem. Soc., 1912, **34**, 811—812.

For ready precipitation of quinquevalent arsenic by means of hydrogen sulphide, the solution should be over $2N$ with regard to hydrogen chloride. For complete precipitation of cadmium it must be less than $0{\cdot}5N$, and for the retention of metals of succeeding groups it must be more than $0{\cdot}125N$. On boiling a solution of an arsenious compound with hydrochloric acid, the loss of arsenic is a function of the quantity present, but from a solution which is originally $N/1$ with regard to hydrogen chloride, the loss when the solution is boiled down to half its bulk is less than $\frac{1}{1000}$ of the quantity originally present. The sulphides of arsenic, antimony, and stannic tin are readily soluble in colourless ammonium sulphide: stannous sulphide is not readily soluble, and copper sulphide is only very slightly soluble. On the above facts the author bases the following reliable and rapid method for analysis of this group, without the use of yellow ammonium sulphide. The solution is made about $N/1$ with hydrochloric acid and a little nitric acid added; it is then boiled down to half its bulk to oxidise the tin, and hydrogen sulphide passed through the hot liquid. When there is no more precipitation, the whole is diluted to about twice the original volume and more hydrogen sulphide is passed. After filtering, the precipitate is covered with concentrated ammonia and treated with hydrogen sulphide with gentle warming. The sulphides of arsenic, antimony, and tin dissolve rapidly, carrying with them no more than a trace of copper.—W. H. P.

Copper; Iodometric titration of ——. K. Sugiura and P. A. Kober. J. Amer. Chem. Soc., 1912, **34**, 818—822.

A constant end point in the iodometric titration of copper is not usually obtained in the presence of nitrates. As a rule the blue colour returns and high results are obtained. If the copper is precipitated as hydroxide (avoiding excess of alkali), filtered off, and washed, and then dissolved in dilute acetic acid, the titration may be carried out with no uncertainty as to the end point, which will remain constant for hours if dust be excluded.—W. H. P.

Yttrium; Determination of ——. C. F. Whittemore and C. James. J. Amer. Chem. Soc., 1912, **34**, 772—774.

Precipitation with sodium hydroxide or ammonium hydroxide gives high results in the gravimetric determination of yttrium when sodium or potassium salts are present. As the result of a systematic search for a satisfactory precipitant, which does not carry down sodium or potassium salts, the authors suggest the use of ammonium sebacate, which gives an effective separation from sodium in one precipitation and from potassium after a double precipitation. For the separation of yttrium from iron, aluminium, lithium, or magnesium, it is sufficient to precipitate with oxalic acid in the presence of ammonium chloride.—W. H. P.

Stannous chloride solution; Seal for vessel containing standard ——. S. Chumanoff. J. Russ. Phys.-Chem. Soc., 1912, **44**, 566—567.

The vessel is connected with one limb of a small U-tube, on a restriction of which rest lumps of marble. The U-tube contains dilute acid and its other limb is closed with an ordinary bulb trap. A similar apparatus may be employed for preparing hydrogen in small quantities.
—T. H. P.

Lactic acid; Determination of —— in the presence of β-hydroxybutyric acid. J Mondschein. Biochem. Zeits., 1912, **42**, 91—104.

Separate portions of the mixture are taken for the analysis. In one of these the lactic acid is oxidised by potassium permanganate in one per cent. sulphuric acid by the method of Fürth and Charnass (Biochem. Zeits., 1908, **26**), the products consisting of acetaldehyde from the lactic acid and a certain amount of acetone from the β-hydroxybutyric acid. The distillate is divided into two portions, in one of which the absorption value for sulphurous acid is determined by Ripper's method of titration with iodine (this J., 1901, 288), whilst the second portion is freed from acetaldehyde by boiling with alkali and hydrogen peroxide beneath a reflux condenser and again distilled and titrated by Ripper's method. The difference between the results corresponds to the acetaldehyde originally in the distillate and is calculated into lactic acid. The other portion of the original mixture is oxidised with 0·5 per cent. potassium bichromate solution in 4 per cent. sulphuric acid, which oxidises the β-hydroxybutyric acid to acetone and a little of the lactic acid to acetaldehyde. The mixture is distilled, the second distillate freed from acetaldehyde as before, and the acetone distilled and volumetrically determined by means of iodine and thiosulphate and calculated into the corresponding amount of β-hydroxybutyric acid.—C.A.M.

Lactic acid; Determination of —— in the presence of proteins. J. Mondschein. Biochem. Zeits., 1912, **42**, 105—122.

Previous determinations of the lactic acid in flesh have been too low owing to the fact that about one-third of the acid is carried down with the coagulated albumin and escapes determination. The lactic acid in a decoction of muscular fibre may be determined with sufficient accuracy by titration, with phenolphthalein as indicator, since other acid substances are not present in appreciable quantities under normal conditions. The portion retained by the coagulated albumin may be determined by boiling the latter with alkali solution, precipitating the albumin from the albuminate solution by the addition of a saturated solution of sodium chloride, and determining the lactic acid in the filtrate by oxidation with acid permanganate solution (see preceding abstract).—C. A. M.

Oxydase-content of plant juices; Measurement of the ——. H. H. Bunzel. U.S. Dept. Agric., Bureau of Plant Industry, Bull. No. 238, Mar. 9, 1912.

The method depends on the accelerated oxidation of pyrogallol by atmospheric oxygen in presence of the plant juice, the degree of oxidation being measured by the change of gas-pressure in the reaction flask. This flask has a capacity of about 150 c.c., and is fitted with a manometer and two tap-funnels, and contains a suspended glass vessel; the bottom of the flask is ridged so that the pyrogallol and plant juice may be kept separate until the flask is shaken. The following procedure is found to give good results:—The flask is clamped on the carriage of a special shaking apparatus contained in a thermostat which can be kept to within 0·1° C., at the desired temperature Eight c.c. of a 1 per cent. solution of pyrogallol, and 2 c.c. of plant juice are run into the respective compartments of the flask, and 1 c.c. of *N*/1 solution of sodium hydroxide is run into the suspended glass vessel; the tap of one of the funnels is then turned off, and when the required temperature has been attained, the tap of the other funnel is turned off and the shaking apparatus is set going at the rate of 5 complete excursions in 3·3 seconds. Shaking is stopped at intervals of 10 or 20 minutes, and the manometer is read, the experiment being continued until absorption of oxygen is no longer appreciable. The amount of carbon dioxide formed (and absorbed by the sodium hydroxide in the suspended vessel) is subsequently determined by titration in an atmosphere free from this gas. Experiments with potato juice show that shaking for 15—30 minutes before adding the pyrogallol, reduces the oxidising power of the juice by about 50 per cent., though further shaking has very little effect. The chief error of the method lies in the rise of pressure which occurs on shaking the flask, probably owing to the formation of water particles in the gas above the liquid; this error can be eliminated in several ways, *e.g.*, by a blank determination. It is found that beet leaves, affected by the condition known as "curly-top," contain considerably more oxydase than normal leaves. The oxydase in potato juice does not appear to be an enzyme in the ordinary sense of the term, since a given quantity of the juice only causes a very definite and limited absorption of oxygen by pyrogallol. The author inclines to the view that the oxydase combines with the pyrogallol to form an easily oxidisable compound, the rate of oxidation of which would depend primarily on the concentration of the oxygen in solution; each molecule of the oxidisable compound combines with one or more atoms of oxygen and is simultaneously decomposed in such a way that the originally active oxydase is destroyed or otherwise injured. —L. E.

Determination of ash in coal. Weisser. *See* IIa.

Laboratory method for the comparison of the coking properties of coal. Lessing. *See* IIa.

Determination of naphthalene in [coal] gas. Laurain. *See* IIa.

Analysis of weighted silk. Farrell and Goldsmith. *See* V.

Determining the value of commercial starches for use in cotton mills. MacNider. *See* V.

Detection of alkali bicarbonate [in normal carbonate]. Haslam. *See* VII.

Determination of iodides by direct titration. Turrentine. *See* VII.

Determination of iodine in iodides, and in particular in kelp. Auger. *See* VII.

Oxidation of arsenious acid [sodium arsenite] by atmospheric oxygen. Reinthaler. *See* VII.

Determination of perchlorates. Lamb and Marden. *See* VII.

Analysis of copper sulphate for agricultural purposes. Zecchini. *See* VII.

Thorium and the rare earths. Wirth. *See* VII.

Use of oxygen under pressure for the determination of the total carbon in ferro-alloys. Mahler and Goutal. *See* X.

Determination of chromium in bronzes containing tin and antimony. Schilling. *See* X.

Determination of lead in tin-lined leads as lead chloride. Crato. *See* X.

Serger's reaction for vegetable oils. Utz. *See* XII.

Detection and determinotion of earth nut oil [arachis oil] in olive oil. Adler. *See* XII.

Examination and valuation of oil of turpentine. Wolff. *See* XIII.

Determination of caoutchouc as tetrabromide by Huebener's process. Becker. *See* XIV.

Determination of humus, especially in heavy clay soils. Beam. *See* XVI.

Neutral permanganate method for [determining] the availability of organic nitrogen. Street. *See* XVI.

Activity of organic nitrogen as measured by the alkaline permanganate method. Jones. *See* XVI.

Detection of sucrose in presence of other sugars, with special reference to must and wine. Rothenfusser. *See* XVIII.

Determination of glycerol in wines. Beis. *See* XVIII.

Chemical and bacteriological examination of disinfectants containing tar oils, with proposals for a new standard bacteriological method. Schneider. *See* XIXb.

Acetification of Java citronella oil. Durrans. *See* XX.

Patents.

Smoke from factory and other chimneys; Apparatus for measuring the density of ——. J. S. Owens, London. Eng. Pat. 16,256, July 14, 1911.

In instruments for measuring smoke in which the density or colour of the smoke is matched with that of graduated smoked or tinted glasses, the aperture through which the smoke is viewed, and the smoked or tinted glasses, are fixed at the focus of a telescope so that all are observed in focus to the eye simultaneously. A circular slide may be attached to the apparatus to enable the observer to divide or multiply the density number of the glass by the thickness of the column of smoke mechanically.—H. H.

Calorimeters. The Cambridge Scientific Instrument Co., Ltd., and R. S. Whipple, Cambridge. Eng. Pat. 25,587, Nov. 16, 1911.

Two helically coiled bi-metallic strips are arranged in two separate chambers or flues, the strips being attached to a shaft which extends through both chambers. The ends of the strips are fixed in such a manner to the shaft and to the wall of the chamber that the expansion of one of the strips under the influence of heat tends to neutralise the expansion of the other under a similar degree of action and to eliminate movement of an indicator attached to the end of one of the strips. The apparatus as a whole is independent of the temperature of the surrounding atmosphere and the movement of the indicator is the result only of the heat applied to one of the strips by the combustion of the gas under examination, a burner being fitted under one of the strips for this purpose. The air supplied to the burner is drawn from the other chamber through an opening in the lower part of the wall separating the two chambers. The apparatus may also take the form of metallic capsules so mounted that when heat is applied to one of them, an indicator is operated; another modification consists of two mobile columns, similar to thermometers, moving in opposite directions under the action of heat, but normally balanced about a common supporting spindle connected with an indicator.—W. P. S.

Pyrometers: Acoustic ——. C. de A. M. Costa, Rio de Janiero. Brazil. Eng. Pat. 25,265, Nov. 13, 1911.

SEE Fr. Pat. 437,560 of 1911; this J., 1912, 561.—T. F. B.

XXIV.—MISCELLANEOUS ABSTRACTS.

Luminescence in presence of oxygen; New classes of compounds showing ——. M. Delépine. Bull. Soc. Chim., 1912, **11**, 576—581.

THIOCARBONYL chloride, S:CCl$_2$, and a large number of organic sulphur compounds containing the group $S:C<$ exhibit luminescence in the dark at ordinary temperatures and in presence of oxygen. It is probable that this property is possessed by all organic sulphides in which the sulphur is doubly linked with another atom and therefore open to the oxidising action of atmospheric oxygen, and which are at the same time sufficiently volatile at ordinary temperatures. Similar luminescence is shown by a number of volatile derivatives of thiophosphoryl chloride, S:PCl$_3$, in which one or more chlorine atoms are replaced by alkyl- or alkoxy-groups. The same property is possessed by the parent substance, S : PCl$_3$, and in a much higher degree by the spontaneously inflammable fluoride S:PF$_3$, whereas the bromide is quite destitute of it. Methods of preparation of some of these organic phosphorus compounds are given.
—J. H. L.

Photochemical lecture experiments of vegetable physiological interest. O. Baudisch and E. Mayer. Ber., 1912, **45**, 1771—1775.

THE source of light used was a quartz mercury vapour lamp or a carbon arc. When aqueous potassium nitrate solution is exposed to the rays in a flat dish, oxygen is liberated within a few seconds: this is rendered visible by the blue colour produced with starch and potassium iodide or the red colour produced with aloin. The interposition of a quartz plate delays the reaction for 25 seconds, whereas a plate of transparent glass delays it for 20 minutes. A suitable apparatus allows the testing of various light filters. The reaction also takes place slowly in sunlight. The elimination of oxygen from potassium nitrite is best shown by means of aloin. The same reagent also serves to indicate the elimination of oxygen from aliphatic and aromatic nitro-compounds, a process which takes 2 minutes with nitromethane, 17 minutes with nitrobenzene. The reaction of these nitro-compounds with *o*-, *m*- and *p*-phenylenediamine hydrochlorides on exposure to light suggests that aliphatic aldoximes are formed, as the colour reactions corresponding with these aldoximes are obtained. The aldoximes probably form labile intermediate compounds and undergo a Beckmann rearrangement into the corresponding acid amides.—E. F. A.

Formaldehyde in plants; Occurrence of ——. T. Curtius and H. Franzen. Ber., 1912, **45**, 1715—1718.

SINCE $\alpha\beta$-hexylenealdehyde, which has been found to be widely distributed in plants (see this J., 1910, 1231; also following abstract), either gives similar reactions to formaldehyde or masks the reactions of the latter compound, the evidence which has been hitherto adduced as to the occurrence of formaldehyde in plants must be regarded as quite unreliable. The authors have, however, proved with certainty the presence of formaldehyde in hornbeam leaves by oxidising with silver oxide the aldehydes isolated therefrom, after removal of the volatile acids as barium salts, and then identifying formic acid in the mixture of acids produced. A determination of the amount of formic acid by Franzen and Egger's method (this J., 1911, 572) indicates that hornbeam leaves contain 0·1550 grm. of formaldehyde in 180 kilos.—A. S.

Green plants; Chemical constituents of ——. *I. The aldehyde of the leaves.* T. Curtius and H. Franzen. Annalen, 1912, **390**, 89—121.

DETAILS are given of the isolation of $\alpha\beta$-hexylene-aldehyde from a number of plants (see this J., 1910, 1231). The authors consider it reasonably certain that this aldehyde is present in all green plants and they discuss its probable function as an intermediate compound in the formation of sugars, fats, and other constituents of plants.—A. S.

Green plants; Constituents of ——. *II. Volatile acids of hornbeam leaves.* T. Curtius and H. Franzen. Sitzungsber. d. Heidelberger Akad., 1912, Abtheil. B., Nr. 1. Chem. Zentr., 1912, **2**, 39.

THE volatile acids of hornbeam leaves consist mainly of formic and acetic acids, but there are also present small quantities of acids sparingly soluble in water, namely a hexylenic acid with one or more of its higher homologues. This hexylenic acid is not the $\alpha\beta$-acid corresponding with the $\alpha\beta$-hexylenealdehyde previously detected in hornbeam leaves (see preceding abstract), nor the $\beta\gamma$-acid, but is perhaps identical with the acid, $C_6H_{10}O_2$, from croton oil (Schmidt, Berendes, Annalen, **191**, 121); it remains liquid at 20° C.—A. S.

Books Received.

TESTING OF WOOD PULP. A practical handbook for the Pulp and Paper Trades. By R. W. SINDALL and W. N. BACON. Marchant Singer and Co., 47, St. Mary Axe, London, E.C. 1912. Price 5s. net.

8vo volume, containing 146 pages of subject-matter with 27 illustrations, and an alphabetical index. The subject-matter is arranged under the following heads:—I. MOISTURE IN WOOD PULP. (i), Selection of bales. (ii), Methods of sampling. (iii), The "wedge" system. (iv), Experimental results (v), Measurement of "probable errors." (vi), Apparatus for testing pulps. (vii), Useful tables. II. BLEACHING QUALITIES OF WOOD PULP. (i), Conditions affecting bleach consumption. (ii), Laboratory methods and experiments. (iii), The question of a standard colour. (iv), Colour measurement. (v), The tintometer. (vi), Standard methods of testing. III. APPENDIX. (i), Bleach liquors. (ii), Oxidation of cellulose.

METHODS OF ORGANIC ANALYSIS. By Henry C. Sherman, Ph.D; Professor of Food Chemistry in Columbia University. Second Edition. The Macmillan Company, New York. 1912. Price 10s. 6d. net.

8vo volume, containing 395 pages of subject-matter, with 18 illustrations, and an alphabetical index, to which may be added the five pages of "References," arranged as a bibliography, and immediately preceding. The subject-matter is classified as follows:—I. Alcohols, detection, determination, etc. II. Aldehydes. III. Carbohydrates, general methods. IV. Special methods of sugar analysis. V. Starch and amylase. VI. Vinegar and acetate. VII. Fatty acids. VIII. Oils, fats, and waxes. General methods. IX. Edible oils and fats. X. Drying oils. XI. Petroleum and lubricating oils. XII. Fuels. XIII. Soap and glycerin. XIV. Nitrogen, sulphur, and phosphorus. XV. Proteins and proteases. XVI. Grain products. XVII. Milk. XVIII. Food preservatives.

PERFUMERY AND ESSENTIAL OIL RECORD.—SPECIAL ISSUE. POST-GRADUATE LECTURES ON THE TERPENES AND ESSENTIAL OILS, by Sir W. A. TILDEN, Prof. W. H. PERKIN, and J. C. UMNEY. Vol. 3. July 9, 1912. G. Street & Co., Ltd., 8, Serle Street, Lincoln's Inn, London, W.C.

Journal of the Society of Chemical Industry.

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Journal and Patent Literature.

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German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT ; MACHINERY.

Granacite. H. Fischer. Z. angew. Chem., 1912, 25, 1327—1328.

Granacite, a form of granite found in Saxony, is grey-blue, medium to fine-grained, very hard and weather-resisting, and has the same crystalline structure as granite. Its crushing strength is 2000 kilos. per sq. cm. and its specific gravity is 2·7. It can be obtained in blocks or in plates, and vessels up to 2000 litres capacity can be cut out of one block. It is specially suitable for towers, vessels, containers, etc., in the following industries: acetic acid and white lead, phosphoric acid, bromine, and alkali manufacture, and in the paper industry for sulphite liquors.—O. R.

Patents.

Raising or forcing liquids ; Methods of and apparatus for ——. H. A. Humphrey, London, and W. J. Rusdell, Dudley. Eng. Pats. 11,818, May 16, 1911, and 13,342, June 2, 1911.

The reciprocating water column of internal combustion pumps such as described in earlier patents by Humphrey and Cerasoli, Humphrey, and Humphrey and Rusdell (compare this J., 1908, 436, 1101 ; 1910, 75 ; 1911, 119, 524, 940, 1099, 1148 ; 1912, 216, 522, 626) is replaced wholly or partly by a solid piston sufficiently heavy to acquire the momentum necessary to limit the velocity of the liquid passing through the valves, and adapted to reciprocate freely and continuously without control otherwise than by work done, or energy stored at each stroke. The return strokes of the piston may be effected by means of air compressed in cushions or buffers during the outward stokes, or they may occur under the pressure of the liquid raised, or the apparatus may be duplicated so that every stroke is caused by an explosion. The piston may reciprocate horizontally or vertically, and may either itself act upon the water to be pumped, or be directly connected by a rod to a separate pump piston. Devices are described for controlling in each cycle the quantity or quality of the combustible mixture used, the amount of energy stored, the amount of work done, the lengths of the strokes, the amount of liquid delivered, the time of the cycle, the weight of the reciprocating masses, the moment of inertia of the oscillating parts, and the maximum or mean velocities of the reciprocating masses.—H. H.

Raising or forcing liquids and compressing gases ; Apparatus for ——. H. A. Humphrey. London. Eng. Pats. 12,055, May 18, 1911, and 12,449, May 23, 1911. (Compare preceding abstract.)

In an internal combustion pump of the type described in the preceding abstract the explosion gases act between and directly upon two or more pistons which constitute a part or the whole of the masses which reciprocate and between which, by a movement towards each other, the combustible mixture is compressed prior to ignition. The pistons may control the exhaust, scavenging, and admission ports in a manner similar to the Oechelhauser gas engine. When the apparatus is used for pumping air, the compressed air remaining in the clearance spaces of the air-compressing cylinders may be sufficient to effect the return strokes of the pistons, in which case separate air cushions for this purpose may be dispensed with.—H. H.

Vessels capable of having partial vacuums therein ; Means for enabling —— to be filled or supplied with liquids or to be cleaned internally. W. A. Brown, Manchester. Eng. Pat. 2173, Jan. 27, 1912.

In vessels such as "liquid soap fountains" of the type with a single horizontal outlet for liquid at the bottom with a vertical bend therein, an opening, normally closed by a plug, is made opposite the horizontal portion of the outlet so that the vessel can be more readily cleaned and may be filled through a funnel when turned on its side.—H. H.

Separating liquids from gases or vapours. A. Bartl, Cottbus, Germany. Eng. Pat. 15,494, July 3, 1912. Under Int. Conv., June 2, 1911.

The separator chamber is provided with perforated baffle plates, the lower ends of which bear resiliently against the bottom of the chamber. The baffles drain separately into separate compartments formed by putting partitions across the liquid-receiving chamber. These partitions are perforated and each liquid-receiving compartment is separated air-tight from the next by a liquid seal, in order to prevent the gas or vapour taking a path of least resistance through the separated liquid.—W. H. C.

Press for extracting liquid from materials. A. S. MacKenzie, Elizabeth, N.J., Assignor to F. Phelps, Little Rock. Ark. U.S. Pat. 1,030,594, June 25, 1912.

The press consists of a continuous annular chamber which is divided into three sections, the first of decreasing width in a radial direction, the second of uniform width equal to the narrow portion of the preceding section, and the third connecting the end of the uniform section with the wide end of the first mentioned section. Pressure is exerted by altering the relative positions of the circumferential walls of the chamber and the material which is fed continuously into the widest portion of the first mentioned section, is compressed there, is kept compressed as it passes through the second section and released from pressure and discharged when it reaches the third section. —W. H. C.

Evaporating apparatus. W. Wiegand. Merseburg, Germany. Eng. Pat. 5944, March 9, 1912. Under Int. Conv., March 28, 1911. Addition to Eng. Pat. 7154, March 25, 1909.

In order to ensure the complete moistening of the walls of the evaporator tubes described in the main patent (see Fr. Pat. 400,860 ; this J., 1909, 1077), the steam separating space of the upper elements is connected with the lower part of the liquid space of the same elements by a tube of very narrow cross-section, so that a limited circulation of the liquid is maintained.—W. H. C.

Evaporating and distilling plant. W. Weir, Glasgow. Eng. Pat. 2813, Feb. 3, 1912.

In order to economise floor space in distilling plants the condenser is arranged horizontally above two evaporators placed side by side. The steam from the evaporators passes through short passages controlled by sluice valves into annular enlargements at the ends of the condenser and flows through holes formed in the upper halves of the inner walls of these enlargements into the steam space of the condenser.—H. H.

Drying apparatus. P. Rassmus. Fr. Pat. 439,510, Jan. 29, 1912. Under Int. Conv., Jan. 30, 1911.

The drying is effected by a number of parallel tubes in a casing grouped round a strong central tube by which they are rotated and to which they are attached by a number of frames spaced apart. The heating medium passes through the tubes and the whole casing is rotated by suitable means within an outer casing, the material to be dried passing through the annular space between the two casings.—W. H. C.

Distillation of liquids; Process and arrangement for the ——. F. von Werenbach. Fr. Pat. 439,780, Jan. 25, 1912. Under Int. Conv., Jan. 27, 1911.

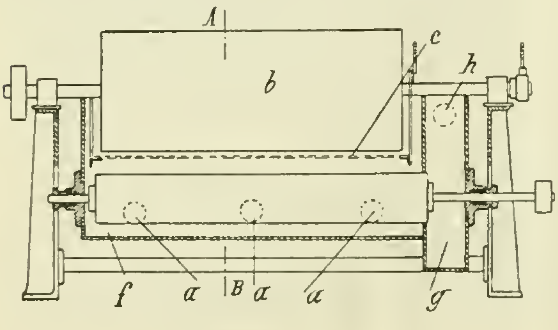
The vapours from the still are at first conducted into a closed receiver standing in an empty tank and provided with an outlet for the air which is driven out by the vapours. As soon as the air has been driven out the outlet is closed and water is poured into the tank with the result that the vapours are condensed and a vacuum is produced. The distillation is then continued under the reduced pressure thus obtained.—W. H. C.

Evaporating apparatus; Polyphase multiple effect ——. A. Mansion. Fr. Pat. 439,980, April 20, 1911.

The apparatus consists of a series of horizontal tubular evaporators set step fashion and provided with distributing chambers to ensure that the liquid passes through all the tubes as a thin film. In a system consisting of 18 evaporators, the first three are heated by steam from an external source and the vapour given off in the first evaporator serves to heat the fourth and so on, the last three being connected with a vacuum pump and condenser. The condensed steam, the liquid undergoing evaporation and any uncondensed vapour from the heating chamber, all travel forward in the same direction from the inlet to the outlet of the apparatus.—W. H. C.

Extracting the juices or the water from animal, vegetable or mineral materials; Apparatus for ——. Ges. für Elektro-Osmose m.b.H. Fr. Pat. 439,271, Jan. 22, 1912. Under Int. Conv., Oct. 2, 1911.

The liquid to be treated enters the chamber, *f*, which contains the anode, *b*, the cathode, *c*, and an agitator, through the openings, *a*, and flows in a direction parallel to the axes of the electrodes into the secondary chamber, *g*. This chamber is at a lower level than the other, *f*, and is connected with it only at the place where the agitator enters the chamber, *f*. The liquid passes into the second chamber after the particles have been deposited on the electrodes and is discharged through the opening, *h*.—W. H. C.



Filter. S. Bornett, Cologne, Germany. Eng. Pat. 7232, March 25, 1912. Under Int. Conv., March 24, 1911.

The filter is constructed of filtering elements which may be conical or of any other suitable shape, and project upwards from the bottom of a tank into which the liquid to be filtered is delivered. The filtering elements are connected with a vacuum pump, and solid bodies which may, if so desired, be filter elements, are suspended between the filter elements first mentioned. This is done so that the solids which separate out on the surface of the filter elements, may become compacted together by reason of their being separated in the confined space between the filter elements and the suspended solid bodies.—W. H. C.

Cooling plates for rectifying columns for volatile products; System of ——. E. A. Barbet. First Addition, dated March 29, 1911, to Fr. Pat. 432,569, Oct. 6, 1910 (this J., 1912, 112).

The claim is for the combination of the system of cooling the plates of the column described in the principal patent with that of methodical overflows described in Fr. Pat. 379,039 of 1906 (this J., 1907, 1190).—W. H. C.

Kiln; Continuous ——. R. Daudy. Fr. Pat. 439,652, April 14, 1911.

The interior of the kiln is divided into a number of compartments by vertical hollow walls through which the heating gases are caused to circulate in a zig-zag manner by horizontal partitions. The material to be treated is fed into the upper end of the kiln and is withdrawn from the lower end by a centrifugal fan-like device.—W. H. C.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Dimethyldicyclopentyl, a petroleum hydrocarbon; Conversion of carbazole into ——. J. Schmidt and A. Sigwart. Ber., 1912, 45, 1779—1787.

In a research on hexahydrocarbazole it was found necessary to investigate closely the reaction on carbazole of phosphorus and hydriodic acid. If excess of phosphorus be used, and the temperature be kept at 130° C., an almost quantitative yield of hexahydrocarbazole is obtained; but if less phosphorus be used, and the temperature be maintained at 230°—240° C., there is a considerable yield of a liquid hydrocarbon instead. Graebe and Glaser obtained this hydrocarbon in small quantity, when preparing hexahydrocarbazole, and attributed to it the formula, $C_{12}H_{20}$. The authors, however, find its formula to be $C_{12}H_{22}$; and its behaviour, especially the results of its oxidation by nitric acid, when large amounts of butyric acid are obtained, prove it to be dimethyldicyclopentyl $(CH_3.C_5H_8)_2$. The purified hydrocarbon is a colourless mobile liquid of marked petroleum-like odour, boils at 213°—214° C. at 738 mm. pressure, has a specific gravity of 0·8784 at 20° C., and refractive index n_D of 1·4730 at 25° C. Mabery and others isolated from Louisiana petroleum several members of a homologous series of which $C_{12}H_{22}$ was the lowest, and they took this to be dihexahydrodiphenyl; but Coates afterwards found two lower members of the series containing C_{11} and C_{10}, and concluded therefore that, whatever the constitution of $C_{12}H_{22}$, it could not be dihexahydrodiphenyl. The authors consider it very probable that this hydrocarbon is identical with that which they have obtained.

from carbazole; for the properties of the two agree fairly closely (bearing in mind the fact that no sharp separation of the homologues in petroleum would be possible), and the smell of the new hydrocarbon is very characteristic of petroleum. It thus seems very probable that American as well as Caucasian petroleum contains cyclopentanes.
—J. T. D.

Coal dust explosions in mines. Report of Committee. Parl. Paper. 1912. [Cd. 6307.] [T.R.]

The results of a number of important experiments with reference to the use of incombustible dust in order to diminish the danger of explosions caused by coal dust in mines are given in the first report to the Home Secretary of the Explosions in Mines Committee.

The Committee state that it may now be considered established beyond all doubt that coal dust suspended in air is capable of being ignited without the presence of any inflammable gas, and of propagating an explosion through the dusty galleries of mines. Experiments at the Altofts Colliery, Normanton, Yorkshire, in 1908 and the two following years, undertaken by the Mining Association of Great Britain, demonstrated conclusively that coal dust, in the complete absence of firedamp or other inflammable gas, is explosive when raised as a cloud in air and ignited under conditions which may exist in a coal mine, and moreover is capable of producing such destruction as is observed after a colliery disaster. The experiments also indicated that the admixture of increasing proportions of an incombustible dust with the coal dust rendered the initiation of an explosion increasingly difficult to accomplish, and that therefore a means of preventing coal-dust explosions in mines might possibly exist in the treatment of the roads with incombustible dust such as stone dust.

Effects of inert dust.—The present Committee began their inquiry in May last year, and their experiments have been carried out at a specially prepared station on the seashore near Eskmeals, Cumberland, on land adjoining Messrs. Vickers' gun range. The works are screened from the surrounding country by sand-hills. The comprehensive investigations undertaken by the Committee are not yet finished, and it may be some time before they can, from their own experiments, recommend definite precautions, but they call attention in this report to the proposal to use an inert dust to prevent explosions. The experiments of the Mining Association, they say, show that the liability of dry coal dust to ignite is largely reduced by an admixture of fine stone dust, but further experiments they consider are necessary. For instance, it has not yet been proved that a flame of coal dust that has attained full explosive violence in a mine will be extinguished on reaching a region where stone dust has been strewn over the coal dust, nor that an explosion of firedamp would not be "extended" by a thin layer of coal dust deposited on stone dust. Further experiments also are needed to test the correctness of Sir F. Abel's conclusion that the presence of an incombustible dust may increase the danger of a gas explosion. The latter experiments the Committee have already started.

Steps have been taken at Altofts and elsewhere to test the effect of inert dust, which is scattered by hand over the whole surface of such haulage roads as require it. This application of inert dust needs no considerable expenditure of capital nor laying down of plant, and is not a costly operation, and the Committee are of opinion that even in the present incomplete state of their knowledge as to the exact action of inert dust those who are working and carrying coal along dry and dusty roads would be well advised to take into consideration this means of obviating danger. The proposal to prevent the ignition of coal dust by admixture with an inert dust may not be applicable in all mines, but the Committee consider that the results of the experiments so far as they have gone are sufficiently striking to merit serious attention.

Dangerous and harmless dusts.—As to the effect of incombustible dusts on health, Dr. Haldane, F.R.S., the well-known authority on injurious dust, advised the committee which conducted the Altofts experiments that coal dust or dusts containing no free silica would not be found to be injurious in any marked degree, but that dust containing uncombined silica or other hard material was exceedingly dangerous. The evidence so far given before the Royal Commission on Metalliferous Mines entirely bears out Dr. Haldane's view. Fearing that the introduction of dust into mines might, unless carefully regulated, produce evils worse than those which it aimed to cure, the committee asked Dr. Beattie, Professor of Pathology at Sheffield University, to conduct special experiments with—(1) the coal dust used in the Altofts experiments; and (2) the shale dust used there with a view to making the mine safe from explosions. The lungs of various animals were exposed to dust to such an extent as to produce fibrosis of the lung, a condition which, while it does not greatly impair the general health, renders the lung very subject to tubercular infection. Dust (say the committee) does not of itself produce tuberculosis, but induces in the lung a fibroid condition, and the work is completed either simultaneously or subsequently by tubercular infection.

The results of Dr. Beattie's experiments in a very marked way confirm Dr. Haldane's opinion. They seem to show that dust, if of slate or shale or other argillaceous substances, is not dangerous. On the other hand, all kinds of dust containing finely powdered silica in its crystalline condition, such as is found in Sheffield grinders' shops, are apt to produce fibrosis of the lung and thereby to facilitate the production of tuberculosis. It follows therefore, that such dusts as these are likely to be dangerous. The lungs of a dead pony which had worked about 14 years underground at Altofts, and for the last year had been subjected also to the effect of shale dust, contained very little coal dust and no shale dust. The lung was quite free from fibrosis. According to Dr. Beattie, this might be explained by the length and diameter of the windpipe, which having a large superficies absorbed the dust readily so that comparatively little reached the lung. It would therefore appear that no injury is to be anticipated to animals in the mine by the use of shale dust such as that at Altofts. According to Dr. Beattie's experiments, the shale dust used by him does not seem any more injurious than ordinary fine coal dust; and the Committee have no doubt that other dusts, when submitted to similar tests, will be found equally innocuous. They propose to have such tests made of other dusts. They think this method of investigation is likely to prove valuable not only to the mining industry but to others.

The heating value of gas. Times, July 19, 1912. [T.R.]

The Committee of the House of Commons on Unopposed Bills has passed the Bill authorising the South Suburban Gas Company to acquire the undertakings of the Bromley and Crays and the West Kent Gas Companies. The most interesting feature of the Bill is the adoption of a test for the calorific value of the gas supplied within the area of the amalgamated company in substitution of the present penalty test for illuminating power. Penalties are attached for any deficiency in the prescribed standard of calorific value, but no penalty is incurred unless the gross calorific value falls below 475 B.Th.U. per cb. ft. (J. Gas Lighting, 1912, **119**, 241). The substitution, which has been agreed to by the company on the suggestion of the London County Council, is due to the almost universal adoption of incandescent mantles and to the largely-increased use of gas for heating and cooking purposes. The only other company which is subject to a calorific value test is the Gas Light and Coke Company.

Increasing value of coke by-products. E. W. Parker U.S. Geological Survey, June, 1912. [T.R.]

A striking and encouraging feature of the condition of the industry is an increase in the amount of coke made in by-product ovens and the incidental conservation of the gas and coal-tar products otherwise wasted. In sympathy with the depression in the iron trade, the total production of coke decreased 15 per cent. in 1911, compared with 1910, but the output from the by-product ovens increased 10 per cent., and the increase in the number of ovens of this type in operation was larger than in any other year, with one exception, since they were introduced into the United States. The total production of coke in 1911 was 35,555,362 short tons, valued at $84,103,571, compared with 41,708,810 tons, valued at $99,742,701, in 1910. The 1911 output consisted of 27,705,517 tons of beehive coke, with an average value of $2.05 a ton, and 7,847,845 tons of by-product coke, with an average value of $3.48 a ton. The difference in price was due largely to the fact that most of the by-product plants are situated nearer to the markets for coke, as well as for gas and other by-products, so that the transportation charges are added to the cost of the coal instead of to that of the manufactured coke. The beehive ovens produced an average of 466 tons each; the by-product ovens an average of 1,817 tons each. At the close of 1911 there were 2,254 ovens in course of construction, of which 698 were of the by-product type.

The problem of gasoline supply. Oil, Paint, and Drug Rep., July 22, 1912. [T.R.]

The question of meeting the growth in the consumption of the more volatile petroleum products is the vital issue of the day in the industry. An advance of one cent in all varieties on July 1, 1912, marked the seventh upward move so far this year; the following table of comparisons gives the figures:—

	Price.		
	Jan. 1, 1912. cents.	Preseat. cents.	Gain, per cent.
Naphtha, auto, steel barrels ..	9	16	77·78
Wooden barrels	12¾	19¾	54·90
Varnish makers' and painters'	10	16	60·00
Gasoline, 86 degrese	22	27	22·75
74 at 76 degrees	17	24	41·18
68 at 72 degrees	14	21	50·00
Stove	12¾	19¾	54·90

In the export quotations there have been general advances, which work out as follows:—

	Price.		
	Jan. 1, 1912. cents.	Present. ceats.	Gain, per cent.
In 100-gallon drums—			
Benzine, 59 at 62 degrees....	8¼	11¼	36·36
Gasoline, stove	11	15	36·36
Naphtha, 68 at 72 degrees	14	17½	25·00
73 at 76 degrees	17	20½	20·59
In caas and cases, 200 aad more—			
Benzine, 59 at 62 degrees....	12¾	15¾	23·53
Gasoline, stove	15½	19½	25·81
Naphtha, 68 at 72 degrees	18½	22	18·92
73 at 76 degrees	21½	25	16·28

The production of lighting oils has been increased to cover the demands for internal combustion engines. The best solution of the problem would be to divert the heavier oils into the fields of consumption of the lighter distillates. In the latest data covering the exports of petroleum products for the fiscal year ending June, are shown shipments of illuminating oil for the last year of 1,019,871,077 gallons, valued at $58,508,732, as against 1,010,416,363 gallons ($56,660,303) for the former fiscal year, indicating a bare gain of 0·936 per cent. in quantity and of 3·26 per cent. in value. In their relation to the total mineral oil exports the illuminating figures constitute 63·37 per cent. in quantity and 56·72 per cent. in value. The shipments of naphthas during the same period reached 132,611,645 gallons, as against 90,108,221 gallons previously, a gain of 47·17 per cent. In values the record shows a heavier increase, $12,022,063, as compared with $7,526,213, or 49·74 per cent. The exports of naphthas comprised 8·24 per cent. in quantity and 11·66 per cent. in value of the entire mineral oil shipments.

The following table gives the proportionate yield of illuminating oil and naphthas in the principal fields of the United States:—

	Illuminating oil.	Naphthas.
	per cent.	per cent.
Appalachian	67	12
Lima (Indiana)	43	11·5
Illinois	31·2	13·2
Mid-continent	41	11
Gulf	15	3
California	18	6

The production of lighting oil is thus nearly four times that of the naphthas. The export figures already given show that the foreign trade in lighting oil outnumbers that in naphthas by nearly seven to one, but the bulk of the kerosene is shipped abroad, while that of the naphthas is consumed at home.

The adaptability of kerosene to motor engines has attracted much attention, but the difficulties are primarily the starting the engine on the heavier fuel, and the excess of carbon, which clogs it. Engine-builders have evolved a system whereby kerosene and gasoline are so combined as to insure high volatility, with a minimum deposit of carbon in the engine. The dependence upon the lighter oil in starting the engine is generally recognised, after which the incorporation of the heavier fuel presents little trouble. With the engine running freely, kerosene should prove the more serviceable product, as it has 2100 thermal units per pound, as against 1800 units for gasoline, besides an advantage in cost.

Patents.

Agglomerating powdered or granular materials, especially carbon; Process for ——. E. M. Heckel, Bouches-du-Rhône, France. Fr. Pat. 439,605, Jan. 26, 1912.

Powdered materials (cokes or charcoals, etc.) are agglomerated by means of glucose (or other suitable amylaceous substances, sugars, etc.), admixed in the proportion of about 4 or 5 per cent., and the mixture is heated for an hour to about 150° C., at which temperature the decomposition of the glucose commences. Naturally occurring glucose may be employed, or it may be obtained from any starchy material or by the inversion of an inferior sugar such as molasses. The agglomerated material is stated to be resistant to boiling water.—H. H.

Coke oven. O. Piette. Fr. Pat. 439,695, Feb. 3, 1912.

In a horizontal coke oven the heating flues are arranged vertically in groups of say four, communicating at the bottom with compartments which are supplied with gas passing through passages running through the floor of the oven and with air passing through orifices formed in walls separating the said compartments from air compartments arranged side by side therewith. The air compartments communicate with one another through orifices which are fitted with removable pierced or hollow cones of refractory material, and the supply of air to the various groups of heating flues is regulated by the insertion of cones of different size according to requirements.—H. H.

Carburetted water-gas; Manufacture of ——. J. M. Rusby, Assignor to The United Gas Improvement Co., Philadelphia, Pa. U.S. Pat. 1,030,332, June 25, 1912.

The gas-making region in the producer is extended by forcing the blast of air into the centre of the mass of fuel and passing the producer gas formed through the whole length of the producer, so as to store up some of its heat in the comparatively cool fuel. The partly cooled gas is then burned and serves to heat up the chamber through which the blue water-gas, produced by blowing steam through the incandescent fuel, after carburetting with a suitable hydrocarbon, is passed to fix the vapours.
—W. H. C.

Separating tar from distillation gases by means of tar, gas liquor containing tar, or a mixture of the two; Process and apparatus for ——. C. Otto and Co., G. m. b. H. Third Addition, dated Jan. 15, 1912 (under Int. Conv., June 9, 1911), to Fr. Pat. 390,470, May 22, 1908 (this J., 1908, 1052).

In each of the ejector tar extractors employed, the vertical pipe conveying the washing liquid is centrally disposed within the gas conduit and may be raised or lowered therein for the purpose of regulating the gas exit: the flow of the washing liquid is regulated by raising or lowering an adjustable horizontal plate attached to the lower end of the pipe.—W. E. F. P.

Materials containing ferric chloride or oxychloride [for purifying acetylene]; Process for activating and rendering complete the oxidation or re-oxidation of ——. P. J. Granjon. Fr. Pat. 440,207, Feb. 15, 1912.

The oxidation by aeration of solutions, etc., of iron chloride (such as those employed for the removal of hydrogen phosphide from acetylene) is facilitated—it is claimed—by the incorporation of a small quantity of copper sulphate (or other copper salt) with the liquid or mass.—W. E. F. P.

Gaseous motive agent; Process for obtaining a —— *employing tetranitromethane as the supporter of combustion.* P. Winand. Fr. Pat. 439,877, Feb. 8, 1912. Under Int Conv., Feb. 25, 1911.

As a motive agent for submarines, etc., an intimate mixture of a combustible gas with tetranitromethane is employed: the mixture is produced by the use (in an appropriate "burner") of liquefied acetylene, ethane, or ethylene, by the vapourisation of which the liquid tetranitromethane is atomised as it enters the combustion chamber.
—W. E. F. P.

Gases from the distillation of coal; Separation of the tar and ammonium chloride contained in the ——. Solvay et Cie. Fr. Pat. 439,509, Jan. 29, 1912.

The gases issuing from the retort are first cooled to a temperature (180°—120° C.) sufficient to cause the deposition of the ammonium chloride with a small proportion of the tar, and then conducted to the tar extractor, the compartments of which are maintained at temperatures sufficient to prevent condensation of water with the tar.—W. E. F. P.

Elimination of carbon bisulphide contained in liquids, gases, etc. Fr. Pat. 439,783. *See* VII.

Machines for expressing liquids from materials [peat, etc.] containing them. Fr. Pat. 439,503. *See* I.

Ammoniacal residues [gas purifiers]: Process of treating —— *to increase agricultural value.* Fr. Pat. 439,365. *See* XVI.

Pyrometers. Eng. Pat. 6364. *See* XXIII.

Method of preparing dehydrated [graphite] mixtures. U.S. Pat. 1,030,372. *See* VII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

Distillation of bituminous coal and the like. J. M. Rusby and O. B. Evans. Assignors to The United Gas Improvement Co., Philadelphia, Pa. U.S. Pat. 1,030,333, June 25, 1912.

The coal and a refractory substance are arranged in alternate layers in an upright chamber provided with flues in the side walls and ports for the introduction or extraction of gas. The coal and refractory material pass downwards and the former is coked by passing hot gases from a furnace, horizontally through the layers of refractory material.—W. H. C.

Hydrocarbons; Process for transforming high boiling —— *into hydrocarbons of lower boiling point.* L. G. Leffer. Fr. Pat. 439,476, Jan. 29, 1912.

The process consists in distilling high boiling hydrocarbons at a high pressure produced by pumping an inert gas such as hydrogen, nitrogen, carbon dioxide, or methane into the still. The gas passes through the condenser and receiver back to the pump. The petroleum in the still is preferably agitated by means of a rotary stirrer, or by the introduction of the compressed gas beneath the surface thereof, and its temperature is not allowed to exceed 410° C.—H. H.

Ketones and esters; Process for making ——. J. Effront. Fr. Pat. 439,683, Feb. 3, 1912.

Fatty acids are converted quantitatively into ketones by passing their vapours mixed with steam over coke or charcoal heated to between 300° and 400° C., contained in an iron tube or other suitable apparatus. When a mixture of two fatty acids is employed the corresponding mixed ketone is produced. Coke may also be used as a catalytic agent in the preparation of esters from alcohols and acids; the temperatures employed vary for different esters; thus, for preparing methyl or ethyl acetate a temperature between 150° and 180° C. is best, whilst the butyrates are preferably obtained between 180° and 210° C. In the preparation of esters the reaction is accelerated by addition of a very small quantity (0·05 per cent.) of a mineral acid. The yields are almost quantitative.—T. F. B.

Acetone; Process for making ——. Cadoret de la Gabinière and E. Deligeon. Fr. Pat. 439,732, April 15, 1911.

In order to avoid the agglomeration of the hot mass which occurs when calcium or barium acetate is heated, it is proposed to substitute a double acetate in the manufacture of acetone. Thus, it is stated that when the double acetate of barium and calcium, obtained by the action of acetic acid on the double carbonate, is heated to the temperature necessary to produce acetone, a spongy mass of the double carbonate is produced, which conducts heat sufficiently well to render mechanical disintegration unnecessary. The process may be made continuous by treating the residue with acetic acid.—T. F. B.

Combustion or treatment by heat of pulverulent materials. E. Gobbe, Jumet, Belgium. Eng. Pat. 15,686, July 5, 1911. Under Int. Conv., July 8, 1910.

In an apparatus for burning, oxidising, baking, fusing, or reducing pulverulent substances, of the kind in which a forced draught is admitted tangentially to the interior of a cylindrical working chamber, the chamber is made in the form of a drum standing on its curved surface, the air or other gas being admitted tangentially at the top and the burnt gases or other gaseous products removed from the centre of one of the flat sides, while the powdered material is introduced by means of a revolving metal brush through an aperture slightly above the centre of the other flat side. The ashes or other solid or liquid products are removed through an opening at the bottom. The apparatus may be used as an ordinary furnace, as a gas producer, as a cement or lime kiln (the powdered combustible being introduced with the chalk or other cement materials), as a blast furnace, or as a glass kiln (gaseous fuel being used in this case to avoid discolouration of the glass). In a modified form the drum-shaped chamber rests upon one of its flat sides, and the powdered material is, in this case, admitted near the gas outlet, at the top of the chamber.
—H. H.

Radioactive materials; Process for utilising the illuminating power of ——. Soc. Geb. Junghans A. G. Fr. Pat. 440,127, Feb. 13, 1912.

The figures on a dial, or other objects, which are required to be self luminous, are formed hollow and the hollow spaces filled with a material such as zinc sulphide upon which a layer of gum is superposed and a radioactive substance sprinkled thereon. The radioactive substance renders the zinc sulphide uniformly luminous even when very small quantities are employed, so that economy is effected and the harmful effect of the radioactive material upon the glass covering the dial is lessened.—H. H.

III.—TAR AND TAR PRODUCTS.

Conversion of carbazole into dimethyldicyclopentyl, a petroleum hydrocarbon. Schmidt and Sigwart. *See* IIA.

PATENT.

Elimination of carbon bisulphide contained in liquids, gases, etc. Fr. Pat. 439,783. *See* VII.

IV.—COLOURING MATTERS AND DYES.

Leuco bases and dyestuffs derived from diphenylethylene. Preparation of two cyclohexylidene bases. P. Lemoult. Comptes rend., 1912, **155**, 217—219. (See also this J., 1911, 531.)

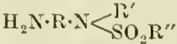
THE author gives details of the preparation of the two bases $C_6H_{10}:C[C_6H_4N(CH_3)_2]_2$. and $C_6H_{10}:C[C_6H_4N(C_2H_5)_2]$ By means of the Grignard reaction magnesium cyclohexyl bromide is caused to react with Michler's ketone $[C_6H_4N(CH_3)_2]_2CO$ or its ethyl homologue $[C_6H_4N(C_2H_5)_2]_2CO$. After adding the ketone, the mixture is boiled for 6 hours. A certain amount of dicyclohexyl and of unattacked ketone is recovered, but the yields of base are quite satisfactory, being 82 and 60 per cent. respectively.—W. H. P.

PATENTS.

Aminoanthraquinone carboxylic acids, their substitution products, and dyestuffs derived therefrom; Process for producing ——. Badische Anilin und Soda Fabrik. Second Addition, dated Jan. 31, 1912, to Fr. Pat. 425,859, Jan. 19, 1911. Under Int. Conv., July 12, 1911.

THE acridones obtained according to the principal patent (this J., 1911, 947), and containing the carbonyl of the acridone ring in the *a*-position as regards at least one anthraquinone residue, are converted into vat dyestuffs by treatment with hydrazine. *Example.* Five kilos. of the anthraquinone-acridone, obtained from 3-amino-4-methyldiphenylketone-2′-carboxylic acid and 1-chloroanthraquinone-2-carboxylic acid, is heated with 5 kilos. of hydrazine hydrate and 250 kilos. of cresol, for 8 hours at about 120° C.: the product, which separates in crystalline form, is filtered, washed with cresol and then with alcohol, and dried; it is insoluble in most organic solvents, but is converted by alkali hydrosulphite into a brown vat which dyes cotton fast grey shades. The dyestuff obtained in a similar manner from the acridone from 3-amino-4-chlorodiphenylketone-2′-carboxylic acid, produces on cotton brownish shades converted by exposure to air into violet.—T. F. B.

Azo dyestuffs for wool and process for producing them. Act.-Ges. f. Anilinfabr. Fr. Pat. 439,400, Jan. 26, 1912. Under Int. Conv., June 17, 1911.

DYESTUFFS which dye wool red to brown shades from acid baths are obtained by combining in alkaline solutions with β-alkylamino- or β-arylaminonaphtholsulphonic acids, the diazo compounds of diamines of the type,  $H_2N{\cdot}R{\cdot}N{<}^{R'}_{SO_2R''}$, where R and R″ are benzene nuclei, substituted or not, and R′ is an alkyl or aralkyl group. Thus, the dyestuff from 5-amino-2-*p*-toluenesulphomethylaminotoluene

$$(R{=}C_6H_3.CH_3\,;\,R'{=}CH_3\,;\,R''{=}C_6H_4.CH_3)$$

and 2-phenylamino-8-naphthol-6-sulphonic acid dyes wool brown.—T. F. B.

Diazotised nitraniline; Process for rendering stable solutions of ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 439,535, Jan. 30, 1912. Under Int. Conv., Oct. 20, 1911.

AQUEOUS solutions or printing pastes containing diazonitraniline can be rendered stable by the addition, before or after diazotisation, of small quantities of aromatic sulphonic acids or their salts, *e.g.*, sulphonic acids of naphthalene or of anthraquinone. It is stated that the addition of one part of naphthalenetrisulphonic acid to three or four parts of the nitraniline is sufficient to ensure stability of the diazo solution.—T. F. B.

Sulphide dyestuffs; Process for making leuco-derivatives of —— *in the form of alkali salts.* Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 440,061, Feb. 12, 1912. Under Int. Conv., April 24, 1911.

THE alkali salts of leuco derivatives of sulphide dyestuffs are obtained in a solid, stable form by evaporating to dryness the solutions resulting from the complete reduction of the dyestuffs by agents other than alkali sulphides. It is advisable to use the dyestuffs in the form of pastes free from sulphur and sodium sulphide. The reduction may be effected by means of glucose and an alkali, with or without using excess of glucose, or by a mixture of glucose and a hydrosulphite; or the glucose may be replaced by an equivalent substance, such as maltose, lævulose, "wood molasses," or mixtures of these. It is preferable to evaporate the solutions *in vacuo*, and without isolating the leuco-derivative. The products obtained are very readily soluble, and are at once available for dyeing from the vat.—T. F. B.

Use of "Rhus Pentaphylla" for the manufacture of tanning or dyeing extracts. Fr. Pat. 439,784. *See* XV.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Silk from India. Bull. Imp. Inst., 1912, **10**, 212—214.

THREE samples of silk gave the following results on examination :—

	No. 1.	No. 2.	No. 3.
Moisture in material as received, on drying at 105° C., per cent.	9·1	0·8	9·7
Loss in weight on "boiling off" in neutral soap solution, per cent. on dried material	20·7	18·8	25·7
Diameter of raw silk thread as received	0·0012 to 0·0029 in., mostly 0·0015 –0·0020 in.	0·0022 to 0·0045 in.	0·0015 to 0·0029 in., average 0·0022 in.
Diameter of brin (single filament)	0·0003 to 0·00055 in., average 0·00043 in.	0·00025 to 0·00045 in., average 0·00033 in.	0·0003 to 0·0005 in., average 0·00037 in.

Nos. 1 and 2 were from Eastern Bengal and Assam. No. 1, from Mirganj, was said to be worth about 11s. per lb., and No. 2, from Rajshahi, 8s. per lb. (Nov. 1910); both of them, though of somewhat low value, show promise of future success, if more modern methods of reeling are adopted. No. 3, from Bangalore, Mysore, was of good quality, superior to ordinary Bengal silks, but not equal to those of China and Japan. It was said to be worth probably 13s. 6d. per lb. (June, 1911).—A. S.

Cotton and Sisal hemp from Papua (British New Guinea). Bull. Imp. Inst., 1912, **10**, 214—216.

A SAMPLE of Caravonica cotton, which had been grown at the Government Experiment Station, Rigo, was of excellent quality, the fibres being of rather greater length than any sample of Caravonica cotton previously examined at the Imperial Institute. The cotton was of a somewhat rough, woolly character, and would be suitable for the manufacture of "union" yarns. It was valued at 10d. per lb., with "good" moderately rough Peruvian at 8¼d. per lb., and "good" rough Peruvian at 9d. per lb.

A sample of Sisal hemp from Rigo compared very favourably in chemical composition and behaviour with Sisal hemp from the East Africa Protectorate, being somewhat richer in cellulose and less affected by the action of hot dilute alkali. Though the material showed evidence of somewhat imperfect preparation in parts, it was valued at £25 per ton, with best Mexican Sisal hemp at £26 per ton.—A. S.

Fibres from India. Bull. Imp. Inst., 1912, **10**, 216—219.

THE fibres examined were received from Eastern Bengal and Assam. Three samples of Sisal hemp were valued respectively at £25, £23, and £22 per ton in London, with best Mexican Sisal at £22, and the best grades of East African Sisal at £24—£26 per ton. In chemical composition and behaviour, two of the samples compared favourably with Sisal hemp from the East Africa Protectorate, but the third sample was somewhat inferior; all three kinds would, however, be readily saleable. A sample of Sisal tow, consisting of fine white tangled fibre of good strength, was valued at £13—£14 per ton in London (Nov. 1911). A sample of "fibre of Sida sp." proved to be comparable with the very finest Calcutta jute and was valued at £30 per ton, with "first native marks" Calcutta jute at £20 per ton.—A.S.

Cellulose; Acetolysis of ——. F. Klein. Zeits. angew. Chem., 1912, **25**, 1409—1415.

FOR the preparation of cellobiose octacetate, 10 grms. of cellulose are treated with 50 grms. of a mixture containing 80 per cent. of acetic anhydride and 20 per cent. of sulphuric acid, with special precautions to avoid local rise of temperature in the early stages. Subsequently the temperature may be raised to 35° C. or even 60° C. in order to accelerate the action. After 2—4 days the liquid sets to a mass of crystals, it is then diluted with glacial acetic acid and poured into a litre of water. The dried precipitate is re-crystallised from three times its weight of 96 per cent. alcohol, the crystals forming long needles or leaflets. With proportions less than 3·5 per cent. of sulphuric acid or more than 30 per cent., no crystallisation of the octacetate is obtained. Hydrocellulose gives the same result as cellulose and is more easily manipulated. The highest yield of cellobiose octacetate obtained is 60 per cent. of the weight of cellulose, or about 30 per cent. of the theoretical quantity. Although not more than about one-third of the monose groups of cellulose are obtained in the form of cellobiose octacetate, the evidence is quite in accordance with the view that all these groups are combined in the same manner. The by-products are of two kinds: acetylated cellulose-dextrins and products soluble in water of the nature of mixed aceto-sulphuric esters. The acetates obtained from the alcoholic mother-liquors from the crystallisation of the cellobiose octacetate, having specific rotations from +11° to +34°, are doubtless intermediate products of the break-down of the cellulose molecule. The regular rise in the rotatory power and percentage of combined acetic acid, in these fractionated dextrin acetates, makes it almost certain that acetolysis proceeds in a regular series of steps. The products soluble in the aqueous liquors after precipitating the dextrin and cellobiose acetates have not been fully investigated: in certain circumstances, these water-soluble products amount to 40 per cent. of the weight of the cellulose, and their properties suggest that they are probably aceto-sulphates either of cellobiose or of dextrose. The experimental methods of investigating the various products of acetolysis include observations of melting point, hygroscopic moisture, specific rotatory power in chloroform solution, combined acetic acid, cupric reducing power and solubility of the free dextrins obtained on saponification. The combined acetic acid is best determined by hydrolysis with a mixture of equal volumes of sulphuric acid and water and titration of the volatile acid. Alkaline saponification with *N*/2-alcoholic sodium hydroxide for 12—18 hours must be resorted to when it is desired to investigate the free dextrins; the acetic acid thus found is 1—3 per cent. higher than by acid hydrolysis. For the isolation of the free dextrins soluble in water, saponification with baryta water is more convenient. The melting points of the dextrin acetates are very doubtful and range round about 100° C.; cellobiose octacetate alone melts sharply, at 222° C.; the combined acetic acid is 70·4 per cent., and $[\alpha]_D = +41{\cdot}7^\circ$.—J. F. B.

Cellulose, hydrocellulose, and alkali-cellulose; Comparative acetylation of ——. H. Ost and T. Katayama. Z. angew. Chem., 1912, **25**, 1467—1470.

SAMPLES of cellulose, hydrocellulose, and alkali-cellulose were acetylated both in presence of zinc chloride and of sulphuric acid, under similar conditions, and the resulting acetates were examined as regards solubility in alcohol, acetone, and chloroform, and the dissolved fractions tested for rotatory power and acetic acid content. In the first series of experiments, 5 grms. of the cellulose was acetylated at 70° C. with 25 grms. of acetic acid, 25 grms. of acetic anhydride, and 2·5 grms. of zinc chloride; the acetates obtained from hydrocellulose and alkali-cellulose, after like periods, contained larger percentages soluble in acetone than the acetates of cellulose; in each case the percentage soluble in acetone increased with the period of acetylation, indicating hydrolysis. Both hydrocellulose and alkali-cellulose were completely esterified within two hours, whilst the cellulose required 20 hours. After 65 hours' treatment, the acetates from cellulose contained 21·7 and 22·5 per cent. soluble in acetone, whilst after 2 hours the esters from hydrocellulose contained 18·9 per cent. and after 20 hours 32·8 per cent., and those from alkali-cellulose after 2 hours' treatment 27·1 per cent. soluble in acetone. These acetone-soluble portions gave films which were either very brittle or non-elastic. In the second series of experiments the same quantities were used, but the zinc chloride was replaced by 0·5 grm. of sulphuric acid and acetylation was carried out at the ordinary temperature: in these experiments only cellulose and hydrocellulose were used, and the ester mixtures from these appeared identical after 48 hours: the percentages soluble in acetone were 20·0 and 24·8 respectively. The specific rotatory power of the fractions soluble in chloroform from cellulose and hydrocellulose varied between —20·5° and —21·1°, and from alkali-cellulose from —21° to —22°: the figures for the corresponding portions soluble in acetone were —17·3 to —17·8°, and —21.8°. The acetic acid content of the chloroform- and acetone-soluble fractions agreed in all cases with that of cellulose triacetate, except that of cellulose acetylated in presence of zinc chloride for 65 hours, when it was slightly higher. In the third series of experiments, cellulose and hydrocellulose were acetylated in presence of sulphuric acid at 70° C.: in this case more than half the product was soluble in alcohol and the remainder completely soluble in acetone: when 1 grm. of sulphuric acid was used instead of 0·5 grm., the products were almost completely soluble in alcohol, and consisted principally of cellobiose-octa-acetate; under suitable conditions this ester is converted into α-dextrose-penta-acetate, of m. pt. 112° C., and specific rotatory power (in chloroform) $[\alpha]_D = +101^\circ$.
—T. F. B.

Paper-making fibres from German S.E. Africa. von Possanner. Papierfabrikant, Fest- und Auslandsheft, 1912, **10**, 60—61.

THE author has tested for paper-making purposes two fibrous raw materials received from German South East

Africa. *Maranta arundinacea,* the arrowroot plant, occurs in the form of hard, brittle bundles of fibre with quantities of starch-bearing tissue distributed among them. On digestion with caustic soda, the raw material yielded only 26·6 per cent. of fibre of inferior quality. The fibres are short and brittle and the pulp can only be bleached with extreme difficulty; these defects, together with the low yield, lead to the conclusion that the arrowroot fibre is unsuitable for paper-making purposes. *Ponzolzia hypoleuca* in the raw state is a fibre somewhat resembling ordinary jute in appearance, with adhering particles of woody tissue and pith. On digestion with alkalis the raw material yields a soft, pliable and very strong fibre of greyish-brown colour resembling boiled rag half-stuff. It is easily broken down in the breaking engine, yielding 58 per cent. of half-stuff calculated on the raw fibre. The pulp bleaches easily with about 6 per cent. of bleaching powder, and a fine bright colour may be obtained by washing and finishing off with a further 3 per cent. of bleaching powder. The yield of bleached pulp amounts to 50—54 per cent. The fibres range from 6 to 10 mm. in length with a fibrillated structure with resemblances both to cotton and linen. *Ponzolzia hypoleuca* therefore appears to be an extremely valuable paper-making material, and the question of supply and economic development is worthy of further investigation. —J. F. B.

Paper; Some microchemical reactions of the constituents of ——. L. Kollmann. Papierfabrikant, Fest und Auslandsheft, 1912, **10**, 81—86. (See also this J., 1911, 949.)

THE author has endeavoured to find some microchemical colour reactions which would distinguish between the various constituents of paper, other than definite fibres, when mounted on the slide. Such constituents include amorphous fibre-debris, mineral loading, free rosin, and rosin in combination with alumina. Obviously for such a purpose it is not permissible to reduce the paper to pulp by macerating with a solvent liquid such as caustic soda. The paper must be prepared with water only by digesting with water in a closed tube for about 24 hours with occasional shaking. The pulp so obtained is drained and then contains all the original elements of the paper. If the pulp be mounted in zinc chloride-iodine reagent, the fibre particles assume the usual characteristic red to blue colours, the mineral particles remain uncoloured, whilst the resinous sizing constituents are coloured various shades of yellow to brown. A somewhat similar result is attained by the use of potassium permanganate solution. If the time of contact with the permanganate be not too long (about 2 minutes), the fibre and mineral particles remain uncoloured, whilst the sizing particles show yellow and brown colourations. There is, however, a slight difference between the action of zinc chloride-iodine and permanganate, consisting in the fact that the iodine stains most strongly the particles of free rosin, whereas the permanganate stains mainly the rosin associated with alumina. Neither of these reactions can be utilised when mechanical wood is present in the paper, since particles of wood are stained yellow by both reagents.—J. F. B.

Methyl alcohol as a by-product in the manufacture of wood cellulose. H. Bergström. Papierfabrikant, 1912, **10**, 677—678.

SINCE 1908 the Billingsfors mill has been recovering methyl alcohol as a by-product from the digestion of wood by the sulphate process. In the manufacture of easy bleaching pulp, about 13 kilos. of methyl alcohol are formed per 1000 kilos. of cellulose. Of this quantity, about 5 kilos. per 1000 are collected by condensing the vapours discharged at between 10 and 4 atmospheres from the digesters. This spirit is purer than ordinary wood spirit and contains 0·5 per cent. of acetone. The cost of recovering methyl alcohol amounts only to 10 œre per kilo. (0·6d. per lb.) of absolute alcohol and its value is 45 œre (2·7d. per lb.). Further quantities of crude spirit may be obtained by condensing the vapours discharged below 4 atmospheres and those formed during evaporation of the lyes, and the refining of the raw spirit is profitable. In the present year five sulphate pulp factories are practising the recovery of methyl alcohol. Pine wood and spruce wood yield about the same quantity of spirit. In the digestion of wood by the Ritter-Kellner sulphite process, from 8 to 10 kilos. of methyl alcohol are formed per ton of easy bleaching cellulose, about 3 kilos. being condensed in the "gassing-off" process. If the waste lyes remaining in the digester be then distilled in a continuous column apparatus, a distillate is obtained containing methyl alcohol, acetaldehyde, acetone, oils and sulphurous acid partly in the state of combination; small quantities of formic and acetic acids are also present. The spirit is readily obtained as relatively pure methyl alcohol, containing small quantities of acetone and acetaldehyde; the tail products of the rectification contain terpene alcohols. The capital and manufacturing costs of the recovery process, whether with the sulphate or sulphite digestion, are comparatively small, and since the recovery in no way interferes with the normal working of the pulp mill, the cellulose industry should before long be in a position to supply considerable quantities of wood spirit to the market.—J. F. B.

Extracts of cellulose. [Tanning extracts from sulphite cellulose waste lyes]. Sody. *See* XV.

PATENTS.

Flax; Process of preparing ——. G. H. Campbell, London. Eng. Pat. 14,715, June 21, 1911.

THE dried flax stalks or straw are passed through a breaking machine either with or without a slight preliminary moistening and are then subjected to a fermentation retting or, the broken material may be scutched, spun and woven before the retting process.—P. F. C.

Cellulose xanthate; Process of coagulating ——. A. Boisson, First Addition, dated Apr. 19, 1911, to Fr. Pat. 436,590, Jan. 19, 1911 (this J., 1912, 428).

A SOLUTION of any sulphate followed by a solution of an acid other than sulphuric acid may be used for coagulating purposes.—P. F. C.

Artificial silk and other products from nitrocellulose; Process of producing [and solvents for] ——. J. Duclaux. Fr. Pat. 439,721, Feb. 5, 1912.

(1) METHYL and ethyl formate are valuable as solvents of nitrocellulose and their solvent properties are not materially reduced if an equal weight of methyl or ethyl alcohol be added to them. (2) The recuperation of the formates can be effected by bubbling the vapours containing them through milk of lime or a solution of sodium hydroxide. This treatment hydrolyses the ester and the alcohols can be recovered by any ordinary process. To the solution of calcium or sodium formate the theoretical quantity of mineral acid is added to liberate the whole of the formic acid and the ester is then re-produced by distilling the mixture with nearly double the quantity of alcohol required to esterify the formic acid.—P. F. C.

Pyroxylin products; Process of rendering —— *non-inflammable.* J. V. Clarac. Fr. Pat. 439,648, Apr. 13, 1911.

THE addition of metallic resinolates to collodion renders it uninflammable without impairing its value for the production of artificial silk or celluloid. To prepare the resinolate a vegetable oil, heated to 50°—100° C. is treated with a metallic hydroxide for about one hour. The product is separated and acidified with a weak acid. Thus obtained, it is soluble in most organic solvents and in collodion. Similar substances can be prepared from resins but heating is not then necessary.—P. F. C.

Paper; Manufacture of ——. R. C. Menzies and J. E. Aitken. Fr. Pat. 439,426, Jan. 27, 1912. Under Int. Conv., Jan. 27 and Mar. 23, 1911.

PAPER intended for the manufacture of cheques and other important documents is impregnated with an insoluble thiocyanate, or with a metallic sulphide and the

iodide of a heavy metal, or with an insoluble ferrocyanide. Any combination of these substances may also be used.
—P. F. C.

Elimination of carbon bisulphide contained in liquids, gases, etc. Fr. Pat. 439,783. *See* VII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Steam discharges on Indigo-bottomed goods, by means of chlorates. C. Casanovas. Färber-Zeit. 1912, **14**, 300—302.

For practically working this style, the author makes many recommendations of which the following are the most important:—(1) The zinc vat is more suitable than the ordinary hydrosulphite vat owing to its slower rate of oxidation. (2) If the goods are soured with hydrochloric acid after dyeing, better discharges will be finally obtained; sulphuric acid is not suitable for the purpose as it may give rise to insoluble sulphates. (3) After printing the discharge, the goods should be steamed for at least 2·5 minutes. The discharged places should then be yellow or reddish yellow in colour; a green discharge is a sign of insufficient steaming. (4) The printed goods should be kept out of contact with aniline vapours, or permanently grey discharges may be produced. (5) The Mather-Platt should be provided with an aspirator to remove free chlorine and oxides of chlorine, which would otherwise attack and weaken the blue ground of the goods. (6) If the steam in the Mather-Platt is too moist, the rollers become wet and smear the printed material. (7) It is best to use grey cloth as back cloths during the printing operation. They should then (without drying) be immediately washed. If the back cloth after printing is overdried it is liable to be attacked. (8) After referring to Tagliani's endeavours to protect the ground of the fabric during the steaming process (this J., 1911, 1051) the author states that he obtained good results by printing the dyed fabric (immediately before applying the discharge colour) with a very thin film of a solution containing 50 grms. of glycerin and 200 grms. of sodium thiosulphate in a litre. The action of this mixture he believes to be partly chemical and partly physical.—P. F. C.

Patents.

Mordanting and dyeing of textile fibres. C. Bolton, Halifax. Eng. Pat. 21,036, Sept. 23, 1911.

The addition of bleaching powder or its constituents to a dye-bath increases the affinity of the fibre, and particularly of wool, for mordants and dyestuffs. Example:—1½ lb. of bleaching powder are made into a cream with water and ammonia is added in slight excess. After settling, the clear supernatant liquor is poured into the dye-liquor. Then 100 lb. of wool, 3 lb. of sodium bichromate, 2 lb. of Anthracene Chromate Brown EB, 0·4 lb. of Anthracene Yellow C and 0·2 lb. of Anthracene Chromate Grey G are successively added to the bath and the liquor is raised to the boil in one hour and afterwards boiled for one hour. The wool is thus dyed a deep olive brown without scroop or tendering.—P. F. C.

Mordanting, washing and dyeing yarn on paper tubes; Apparatus for ——. Soc. Anon. de Teinture et d'Impression. Fr. Pat. 439,979, April 20, 1911.

A perforated paper cop bobbin is closed at one end and mounted at the other end on a conical projection fixed at its lower end in one of the perforations of the false bottom of a dye-vat. The projection has a longitudinal opening which places the paper bobbin in communication with the space below the false bottom of the vat. The circulation of the dye-liquor is effected by means of a pump.—P. F. C.

Aniline Black on animal fibres or on mixed animal and vegetable fibres; Process of producing ungreenable ——. J. Heilmann et Cie. and M. M. Battegay. Fr. Pat. 439,337, Jan. 24, 1912.

Diamines or aminophenols are added to ordinary Aniline Black liquors containing either vanadium salts or prussiates. The black is developed either by a long "ageing" or a short steaming. Example:—Wool is thoroughly impregnated with a liquor containing 120 grms of aniline salt, 8 grms. of paraphenylenediamine, 65 grms. of sodium chlorate, 100 grms. of acetic acid (7° B.), 20 grms. of ammonium vanadate (0·1 per cent.) and a suitable amount of thickening in 1 litre of solution. The impregnated material is squeezed, dried, steamed 1—2 minutes and finally washed, soaped and dried.—P. F. C.

Lithographic stones; Manufacture of artificial ——. H. Wagner, Munich, Germany. Eng. Pat. 19,534, Sept. 1, 1911. Under Int. Conv., Sept. 10, 1910.

A powder consisting of two parts of magnesite and one part of lime is mixed and thoroughly incorporated with a solution of nine parts of magnesium chloride and one part of magnesium sulphate. The process is carried out *in vacuo* and at a temperature not exceeding 5° C. The mass in suitable quantity is then transferred into a vessel in which a vacuum has been produced and the vessel is next opened. Solidification is finally effected by compression at a low temperature.—P. F. C.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Alkali, etc., works; Forty-eighth annual report on —— *by the Chief Inspector. Proceedings during the year* 1911, *etc.* pp. 147. Price 1s. 8d.

The number of works registered in the United Kingdom was 1463, a net increase of 29; this includes 167 works in Scotland. Of these, 82 are "alkali" works, 8 being in Scotland. There is again a reduction in the acidity of gases of "all chimneys," this acidity being equivalent to 1·192 grain of sulphuric anhydride per cb. ft., as compared with 1·247 grain in 1910. Out of the 6297 tests made by the inspectors, a very small proportion were found to be in excess of the legal limits, and in no case was it considered necessary to take proceedings. In 4 cases, however, back fees have been accepted, in lieu of penalties, in respect to processes which had not been registered.

Operations continued active throughout the year in the alkali and copper (wet process) works, the number of works being 4 greater than in 1910. A new form of mechanical furnace (see Ramen and Baskow; this J., 1910, 1459), for the calcination of burned cupreous pyrites with common salt, was put into operation during the year, for the first time in this country, and another form has been under trial. In fact, there has been an extended adaptation of mechanical appliances to various chemical processes. At one alkali works in District No. 3 (Cheshire, N. Wales, etc.), hoods have been erected for drawing off the vapours at the time of drawing the hot saltcake from the furnaces, and it is suggested that the idea, which has proved quite successful, might be applied elsewhere with advantage; much fume may also be avoided in this operation by immediately covering the hot material with a little cold saltcake.

The year has been a very active one in the cement industry. The evolution and development of the later forms of kiln still continues, whilst the earlier forms are steadily going out of use; this has been accompanied by a diminution in the proportion of fume given off during working, a lessening in the formation of black smoke, and the discharge of fuel gases, etc., into the air from a smaller number of higher chimneys. Rotary kilns have reached a great size and output capacity; of the 6 erected and started during the year, all exceeded 150 feet in length, the longest being 230 feet.

Further progress has been made in reducing considerably the proportion of dust and fume present in the gases from smelting works, and in preventing the escape of an undue proportion of acid gases. In 3 works calcining zinc blende, the sulphurous gases evolved are successfully utilised in the manufacture of sulphuric acid. S. E. Linder, as the outcome of a series of experiments to determine the accuracy of the "chromate" method of estimating lead, gives the following process. A measured volume, in excess, of standard chromate ($N/50$ strength) is added to the lead solution, and the excess is determined by titration with standard lead nitrate solution (containing 8 grms. of lead nitrate per litre), using silver nitrate as indicator. The solutions are standardised by adding 25 c.c. of the chromate solution, with stirring, to a mixture of 50 c.c. of water, 5 c.c. of sodium acetate solution (nearly saturated, and containing 40 c.c. of glacial acetic acid per litre), and 5 c.c. of lead nitrate solution, heated to about 80° C., and then introducing 0·5 to 1 grm. of precipitated calcium carbonate and heating the mixture to boiling, after which lead nitrate solution is run in, until a drop of the supernatant liquid, drawn from near the surface, gives no perceptible colour change with a drop of $N/10$ silver nitrate, the temperature of the solution at the close being about 40° C. Eighty-five to ninety c.c. is the volume most suitable for the test. This gives the lead equivalent of the chromate, and the operation is then repeated with the lead solution under examination, 25 c.c. of chromate being added to 50 c.c. of this solution and 5 c.c. of acetate solution, as before. If there be not an excess of chromate, a further 25 c.c. are added, followed by calcium carbonate, before proceeding to titrate with lead nitrate. Small quantities of copper and zinc do not interfere, but the method is inaccurate in the presence of arsenic or iron. Arsenic is best removed by evaporating the solution with excess of sulphuric acid and gently heating to fuming point to expel nitric acid; the residue is diluted to 10 c.c., heated to boiling, diluted with twice its volume of 90 per cent. alcohol, well stirred, and allowed to stand for 10—15 minutes; the precipitate is then washed (as far as possible by decantation) 2 or 3 times with 50 per cent. alcohol, and once with 90 per cent. alcohol, and the sulphate is dried on the water-bath. The filter paper is separately dried and the trace of sulphate retained thereby added to the main portion, the paper being warmed with 5 c.c. of acetate solution and the extract, together with the washings, added to the sulphate which is then dissolved by warming; finally, the solution, diluted to 50 c.c., is titrated as above. If the amount of arsenic be excessive, it is necessary to dissolve the lead sulphate, after washing once with 50 per cent. alcohol, in 5 c.c. of pure $N/1$ sodium hydroxide and reprecipitate with sulphuric acid and alcohol, proceeding then as before. If the amount of lead exceed the equivalent of 50 c.c. of $N/50$ chromate, the final solution is diluted to a measured volume and an aliquot portion taken for analysis, with addition of sufficient sodium acetate solution to bring the total volume of this reagent to 5 c.c. Ballard gives the following method of estimating lead in chimney gases, arsenic being absent. About 250 c.c. of distilled water are taken in the bellows aspirator, with addition of 7 c.c. of 10 volume hydrogen peroxide, and, after aspirating a given volume of the gases, the tube employed in the test is carefully washed, any adhering particles of lead fume being removed, and the solution is titrated with standard alkali, to determine total acidity. 0·2 grm. of magnesium sulphate, followed by a small excess of sodium carbonate solution, is then added, and the whole is heated, stirred, and filtered through a small filter (the magnesium carbonate precipitated helping towards the efficient filtering of the lead). The filter paper is dried and burnt at a low temperature, and the ash warmed with a little strong nitric acid and a drop or two of sulphuric acid. A little water is then added and the solution neutralised with sodium carbonate, after which 5 c.c. of the acetate solution (mentioned above) are introduced, the whole is boiled to dissolve the lead sulphate, the solution diluted to about 80 c.c., and the lead determined by the chromate method already described. As an alternative method for dissolving the fume, Ballard recommends cautiously incinerating the residue on the dried filter paper and fusing the ash in a porcelain crucible over a Bunsen burner for 3—5 minutes, with about 0·7 grm. of sodium sulphate and 2 grms. of potassium nitrate. The sulphides are thereby oxidised to sulphates and carbonaceous matter is destroyed. The residue is dissolved by means of sodium acetate solution in the manner described above. The lead equivalent of the chromate solution must be determined under the same conditions as those obtaining in the analysis, dilution, amount of sodium acetate or other salts present, and temperature being approximately the same.

An active and general demand for sulphuric acid kept works of this class busy throughout the year. In some cases, excessive escapes of acid gases were due to difficulties associated with working the chamber process during the unusual heat of the summer. Extended adoption of the "intensive" system of working the chamber process occurred during the year, and one process, in which the manufacture is carried on in towers only, that of Opl, as practised at Hruschau for about 3 years (see this J., 1909, 309), was put into operation towards the end of the year, and with apparently successful results, a large saving in the area of ground required for a given production of acid, and in the first cost of construction being effected by its adoption. Mechanical burners for pyrites, spent oxide, etc., were also more extensively introduced, and several designs, tending to lessen fume and lighten labour, are in successful operation. Several cases occurred of serious damage to vitriol chambers from the effects of strong winds, in one case an entire installation of chambers being levelled to the ground with the loss of one life. In this case, it is noted that the top-bracing of the chambers, which is regarded as a most important safeguard in windy positions, had not been adopted. In District No. 6A (S. Wales and Monmouth), new types of packing are being largely used in both Glover and Gay-Lussac towers, and in several districts a further increase in the use of fans to secure steady draught of chamber gases is reported. The steam jet blower originally used in the Kessler concentrating plant is being displaced by mechanical blowers, and the employment of silica vessels, where concentration is effected in plant of the "cascade" type, has considerably extended, "tantiron" basins having also been found satisfactory.

Mechanical devices for the removal of manufactured superphosphate from the "den," and for the simultaneous rapid removal of excessive moisture, are being more widely adopted, and of late the acid effluent leaving the wash-towers has been utilised in some cases for the preparation of an alkali silicofluoride, which has a ready sale. The statistics relating to the importation of some of the materials in largest use in the manufacture of chemical manures show a marked increase in all cases, the figures for guano almost reaching the amount of 1908 (34,417 tons), after a continued fall. The quantity of manure materials, expressed in tons, imported into the United Kingdom during the years 1909-11 were:—

	1911.	1910.	1909.
Guano	34,124	7,000	20,321
Mineral phosphates	493,413	450,000	451,807
Sodium nitrate	128,487	120,600	90,207

The exports of ammonium sulphate in 1911 amounted to 292,000 tons, as compared with an estimated home consumption (for all purposes, including manure manufacture) of 85,500 tons. The corresponding figures for 1910 were 284,000 and 87,000 tons.

Under the heading "Sulphate and Muriate of Ammonia, and Gas Liquor Works," a further increased production is reported, there being also 26 more processes under inspection than in 1910. The amount of ammonia recovered in the United Kingdom (expressed as tons of sulphate) was :—

	1911.	1910.	1909.
Gas works	168,783	167,820	164,276
Iron works	20,121	20,139	20,228
Shale works	60,765	59,113	57,048
Coke oven works	105,343	92,665	82,886
Producer-gas and carbonising works (bone and coal) ..	29,964	27,850	24,705
Total	384,076	367,587	349,143

The influence of unrest in the labour world continued to retard advance throughout 1911, especially as regards the extension of recovery plant in connection with coke ovens. The relative proportion of ammonium sulphate from gas works, as compared with the total production of gas, is becoming less, owing partly to the greatly increased production of gas per ton of coal carbonised, arising from changes in methods of gas manufacture, and partly to the rapid growth of processes for the recovery of by-products from coke oven gases and from producer gas. The "direct" method of ammonia recovery (see Report for 1910; this J., 1911, 890) was brought into further use during the year, but not to the extent which might have been anticipated. At one works, in which the process has been applied successfully, a reduction of 75 per cent. in the effluent is reported, and, in this connection, it may be observed that during the heat of last summer, many cases of large losses of ammonia from ammoniacal liquor occurred. Attention has also been directed to methods by which the ammonia present in crude gas may be recovered without the provision of sulphuric acid, hydrogen sulphide from the gas being utilised instead, and the Burkheiser process of producing ammonium sulphate in this manner (this J., 1909, 359) is being experimented with at one works in District No. 6 (S. and S.W. of England). A double fatality is reported in connection with the repacking of a scrubbing tower used for the purification of gas liquor, and occasion is taken to emphasise the importance of complete disconnection from any other plant where poisonous gas may exist, on occasions of men entering closed apparatus. (See also this J., 1912, 698—699.) In view of the somewhat rapid deterioration of the brick depositing chamber in the Claus sulphur recovery process, especially at the kiln end, a sheet lead chamber has been introduced at one works, and has been found a marked improvement. As regards the waste gases resulting from the distillation of ammoniacal liquor, experience continues to show that when using oxide of iron purifiers (which are most frequently and widely adopted), the heap form is to be preferred, and that the low broad-based heap has advantages over the high conical heap with comparatively restricted base. An endeavour has been made to ascertain the factors which make for efficiency in the use of oxide purifiers, and the "souring" of oxide, in particular, as experienced at some works (chiefly in Scotland), has been submitted to a detailed study, both as regards the facts relating to the use of oxide material in the works and also the behaviour of similar material in the laboratory. Temperature records have been taken at two sets of purifiers, working with revivification *in situ*, and, in one case, the variation of temperature at different depths in the material, both during continuous and alternate working, is shown by means of graphs. Comparative tables are also given, summarising the practice in vogue in a number of typical English and Scotch works, as regards form of purifiers and oxide content in relation to sulphate made, character of oxide, method of work, and "rate of fouling," but the information obtained has not enabled a cause to be assigned to the formation of "soured" oxide. Some conclusions arrived at from the results of laboratory experiments are as follows :—Air has a beneficial effect in increasing the efficiency of the oxide, both in respect to the weight of sulphur absorbed and the yield of free sulphur, and relatively hydrated oxide absorbs a greater weight of hydrogen sulphide than the same oxide in a less hydrated form. A gradual fall in efficiency is observed as sulphiding proceeds, at all temperatures, and at higher temperatures, soluble salts of iron and an increasing amount of disulphide are formed. The presence of ferrous sulphate and iron disulphide appears to confer upon the higher temperature products the peculiar properties that are associated with the term "sour"; the oxide becomes inert towards hydrogen sulphide, and, on exposure to air, the disulphide slowly oxidises to ferrous sulphate, so that revivification may lead to an accumulation in the mass of oxidised products which are useless for purification purposes. At lower temperatures, the amount of disulphide formed is relatively small, and, by exposure to warm air, in the presence of moisture, it is oxidised, partly at least, to insoluble basic sulphates which are not wholly inert towards hydrogen sulphide. Presence of air is unfavourable to the formation of ferrous sulphate at all temperatures, when excess of hydrogen sulphide is present. The following equations are submitted as explanatory of the sulphiding and oxidation stages in the purifiers :—*Sulphiding stage.* (1) $Fe_2O_3+3H_2S=Fe_2S_3+3H_2O$; (2) $Fe_2O_3+3H_2S=2FeS+3H_2O+S$; (3) $FeS+S=FeS_2$; (4) Interaction in part, of Fe_2O_3 with Fe_2S_3.FeS, or FeS_2, to form $FeSO_4$. *Oxidation stage.* (1) $Fe_2S_3+3O=Fe_2O_3+3S$; (2) $2FeS+3O=Fe_2O_3+2S$; (3) Interaction of FeS_2 with oxygen to form $FeSO_4$ and SO_2, and interaction of SO_2, air, and moisture, in contact with hydrated oxide, to form free sulphuric acid and ferric sulphate; (4) Interaction of ferrous sulphate with hydrated oxide and air to form basic sulphates, insoluble in water. The temperature most favourable for maximum absorption of hydrogen sulphide and maximum yield of free sulphur, both in presence and absence of air, would appear to lie in the neighbourhood of 60° C. The laboratory results point to the desirability of more accurate knowledge of the conditions existing in purifiers, as regards temperature, both during the sulphiding and revivifying stages, the proportion of moisture, and that of air added to the waste gases when concurrent revivification is practised, the proper distribution of the waste gases, and their sufficient cooling before reaching the purifier. Too long a passage of the waste gases through one purifier causes an accumulation of sulphided material, which is likely to lead to unduly high temperatures if revivification be effected *in situ*; the employment of alternate purifiers at suitable intervals is preferred. Revivification *in situ* by a current of air travelling in the same direction as did the waste gases during sulphiding has the disadvantage of removing a maximum of moisture from the zone of oxidation, bringing about conditions adverse to that hydration which appears essential for efficient revivification. Although no definite factor has been recognised which accounts for the more frequent occurrence of "souring" in Scotland than elsewhere, it is thought to be possibly connected with the differences observed by Gedel (this J., 1905, 664), between the reactions of gases which are slightly acid in character and those which are faintly ammoniacal.

A further installation for the manufacture of bleaching powder in mechanically wrought plant was put into operation during the year, and is favourably noticed, as minimising nuisance from dust, escape of chlorine, etc. In view of the present over-production in the carbide industry, the attention of manufacturers is drawn to a possible new outlet for chlorine in the preparation of a series of compounds starting from the parent substance acetylene tetrachloride, produced by the direct combination of acetylene and chlorine, under the influence of antimony chloride as catalyst. In District No. 3A (Widnes, Runcorn, and Liverpool) it is reported that the employment of coke towers in the production of chlorine for bleach manufacture is being given up since they lead to reactions taking place which are detrimental to the formation of high-class bleach.

Great activity continued throughout the entire year in the tin plate industry, new works being built and extensions made in existing works. The means referred to in previous reports for enabling manufacturers to comply with the requirements of the statute in the scruff melting process, continue to give satisfactory results. The advisability of separating the flux skimmings from the scruff proper is again insisted upon, excessive flux (chloride of zinc) in the scruff furnace, bringing about the production of flue dust (that is, effecting a transference of valuable tin compounds from furnace to flues), besides having a deleterious effect on the metal produced.

There was an increase of nine tar works, as compared with 1910, this increase being attributed in large measure to the installation, in gas works, of plant for the production of prepared or boiled tar for road making (see Report for last year; *loc. cit.*). The practice of using crude tar for road surfacing is being given up, since this practice leads to the possible contamination of streams and destruction of fish life, together with probable injury to the road surface through deterioration of the tar, if this be not sufficiently heated before use, and to nuisance, if this heating be effected at the roadside. In the Eastern and South-Eastern District, there has been a further installation of plant for the continuous dehydration of tar by the heated coil method, in which the tar is heated, under pressure, in a coil enclosed within a brickwork chamber, and is delivered into an expansion box, where the light oil and water separate from the less volatile portion. The small coil plant appears capable of dehydrating completely, provided the raw tar does not contain a very high percentage of water. The supply of raw tar to distillers, in this district, was seriously curtailed in consequence of the enormous demand for road-making purposes, and the value of both raw tar and tar products has therefore risen considerably.

At a zinc works in No. 2 District (N. of England), a process has been introduced, in which a haloid salt, such as sodium chloride, is brought into contact with the retort vapours, this agent, in the presence of carbonic acid, being claimed to prevent the formation of zinc oxide and "blue powder," thereby increasing the yield of spelter.

In Scotland, the number of works registered has again decreased by one, as compared with the previous year. 60.284 tons of bones and phosphates were dissolved, as compared with 70.640 tons in 1910, and 133,740 tons of pyrites have been burned, as against 132,168 tons in 1910. The production of ammonium salts (expressed as sulphate) and pitch amounted to 121.339 tons and 165.692 tons respectively, the corresponding figures for 1910 being 116.958 and 170,793. The total shale mined and quarried in Scotland during 1911 was 3.116.803 tons, and the yield of ammonium sulphate, per ton of shale, 43·7 lb., as compared with 3.130.280 tons and 42·3 lb. respectively in 1910.—F. Sodn.

Chlorous acid. Lasègue. Comptes rend. 1912. **155**. 158—160.

According to Millon (Annales, 3rd Series, 1843, 7, 298), an aqueous solution of chlorine peroxide (obtained by treating chloric acid with tartaric acid) is neutralised with baryta and filtered: the filtrate is precipitated with lead nitrate, the resulting lead chlorite being treated with barium carbonate and water for the production of a solution of barium chlorite which is subsequently purified by reprecipitation with lead nitrate as before. Having prepared a solution of pure barium chlorite by this method, the author made quantitative determinations by precipitating the solution with lead nitrate (in the presence of alcohol) and weighing the resulting lead chlorite, and by titrating the solution with N/10 sulphuric acid. In the latter case the solution obtained, after the settlement of the barium sulphate, was colourless but began to turn yellow (indicating decomposition) after a minute at 15° C. or after 10 minutes at 0° C. The colourless liquid was neutralised with a quantity of N/10 baryta equal to that of the N/10 acid employed and the chlorous acid was determined in the resulting solution by precipitation with lead nitrate, the amounts of chlorous acid thus found being from 98 to 100 per cent. of those actually present. By the spontaneous decomposition of chlorous acid and the subsequent neutralisation of the solution with baryta, a liquid containing chlorate, chlorite, hypochlorite and chloride of barium is obtained. By the analysis of this liquid it was found that of the chlorine originally present as chlorous acid 13·1 per cent. was present as chloride, 11·92 as hypochlorite, 37·48 as chlorate and 37·34 as chlorite (total 99·84), these results corresponding with the mode of decomposition indicated by the equation $4HClO_2 = 2H_2O + 3ClO_2 + Cl$. In dilute solutions the decomposition of chlorous acid is not very rapid; it was found that 70 per cent. of the acid originally present in a solution containing 2·64 grms. of chlorous anhydride per litre was decomposed by standing for 4 hours at a temperature of 17° C.—W. E. F. P.

Nitric and nitrous acids in acetic acid solution; Determination of ——. Stability of nitric acid in acetic acid solution. K. J. P. Orton and W. H. Gray. Analyst 1912, **37**, 303—306.

All the nitric acid in acetic acid solution is retained as potassium nitrate, if the solution is evaporated to dryness on the water-bath with a slight excess of potassium carbonate. Any nitrous acid is destroyed under this treatment. The potassium nitrate which is mixed with some acetate is determined by the Lunge process. The nitrous acid can be best determined by Raschig's permanganate method (see this J., 1906, 41). Nitric acid is stable in acetic acid solution, and can be kept at constant concentration for many weeks. If nitrous acid is present, the greater portion is slowly oxidised to nitric acid, and the solution becomes nearly colourless. Solutions in 50 per cent. acetic acid showed similar behaviour. No reduction of the nitric acid occurs even after prolonged exposure to diffused light.—F. Shdn.

Arsenious acid; Determination of —— with potassium permanganate in presence of hydrochloric acid. L. Moser and F. Perjatel. Monatsh. Chem., 1912. **33**, 751—758.

Arsenious acid can be accurately determined by dissolving 0·1—0·3 grm. in a little concentrated sodium hydroxide solution (containing about 1 grm. of the hydroxide), diluting with 100—200 c.c. of water, acidifying with concentrated hydrochloric acid (sp. gr. 1·19), 10—15 c.c. of acid being added, and titrating with permanganate in the cold, the solution being added drop by drop, with continual shaking. An acid solution of arsenious acid is neutralised with sodium hydroxide, and then 5—10 c.c. of strong hydrochloric acid are added before titrating.
—F. Sodn.

Arsenic from antimony and other metals; Separation of —— with methyl alcohol in a current of air. L. Moser and F. Perjatel. Monatsh. Chem., 1912, **33**, 797—820.

The process consists in volatilising the arsenic, in the tervalent form, by heating with methyl alcohol and concentrated hydrochloric acid in a current of air. The dry substance, containing not more than 0·22 grm. of arsenious acid, is heated in a 300 c.c. distillation flask, which is fitted with an air supply tube and tap funnel, plunged up to the neck in a boiling water-bath, with 40—50 c.c. of concentrated hydrochloric acid and 30—40 c.c. of methyl alcohol, for 15 minutes, without air passing through, and for half-an-hour in a vigorous current of air; then twice in succession a further 20 c.c. of methyl alcohol are added, and heating is continued for 15 minutes, the whole distillation lasting 1½ hours, about 1 hour of which is with the current of air. The distillate, which is collected in 200 c.c. of cold water, contains all the arsenic, this passing over partly as arsenious chloride and partly as the methyl ester of arsenious acid, and the whole of the antimony remains in the residue. The analysis is completed in any desired manner, the antimony being best precipitated, after diluting, by means of hydrogen sulphide. Arsenic acid is reduced, before distillation, by adding 5—8 grms. of ferrous sulphate and 40—50 c.c. of hydrochloric acid (sp. gr. 1·19), and the mixture is heated to boiling for 5—10 minutes on the water-bath, after which 30 c.c. of methyl alcohol are added, and the process is continued as above. Methyl alcohol has no reducing action on arsenic acid, under the conditions of the experiment. The method can be used directly for the determination of arsenic in ores, sulphide ores being best decomposed by nitric acid and the latter displaced by sulphuric acid, small quantities of which have no ill effect. Oxidation with hydrochloric acid and potassium chlorate is to be avoided, since loss of arsenic is liable to occur.—F. Sodn.

Alkali hydroxides; Action of ozone on ——. W. Traube. Ber., 1912, **45**, 2201—2211. (Compare Baeyer and Villiger, this J., 1902, 1301.)

When powdered potassium hydroxide is treated with ozonised oxygen, the ozone is for the most part converted into ordinary oxygen, but a small part is absorbed by the alkali forming a yellowish-red product (ozonised potash), which is decomposed by water or acids with the vigorous evolution of oxygen and the formation of a solution containing hydrogen peroxide. The author shows that when the freshly prepared substance is treated with water, practically all the absorbed oxygen is evolved as gaseous oxygen, only a small amount of hydrogen peroxide being found in the liquid—the ratio of H_2O_2 to evolved O_2 varying from 1 : 23 to 1 : 88. When, however, the substance is kept for some time at ordinary temperatures, or when it is warmed to 90°—100° C., it loses its yellowish red colour and at the same time evolves oxygen. If the product be now treated with water much less oxygen is evolved, and much more hydrogen peroxide is found in the solution, the ratio of hydrogen peroxide to evolved oxygen being now as 1 : 1. Hence the substance now behaves like a mixture of KOH and K_2O_4, since potassium tetroxide when treated with water or acids yields mol. oxygen and H_2O_2 in the ratio of

$$1 : 1 :— K_2O_4+2H_2O=2KOH+O_2+H_2O_2.$$

The author explains these results by assuming that the product first formed when ozone acts on powdered KOH is a new intensely coloured oxide $K_2O_7(K_2O+2O_3=K_2O_7)$, which decomposes with water evolving all its oxygen as O_2, thus :—$K_2O_7+H_2O=2KOH+3O_2$, no H_2O_2 being formed. On keeping, or heating, this oxide gradually breaks down into K_2O_4 with evolution of oxygen :—$2(K_2O_7)=2K_2O_4+3O_2$.

The author finds that the amount of ozone absorbed by the powdered potassium hydroxide varied very much with the conditions of the experiment; the maximum increase in weight of the KOH recorded in any experiment was 8 per cent. Usually the increase in weight was much less than this. If 2 molecules of KOH absorbed only one atom of oxygen there would have been an increase of weight of 14·2 per cent. Hence the red substance produced when ozone acts on KOH is no single compound, but a mixture of excess of KOH with the higher oxides above discussed. The author states that rubidium and caesium hydroxides behave in a similar manner towards ozone.—G. M.

"Ultraphosphates." Some salts of extreme anhydride stages of phosphoric acid. A. V. Kroll. Z. anorg. Chem., 1912, **76**, 387—418.

The supposed existence of the compound, $12CaO,3P_2O_5$, in Thomas' slag (this J., 1911, 1218) has led the author to an investigation of similar triphosphoric molecules by attempting the preparation of salts of acids which should result from the progressive dehydration of metaphosphoric acid. The salts prepared correspond to the acids, $H_2O,3P_2O_5$ and $2H_2O,3P_2O_5$, and are referred to as ultraphosphates-I and ultraphosphates-II respectively; they have been obtained as clear glasses by passing mixtures of phosphoric oxide vapour and oxygen over heated metallic oxides or carbonates (or, in some cases, the metals themselves), at about 350° C. For example, calcium ultraphosphate-II was prepared from lime, silver ultraphosphate-I from the metallic silver, and lead ultraphosphate-I from lead oxide; the last two salts dissolve in water with decomposition. The ultraphosphates lose phosphoric oxide at high temperatures, and this fact is considered to explain why only the most basic phosphates are found in the converter. The silver ultraphosphate prepared was found to contain metallic silver in the colloidal form, and in this connection, the loss of metal known to occur in smelting, with very acid slags, is referred to, as being probably due to colloidal solution of metals, especially noble metals, by the slag. Lead is attacked by phosphoric oxide vapour, even in absence of oxygen, probably with the formation of phosphide. The free ultraphosphoric acids have not been isolated with certainty, but evidence is given of their formation from metaphosphoric acid and from phosphoric oxide, as well as of the existence of acid salts corresponding to the acid, $3H_2O,3P_2O_5$.—F. Sodn.

Hydrazine and hydroxylamine; Action of —— on ferricyanides and new methods for determining hydrazine and ferricyanides. P. R. Ray and H. K. Sen. Z. anorg. Chem., 1912, **76**, 380—386.

Hydrazine is readily oxidised by an alkaline solution of potassium ferricyanide, yielding the whole of its nitrogen as such, and phenylhydrazine similarly gives nitrogen and benzene; the ferricyanide is reduced to ferrocyanide, and the reaction furnishes a very rapid method for the determination of either hydrazine or ferricyanide. When the former is to be estimated, the substance (*e.g.*, 0·03—0·07 grm. of hydrazine sulphate) is introduced into the cup of a Crum's nitrometer and washed through with a little water, followed by 4—5 c.c. of a 15 per cent. solution of potassium hydroxide, and then an excess of solid ferricyanide is introduced from below, the apparatus is shaken, and the determination completed in the usual way. For the estimation of ferricyanide, solid hydrazine sulphate is introduced into the nitrometer from below and 0·3—0·7 grm. of finely powdered ferricyanide rinsed in through the cup with a little water, potassium hydroxide solution being added as before. The oxidation of hydroxylamine by alkaline ferricyanide results in the production of ammonia, nitrous oxide, and nitrogen, the relative amounts of which depend on the concentration of the solutions.—F. Sodn.

Cuprous-sodium thiosulphate with acetylene-cuprous acetylide; Compound of ——. K. Bhaduri. Z. anorg. Chem., 1912, **76**, 419—421.

When acetylene is passed into a solution of cuprous acetate to which sodium thiosulphate has been added until the liquid has become pale green in colour, a red precipitate gradually separates. This is soluble in water, giving a red solution, and is reprecipitated on adding salts (other than sodium chloride); it decomposes slowly, even at 33° C., and burns like gunpowder when heated in air; on explosion, it gives a mixture of carbon dioxide, sulphur dioxide, and acetylene. The aqueous solution is decolourised by acids and gives a brown precipitate with potassium hydroxide, which is more explosive than the original substance; it decomposes on standing or when heated, acetylene being evolved. The substance is given the formula, $5Na_2S_2O_3,5Cu_2S_2O_3,5Cu_2C_2,C_2H_2,10H_2O$.—F. Sodn.

Thorium sulphate; Solubility of —— in sulphuric acid and in solutions of lithium sulphate. Barre. Bull. Soc. Chim., 1912, **11**, 646—648.

The solubility curve for thorium sulphate in solutions of lithium sulphate, at 25° C., shows a regular increase of solubility with increasing concentration, 1·722 and 18·87 grms. being dissolved, per 100 grms. of water, containing 0 and 25·18 grms. of lithium sulphate respectively; no complex salt has, however, been isolated. The sulphuric acid curve exhibits a maximum with 3—4 per cent. of acid (due possibly to the formation of an acid salt), the solubility then diminishing regularly.—F. Sodn.

Thorium; Quantitative determination of ——, especially in monazite sand, by means of sodium hypophosphate. A. Rosenheim. Chem.-Zeit., 1912, **36**, 821.

The author has used sodium hypophosphate, which Koss recently claimed as a new reagent for thorium (this J., 1912, 664), for quantitative estimations for some years. In making an analysis of monazite sand, 100 grms. of an average sample are heated with concentrated sulphuric acid to 180°—200° C., the sulphates are dissolved in cold water and the solution is made up to 1 l.; after allowing the insoluble residue to settle, 100 c.c. of the clear solution are treated with 50 c.c. of concentrated hydrochloric acid (s.g. 1·12) and 180 c.c. of water, the solution is boiled, and a cold, saturated solution of sodium hypophosphate is added until no further precipitation takes place. The solution is filtered hot, and the precipitate is washed with hot water containing a little hydrochloric acid, until the filtrate gives no precipitate with ammonia and oxalic acid, showing freedom from other earth-metals, especially cerium. The precipitate, consisting of nearly pure thorium hypophosphate together with the hypophosphates of zirconium and titanium, is partly dried, and together with the filter paper boiled with 50 c.c. of concentrated sulphuric acid in a large platinum basin under a clock-glass, small crystals of potassium nitrate being added from time to time to oxidise the charred paper. In 1—2 hours the solution should be complete and pale yellow in colour, after which it is evaporated nearly to dryness, the damp residue taken up with water and a trace of ammonia, and the liquid boiled for several minutes. As soon as the suspended powder has been converted into flocculent thorium hydroxide, an excess of hydrochloric acid is added, the solution is boiled and filtered, and the thorium is determined in the acid filtrate in the usual way by precipitation as oxalate and conversion into oxide.—O. R.

Helium. Natural gaseous mixtures particularly rich in ——. C. Moureu and A. Lepape. Comptes rend., 1912, **155**, 197—200.

THE authors give the following table of mineral springs from which gas containing a large percentage of helium is evolved :—

Location of Spring.	Helium per cent. in natural gas.	Yield in litres per year of	
		Natura gas.	Helium.
Sautenay (Côte-d'Or)			
Source Lithium	10·16	51,000	5182
,, Carnot	9·97	179,000	17,845
,, Fontaine-Salée	8·40	—	—
Maizières (Côte-d'Or)			
Source Romaine..........	5·92	18,250	1080
Grisy (Saône-et-Loire)			
Source d'Ys	2·18	—	—
Bourbon Lancy (Saône-et-Loire)			
Source du Lymbe	1·84	547,500	10,074
Néris (Allier)			
Source César	0·97	3,504,000	33,990
La Bourboule (Puy-de-Dôme)			
Source Choussy	0·1	30,484,800	3048

If the helium be assumed to come in the first place from radioactive disintegrations, it may be looked upon either as nascent helium evolved immediately it is produced, or as dissolved or ancient helium evolved by the disintegration of minerals in which it has been absorbed. The quantities are, however, too large for the former view and it is more probable that the immediate source is dissolved helium. It is to be noted also that most of the above stations as well as other sources of radioactive gas, are grouped in the neighbourhood of a line drawn through the towns of Moulins, Dijon and Vesoul.—W. H. P.

Scandium. R. J. Meyer and H. Goldenberg. Chem. News, 1912, **106**, 13—14. (See also this J., 1909, 108, 543; 1910, 1008, 1055.)

IN applying the iodic acid method (this J., 1910, 486; 1911, 837) to the purification of scandium, it was found that thorium iodate is appreciably soluble in presence of a large excess of scandium iodate, and hence the thorium can be completely precipitated as iodate only if such a large excess of potassium iodate is added that some of the scandium iodate is also precipitated. The atomic weight of scandium freed from thorium in this way was found to be 44·1 (the value given earlier by Nilson), as compared with 45, the value obtained previously. Incidentally these results showed that 0·5 per cent. of thorium oxide cannot be detected by spectrographic and electrometric methods. The iodic acid method is only suitable for small quantities and the yield of scandium is unsatisfactory, hence the authors devised another simpler method for the separation of thorium and scandium, based on the fact that in general the more negative earths are relatively most easily separated when in the form of the most complex compounds possible. It is known that in presence of a sufficient quantity of tartaric acid or ammonium tartrate, the precipitation of the hydroxides of the rare earths by ammonia is prevented, but it has not been mentioned in the literature that under these conditions the yttrium earths are separated in the form of sparingly soluble ammonium double tartrates, whilst the cerium earths form soluble double salts. Scandium behaves like the yttrium earths, whilst thorium behaves like the cerium earths. Hence in order to free scandium from thorium, the neutral solution of the scandium salt is slowly dropped into a concentrated solution of neutral ammonium tartrate, which is kept agitated, and the clear solution thus obtained precipitated with ammonia while boiling. The precipitate of scandium ammonium tartrate is separated, and washed with a dilute solution of ammonium tartrate. 100 grms. of pure scandium oxide have been prepared by this method: in this product the scandium was found to have the atomic weight 43·9.—A. S.

German chemical industry. U.S. Consular Reports, June, 1912. [T.R.]

HEAVY orders were received both for home and foreign consumption, and in many lines the prices for natural and artificial preparations were higher. The manufacturers of heavy chemicals experienced great difficulty in filling their orders. There were especially notable increases in the demands for medicinal preparations. Many orders were received by the German manufacturers for disinfecting and other materials which were used in stamping out the plague in the Far East.

The favourable business year of the German chemical industry is reflected in the increased dividends declared by many of the chemical companies, in the amount of capital invested in new companies, and in the capital used in extending existing industries. The total amount of new capital invested in the chemical industry last year was £3,245,400, compared with £1,266,700 for 1910. For last year £2,002,100 was employed for the creation of new companies, and £1,243,400 for the extension of existing industries.

British Consular inquiries from chemical manufacturers. Bd. of Tr. Jnl., July 25, 1912.

H.M. CONSUL at Stettin draws attention to the vague way in which inquiries are worded in regard to chemicals, drugs, etc. The bare mention of the name of a chemical, without any details as to the trade or industry in which it is used, renders it no easy matter, in many cases, to ascertain which factories may use, or which firms may purchase, the product in question. The difficulty is further increased should the British and German names be entirely different, or the product be new.

German potash and salt output. U.S. Dept. of Comm. and Labor, July, 1912.

STATISTICS recently prepared by the Minister of the Interior of Germany, give the production of potash and salt mines in that country during 1909 and 1910. These statistics show that in 1910 there were 82 works employing 27,790 persons to whom was paid $8,869,678 in salaries and wages. This was a gain of four works, compared with the previous year. The detail figures of the various potash and salts during 1910 in metric tons and value is as follows :—

Potash and Salts.	1910.	
	Metric tons.	Value.
Raw salts :		
Rock salt	1,136,776	$1,341,260
Potash salts —		
Carnallite, including kieserite ..	3,729,409	7,644,105
Kainite, sylvinite (sylvite)	4,610,152	13,862,702
Boracite	166	6,704
Salts to be used in further manufacture —		
Carnallite	3,569,937	7,382,753
Kainite, sylvinite..............	1,320,523	3,808,893
Products ready for sale ;		
Stone salt	1,112,562	1,346,673
Carnallite with 9 to 12 per cent. K_2O	402,476	908,250
Crude salt with 12 to 15 per cent. K_2O	2,924,709	8,756,404
Salt with 15 to 19 per cent. K_2O	153,297	137,472
Fertiliser salts—		
With 20 to 22 per cent. K_2O	136,233	850,184
With 30 to 32 per cent. K_2O	55,556	626,330
With 40 to 42 per cent. K_2O	335,671	5,196,046
Potassium chloride—		
With 50 to 60 per cent. K_2O	304,145	8,673,969
With over 60 per cent. K_2O	130,767	4,336,013
Potassium sulphate of over 42 per cent. K_2O	90,389	3,239,079
Potassium magnesium sulphate	39,011	688,366
Magnesium sulphate	68,862	224,623
Magnesium chloride	31,012	92,911
Sodium bisulphite	2,540	19,078
Boracite	135	5,412
Bromine, etc.	14,293	472,496
Total	20,177,621	$69,922,723

Heavy chemicals in Japan. Chem. and Drug., July 27, 1912.

The quantity of the principal heavy chemicals produced in Japan has greatly increased of late. The total for 1910, as compared with that of 1904, shows an increase of about twice as much, being estimated at 4,895,065 yen. The list of the principal heavy chemicals in each year is as follows :—

	1904.	1910.
	Yen.	Yen.
Sulphuric acid	1,931,366	1,614,320
Hydrochloric acid	—	136,052
Nitric acid	—	235,852
Sodium sulphate	—	32,562
Sodium carbonate	5,398	57,382
Caustic soda	296,895	407,076
Iodine..........................	—	382,324
Potassium iodide	—	517,580
Alum	—	179,029
Ammonium sulphate	—	181,966
Sodium acetate	—	5,023
Bleaching-powder................	577,519	1,096,771

Treatment of seaweed in Norway. Bd. of Tr. Jnl., July 25, 1912.

Seaweed is collected by the population of the west coast of Norway, from Lofoten in the north to Mandal in the south. It is then dried in the sun and burnt without too much heat, so that the iodine is not expelled. This is effected by using damp seaweed as fuel, and only burning small heaps at a time ; the experiment of burning the weed on grills has been tried, but without success. The price of the resultant ash is from ¾d. to 1½d. per kilogram, according to analysis ; in the year 1911, during which 1806 tons to tho value of £9,933 were exported, the price appears to have averaged £5 10s. per metric ton.

The product is sold to agents at Stavanger and other ports, and is mainly exported to Great Britain ; it is also used as manure in Norway.

Destruction of cement drain-pipes [by effluent from potassium chloride factory]. Barth. *See* IX.

Patents.

Compounds of nitrogen ; Process and apparatus for the manufacture of ——. A. Schweitzer and F. Hauff. Fr. Pat. 439,872, Feb. 8, 1912. Under Int. Conv., Feb. 10, 1911.

A porous mixture of alkali or alkaline-earth compounds and carbon (with or without fluxes), in such a form that it conducts electricity, is made to pass continuously through an electrically heated zone in a furnace, where it meets an opposing current of gas containing nitrogen, with which it reacts. The mixture is prepared (for example, from equal weights of barium carbonate and coal) by a preliminary coking process, preferably after moulding into briquettes. The process is carried out in a vertical shaft furnace, the walls of which are penetrated, about half way up, by two or more opposing electrodes, preferably of cooled metal, the interior of the furnace being divided, except in the region of the electrodes, by a transverse vertical partition (or partitions) of non-conducting material, so that the conduction of the electric current, which heats the furnace, is confined to this region. The mixture is fed in continuously at the throat of tho furnace, and an ascending current of gas is blown in from below.—F. Sodn.

Hydrogen peroxide ; Process of obtaining pure solutions of ——. Darrasse Frères and L. Dupont. Fr. Pat. 439,566, Jan. 31, 1912.

Commercial hydrogen peroxide (of 10 or 12 vol. strength) is distilled, under reduced pressure, in the presence of non-volatile stabilising substances, such as sulphuric acid (for example, 100 kilos. of acid to 100 litres of the peroxide), when solutions are obtained which are chemically pure and may be much more concentrated than the ordinary commercial peroxide.—F. Sodn.

Ammonia from its elements ; Process for the catalytic production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 439,261, Jan. 22, 1912. Under Int. Conv., Feb. 3 and Nov. 17, 1911.

Claim is made for the synthetic production of ammonia by the use of tungsten as a catalyst, either as metal or a nitrogen compound, and mixed, if desired, with other substances, the catalyst being prepared by reduction of a compound of tungsten at a temperature not appreciably above 600° C., or by treating such a compound with ammonia, in which case a higher temperature is permissible. The reduction may be effected in the contact chamber itself, tungstic acid, for example, being so treated, at 550°—600 C., in the presence of nitrogen and hydrogen (3 : 1), under a pressure of 120 atmos., and the reduction immediately followed by the formation of ammonia. —F. Sodn.

Sulphur ; Recovery of —— from gases. F. L. Teed, H. L. Sulman, and H. F. R. Picard, London. Eng. Pat. 14,628, June 20, 1911.

Sulphurous gases are mixed with non-sulphurous reducing gases, such as producer-gas, water-gas, or the like, and passed over a heated contact agent, such as magnesia, calcium sulphate, or iron oxides, when the following reactions take place : $SO_2+2CO=2CO_2+S$, and $SO_2+2H_2=2H_2O+S$. A suitable method of carrying out the process is to pass the gases in the required proportions through a chequer-work of magnesia bricks maintained at a red heat.—O. R.

Zinc sulphate ; Process for the treatment of galvanised iron articles for the production of ——. Ulmar Villette et Cie., St. André les Lille, France. Eng. Pat. 29,267, Dec. 29, 1911. Under Int. Conv., July 21, 1911.

Galvanised iron articles are covered with water in lead-lined tanks and treated with sulphuric acid of 25° to 30° B. strength, the temperature being kept as low as possible. The small excess of acid is neutralised with zinc oxide or zinc carbonate, the neutral liquor is oxidised with potassium chlorate or other oxidising agent, and the oxidised liquor is treated with zinc oxide to precipitate ferric and manganese oxides; the latter are deposited in a non-gelatinous form in which they are readily filtered off from the resulting pure solution of zinc sulphate.—O. R.

Arseniate of lead; Process for the manufacture of ——. F. Kaufler. Vienna. Eng. Pat. 10,017. April 27. 1912. Under Int. Conv., June 2. 1911.

NEUTRAL, acid, or basic lead arsenate is prepared by treating a higher oxide of lead than the monoxide with arsenious acid, or with a mixture of arsenious and arsenic acids.—O. R.

Dehydrated [graphite] mixtures; Method of preparing ——. E. G. Acheson, Ontario, Canada. U.S. Pat. 1,030,372, June 25. 1912.

DEHYDRATED mixtures containing deflocculated graphite and oil are prepared by suspending moist deflocculated graphite in oil, agitating the mixture, and evaporating the water from it.—O. R.

Perborates containing water of crystallisation; Process of stabilising mixtures of dry acids or acid salts with ——. Pearson and Co., Ges. m. b. H., Hamburg, Germany. Eng. Pat. 1578, Jan. 19, 1912. Under Int. Conv., Feb. 27. 1911.

TABLETS, yielding an alkaline solution of hydrogen peroxide when dissolved in water, are prepared by mixing perborates, containing the normal quantity of water of crystallisation, with dry acids or dry acid salts and sodium bicarbonate.—O. R.

Asbestos; Purification of ——. The British Thomson-Houston Co. Ltd., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 24,259, Nov. 1, 1911.

COMMERCIAL asbestos containing difficultly soluble metallic oxides, especially magnetite, is subjected to the action of dilute oxalic acid, preferably a 2 per cent. aqueous solution; after about 48 hours the magnetite will have been entirely dissolved and the asbestos is washed with water to free it from iron oxalate.—O. R.

Nitrogen; Process of fixation of —— in the form of ammonia. Comp. Bordelaise des Produits Chimiques. Fr. Pat. 440,217, April 27, 1911.

A MIXTURE of nitrogen and hydrogen, in suitable proportions, is passed over a red-hot mixture of a metal capable of forming a nitride under the influence of nitrogen, and a hydrogen-fixing catalyst (nickel, iron, or cobalt). —F. SODN.

Nitrogen; Process of fixation of —— in the form of oxygen compounds. Comp. Bordelaise des Produits Chimiques. Fr. Pat. 440,218, April 27, 1911.

A MIXTURE of nitrogen and oxygen, such as air, is passed over an oxidising catalyst, which is heated to a temperature above 500° C., the catalysts employed being, in order of decreasing efficiency, the oxides of cobalt, manganese, chromium, nickel, barium, lead, and cerium. The gases are preferably cooled immediately after their passage over the catalyst by blowing a current of cold compressed air into the tube by which they escape.—F. SODN.

Oxygen; Process and apparatus for the industrial manufacture of ——. B. J. B. V. J. Brianchon. Fr. Pat. 439,737, Feb. 5, 1912.

WATER, containing a small quantity of an electrolyte such as sulphuric acid, is electrolysed and the oxygen, which accumulates at the positive pole, is removed; air is then supplied to the electrode, from which the oxygen has been removed, or to an independent electrode, which is inert during the first stage of the electrolysis, and the circuit between the electrode surrounded by hydrogen and the electrode surrounded by air, is closed and the electric current, which is generated, is used to decompose a fresh quantity of water. Commutators are provided for reversing the cycle of operations at regular intervals, which should not exceed one minute, and means are provided for the withdrawal of the oxygen formed, and pumping it into compressors, the pumps automatically operating the commutators.—O. R.

Oxygen; Process and apparatus for the economical manufacture of —— by means of manganese dioxide with recovery of by-products. Soc. Anon. d'Application des Hautes Temperatures. Fr. Pat. 440,178, April 26, 1911.

MANGANESE dioxide is heated in retorts to an extremely high temperature, whereby all its oxygen is liberated ("la totalité de son oxygène)"; the gas passes into a collector, from which it is aspirated by means of a suction fan, through a washer and either of two sets of purifiers, and forced into a gas holder; after the operation the retorts contain "crude manganese," which can be used for metallurgical purposes, and the purifiers contain other by-products, which can be recovered; the waste heat from the retort-furnace may be used for developing the steam power required for driving the fan.—O R.

Hydrogen; Process for the preparation of pure ——. Badische Anilin und Soda-Fabrik. Fr. Pat. 439,262, Jan. 22, 1912. Under Int. Conv., Feb. 9, 1911.

HYDROGEN, containing traces of carbon monoxide, is freed from the latter by passing the gases through caustic alkali solutions at high temperatures and pressures, *e.g.*, hydrogen containing 1 per cent. of carbon monoxide is treated with (*a*) an 80 per cent. solution of caustic soda at 50 atmospheres pressure at 260° C., or (*b*) a 25 per cent. solution of caustic soda at 200 atmospheres pressure at 240° C. The process is specially recommended where the hydrogen is subsequently to be used for the synthetic manufacture of ammonia.—O. R.

Ammonium sulphate; Process of manufacture of ——. Soc. Industr. de Prod. Chimiques. Second Addition, dated Mar. 29, 1911, to Fr. Pat. 427,065, May 18. 1910 (this J., 1911, 1057 and 1160).

A SOLUTION of ammonia, preferably as strong as possible, is allowed to flow into an aqueous suspension of calcium sulphate, a current of carbon dioxide being passed in at the same time.—F. SODN.

Sulphur vapours; Process for condensing —— in subliming chambers. A. R. Scott and A. Meyer. Fr. Pat. 439,258, Jan. 22, 1912.

To prevent the formation of plastic or fused sulphur at the end of the conduit leading from the furnace, the vapours are subjected to agitation at the point where they enter the subliming chamber, by means of a ventilating fan or similar device.—O. R.

Carbon monoxide; Apparatus for obtaining —— G. A. Schütz. Fr. Pat. 439,646, Jan. 29, 1912.

THE crude gas obtained by the combustion of coke is passed first through a washing apparatus and then through a filter to remove the last traces of dust, after which it is conducted to the compressor.—W. F. F. P.

Carbon bisulphide; Process for the elimination of the ——, *contained in liquids, gases, etc.* Chem. Fabr. Heidenau G. m. b. H. Fr. Pat. 439,783, Jan. 25, 1912. Under Int. Conv., Jan. 26, 1911.

THE liquid or gas is subjected to the catalytic action of a small quantity of a primary or secondary amine in the presence of water and the hydroxide or hydrosulphide of an alkali or alkaline-earth metal, the reactions involved being represented by the following equations:—

(1) $C_6H_5NH_2+CS_2+NaOH=NaS{\cdot}CS{\cdot}NHC_6H_5+H_2O$.
(2) $NaS{\cdot}CS{\cdot}NHC_6H_5+C_6H_5NH_2=CS(NHC_6H_5)_2+NaHS$.
(3) $NaS{\cdot}CS{\cdot}NHC_6H_5=CSNC_6H_5+NaHS$.
(4) $CS(NHC_6H_5)_2+NaOH=2C_6H_5NH_2+Na_2CO_3+NaHS$.
(5) $CSNC_6H_5+3NaOH=C_6H_5NH_2+Na_2CO_3+NaHS$.

The process is applicable to the purification of illuminating gas and of benzol, and also in the manufacture of cellulose xanthates (viscose).—W. E. F. P.

Radium, radioactive emanations, and other radioactive substances; Process of extraction, isolation, and concentration of ——. E. Ebler. Fr. Pat. 440,236, Feb. 16, 1912. Under Int. Conv., Mar. 6 and Nov. 21, 1911.

Solutions of radioactive substances (*e.g.*, natural waters containing radium) are agitated with colloids or other materials presenting a very large surface, at or above the ordinary temperature, and the radioactive substance, which is thereby adsorbed, is obtained in a concentrated form by separating the colloid from the solution and then volatilising or otherwise eliminating it. Radioactive emanations are likewise adsorbed on colloids by merely confining the materials (colloid and active substance) together in hermetically sealed vessels, until radioactive equilibrium is established, when a fresh quantity of colloid may be introduced. Radium emanation is adsorbed in this manner on a dry powdered gel of silicic acid. (See also this J., 1911, 1210, 1380.)—F. Sodn.

VIII.—GLASS; CERAMICS.

Alabaster-mirrorglass; A defective ——. E. Selch. Sprechsaal, 1912, 45, 408—409.

A glass which became rough and flecked in domestic use, was found to contain an alkali-alumina ratio of 4·8 : 1 by weight, whilst a good glass contained a ratio of only 2·1 : 1. Ground up and digested with water for an hour, the defective piece lost in solution 2·41 per cent., the alkalinity of which corresponded to 0·45 per cent. Na_2O. The sound ware lost only 0·13 per cent., of alkalinity 0·06 per cent. Na_2O. It is concluded that the low proportion of alumina to alkali is the cause of the defect. The analyses of the two wares are :—

	Defective.	Good.
SiO_2	72·62	73·07
$K_2O + Na_2O$	18·58	12·94
$Al_2O_3 + Fe_2O_3$	3·88	6·15
CaO	2·43	5·70
F	3·81	3·96
P_2O_5	0·08	—
O equiv. to F	—1·60	1·67
	99·80	100·15

—H. H. S.

Glazes; Gold in ——. A. Berge. Sprechsaal, 1912, 45, 406—408, 419—421, 435—437.

Gold, despite its cost, enters into the composition of many glasses, glazes and enamels, for as little as 1 part in 10,000 of glaze can cause a deep-red colouration. Various chemicals were mixed in slip with gold and added to the following two fluxes, one loaded, the other leadless—so that 0·1 per cent. of gold was always present. Flux *e* had the composition: 2·5 SiO_2, 2·0 B_2O_3, 0·3 Al_2O_3, 1·0 PbO; and flux *n*: 2·4 SiO_2, 1·2 B_2O_3, 0·4 Al_2O_3, 0·6 Na_2O, 0·4 ZnO. The results are given in the table.

Kaolinite; Molecular disintegration of by heat. A. M. Sokoloff. Tonind.-Zeit., 1912, 36, 1107—1110.

After summarising the previous work of Sachsse and Becker, Semjattschenki, Purdy and Moore, Rieke, and Mellor and Holdcroft on the constitution of kaolinite, the author proceeds to discuss the questions: (*a*) at what temperatures the evolution of combined water begins and ends, (*b*) the quantitative relation between loss of combined water and alumina liberated (as measured by its solubility in dilute acid), (*c*) the structural position of the four hydroxyl groups. His experimental results were as follows :—

Temperature.	Time of firing.	Loss of water.	Alumina dissolved.	$Al_2O_3 : H_2O$
°C.	hour.	per cent.	per cent.	
300	1	0·72	2·12	1 : 1·91
400	1	0·67	2·08	1 : 2·03
	3	0·94	2·61	1 : 2·00
	5	3·85	—	—
500	1	2·33	—	—
	3	10·77	28·80	1 : 2·12
	5	11·20	—	—
600	1	10·94	28·16	1 : 2·14
	3	11·93	31·85	1 : 2·12
700	1	11·92	32·30	1 : 2·06
	3	12·40	—	—
	5	12·94	33·96	1 : 2·12
800	1	12·99	34·66	1 : 2·12
	3	12·99	34·61	1 : 2·06
	5	13·00	34·67	1 : 2·12

The figures show that two molecules of water of hydration driven off, correspond to one molecule of alumina liberated. A structural formula is not given.—H. H. S.

Kaolin; Rapid method for the analysis of ——. E. Ladd. Min. and Eng. World, June 29, 1912, 1350.

The author has found that if kaolin be calcined to expel its combined water, it subsequently becomes soluble in concentrated hydrochloric acid. In carrying out an analysis, the dried sample is heated to redness over a full Bunsen burner flame (without blast) for 25 minutes. The dehydrated kaolin is then digested with concentrated hydrochloric acid on the hot plate for two hours, and the remainder of the analysis is performed in the usual way. —O. R.

Patents.

Refractory products; Process of manufacture of light ——. M. Hanabusa. Fr. Pat. 439,970, Feb. 10, 1912.

Equal quantities of two clays, one with a high plasticity and the other of a hard character are mixed together, and to this mixture is added sulphur and other combustible materials, such as coal, coke, sawdust, etc., which can be employed either separately or together; this mixture is moulded into blocks which are then burned in the ordinary manner. Graphite may be added to the mixture, before burning, in order to render the blocks more resistant.—W. C. H.

Enamels or glasses; Process for preparing frits designed for the manufacture of ——. T. Goldschmidt A.-G. Fr. Pat. 439,609, Feb. 1, 1912. Under Int. Conv., Sept. 29, 1911.

The use of hydrated stannic oxide containing some alkali is claimed for the preparation of frits for making enamels

Stain.	Fired at 800° C. with frit *e*.	Fired at 950° C. with frit *n*.
1 Gold : 10 alamina (by weight)	Purple red, blue spots	Deep rose
1 ,, : 10 magnesia ,, ...	Bright purple red, blue spots	Bright pure red
1 ,, : 10 barium oxide ,,	Purple red, blue spots, not quite smooth	Rose red
1 ,, : 20 calcium oxide	Blue red, not smooth	Matt, rose red
1 ,, : 100 strontium oxide	Deep purple red, not quite smooth	Matt, rose red
1 ,, : 10 zinc oxide	Gray rose red	Rose red, with metallic separation
1 ,, : 20 bismuth trioxide	Purple red	,, with grey metallic flakes
1 ,, : 200 calcium phosphate	Purple red, opaque, not smooth	Rose red, not smooth

—H. H. S.

and glasses. The product is obtained by precipitating hydrated stannic oxide from solutions of stannates by means of an alkali, washing the precipitate merely with cold water, and finally drying it carefully, or *in vacuo*, in order not to expel the water of hydration.—W. C. H.

Glass; Process of working [polishing] ——. R. de Reytere. Fr. Pat. 439,466. Jan. 27, 1912. Under Int. Conv., Feb. 23, and Oct. 3, 1911.

Glass sheets are polished in one operation, up to the point of the sand washing process, by the action of rollers with a base of emery or carborundum, or a mixture of the two, the rollers being made to rotate in the reverse direction to the motion of displacement of the glass. Independently of their rotating movement, the rollers receive a longitudinal displacement. In conjunction with these rollers felt rollers may also be employed. In the arrangement in which rollers are employed in conjunction with a revolving table, the active effect of the rollers is varied from the centre of the table towards the periphery, either by varying the number of the rollers, or by giving them a special shape, for example a conical shape, in order to render the work uniform over the whole surface of the table.—W. C. H.

Mirrors; Process for the preservation of —— from atmospheric and other gaseous influences. F. Daurelle, Hanoi, Annam. Eng. Pat. 28,141. Dec. 14, 1911.

The tinned or silvered surfaces of mirrors, or the protective coatings covering the same, are protected from atmospheric and other gaseous influences by coating them with lacquer, especially lacquer made from the latex of gum-lac trees of the Rhus and Melanorrhea laccifera genera of Indo-China, China, and Japan.—O. R.

Carbosilicon. H. N. Potter, New Rochelle, N.Y., Assignor to G. Westinghouse, Pittsburgh, Pa. U.S. Pat. 1,030 327, June 25, 1912.

Powdered silicon carbide and a binding material are pressed into a compact form and brought into contact with molten silicon.—O. R.

IX.—BUILDING MATERIALS.

[Portland] cement; Technical methods of analysing ——. G. Hentschel. Chem.-Zeit., 1912, **36**, 821—822.

To determine silica, acetic acid is used for decomposing the cement instead of hydrochloric acid, and the subsequent prolonged heating of the residue at 105°—110° C. is dispensed with. 1 grm. of cement is stirred with 20—30 c.c. of 80 per cent. acetic acid and heated on the water bath for 25—30 minutes. The mixture is then boiled, dilute nitric acid added drop by drop, until the red colouration due to ferric salts just disappears, and after allowing to settle, the insoluble residue washed on the filter with hot water, then with water containing a little dilute nitric acid, and finally with hot water again, the filter and its contents being then ignited and weighed. The results agree very closely (within 0·02 to 0·08 per cent. in 4 analyses) with those of the much slower hydrochloric acid method. Sulphuric anhydride is determined by dissolving the cement in acetic acid as above, filtering off the insoluble residue, and precipitating barium sulphate from the boiling acetic acid solution by means of crystalline barium chloride. The liquid is boiled for 5—10 minutes, concentrated hydrochloric acid is added, the mixture is boiled again for 5—10 minutes, and after a further period of 5 minutes, the barium sulphate can be filtered, washed, ignited, and weighed. The ignited precipitate is free from iron oxide and lime, and the results agree within 0·01 to 0·04 per cent. (in 4 analyses) with the results obtained by the hydrochloric acid methods.—O. R.

Cement drain-pipes; Destruction of —— [by effluent from potassium chloride factory]. J. Barth. Tonind.-Zeit., 1912, **36**, 1081—1083.

A cement drain, constructed of circular and egg-shaped pipes, which was laid down at Schönebeck in 1899, was found to be almost completely destroyed after 10 years The cause was traced to the effluent of a potassium chloride factory, which contained a large amount of magnesium salts, especially magnesium chloride, in solution. The latter reacted with the lime of the cement, forming calcium chloride and magnesia, as was proved by analyses of weakened fragments of the drain-pipe, which showed an increase in the magnesia content of the cement and a corresponding decrease in the lime content.—O. R.

Slag-concrete. A. Knaff. Stahl u. Eisen, 1912, **32**, 929—935, 982—989, 1021—1025. (See also this J., 1911, 426.)

Two sorts of slag may be used. (1) lump slag, which must not be so basic as to disintegrate in the air, and is best used after weathering, and (2) slag-sand, which is used in conjunction with lime or Portland cement to form the binding agent. In addition to its chemical composition the author emphasises two important properties of slag-sand, namely (a), the air-volume contained in unit volume of the heaped-up, dry material, *i.e.* $1-\frac{r}{s}$, where r is the apparent and s the actual specific gravity of the material, and (b) the degree to which the material will contract when subjected to stamping or compression. The author made a large number of tests with mortars composed of 1 volume of Portland cement and 3, 5, 6, 8, 10, 12, 14 and 16 volumes of various kinds of natural sands and slag-sands respectively, the crushing strengths of the mortars being determined after 28, 45, 60, and 100 days in air and under water respectively. The results were plotted on curves in which the ordinates represented the crushing strengths and the abscissæ the proportions of cement to sand. Very similar curves were obtained in the cases of washed river sand and a large variety of blast-furnace, foundry, and steel slags, the distinctive features of the curves being the steep gradients between the points representing cement mixtures 1 : 3 and 1 : 6, and the flatness of the curves representing the "lean" mixtures from 1 : 6 to 1 : 16. An exception was found in the case of highly manganiferous slags from spiegeleisen, the strengths of which diminished less rapidly with increasing "leanness," the minimum strengths of mixtures 1 : 16 being considerably in excess of the minima for the other sands and slag-sands, which were examined. The increase in the basicity of a slag was found to be accompanied by a corresponding increase in "activity." The fineness of the material had a considerable influence on the strengths of the mortars; up to a certain point slag-sand behaved like ordinary sand and increase in fineness was accompanied by decrease in strength, owing to the fact that a certain quantity of cement no longer sufficed to knit together the increased surface area of the sand; beyond a certain degree of fineness, however, certain slag-sands, especially spiegeleisen slags, became active and increased in strength with increasing fineness. In preparing concrete the filling material, such as lump slag, should be freed from adhering impurities and graded into, say, three increasing degrees of fineness, (1), (2), and (3), and the air-volume of each determined; the quantities to be used should then be so chosen that the volume of (2) and (3) exactly fill up the air-volume of the coarsest sort (1), and the volume of mortar necessary for the concrete would then be represented by the total remaining air-volume of the mixture so obtained.—O. R.

Granacite. Fischer. *See* I.

Patent.

Portland cement; Process and arrangement of the furnace for burning ——. M. J. Davidsen. Fr. Pat. 440,118, Feb. 13, 1912.

The slurry is sprayed into, or allowed to fall in the form of rain through, the chimney stack of the kiln, and to enter the latter by way of a shoot. By thus allowing the slurry to pass freely through the hot gases of combustion, it is dried, and if the temperature of the gases is high enough the carbon dioxide in the raw materials is partly or entirely eliminated before the materials are actually introduced into the rotary kiln.—W. C. H.

Moulded masonry; Materials for —— and the process of obtaining them. Ges. zur Verwertung neuer Bauverfahren. G. m. b. H. Fr. Pat. 440,281, Feb. 17, 1912. Under Int. Conv., July 28, 1911.

Dry cement is incorporated with filling materials and introduced into a liquid mixture of chemical products which are to be added. Porous-waste materials, such as bricks, earthenware, blast furnace slag, etc., are worked up with cement, and with potassium silicate diluted with water, calcium hydroxide, kieserite (magnesium silicate), Glauber's salt (sodium sulphate), and kieselguhr, in order to yield a thick paste, to which are further added chips, turnings, wire and other iron waste. The moulded objects obtained are claimed as new products.—W. C. H.

Wood-meal, sawdust, and the like; Manufacture of a composition from ——. B. Lach, Vienna. Eng. Pat. 6031, March 11, 1912. Under Int. Conv., March 13, 1911.

Wood-meal, sawdust, or the like is treated with alkali solutions, whereby the resinous and gummy constituents are extracted; the latter are separated from the solution obtained by means of dilute acids, and are dissolved in a suitable solvent, such as carbon tetrachloride, benzol, alcohol, or the like. The extracted wood-meal is then mixed with the hot concentrated solution of the resinous matter, quickly cooled, and subjected to great pressure in moulds of the desired shape, whereby the solvent is pressed out of the mixture and the gummy constituents are deposited on the wood fibres and bind them together. To increase the hardness and density of the composition, various materials, having adhesive properties, may be added to the solution of the resinous or gummy constituents, suitable substances being viscose, glue, water-glass, and the like, and especially the waste sulphite liquors from the manufacture of cellulose.—O. R.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Minerals; Flotation of —. K. A. Mickle. Eng. and Min. J., 1912, **94**, 71–76. From Proc. Roy. Soc. Victoria, 1911, **24**, (N.S.) Pt. II. See also *ibid* 1911, **23**, (N.S.) Pt. II. (See also this J., 1910, 700.)

An account is given of a comprehensive series of tests made with various oils, and in the presence of pure and acidulated water, upon galena, blende and gangue-forming minerals separately and upon products from the treatment of Broken Hill ore. It was found that the finely divided mineral sulphides adsorbed oil in varying quantities, depending upon the extent of surface exposed by the particles, the maximum for the 80-mesh mineral being from 10 to 15 per cent. of the weight of the latter. With sulphides containing about 5 per cent. of adsorbed oil there was a tendency for gaseous bubbles to become attached to the particles; this tendency increased as the proportion of oil diminished, attaining the maximum when the oil content was about 0·5 per cent. Although the adsorption of oil by quartz and the more acid silicates was less pronounced than that by sulphides, in pure water oil was adsorbed by the more basic gangue-forming minerals (magnetite, calcite, rhodonite and garnet) to almost the same extent as in the case of sulphides; in acidulated solutions, however, the tendency of both acid

Flotation Experiments with Oils and Acids.

No.	Materials Taken for Test.	Flotation Product, Grams.	Zn., %	Insol. Gangue, %	Residues, Grams.	Zn., %	Insol. Gangue, %	Remarks.
1	No. 1 Broken Hill tailings, 400 grams; oleic acid, 0·8 gram; water, 1400 c.c.	272	22·4	46·6	119	14·3	39·6	Heated to near boiling point. Agitated repeatedly and skimmed.
2	Tailings, 400 grams; H_2SO_4, 3 lots of 8 c.c. each added..................	129	49·4	1·4	236	6·3	71·4	First 8 c.c. of acid gave little scum; 2nd copious 3rd poor.
3	Tailings, 400 grams; H_2SO_4, 5 c.c.; oleic acid, 0·8 gram................	93	46·3	1·1	292	11·0	60	Flotation distinct at 80° C.
4	Tailings, 400 grams; H_2SO_4, 10 c.c.; oleic acid, 0·8 gram................	105	46·8	1·2	276	9·8	69	
5	Tailings, 400 grams; H_2SO_4, 15 c.c.; oleic acid, 0·8 gram................	109	48·7	1·4	261	8·3	64·6	
6	Tailings, 400 grams; H_2SO_4, 1 gram; oleic acid, 0·4 gram................	37·5	48	1·8	354	1·9	49·2	Skimmed and stirred about 20 times.
7	Tailings, 400 grams; H_2SO_4, 2 grams; oleic acid, 0·4 gram................	84·5	33	23·2	308·5	17·5	53·6	Skimmed and stirred about 20 times.
8	Same as No. 7 with H_2SO_4, 4 grams ..	78	40·5	3·2	312	14·3	58	
9	Same as No. 7 with H_2SO_4, 8 grams ..	77	47·5	1·2	308	12·7		
10	Same as No. 7 with H_2SO_4, 12 grams ..	80	47·4	1·0	295	12·4	58·6	
11	No. 2 Broken Hill tailings, 400 grams; H_2SO_4, 4 c.c.; oleic acid, 0·4 gram .	27·5	36·8	9·0	365	11·4	54·6	
12	Same as No. 11 with H_2SO_4, 8 c.c.	36	43·7	4·8	351	9·7	62·4	
13	Same as No. 11 with H_2SO_4, 12 c.c. ..	78	45·3	2·2	298	5·0	69·6	
14	Same as No. 11 with H_2SO_4, 16 c.c. ..	78·5	45·4	0·8	311	4·6	67	
15	Broken Hill slimes, 400 grams; water, 1500 c.c.; H_2SO_4, 7 grams; oleic acid, 0·8 gram	122	31·5	11·0	277	15·1	34·2	
16	Same as No. 15, but with 14 grams H_2SO_4	217	32·2	9·0	166	4·8	54·6	Skimmed about 30 times.
17	Broken Hill tailings, 340 grams; slimes, 60 grams; H_2SO_4, 19·2 c.c., added in 3 lots of 6·4 c.c. each	(1) 38·5 (2) 72	42·9 51·2	2·8 1·0	262	8·4	64·8	The third addition of 6·4 c.c. produced no more flotation.
18	Same as No. 17, but with oleic acid, 0·4 gram; H_2SO_4 added in 3 lots of 6 c.c. each	(1) 75·5 (2) 17·5 (3) 7·5	39·2 46·3 45·7	8·6 2·2 2·4	268	5·8	60·4	
19	Broken Hill tailings, 340 grams; slimes, 60 grams; fuel oil, 1·5 grams; H_2SO_4, added in 3 lots of 6 c.c. each	(1) 122·5 (2) 25 (3) none	38·2 47·9	10·8 5·1	230	18·8	44·6	
20	Broken Hill tailings, 340 grams; slimes, 60 grams; hydrocarbon oil, 0·8 gram; H_2SO_4, 20 c.c., in 5 lots of 4 c c. each	(1) 7·2 (2) 22·7 (3) 16·8 (4) 8·5 (5) none	35·4 44·9 45·0 48·4	10·6 2·2 1·4 1·2	330	8·3	63·8	
21	Broken Hill crude ore, 200 grams, oleic acid, 0·4 gram; H_2SO_4, 2·4 c.c.	6·4	37·7	4·4	128	6·8	63·2	
22	Broken Hill crude ore, 200 grams; oleic acid, 0·4 gram	(1) 57·5 (2) 69·5	20·6 20·8	29·2 30·6	73	10·9	56	1st float 6 skims. Heated gradually to 80° C. 2nd float 15 skims; 20 minutes' agitation.

and basic gangue-forming minerals to adsorb oil was greatly reduced, that of the sulphides being but little affected. As regards the attachment of gas bubbles to mineral particles it was found that, although assisted by the presence of oil (the latter probably causing the gas bubbles to become more adherent), the occurrence was initiated by the mineral itself. By experimenting upon Broken Hill tailings with a saturated solution of carbon dioxide (oil being absent) it was found that, whereas gas bubbles became attached to sulphide and gangue particles alike when the tailings were used without preliminary treatment, the bubbles were formed only upon the sulphides and some of the garnet when the tailings were treated with dilute sulphuric acid and washed previous to being immersed in the solution of carbon dioxide. Analyses of the gases obtained from various flotation products indicated that the affinity of mineral sulphides for carbon dioxide was greater than that for air, a concentration or condensation of gas (consisting mainly of carbon dioxide) occurring upon the sulphide particles (and to a much smaller extent upon the other minerals tested) and persisting even when the minerals were dried, but being removable by means of solvents. From a series of tests made to determine the effect of acid upon the flotation product obtained by the use of an oil, it was found that, by the addition of acid up to a certain point, the proportion of gangue in the product was decreased. In these tests, particulars of which are given in the following table, each charge (containing 1400 c.c. of water) was placed in an enamelled pot provided with an agitator and heated from below by gas, flotation being effected by gradually heating the mixture during agitation, then allowing it to stand for a few minutes and skimming off the product with a wire gauze strainer. The gangue of the No. 1 Broken Hill tailings used in tests 1—10 was maintly quartz and rhodonite, that of the No. 2 Broken Hill tailings used in tests 11—14 being calcitic.

Reference is made to the Horwood process in which finely divided sulphide ores and products are subjected to a preliminary roast at a low temperature in order that the particles of galena may become coated with lead sulphate and thereby prevented from rising to the surface with the blende in the subsequent treatment by flotation. In this connection the author has found that the preliminary roasting of the material may be replaced by treatment with a solution of ferric chloride, the particles of galena thus becoming coated with a film of sulphur and lead chloride while the blende remains unaffected. Highly satisfactory results were obtained in the laboratory by the use of ferric chloride, previous to flotation with oil and acid, in the separation of the blende from the galena contained in crude Tasmanian ore and in various concentration products from the tailings and slimes of Broken Hill ore.—W. E. F. P.

Manganese: Electrolytic determination of ——, *and its separation from iron.* H. Golblum and H. Gunther. Comptes rend., 1912, **155**, 166—168.

By the electrolysis of strongly agitated solutions containing the sulphates of manganese and iron in various proportions, it was found possible—at 80° C. and in the presence of ammonium oxalate—to effect quantitatively the precipitation of the manganese upon the anode as a homogeneous and adherent deposit of manganese dioxide practically free from iron, only a small quantity of iron being simultaneously deposited upon the rotating cathode. Although essentially dependent upon the current density, the precipitation and purity of the manganese dioxide were noticeably influenced by the rate at which the cathode was rotated; the best results were obtained with a current of 2 amp. at 3 volts, the cathode being rotated at 700 revolutions per minute. From solutions (100 c.c. each) containing 0·1 grm. of manganese, 10 grms. of ammonium oxalate and various quantities of iron, the manganese was thus completely precipitated in from 60 to 90 minutes; the deposit contained from 0·2 to 0·5 per cent. of iron which was subsequently determined colourimetrically and allowed for.—W. E. F. P.

Aluminium; Gases from ——. M. Guichard and P. R. Jourdain. Comptes rend., 1912, **155**, 160—163.

The quantity and composition of the gases obtained by heating various samples of aluminium *in vacuo* was determined, the metal employed including portions of army utensils some of which had been in use for long periods. The quantity of gas obtained (under similar conditions in all cases) was found to increase with the alteration (oxidation) of the metal, the most noticeable feature being the increase in the amount of carbon dioxide obtained from the more altered samples. The results of the investigation are shown in the following table. Sample A, from a drum, was cleaned with emery before use; B, from a plate, was treated with boiling carbon bisulphide for 3 hours before use; C was a portion of a plate which had been amalgamated and then exposed to the air for a year; D, from the cover of a cooking pot after 10 years' service, was cleaned with emery before use; E and F, also obtained from the cover of a cooking pot, were respectively treated for 4½ hours with boiling carbon bisulphide, and for 2 hours with acetone and ether, before being tested. Samples A, B and E contained, respectively, 2·75, 2·9 and 2·62 per cent. of copper.

	A.	B.	C.	D.	E.	F.
Weight of metal taken (grms.)	32·196	79·08	35·667	6·152	61·850	25·0
Total gas from 10 grms. (c.c)	0·3	0·19	6·1	11·4	21·31	26·0
Containing CO_2 (c.c.)	0·02	0·02	4·0	3·0	8·2	8·3
CO ,,	0·03	0·02	0·7	0·2	—	—
CH_4 ,,	0·03	0·02	1·35	1·7	—	—
H ,,	0·18	0·12		6·4	—	—
N ,,	0·03	0·01		0·1	—	—

The authors conclude that the gases proceed partly from the mass of the metal and partly from the surface coated with alumina, this view accounting for the increase in the amount of gas obtained from the more oxidised samples. It has already been shown (P.-R. Jourdain, this J., 1910, 884) that carbon dioxide is always present in the alumina produced by the spontaneous oxidation of amalgamated aluminium.—W. E. F. P.

Molybdenum; Electrolytic determination of ——. A. Fischer and J. Weise. Z. anal. Chem., 1912, **51**, 537—550.

Molybdenum is quantitatively separated from acidified aqueous solutions of alkali molybdate by electrolysis, in the form of a hydrate of molybdenum sesquioxide; according to Kollock and Smith (this J., 1901, 1145, and J. Amer. Chem. Soc. 1901, **23**, 669) this is dissolved in nitric acid, evaporated to dryness, and the residue heated on an iron plate to convert it into the trioxide. The present authors now show that this conversion is only quantitative at temperatures about 400° C., and they describe an electrically heated oven in which the oxidation may be effected. Attempts to repeat Exner's rapid electrolytic method (this J., 1903, 1150) gave low results, complete separation requiring more than two hours in every case. The following rapid method, however, gave good results, using hydrochloric acid in place of sulphuric acid:—About 0·2 grm. of alkali molybdate is dissolved in 120 c.c. of water and acidified with 0·2 to 0·25 c.c. of concentrated hydrochloric acid (sp. gr., 1·19); the solution is electrolysed at a temperature of 20° C., using a rotating platinum-iridium anode and a current of 3·5 to 4 ampères. The molybdenum is completely separated as sesquioxide-hydrate at the end of 25 minutes, and is converted into the trioxide by heating for two hours in the electric oven at 400° C., and weighed as

such; the results were further checked by titration with standard sodium hydroxide. The use of a current of 2·5 ampères for 35 minutes gives equally accurate results. When the amount of hydrochloric acid is raised to 0·33 c.c., the results are approximate but slightly low in each case. whilst lowering the amount to 0·7 to 1 c.c. gives very low results, the electrolyte at the end of the operation containing considerable quantities of molybdenum. Accurate results are obtained when quantities of molybdate considerably lower than 0·2 grm. are used, but with larger quantities (*e.g.*, 0·3 or 0·4 grm.) low figures result.
—T. F. B.

Alloys of platinum with aluminium. Chouriguine. Comptes rend., 1912, **155** 156—158.

The alloys were prepared in an electric resistance furnace by the gradual addition of platinum wire to molten aluminium; the latter metal was protected from oxidation by being soaked in a solution of lithium chloride and dried before being melted. The results obtained in the thermal examination of the series are shown in the following table:—

Composition.		Commencement of solidification. (° C.)	End of Solidification. (° C.)	Point of transformation. (° C.)	Transformation from the solid state. (° C.)
Platinum.	Aluminium.				
5	95	648	639	—	—
10	90	639	639	—	547
20	80	695	635	—	543
30	70	741	635	—	551
40	60	788	643	—	—
50	50	972	639	772	—
60	40	1072	648	790	—
70	30	1164	—	787	—
80	20	1457	—	—	—

A definite compound containing 70·4 per cent. of platinum and having the formula $PtAl_3$ was found to occur (in quantities increasing with the percentage of platinum) in all the alloys containing from 10 to 70 per cent. of platinum. This compound—violet black in colour (golden yellow in places by oblique illumination under the microscope)—was isolated in the form of dendrites and octahedral crystals by treating the alloys with 5 per cent. hydrochloric acid; although soluble in aqua regia and attacked by strong ferric chloride solution, the product was not affected by ordinary cold acids or by exposure to air. When containing less than 10 per cent. of platinum the alloys were white, soft and very malleable, being found, under the microscope, to consist of a white ground mass of aluminium in which occurred small plates of the eutectic (9 per cent. of platinum) containing crystals of aluminium and of the compound $PtAl_3$. With a platinum content of from 10 to about 70 per cent. the alloys were white, hard and brittle, those containing from 70 to nearly 90 per cent. of platinum being also brittle but yellow in colour. By micrographic examination of these yellow alloys after etching with a 50 per cent. solution of ferric chloride, the presence of characteristic crystals of a new constituent richer in platinum than the mass and having the appearance of white bands was indicated; a bronze coloured powder was obtained by treatment of these alloys with boiling concentrated hydrochloric acid but the composition of this product was indefinite. The alloys containing 90 per cent. and upwards of platinum were white and malleable and. although dissolved by aqua regia, were unaffected by ordinary acids.—W. E. F. P.

Platinum alloys; A method for the analysis of ——. H. Arnold. Z. anal. Chem., 1912, **51**, 550—554.

This method for the analysis of alloys containing platinum, copper, silver, nickel, and iron, depends on the fact that the chlorides of copper, nickel, and iron are readily soluble in alcohol. One grm. of the alloy is dissolved in *aqua regia*, the solution is evaporated to dryness, and evaporated three times to dryness with hydrochloric acid. A solution of 10 c.c. of hydrochloric acid (sp. gr. 1·12) and about 1 grm. of caustic potash in a small quantity of water is now added, and the mixture evaporated. The residue is treated with 50 c.c. of methyl or ethyl alcohol, well stirred, and decanted through a filter, the residue being washed with alcohol until the washings are colourless. The filter paper is incinerated and the ash, together with the dried potassium platinichloride, is heated until the excess of potassium chloride melts, when the platinum salt is reduced to metal by heating in a current of hydrogen. The mass is now heated with dilute hydrochloric acid and then with ammonia to remove the potassium chloride and also any trace of silver. The platinum residue is extracted with hydrofluoric acid to remove any silica which may have been taken up from the vessels used. The silver is precipitated from the platinum filtrate as sulphide, converted into chloride, and weighed as such. The alcoholic solution of the other chlorides is evaporated and the residue dissolved in dilute hydrochloric acid. The iron is preferably separated by Rothe's ether-extraction method (see this J., 1892, 940). The solution of copper and nickel chlorides is converted into sulphates and the copper is either precipitated as sulphide, or is separated electrolytically, in which case its content of nickel is determined preferably by the dimethylglyoxime process. The filtrate from the copper precipitation is evaporated to a small volume, mixed with saturated ammonium sulphate solution and 50 c.c. of 25 per cent. ammonia, and the nickel is separated from it electrolytically. When analysing alloys containing lead as well as silver, the chlorides of these metals, which are insoluble in alcohol, may be separated from the platinum by converting the latter into the soluble sodium platinichloride.—T. F. B.

Nickel as catalyst. J. B. Senderens and J. Aboulenc. Bull. Soc. Chim., 1912, **11**, 641—646.

The temperature at which nickel oxide is reduced by hydrogen is found to depend on the mode of preparation and treatment of the oxide used, there being also a considerable difference between the temperature at which reduction commences and that at which it is complete. Complete reduction is not effected below 300° C., but the mixture of metal and oxide thus obtained is more active than the metal prepared by total reduction at a higher temperature, the activity of reduced nickel being diminished by heating to a comparatively high temperature, although, at the same time, its catalytic properties are rendered more permanent. Pyrophoric nickel, when heated in the air, furnishes an oxide which is reducible at a comparatively low temperature, and reduced nickel of impaired activity, may be restored, therefore, by oxidising it and again reducing.—F. Sodn.

[Gold and silver]. The Parks electro-cyanide process. J. R. Parks, School of Mines Quart., 1912, **33**, 365—372.

A description of the process (this J., 1910, 31 and 1911, 370), with a statement of results obtained in the treatment of various American ores. The "pan" of the apparatus is charged with 6 or 7½ tons of ore and 9 or 7½ tons of water, respectively (the larger proportion of water being employed with clayey ores), together with the necessary quantities of cyanide and common salt. The daily capacity of the pan for average ores varies from 36 to 60 tons, the time required for the treatment of a charge being generally from 2½ to 4 hours. For a single pan the power required is 0·6 h. p. for mechanical agitation, 1 to 1·5 for compressed air and 4·5 to 6 for electric current. The following results were obtained by direct pan treatment:—(1) At the Ruth mill, Kingman, Arizona, 96·66 per cent. of the gold and 87·77 of the silver (representing 95·09 per cent. of the total value) was extracted from the ore. The latter contained gold and silver in the ratio of 1 to 12 and to the value of 18 dollars per ton, and consisted of quartz associated with manganese minerals and metallic sulphides, in which latter the bulk of the values occurred. Three pans were employed, each with 7½-ton charges, the time of treatment being 6 hours per charge, and the amount of potassium cyanide 1 lb. per ton of ore. (2) At the Maginnis mill, Maiden, Montana, oxidised ores containing carbonates of lead, zinc and copper with 0·33—0·50 oz. of gold and 1·5—4 oz. of silver per ton were treated in 7½-ton charges in a single pan. One lb. of potassium cyanide per ton of ore employed, the time of treatment was 2½ hours per charge, and 86—92 per cent. of the gold and 62—72 of the silver extracted. (3) 225 lb. of ore from Kendal, Fergus County, Montana—consisting of porous limestone impregnated with gold to the value of 8 dollars per ton (testing pan). The ore crushed to 12-mesh size and 1 lb. of potassium cyanide per ton employed. Extraction of 90·5 per cent. of the gold in 1 hour, 97 per cent. being extracted in 2½ hours. (4) Ore from Orient, Washington (1·03 oz. of gold per ton, and none "free"), consisted of andesite containing fine crystals of pyrites. Treated in 230-lb. lots. Fineness of pulp 120-mesh, and time of treatment, 4 hours per charge: 4½ lb of sodium cyanide per ton of ore, used, and 95·35 per cent. of the gold extracted. (5) At the Whitman mine, Pearl, Idaho, ore (120-mesh size) containing 25-27 per cent. of mispickel, 40 of pyrites and 35—37 of gangue, together with 1·3385 oz. of gold per ton; treated for 6 hours with 4 lb. of potassium cyanide per ton; 88·8 per cent. of the gold extracted. (6) Ore from the Metates mine, Sinaloa, Mexico (quartz with galena and antimonial sulphide minerals, 5 per cent. of pyrrhotite and 0·625 oz. of gold and 63·015 oz. of silver per ton yielded 99 and 91·1 per cent. gold and silver respectively when treated in 230-lb. lots with 12 lb. of potassium cyanide per ton; each charge (120 mesh pulp) treated for 12 hours, the cyanide consumed being 7·7 lb. per ton.—W. E. F. P.

Copper-tin alloys; Electrical properties of ——. R. Ledoux. Comptes rend., 1912, **155**, 35—37.

THE author has determined and plotted curves to represent (1) the electrical resistance (2) the temperature-coefficient of resistance between 0° and 100° C. (3) the thermoelectric power against lead and (4) the temperature coefficient of the thermoelectric power, in each case for alloys with varying percentages of copper and tin. Practically all the measurements indicate the compound Cu_3Sn, while several of the curves indicate the existence of a compound Cu_4Sn.—W. H. P.

Metal colouring; Anodic —— in ammoniacal baths. V. Paissakowitsch. Elektrochem. Zeits., 1912, **18**, 274—276, 309—311, 340—346, **19**, 6—11, 40—43, 65—67, and 95—97.

THE author has investigated the anodic separation of oxides of iron, manganese and nickel on the electrolysis of ammoniacal solutions of their salts, with the object of producing coloured films on the surface of metallic articles used as anodes. For good adherence of the film it is necessary that the surface of the metal should be well cleaned and polished and thoroughly freed from grease. The removal of grease is best effected electrolytically in a bath containing alkali carbonate or cyanide. This removes not only saponifiable but also unsaponifiable grease, particularly if the article is made alternately anode and cathode. The investigations were carried out with iron or steel anodes in all cases. Ferric oxide and manganese dioxide can easily be deposited as adherent layers of varying colour, and under suitable conditions the process may be of technical value. This is particularly the case with the deposit of manganese dioxide which is produced with a voltage of 1·75 to 2·5. This deposit is very adherent and appears to form an admirable protection against corrosive influences. From ammoniacal nickel solutions the deposits produced are not so satisfactory. The conditions under which precipitation takes place are very limited, and difficult to control. The colour is unattractive and the deposit adheres badly. The potential required for the deposition of the oxides varies considerably with the metal. In the case of iron a deposit which consists partly of ferrous iron is apparently obtained with very small potentials. As the potential rises the amount of ferric iron in the deposit increases. In the case of manganese no oxide at all is deposited below 0·4 volt, and in the case of nickel the formation of the peroxide seems to be closely connected with the production of molecular oxygen, and consequently it only appears at potentials which allow of the evolution of gaseous oxygen. —W. H. P.

Treatment of mercury ore. H. D. McCaskey. U.S. Dept. of Mines, June, 1912.

PRODUCERS reported 143,582 short tons of new ore mined and available for treatment in 1911, against 131,813 tons in 1910, of which 138,525 short tons of ore were treated, against 123,562 tons in 1910. The average recovery was 11·5 pounds of metal per ton, or 0·575 per cent. of ore treated, against 12·5 pounds, or 0·625 per cent. of ore, in 1910. Inquiries were made as to the methods of recovery. Retorts for recovery of mercury are of two types, known as the pipe retort and the D retort. Both distil off the mercury from the ore separately from the gases of combustion and convey the volatilised metal through short outside condensing pipes to a trough in which mercury is collected. The retorts are themselves built over fire boxes, and are filled and discharged horizontally from the furnace floor, the D retort by means of iron pans resting on the flat bottom and the pipe retort by means of shovels and semicircular hoes. Retort plants contain from one to fifteen or more retorts, are inexpensive to erect and operate, and may serve useful purposes in the early development of a mine, but are best used, perhaps, for treatment of concentrates or furnace soot. Unless very carefully worked, however, they affect the health of the workmen; and when in operation at new mines, the temptation is to tear out the rich ore of the mines, for which they are best adapted, and quickly sacrifice a property that might longer be remunerative if worked on a larger scale and by better methods. The great bulk of present domestic output is from shaft furnaces, in which the descending ore meets the upward heated furnace flames and gases, and the volatilised metal passes with the gases and impurities of combustion into a series of condenser chambers, usually of brick, in which the metal is collected and from which it is drawn off. The gases pass from the final chamber to the stack, usually through an inclined flue.

The Huttner tile furnace perfected by Robert Scott, formerly of the new Almaden mine, is now adapted to both medium and fine ore. All the furnaces in Texas, and the new plant in Nevada, are of this type. At New Idria, also, are the coarse-ore furnaces designed by B. M. Newcombe and at the Guadalupe mine are the Davey modified Litchfield furnaces.

Osmiridium in Tasmania. Chem. and Drug., July 20, 1912.

THE chief source of the world's supply of osmiridium is in the neighbourhood of the Savage River, on the west coast of Tasmania. The return of the Mines Department states that 409 oz. was produced in the quarter ended March 31. The metal, which is used in the production of metallic-filament electric lamps, sells at £7 10s. per oz., as against 85s. per oz. for gold.

Manganese mining in the Caucasus. U.S. Cons. Rept. July, 1912.

THE manganese deposits of the Caucasus are among the richest in the world. The principal mines are situated at Tchiatouri, in the government of Kutais, about 190 versts (126 miles) from the Black Sea ports of Batum and Poti. The exploitation of the Tchiatouri mines began in 1878, but remained on a very limited scale until 1885, when the Trans-Caucasian railway was constructed.

The total export of the ore from Batum and Poti during the past 4 years has been as follows:—

	1908.	1909.	1910.	1911.
Ports.	Tons.	Tons.	Tons.	Tons.
Poti	366,600	544,000	364,500	442,460
Batum	8,160	25,500	36,215	129,233
Total	374,760	569,500	400,715	571,693

The increase of the shipments from Batum during 1911 is attributed to the heavier cost of loading ore at Poti owing to the levying, in 1910, of a duty of one-half kopeck per pood (0·2575 ct. per 36·112 lb.) on ore exported from that port.

Until the beginning of 1911, no statistics were kept at the custom-houses of Batum and Poti that would show to what countries the shipments of manganese ore from these ports went. The statistics now available for 1911 give the following destinations of exports:—

	From Poti.	From Batum.
Exported to—	Tons.	Tons.
Austria	8,928	4,256
Belgium	53,315	12,994
France	29,025	15,885
Germany	4,345	25,536
Great Britain	105,943	31,869
Netherlands	204,164	27,999
Spain	30,300	—
United States (by direct boat)	5,450	10,694
Total	442,460	129,233

The ore credited to the Netherlands is in reality destined for Germany. From Rotterdam the ore is sent up the Rhine to the iron districts of Germany.

The ore exported through the ports of Batum and Poti generally contains 48 to 52 per cent. of manganese metal, while concentrates obtained from washing the granular ore and used for chemical purposes (glass making) are shipped containing 81 to 90 per cent. of manganese dioxide.

The following table gives figures reproduced from statistical information relating to manganese shipments from all producing countries during the past 3 years:—

	1909.	1910.	1911.
Producing regions.	Tons.	Tons.	Tons.
Caucasus	524,249	637,718	574,335
Donetz	41,490	22,592	13,888
Algiers	100	—	—
Turkey	3,000	—	620
Greece	3,000	—	—
Sweden	707	255	—
Spain	14,734	4,967	24,435
North Wales	2,761	5,586	4,658
India	519,637	695,504	656,512
Brazil	242,721	247,463	211,200
Japan	170	—	—
Java	—	992	98
Canada	26	—	—
Cape Colony	—	850	—
Total	1,350,495	1,615,927	1,485,746

These figures give the movement of ore from the mines at Tchiatouri to other parts of Russia as well as into stocks and to foreign countries.

Slag concrete. Knaff. *See* IX.

PATENTS.

Steel; Process for hardening low-carbon ——. Gebr. Schubert, Berlin. Eng. Pat. 7558, March 28, 1912. Under Int. Conv., March 30, 1911. Addition to Eng. Pat. 5702 of 1912, dated March 7, 1911.

The process described in the main patent (this J., 1912, 590) is employed, with the variation that the hardening powder is brought by pressure into a solid form adapted to fit the article to be hardened, or parts of the same; the article is placed in this mould, then packed in pure calcined silicious sand and subjected to heating.—B. N.

Zinc: [Electro-]Metallurgy of ——. C. V. Thierry, Paris. Eng. Pat. 20,913, Sept. 21, 1911.

The electric furnace is provided with a bed of carbon as a resister, resting on a refractory hearth, and the charge of zinc oxide and carbon is placed on this. The proportions of the constituents of the charge are such that when heated by the resister, the resulting reaction volatilises the products of the action. Carbon portions are arranged adjacent to the resister, and form part of the sides of the reaction chamber, the inlet ends of the condensers being attached to these carbon parts. The condensers contain carbon, so that the zinc fumes pass through the carbon resister into contact with the carbon side portions and the carbon in the condensers, being thus maintained uninterruptedly in contact with or adjacent to a carbon reducing medium. The series of condensers are arranged within a chamber, the outer wall of which is thinner than the furnace wall, so as to aid radiation of heat, and the chamber and condensers are heated in a suitable manner, by gas, coke or electricity. The zinc condenses to the liquid state in the condensers, but by attaching balloon-like condensers to the outer thinner walls of the internal heated condensers, the zinc may also be condensed in the form of powder.—B. N.

Metals; Apparatus for smelting —— *more particularly for the production of tin from tin ores.* H. F. Höveler, Merton Abbey, Surrey. Eng. Pat. 23,117, Oct. 19, 1911. Under Int. Conv., Oct. 19, 1910.

The furnace is provided with two burner-openings situated in the longitudinal axis, through which are introduced jet-flames produced from liquid fuel burners outside the furnace. The flames produce an incandescent zone in the longitudinal axis of the furnace. The material to be smelted slides down the sloping side walls disposed longitudinally, and is partly reduced before it reaches the incandescent zone, but in the latter is raised to such a high temperature that even the tin silicates are broken down by the action of suitable fluxes.—B. N.

Steel: Manufacture of electric ——. V. Stobie, Sheffield. Eng. Pat. 17,179, July 27, 1911.

A low-silicon steel is obtained in an electric melting or refining by adding aluminium to the bath under a suitable finishing slag, the latter having been freed or substantially freed from iron oxide by means of carbon. —B. N.

Ferrosilicon: Method of tapping-off ——. Elektrizitätswerke Lonza. Ger. Pat. 246,716, March 10, 1911.

The molten ferrosilicon is tapped-off from the electric furnace in which it is produced, into water or an aqueous solution, the portion of the furnace below the tapping hole, dipping into the water or other liquid. It is stated that ferrosilicon does not disintegrate when cooled rapidly in this way, but forms a compact mass of micro-crystalline structure.—A. S.

Crucibles or melting pots. The Morgan Crucible Co., Ltd., and L. C. Harvey, London. Eng. Pat. 28,269, Dec. 15, 1911.

For the purpose of enabling molten metal to be poured from the crucible in an unbroken stream and free from dross, the upper part of the vessel is provided with a perforated lateral protuberance forming a reservoir spout. —W. E. F. P.

[Gold and silver.] Metals; Extraction of —— *from their ores.* H. M. Leslie, Glasgow. Eng. Pat. 28,235, Dec. 15, 1911.

To prevent loss of hydrocyanic acid during the treatment of ores by the cyanide process, the agitator, filter, extractor, etc., of the apparatus employed are provided with covers; the gases thus collected are conducted to absorption vessels (containing an alkali hydroxide or carbonate) from which the regenerated cyanide solution is transferred to the sump as required.—W. E. F. P.

Ore roasting and like furnaces; Mechanical ——. J. Harris, Sheffield. Eng. Pats. 17,847, Aug. 5, and 19,053, Aug. 25, 1911.

In a process for chloridising ores in a mechanical roasting furnace comprising a series of superimposed hearths, the roasted ore and salt are heated upon the uppermost hearth by a flue beneath the latter and by the hot gases evolved on the lower earths. Overheating of the charge is prevented by causing the material to travel more quickly along the lower hearths and by the cooling action of an air channel adjacent to that part at which the highest temperature of reaction is developed, means being also provided for admitting air from the cooling channel into the furnace if desired.—W. E. F. P.

Ore roasting furnaces; Mechanical ——. J. Harris, Sheffield. Eng. Pat. 16,583, July 19, 1911.

In a mechanical roasting furnace comprising a series of superimposed hearths, claim is made for the provision of one or more chloridising hearths below, and in continuity with, the roasting floors. The hot ore from the lowest roasting hearth is mixed with the requisite quantity of salt from an exterior hopper before passing to the chloridising hearths, the roasting and chloridising portions of the furnace being provided with separate flues for the escape of the respective gaseous products. For the purpose of rendering all parts of the interior easily accessible, a number of tapered apertures (normally closed by removable bricks) are provided in the exterior walls of the furnace. —W. E. F. P.

Non-ferrous metals; Bright annealing of ——. W. K. Barker, near Manchester. Eng. Pat. 14,648, June 21, 1911.

The articles, contained in perforated metal boxes, are made to pass, by gravity, through a heated inclined retort in which an inert atmosphere is maintained. The retort is provided at the inlet and outlet with a device comprising a series of rotatably mounted chambers through each of which the inert gas passes on its way to or from the retort, each chamber being adapted to receive and completely enclose one of the metal boxes without impeding the flow of gas through the apparatus.—W. E. F. P.

Aluminium or aluminium alloys; Treatment of the surfaces of —— to prepare them to receive metallic depositions. The Harvey Electro Chemical Co., Ltd. Fr. Pat. 440,212, Feb. 15, 1912. Under Int. Conv., Jan. 26, 1912.

The aluminium is first cleaned and then immersed in dilute nitric acid (about 2 per cent.). After a good rinsing it is immersed for several seconds in a solution containing a metallic fluoride (such as tin fluoride) and potassium tartrate. The surface thus receives a light deposit of the metal (such as tin). This deposition may be assisted by a feeble electric current. The aluminium is then, after being washed, in a condition to receive metallic coatings electrolytically which will adhere well and will stand burnishing. The solution of the metallic fluoride is preferably prepared by dissolving the precipitated "carbonate" in hydrofluoric acid.—T. St.

Bronzes and steels containing silicon, and more particularly steels and bronzes of aluminium-silicon; Manufacture of ——. L. C. E. Gautrelet and U. J. Thuau. Fr. Pat. 440,179, April 26, 1911.

Silicon-containing alloys, from which the silicon does not crystallise on cooling, are formed by reducing the silicates of the alkaline-earths (particularly magnesium) by a metal (such as magnesium) in presence of the metal or alloy into which it is desired to introduce the silicon. —T. St.

Steel and metals; Furnace for melting ——. A. Festa. First Addition, dated Jan. 30, 1912, to Fr. Pat. 433,125, Aug. 9, 1911 (this J., 1912, 135).

Instead of fixing the supports of the furnace proper to the ground, the furnace may be carried by a carriage running on rails. By this means the melted metal may be poured at some distance from the melting place, and the furnace may be moved for repairs, etc.—T. St.

Oxides reducible by carbon and carbon monoxide; Process for the economic reduction of ——. Soc. Electro-Métallurgique Française. Second Addition, dated April 19, 1911, to Fr. Pat. 432,721, Oct. 10, 1910 (this J., 1912, 135 and 541.).

The process may be carried out with a single rotary furnace or several connected together. Where the material is treated successively in two or more furnaces, adjoinin furnaces are connected by fixed inclined passages. Thes stationary parts serve for the introduction of carbon or ai during working.—T. St.

Precious metals; Apparatus for the recovery of ——. H. N. Potter, Hollywood, Cal. U.S. Pat. 1,030,490 June 25, 1912.

A series of interchangeable, superposed pans, each adapted to contain portions of mercury or amalgam, the latter forming cathodes above which anodes are disposed The arrangement is such that the charge traverses an enclosed, tortuous path or series of paths in passing through the apparatus. The moulded containers for the amalgam comprise "an inert filling material and an inert synthetic organic binder" the interior surfaces of the same consisting of an insoluble and infusible condensation product of phenolic bodies and formaldehyde or a composition thereof.—W. E. F. P.

Zinc; Metallurgy of ——. C. V. Thierry, Paris. U.S. Pat. 1,030,350, June 25, 1912.

See Eng. Pat. 20,913 of 1911; preceding.—T. F. B.

Zinc; Metallurgy of ——. C. V. Thierry, Paris. U.S. Pat. 1,030,351, June 25, 1912.

See Fr. Pat. 439,143 of 1911; this J., 1912, 547.—T. F. B.

XI.—ELECTRO-CHEMISTRY.

Electrolytic separation of oil from condenser waters. Heyn. *See* XII.

Patent.

Carbon articles of low initial conductivity; [Electrical] Method of treating ——. E. C. Sprague and A. M. Williamson, Assignors to International Acheson Graphite Co., Niagara Falls, N.Y. U.S. Pat. 1,030,620, June 25, 1912.

The articles are disposed between the electrodes of the furnace in a series of piles, with interposed resistance material. The piles are electrically heated, chiefly from the opposite ends, until the articles are rendered electrically conductive, after which the piles are heated throughout their length by heat developed in the interposed resistance material. Throughout the greater part of the heating stage, a higher temperature is maintained in the ends of the piles than in the interior portions, and finally all portions of the piles, at approximately the same time, are brought approximately to the same maximum temperature. —B. N.

XII.—FATS; OILS; WAXES.

Fatty acids; Determination of volatile ——. F. Edelstein and F. v. Csonka. Biochem. Zeits., 1912, 42, 372—392.

In the absence of other volatile substances forming salts with silver nitrate, volatile fatty acids may be quantitatively determined by distillation with steam *in vacuo*, followed by fractional precipitation with silver nitrate, by the following method:—A given quantity of *e.g.* milk (100 to 250 c.c.) is mixed with 7·5 c.c. of phosphoric acid (sp. gr. 1·12) and distilled with steam *in vacuo* at 60° C., until the final distillate requires not more than 1 c.c. of $N/10$ sodium hydroxide solution for neutralisation. If chlorine or phosphoric acid (mechanically carried over) are found in the distillate, the latter must be redistilled. The total distillate (800 to 1000 c.c.) is then neutralised with $N/10$ sodium hydroxide solution, care being taken to avoid an excess of alkali, after which it is concentrated to 100 c.c. and filtered, and the filtrate and washings concentrated to about 20 to 30 c.c., and their contents fractionated by means of N-silver nitrate solution. From 0·3 to 0·5 c.c. are first added, and if the precipitate (which in the absence of excess of alkali should be white) does not dissolve on shaking, the heavier soluble fatty acids (caprylic and caproic acids) are present. In this case it is advisable to wash the two first fractions with dilute alcohol. The filtrate and washings are now treated successively with 0·7, 1, 1·5, 2 c.c., etc., of silver nitrate solution until no further precipitate is formed after 30 minutes' chilling of the beaker in ice-water. The several silver salts are dried on the tared papers for 1 or 2 days at 40° to 50° C. *in vacuo* over sulphuric acid until friable and constant in weight. They are then cautiously ignited, and the residue of silver weighed and calculated into its percentage in the salt. From this the proportions of the two silver salts in the mixture may be calculated. The amounts of the corresponding salts are then added together and the corresponding amounts of the respective free acids calculated.—C. A. M.

Electrolytic separation of oil (*from condenser waters*). W. Heym. Elektrochem. Zeits., 1912, **19**, 91—94.

The oil which separates in the condenser water from steam engines is apparently present in a condition similar to that of a negative colloid. It is therefore suggested that it should be removed by electrolysis of the condenser water, to which sodium carbonate or other salt has been added, between iron electrodes. The formation at the anode of a positive colloidal basic salt of iron leads ultimately to the mutual precipitation of the oil and the basic salt which can easily be removed by filtration.
—W. H. P.

Chinese wood oil, The heat test for ——. F. Browne. Chem. News, 1912, **106**, 14—15.

Especially in the United States the quality of Chinese wood oil is ascertained to a large extent by its behaviour on heating, but owing to the varying conditions under which tests are conducted, the results obtained by different workers are not comparable. The author proposes the following as a standard method: 5 c.c. of the oil are placed in a test-tube, 16 cm. by 15 mm., closed by a cork so perforated that a glass rod, 3 mm. diam., therein, can be moved up and down freely. A copper beaker, 12 cm. high, 6 cm. internal diam., filled with cottonseed oil to a height of 7·5 cm., is heated until the temperature of the oil is 293° C. (560° F.) and is rising very slowly, whereupon the test-tube containing the oil to be tested is introduced and is fixed so that the bottom of the tube is level with the lowest part of the bulb of the thermometer (length 30 cm., graduations 100°—400° C.), the latter being 1·5 cm. from the bottom of the bath. (The readings are corrected for the exposed portion of the stem.) The time is now noted and the source of heat is removed for 45 seconds and then re-applied. In less than 2 mins. the temperature will have fallen to 282° C. (540° F.), at which point it is kept constant. After the lapse of nine minutes from the time at which the test-tube was introduced, the glass rod is raised at intervals of half a minute, and the time noted when the gelatinised oil is firmly set. Duplicate results differing by not more than half a minute can be obtained without difficulty. For seven samples of wood oil, the values obtained varied from 11 to 13 minutes, whilst for samples mixed with 10 per cent. and 20 per cent. respectively of different adulterants (bean oil, earth nut oil, mineral oil, cottonseed oil) the values were 13—15 and 16½—19 minutes. If the time required does not exceed 12½ mins., the oil is in all probability genuine, but with heat tests of 13 mins., further examination is desirable. In such cases the test with chloroform and iodine (Analyst, **33**, 43) is useful:—1 grm. of the oil is dissolved in 5 c.c. of chloroform in a small dish, 5 c.c. of a clear saturated solution of iodine in chloroform are added, and the mixture is stirred until a jelly is formed. With seven samples of wood oil the time required varied from 40 to 55 seconds, whilst with wood oil adulterated with 10 per cent. of bean oil, 105 seconds were required.—A. S.

East Indian Beeswax. A. Lipp and E. Kuhn. J. prakt. Chem., 1912, **86**, 184—199.

The authors' examination of East Indian beeswax has shown that it yields only ceryl alcohol on saponification; in this way differing markedly from ordinary beeswax, the chief alcoholic constituent of which is myricyl alcohol accompanied by only a little ceryl alcohol. The calculated composition of East Indian beeswax given by Buchner (this J., 1905, 151) is thus shown to be erroneous, and it is suggested that the two varieties of beeswax may also differ as regards their acidic constituents, although the hydrocarbons found in both are the same.—J. A.

Oil-seeds of Telfairia pedata. Bull. Imp. Inst., 1912, **10**, 223—225.

The kernels of the seeds of *Telfairia pedata*, a perennial climber which is indigenous in Eastern Africa, Zanzibar, and Pemba, are rich in oil, but the husks contain an intensely bitter substance, which passes to some extent into the oil and prevents the use of the latter for edible purposes, whilst it also renders the press-cake unsuitable for feeding purposes. There is no machine available for shelling the seeds and removing the husks, and, moreover, no large regular supply of Telfairia seeds could be guaranteed at present, even if it were found possible to use them.—A. S.

Lophira oil seeds from West Africa. Bull. Imp. Inst., 1912, **10**, 226—229.

Samples of *Lophira alata* kernels from Sierra Leone and of *L. procera* seeds from the Gold Coast were examined. The *L. alata* kernels contained about 40 per cent. of fat of a similar character to that described previously (this J., 1908, 1161). The *L. procera* ("Kaku") seeds consisted of 25 per cent. of shell and 75 per cent. of kernel, and the kernels yielded 55·3 per cent. of a cream-coloured solid fat of a similar character to *L. alata* fat. Both fats would be suitable for soap-making. The press-cakes could not be used as feeding-stuffs, but would have to be used as manure. The *L. alata* fat was valued at £30 to £31 per ton and the press-cake at about £3 per ton in Liverpool (Nov. 1911), whilst the decorticated kernels were valued at about £10 per ton c.i.f. Liverpool (Oct. 1911). The decorticated kernels of *L. procera* were valued at £12 per ton in Liverpool (Feb. 1912) and the press-cake, which contains only 3½ per cent. of ammonia, at 35s. per ton.—A. S.

Oils and oil-seeds from Hong-Kong. Bull. Imp. Inst., 1912, **10**, 229—233.

Four samples of ground nut oil were valued at £30, £29, £29, and £28 respectively per ton, less 2½ per cent. discount, in London (Feb. 1912), with finest ground nut oil at £38—£45 per ton. A sample of "Tai Fung Chi Yau" oil, stated to be derived from *Gynocardia odorata*, proved to be optically active, and differed in other characters from *G. odorata* oil. It resembled the oil of *Hydnocarpus anthelmintica* (see Power and Barrowcliff, this J., 1905, 741) and was probably derived from this or some closely allied plant. It had the sp. gr. 0·956 at 15·5° C.; acid value, 37·6; saponification value, 192·0; iodine value, 86·5. Four samples of soy beans were examined. No. 1: "White bean" ("Pak tau") contained 18·1 per cent.; No. 2, "Green bean" ("Tsing tau"), 17·9; No. 3, "Yellow bean," 16·6; and No. 4, "Black bean," 15·1 per cent. of oil. The samples were valued at £8, £7 17s. 6d. to £8, £7 15s. to £7 17s. 6d., and £7 10s. to £7 15s. respectively per ton at an English port (Feb. 1912). The moisture content of the beans was low (just over 8 per cent. in all cases), and on this account they would be preferred to the Manchurian beans commonly imported. A sample of soy bean oil was valued at £23 5s. per ton in Hull (Feb. 1912). A sample of hemp seed yielded 28·2 per cent. of oil and was valued at £8 5s. to £9 per ton (Feb. 1912) for the purpose of oil extraction.—A. S.

Tea-seed oil and tea-seed cake. Bull. Imp. Inst., 1912, **10**, 234—235.

The samples examined were sent from Hong Kong, having been imported there from Wuchow on the West River, Kwangsi Province. They were derived from *Camellia Sasanqua*. The yellowish-brown, slightly opalescent oil had the sp. gr. 0·918 at 15·5°/15·5° C.; acid value, 9·4;

saponification value, 193·4; iodine value, 87·5. It would be suitable for lubricating and soap-making. It yielded a softer soap than cottonseed oil and was valued at about £21 per ton, with cottonseed oil at £22 2s. 6d. per ton in Hull (Feb. 1912). The press-cake had a pungent bitter taste and contained 7—8 per cent. of saponin. It would probably be useful for the preparation of vermicides for dressing lawns.—A. S.

Oils and Fats of India. D. Hooper. The Agricultural Ledger, 1911-12, No. 5. [Dictionary of economic products, Vol. V., 50—110.] Calcutta, Superintendent Government Printing, India, 1912. Price 8 annas.

The oils and fats of vegetable origin produced in British India are here enumerated and described.

Alcohols and alcoholic hydroxyl groups; A colour reaction of ——. [Glycerol]. Rosenthaler. *See* XVIII.

Patents.

Soap; Process and apparatus for manufacturing ——. A. F. Blangonnet, Moscow. Eng. Pat. 20,313, Sept. 13, 1911.

Bars of soap containing a central core are prepared by forcing the soap through a funnel containing a drawing plate with a central opening in which a central core is fixed by means of a cross-head supported on bolts projecting from the plate. This core is so mounted that it may be readily exchanged for another of different shape. —C. A. M.

Glycerin separating in the saponification of oils and fats; Process and apparatus for collecting ——. C. Reger. Fr. Pat. 439,663, Feb. 2, 1912.

The fats, etc., are saponified with metallic oxides or alkalis, and the product washed with hot water and heated during the washing. For instance, it may be introduced gradually into a hot water bath whilst jets of steam are meanwhile passed into the mass. Or the mass may be continually agitated during the washing. A special apparatus for carrying out this process automatically is also claimed.—C. A. M.

Fats and oils; Process for separating saponifiable and unsaponifiable ——. C. Stiepel. Fr. Pat. 439,858, Feb. 7, 1912.

The saponifiable portion of *e.g.* a waste fat is saponified as completely as possible, and the mixture distilled in a current of superheated steam or a superheated inert liquid such as petroleum spirit or carbon tetrachloride, to remove the unsaponifiable oil.—C. A. M.

Fats of vegetable origin; Process of preserving ——. A. Ruffin. Fr. Pat. 439,753, Feb. 6, 1912.

The formation of volatile acids is prevented by incorporating the fat with an aqueous solution of sugar or gum, and then separating the water by filtration or evaporation at the ordinary pressure or *in vacuo*.—C. A. M.

Lubricating oils; Process for increasing the viscosity of ——. E. Lecocq. Fr. Pat. 439,467, Jan. 25, 1912. Under Int. Conv., Jan. 31, 1911.

Wool fat is neutralised and the product mixed with a certain proportion of vegetable or mineral oil, or fatty acids or hydrocarbons, according to the melting point desired.—C. A. M.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Rinmann's Green, Cobalt Green. Hedvall, A. Ber., 1912, 45, 2095—2096.

Large crystals (2—3 cubic millimetres in volume) of Rinmann's Green were prepared by heating zinc oxide with cobalt carbonate or oxalate to 1100° C., using 150 per cent. of potassium chloride as flux, and cooling the product in an atmosphere of carbon dioxide. The crystals usually form thin tablets, of positive hexagonal form. Sometimes they form long needles or a skeleton of small pyramids. They are of a fine green colour, with index of refraction $>2·2$, and sp. gr. $=5·69$. Analyses showed that all the cobalt was in a divalent condition, and that the substance had the approximate composition 1CoO : 4·8ZnO.—G. M.

Zinc oxide; Impurities in ——. *Process for rapid examination of zinc oxide paints.* Kohn-Abrest. Ann. Chim. Analyt., 1912, 17, 249—254.

Commercial zinc oxide nearly always contains lead compounds (carbonate or basic sulphate). The following method serves for detecting them in paints, etc.:—The sample (0·3 grm. of the mixed paint, or 0·35—0·4 grm. of the paint coating), is ignited in a nickel dish with 1—2 c.c. of a 15 per cent. solution of ammonium nitrate. The residue is treated with 12 c.c. of the ammoniacal solution prescribed by Tambon (this J., 1907, 977), the mixture being shaken, at intervals, during some minutes. If the sample contain zinc sulphide, or lead or barium compounds, the liquid remains turbid, and the amount of impurity may be roughly determined by comparison with suitable standards (mixtures of zinc oxide and lead carbonate treated with the ammoniacal solution): the nature of the insoluble matter should then be investigated. In the case of zinc oxide in the form of powder, the material (0·2 grm.) is treated with the ammoniacal solution directly.—L. E.

Patents.

Red lead; Process for the preparation of a product suitable for the manufacture of ——. G. Jansen. Fr. Pat. 439,287, Jan. 23, 1912. Under Int. Conv., Mar. 4, 1911.

Molten lead, issuing from a container in a fine stream, is atomised by means of a steam jet containing air, carbon dioxide, and acetic acid vapour; a dry powder is obtained, which is suitable for charging into a mechanical roaster for the manufacture of red lead.—O. R.

Preservation of mirrors from atmospheric and other gaseous influences. Eng. Pat. 28,141. *See* VIII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

"Balata" rubber (Ficus Vogelii) from Northern Nigeria. Bull. Imp. Inst., 1912, 10, 209—210.

The four large blocks of "balata" examined were very dirty externally and covered with mould. Internally, the material, which was deficient in elasticity and somewhat sticky, varied in colour from white to pink. The loss on washing (moisture and impurities) was 26 per cent., and the dry washed "balata" contained 49·2 per cent. of caoutchouc, 47·7 of resin, 2·4 of protein, and 0·7 of ash. It is stated that there is a good market for block "balata" of this kind, and the present sample was valued at 1s. 8d. per lb. (Liverpool, Nov. 1911).—A. S.

Ficus elastica rubber from Southern Nigeria. Bull. Imp. Inst., 1912, 10, 208—209.

Three samples were examined, viz., (1). Six biscuits of rubber prepared by coagulation with potassium carbonate and drying in the smoke of a fire of kernels of *Elæis guineensis*; the biscuits had become firmly adherent owing to the slightly sticky character of the rubber, which was brown, clean, but rather weak. (2) Four biscuits of rubber prepared as No. 1, but without addition of potassium carbonate to the latex; the biscuits were not so firmly adherent as No. 1 and the rubber was stronger. (3) Five biscuits of rubber prepared without potassium carbonate and dried over a fire of green wood; the rubber was similar to, but stronger than No. 2. The results of alyses and the values of consignments of similar character the three samples are shown in the following table :—

	No. 1.	No. 2.	No. 3.
	per cent.	per cent.	per cent.
oss on washing (moisture and impurities)	1·3	0·6	1·2
omposition of dry washed rubber :—			
Caoutchouc	89·6	92·3	93·7
Resin	8·4	6·6	5·4
Protein	0·8	0·8	0·7
Ash	1·2	0·3	0·2
alue in London, with fine hard Para at 4s. 4d. per lb.	3s. 4d.	3s. 4d. to 3s. 6d.	3s. 6d.

—A. S.

Rubber of Cryptostegia grandiflora. Bull. Imp. Inst., 1912, **10**, 210—212.

The samples examined gave the following results on nalysis :—

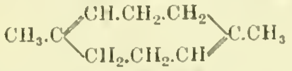
	No. 1.	No. 2.	No. 3.
	per cent.	per cent.	per cent.
Loss on washing (moisture and impurities)	18·5	0·6	20·2
Composition of dry washed rubber :—			
Caoutchouc	74·2	89·2	86·8
Resin	9·7	8·2	9·1
Protein	11·5	1·9	3·8
Ash	4·6	0·7	0·3

No. 1 was an irregular ball of fairly strong rubber from Gwalior State, India: it was valued at 3s. 4d. to 3s. 6d. per lb. compared with fine hard Para at 4s. 8d. per lb. Nos. 2 and 3 were from the Bahamas, and were from vines 3 and 4 years and 1 year old respectively. They were valued at 3s. 10d. to 4s. per lb. for No. 2, and about 3s. per lb. for No. 3, compared with fine hard Para at 4s. 4d. per lb.—A. S.

Artificial caoutchouc. C. Harries. Z. angew. Chem., 1912, **25**, 1457—1462.

The physico-chemical methods employed for the characterisation and identification of most organic substances are inapplicable to the examination of caoutchouc substances; of the chemical methods, those in which use is made of the tetrabromides and the nitrosites are also rejected, owing to the difficulty of obtaining pure products, and to the fact that the products are not characteristic. The only method which appears likely to afford useful results is that depending on the formation of ozonides (see this J., 1903, 1155; 1904, 830; 1906, 33); by aid of this method it is possible to detect whether the product be a "true caoutchouc substance" or not. The following definition is given of a "true caoutchouc-substance," whether of natural origin or derived from isoprene. In addition to possessing the usual physical properties it must, when treated with 6 per cent. pure ozone, furnish a thick oily diozonide, $C_{10}H_{16}O_6$, and with crude ozone a dioxozonide, $C_{10}H_{16}O_8$, which by boiling with water are converted into definite quantities of lævulinic aldehyde or its peroxide and lævulinic acid, viz., the diozonide into two-thirds aldehyde and one-third acid, and the dioxozonide into one-third aldehyde and two-thirds acid. Homologous caoutchouc-substances must give analogous reactions; thus, succinic aldehyde and succinic acid result from the ozonide of butadiene-caoutchouc, and only acetonylacetone from 2.3-dimethylbutadiene-caoutchouc. It is stated that the caoutchouc substances prepared from isoprene by the author's glacial acetic acid process (see this J., 1910, 502) and by the Bayer Company's processes (see this J., 1910, 1215; 1911, 226, 637, 969, 1076; 1912, 141, 240, 547, 596) comply with these conditions. Since all the decomposition products mentioned above give Knorr's pyrrole reaction, this may serve as a preliminary test. By applying the above method quantitatively to natural caoutchouc and guttapercha, and to various artificial caoutchouc-substances, a series of curves was obtained, shewing the comparative rates of decomposition of the various ozonides. The curves derived from natural (Para) rubber and guttapercha and from autopolymerised artificial caoutchouc (both O_6 and O_8 ozonides) and from acetic acid-caoutchouc were practically identical, but those from the caoutchouc substances obtained by polymerising isoprene with sodium and by polymerising piperylene (α-methylbutadiene) differ considerably from these; that this should be the case is explained by the fact that the "sodium-caoutchouc" ozonide furnishes no trace of lævulinic aldehyde or acid and the piperylene-caoutchouc only very small quantities. On the other hand, the decomposition curves of the diozonide and the dioxozonide of natural rubber and of guttapercha are identical, and the decomposition products are also identical.

Constitution of artificial caoutchoucs. In the decomposition of ozonides of isoprene-caoutchoucs (other than those obtained by the sodium process), lævulinic aldehyde and acid are the sole products produced; in only one case has a small quantity of another product been obtained; and this was identified as methylglyoxal, which was most probably derived from the isoprene itself, which proved to be present in small quantity in the product examined. It therefore follows that the caoutchouc must contain the grouping, $CH_3.\ddot{C}.CH_2.CH_2.CH :$, repeated symmetrically. It is possible that two isoprene molecules are condensed, forming first an open-chain hydrocarbon, $CH_2 : C(CH_3).CH_2.CH_2.CH : C(CH_3).CH : CH_2$, and then a closed chain, viz., 1·5-dimethylcyclo-octadiene(1·5).



$$CH_3.C\begin{array}{l}\diagup CH.CH_2.CH_2\diagdown \\ \diagdown CH_2.CH_2.CH\diagup\end{array}C.CH_3$$

It is also possible, however, that three or more molecules of the isoprene could condense, to form a ring of twelve or more members. The symmetrical condensation is the only possible explanation in view of the nature of the decomposition products, since the decomposition products of the unsymmetrical 1.6-dimethylcyclo-octadiene(1.5) would include acetonylacetone and succinic aldehyde. In an analogous manner, 1.3-butadiene would condense to form the homologous 1.5-cyclo-octadiene. In the case of 2.3-dimethylbutadiene-caoutchouc, the principal decomposition product of which is acetonylacetone, it is suggested that a rearrangement of the double linkages occurs, thus,

$2CH_2 : C(CH_3).C(CH_3) : CH_2 \rightarrow 2\dot{C}H_2.C(CH_3) : C(CH_3).\dot{C}H_2$ $\rightarrow$ 1.2.5.6.-tetramethylcyclo-octadiene(1.5). The normal condensation to 1.4.5.8-tetramethylcyclo-octadiene(1.5) only results to a very small extent, as judged by the small amounts of methyllævulinic aldehyde and acid produced. According to the same reasoning, the caoutchouc from piperylene would have a different constitution to isoprene-caoutchouc, the double linkages occupying different positions relative to the methyl groups. Further weight is added to this theory of the constitution of caoutchoucs by the fact that the ozonide of 1.3-butadiene-caoutchouc and that of Willstätter's *pseudo*-pelletierine (1.5-cyclo-octadiene) have been found to bear the closest similarity, both as regards the initial points of their splitting curves and also in the amounts of succinic aldehyde produced. Hence it is concluded that these caoutchouc-substances contain an 8-membered ring of the octadiene series, the parent hydrocarbon of the isoprene caoutchoucs and of natural caoutchouc being 1.5-dimethylcyclo-octadiene, $C_{10}H_{16}$, forming the known diozonide, $C_{10}H_{16}O_6$: the molecular magnitude of the caoutchouc complex, $(C_{10}H_{16})_x$, remains undetermined. Further, from the identity of the ozonides and oxozonides of caoutchouc and guttapercha, it is concluded that these substances are both polymers of the same parent hydrocarbon, but of different molecular magnitude. (*See* also this J., 1911, 1073.)—T. F. B.

Caoutchouc; Contribution to the knowledge of the colloidal nature of ——. A. Wagner. Chem.-Zeit., 1912, **36**, 833.

The statement of Ahrens (this J., 1912, 502) that the so-called *Para-spots* ("Paraflecken") in pure vulcanised mixtures consist of an organic substance and not of crystallised sulphur, is shown by the following experiment to be erroneous. When a thin section of pure vulcanised rubber is placed together with a solvent, such as benzene, between two glasses and examined under the microscope with a comparatively low magnification, ramified, arborescent forms are seen, which are composed of small crystals; there are also present small, round, floating bodies, which prove to be amorphous sulphur. After a short time the sulphur dissolves, and the spherical bodies as well as the arborescent forms gradually disappear: with carbon bisulphide as a solvent, solution takes place more rapidly. The resulting solution is clear with the exception of small fragments of foreign matter (filling, etc.). Thus the theory of the net-work structure of albuminoid compounds or of polymerised or oxidised rubber in vulcanised rubber appears untenable. Further proof of this is given by the fact that when vulcanised rubber containing no free sulphur is examined as above, the structure described is not seen, at any rate, not under such low magnifications as are necessary for the identification of the different crystalline forms of free sulphur in rubber.—T. F. B.

Rubber resins; Commercial ——. W. Vaubel and E. Diller. Gummi-Zeit., 1912, **26**, 1587—1588.

THE authors examined 7 samples of commercial rubber resins. The m. pts. varied between 90° and 125° C. Ash, 0·54 to 2·16 per cent. Acid number, 3·2 to 13·6. Saponification number, 19·4 to 24·3. Bromine number 12·9 to 26·4 (iodine number calculated therefrom, 20·2 to 41·5). The bromine number was determined by solution in benzene, adding aqueous potassium bromide and hydrochloric acid, titrating with potassium bromate and titrating back with sulphite. The optical activity was determined: spec. rotation 60·2 to 69·6. The iodine numbers and specific rotations do not vary so much as those found by Hinrichsen and Marcusson (for a larger number of samples of rubber). (this J., 1910, 224).—H. E. P.

E. African plantation rubber. II. E. Marckwald and F. Frank. Gummi-Zeit., 1912, **26**, 1666—1671. (See this J., 1911, 436.)

FORTY-ONE samples of E. African *Manihot* rubber latex were coagulated in various ways, and analysed; viscosity measurements were made. They were then vulcanised and tested chemically and mechanically. The quality as judged by viscosity agreed in some, but not all cases with that judged mechanically. Exhaustive tables are given of the methods of coagulation and all the data obtained. The authors conclude:—For coagulating the latex on the tree, acetic acid, if desired, with the addition of carbolic acid, sisal juice, citron juice, calcium chloride and Purub (hydrofluoric acid), may be advantageously used. Acetic acid appears to give good results though the product does not last well. Sisal juice appears to give fair results. Care must be employed with calcium chloride. Wild citron juice appears the best, in the case of those districts where it is to be had in sufficient plenty. For coagulation of the latex itself those methods are not good in which the latex is to be diluted with water, since although the rubber may be of a good colour, it has no "nerve." The use of Purub alone, or, pouring the latex into boiling water, was not good. The best method is that in which coagulation is effected by means of citric acid, heat, etc., in presence of magnesium salts or calcium phosphate. Rubber thus obtained shows a nerve and strength hitherto unobtainable. Treatment of the rubb by washing or rolling at the place of preparation, is ba

—H. E. P.

Rubber-sulphur; The system ——. F. W. Hinrichse Z. Elektrochem., 1912, **18**, 530—532. (See also this J 1912, 348.)

THE author considers hot vulcanisation consists of a rapi adsorption of sulphur followed by a slower chemica combination. Examples are given of mixings containin only traces of combined sulphur which after keepin 1½ years at room temperature contained respectively 0·1 and 0·24 per cent. of combined sulphur (in the dark and 0·32 and 1·03 per cent. (in the light). The reversi bility of vulcanisation is mentioned; 20 grms. of vul canised rubber with 4·35 per cent. of combined sulphu only contained 2·06 per cent, after heating with 1½ litre of benzene and ½ litre of $N/4$ alcoholic caustic soda i presence of metallic zinc for 2 hours in an autoclave a 4 atmo. After 2 hours at 10 atmo. the combined sulphu was 1·47 per cent.—H. E. P.

Rubber; Behaviour of —— *towards carbon dioxide.* F. Steinitzer. Gummi-Zeit., 1912, **26**, 1626—1628.

THE author has investigated (1) the absorption of carbon dioxide by rubber and (2) the passage of the gas through rubber membranes, from the standpoint of its possible employment for the inflation of pneumatic tyres. He finds that various qualities of rubber employed for the purpose show different absorptive powers towards the gas, varying from about 25 c.c. in the case of a heavily-loaded grey inner-tube rubber, to 131 c.c. in the case of a "best red Para rubber," per 100 grms. of rubber. Certain of the samples examined, notably the purer ones, became more or less tacky on absorbing carbon dioxide, and a decrease in tensile strength of from 12·6 to 27·5 per cent. was sustained. The samples were exposed in an atmosphere of dry carbon dioxide at a pressure of 1 to 1·5 kilos. per sq. cm. for from 5 to 8 days for the various tests referred to. In the diffusion tests, the area of the test-piece employed was 22·3 sq. cm. and the pressure of the carbon dioxide on the high pressure side was 1 kilo. per sq. cm. Some time elapsed before diffusion began, after which its rate showed only a slight decrease in 10 days. The following table shows the results obtained:—

Sample of	Thickness.	Mineral matter.	Diffusion began after:	CO_2 diffused after 36 hrs.	Diffusion per sq. cm. per hr.
	mm.	per cent.	hr. min.	c.c.	c.c.
1. Grey inner-tube of poor quality	1·75	58·60	5 35	4·90	0·0061
2. Black tube, best quality	1·90	18·57	4 17	6·99	0·0087
3. Red sheet of good quality	2·15	37·74	6 20	2·07	0·0026
4. Best Para sheet	4·17	11·82	10 30	1·90	0·0024

The rate of diffusion increases with the temperature; in the case of sample 4, at 10° C., the diffusion per sq. cm. per hr. was 0·00200 c.c.; at 15° C. 0·00229 c.c.; and at 20°, 0·00266 c.c. Inner tubes of the four qualities referred to in the table, were filled with carbon dioxide at a pressure of 1 kilo. per sq. cm., and the times noted at which the pressure had fallen to 0·5 kilo. The respective times were as follows:—No. 1, 106 hrs.; No. 2, 74 hrs.; No. 3, 245 hrs.; No. 4, 276 hrs. A solution of 10 to 15 parts of glycerin and 20 parts of glue in 100 parts of water is recommended for producing a gas-tight coating on the inner surfaces of the tubes.—E. W. L.

Viscosity of carbon dioxide [and indiarubber packings]. P. Phillips. Royal Soc. Proc. 1912, **87**, 48—61.

IN the course of describing his apparatus and the question of employing therein indiarubber washers, the author says "Indiarubber washers were not used at first because indiarubber absorbs carbon dioxide and allows it to diffuse through. Other packings which were tried, had to be screwed up so tightly, and became so hard; that they broke the tubes before they were air-tight. In the end indiarubber packing was tried and was found to be admirable, the absorption of carbon dioxide proving to be a great advantage, for the indiarubber swelled up and made a perfectly tight joint. The diffusion of the carbon dioxide through it was so slow that no leak was detected for several weeks."

Hevea brasiliensis Müll. Arg.; Glucoside of the seeds of ——. K. Gorter. Rec. Trav Chim. Pays-Bas, 1912, **31**, 264—266.

The glucoside of the seeds of *Hevea brasiliensis* is shown to be identical with phaseolunatin, found in *Phaseolus lunatus*.—F. Shdn.

Patents.

Isoprene; Process for the production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 440,130, Feb. 13, 1912. Under Int. Conv., May 12, 1911.

When unsymmetrical dimethylallene (b. pt. 39°—41° C.) is heated and passed over suitable contact substances, preferably under reduced pressure, under such conditions as to avoid the formation of polymerised hydrocarbons, the double linkages are rearranged and the isomeric isoprene is produced. Alumina and aluminous substances are especially suitable as catalysts.—T. F. B.

Ebonite substitute. R. Reinecke and E. Knoll. Fr. Pat. 439,570, Jan. 31, 1912.

A viscous mass is prepared by heating waste moulded rubber with oil; this is mixed with inert substances, such as slate powder or leather powder, and sulphur, and vulcanised and moulded; to this base are added substitutes for rubber such as Guayule, Creeps, balata or artificial products, and oils, waxes, resins or the like in small quantities, after which the whole is again vulcanised with sulphur. Colouring matters may be added to the base. —H. E. P.

Rubber; Extraction of —— from Ceara trees. Comp. Française du Congo Occidental. Fr. Pat. 439,408, Apr. 5, 1911.

Ceara trees are tapped by pricking with needles or an instrument having very fine teeth, preferably movable. The pricks are made in lines down which the latex trickles and a liquid is made to drip thereon consisting of an aqueous solution of sodium bicarbonate and glycerin to which a viscous substance such as gum arabic may be added. The liquid prevents coagulation and causes the latex to adhere to the tree.—H. E. P.

Rubber; Production of substances similar to ——. Badische Anilin und Soda Fabrik. Fr. Pat. 440,173, Feb. 14, 1912. Under Int. Conv., Aug. 28, 1911, and Jan. 6, 1912.

Isoprene or its homologues are polymerised in presence of bodies capable of yielding oxygen or acting as oxygen carriers. Examples are sodium in presence of air, old oxidised rubber, perborates, isoprene partially oxidised by air, oxygen or ozone, or the ozonides of isoprene, its homologues, rubber and terpenes.—H. E. P.

Elastic bodies made of albumins and insoluble in water; Production of ——. G. G. Diesser, Zürich, Switzerland. Eng. Pat. 8402, April 9, 1912.

In order to confer elastic properties on the product obtained by dissolving albumin in formic acid, the condensation products of phenols and aldehydes are added, with or without substances which facilitate the condensation. For example, 1 drop of phenol and 1 drop of a cold-saturated solution of oxalic acid in formic acid of sp. gr. 1·22 are added to 2 grms. of a 10 per cent. solution of albumin in formic acid. After evaporating the formic acid, the residue is placed in formaldehyde at the ordinary temperature, heated for some minutes, and then washed with cold water.—A. S.

XV.—LEATHER; BONE; HORN; GLUE.

Caesalpinia digyna; Utilisation of —— [*as a source of tannin*]. Bull. Imp. Inst., 1912, **10**, 219—222.

Previous investigations have shown that the pod-cases of *Caesalpinia digyna* are useful as a tanning material; of six samples, one contained 45·45 per cent. of tannin (referred to the dry substance), whilst in the other five the tannin-content ranged from 53·82 to 59·89 per cent. The plant occurs plentifully in a wild state in Burma and in Bengal and Assam, and its cultivation in India has been recommended. An experimental consignment of the whole pods was sold recently in London at £14 per ton. As practically the whole of the tannin is contained in the pod-cases, a very large quantity of the seeds would be available if the pods were used commercially as a source of tannin. The results of analyses indicated that if finely ground and mixed with a cheap ground pulse, the seeds might be used for cattle feeding in India, but they could not be exported profitably.—A. S.

Salt stains on skins and leather. G. Abt. Comptes rend., 1912, **155**, 220—222.

Hides which have been preserved by salting are often stained, with small spots the colour of rust on the flesh side, and a pale yellow on the grain side, which become greyish black or brown after tanning. The formation of these stains depends on the salt used. The supply which caused the trouble, contained 4·27 per cent. of calcium sulphate, which was found in the hide in the form of grains of so-called "*schlott*," $CaSO_4.Na_2SO_4$, containing also organic matter, traces of iron and phosphate (about 4 per cent. of P_2O_5). The spots therefore always contained an abnormal amount of phosphoric acid and of calcium, whilst the leather as a whole was exceptionally rich in sulphuric acid. The phosphoric acid must be of organic origin and is probably the result of reaction between ammonium phosphate, produced by bacterial decomposition of the organic matter, and the calcium sulphate forming insoluble calcium phosphate. This view is confirmed by the colour of the spots formed in chrome tannage, which is exactly the same as that of the precipitate obtained by treating tricalcium phosphate with basic chromic chloride. It is not clear how a colourless salt like calcium phosphate produces coloured spots, but they are probably due to complex reactions in which iron salts take part.—W. H. P.

Patent kid; Manufacture of ——. B. R. Johnston. The Leather World, 1912, **4**, 358—360, 433—434, 510—511.

Patent kid has attained a popularity as a shoe upper leather that has outrivalled almost every other kind of leather. The wet work of soaking, liming, and puering must be thorough, and the tannage must be such that the leather will be plump, soft and devoid of too much stretch. *Soaking.* Inefficient soaking (excess or the reverse) yields thin flat leather. The skins should be freed from the salt cure, and the fibres should be well separated to enable the lime to act properly. Caustic potash, to the extent of 1 lb. per 1000 gallons of water, is recommended as the best chemical assistant in the soaking operation. It plumps the skin, opens up the fibres, and does not produce harsh grain. The skins are thrown into this soak-water, hauled each day, for two or three days, and then drummed in a pin-wheel for two hours in a weak borax solution at a temperature not exceeding 90° F. 7—8 lb. of borax per 1000 skins is sufficient. The skins must be well washed in clean water by running in the wheel for one hour, and should then be quite soft and pliable. *Liming.* Painting with a lime and arsenic mixture and "flooding" is recommended as the best way of liming; 6 lb. of red arsenic are mixed with 100 lb. of lime, and 40 gallons of hot water are poured over the mixture and allowed to stand for several days. The skins are painted with this mixture on the flesh side, folded down the middle and laid in a pit. When the pit is three-quarters full, planks are laid across the skins and weighted with stones, and water is run to fill the pit. In 5 or 6 days they are removed and unhaired by the serial table putting out machine. After unhairing, they are further limed for 3 days in a lime pit fitted with paddle wheel, using one-eighth of the weight of skins of lime, and one-twenty-fifth of red arsenic. Fleshing by hand then follows and after washing in tepid water the skins are drained ready for puering. *Puering.* Puering is best done in the paddle using dog excrement. Puering must be thorough, 2—3 hours being usually sufficient. The skins should be soft and silky on the grain, quite flaccid and the flesh possessing a tendency to slip when scraped with the thumb-nail. "*Slating*" by hand opens up the grain and removes the dirt. After slating the skins should be paddled in a weak borax solution, drained and weighed ready for pickling. *Pickling.* Salt and hydrochloric acid are recommended, using, per 100 lb. weight of pelt, 15—20 galls. of water, 15 lb. of common salt and 3 lb. of acid. *Chrome Tanning.* The two-bath tannage is preferred to the one-bath method, and chromic acid is used instead of potassium bichromate. For each 100 lb. of pelt, dissolve 4 per cent. of chromic acid and 5 per cent. of salt in 18—20 galls. of water. Drum for 4 hours and horse up over night. Strike out by machine and proceed to the reducing bath, using 15 per cent. of hypo- and 6 per cent. of hydrochloric acid, the acid being added in three portions at intervals of one hour. From the reducing bath, horse up and leave for 3 or 4 days before washing and neutralising. Washing must be thorough and is best done with warm water in a wash wheel. Shaving follows washing. For neutralising, one per cent. of sodium phosphate is recommended, drumming the goods for half an hour at 120° F. and finally washing with water to free from soluble salts. *Dyeing* is best performed with logwood and nigrosine, drumming for 30 minutes at 120° F. with 3 per cent. of logwood crystals and then adding 2 per cent. of nigrosine and drumming again for 30 minutes. *Fat-liquoring* should be performed in the drum, in the waste dye bath. For each 100 lb. of leather use 2 lb. of castile soap, 1 lb. of dégras and 2 lb. of neatsfoot oil, and drum for 20 minutes. After draining, the skins are set out on the machine and a coating of 1 part of glycerine in 3 parts of water, is applied to the grain side with a velvet pad and then lightly oiled with sperm oil and hung up to dry. Drying should be rapid. When the skins are required for japanning, they are damped back in sawdust, and allowed to equalise, staked, fluffed on the flesh side and tacked out on boards to dry. When dry, the grease is removed from the grain surface by rubbing with benzine, and the skins toggled into frames. *Japanning.* The linseed oil to be used in the preparation of the japan varnish, must be of good quality and thoroughly "racked" by allowing to stand. The first varnish is made by boiling the oil as follows:—A large iron kettle, mounted on two wheels over a fire, is half filled with well-racked, raw linseed oil, and to each 10 galls., 3 lb. of litharge, 1 lb. of manganese borate, 6 oz. of burnt umber, and 1 lb. of prussian blue are added. The materials should be in a finely ground condition. Boiling is continued until the oil is of the consistency of a thin syrup. The temperature should be taken to 500° F. and the oil allowed to remain for 6 to 8 hours, allowed to cool and again heated to 500° F. for 4—6 hours. The daub may be tested by allowing a little of the mixture to dry in a thin film on a saucer. The film should be pliable, soft and elastic. If the oil does not answer to this test the heating must be repeated. The mixture should be allowed to cool slowly to about 100° F. and then thinned by the addition of petrol or petroleum benzine. Not more than 3 galls. of benzine will be required for each 10 galls. of oil. The mixture is applied to the leather warm, and in the japanning stove, which is kept at about 100° F. The japanning stove is arranged so that the frames holding the skins are placed in the form of shelves one above the other. The temperature is regulated by hot air blast or by steam pipes. The first stoving is continued until the varnish is quite dry, when the skins are removed and placed out of doors exposed to sunlight and air for 24 hours. Instead of the linseed oil daub, a solution of soluble cotton in amyl acetate, may be used. A 3 per cent. solution is suitable. After the preliminary daub the first varnish is applied. This is prepared in a similar manner to the preparation of the daub, using 5 lb. of prussian blue, and 3 or 4 lb. of vegetable black, to 10 galls. of linseed oil. The oil is boiled for 1 hours at 600° F. and the vegetable black must only b added towards the end of the boiling. This varnish i applied to the goods after pumicing and brushing, b means of a brush. After the application of a thin coa the goods are returned to the stove until dry. The finishin varnish is boiled at a temperature of 650°—680° F. fo 12 hours. To each 10 galls. of linseed oil 2 lb. o chinese blue and 2 lb. of manganese borate, are added After the application of this varnish the goods ar stoved for 24 hours, then exposed to the air and sunshin for 2 days before going to the warehouse.—J. R. B.

Tanning-extracts adulterated with cellulose extract. Paessler. Chem. Zeit. 1912., 812—813.

In the author's experience no leather of any value could be made by the use of cellulose extract alone. In one case, in which the tanning was allowed to proceed for a year, a kind of leather was produced, but its character was unsatisfactory and the gain of weight very small. When cellulose extract is used mixed with other extracts, good leather is obtained but it is difficult to see whether the action is due to the other materials alone or whether the cellulose extract plays any part. It is quite possible that the latter may have certain tanning properties of its own when mixed with other extracts. Procter and Hirst's lignin test gave a negative result with an extract made by treating quebracho wood for 12 hours at 2 atm. pressure without bisulphite, or for 5 hours at 2 atm. pressure, with 4 per cent. of bisulphite. When the latter treatment was carried out at 6 atm. pressure a positive result was obtained but these conditions are never used in the manufacture. In the discussion it was stated that abnormal results were obtained in the examination of oak-wood extract when bad or spoiled wood had been used for its manufacture. Large quantities of cellulose extract were used in leather manufacture in England. A marketable leather could be produced by using a mixture of mangrove and cellulose extract in the proportion of 2 : 1.—D. J. L.

The sugar-content of tanning materials and extracts. Paessler. Chem. Zeit., 1912, 812.

Oak-bark, valonia and myrobalans both whole and with the kernels removed, contain no bodies of a sugar character whilst, of common tanning materials, pine-bark has the most. The ratio of tannin to non-tannin and to sugar, depends not only on the constitution of the original materials but also on the method of extraction. This was noticed in the case of the wood of chestnut, oak and quebracho. The age of chestnut-wood has a marked influence on the ratio of tannin to non-tannins, and is also noticeable in the extracts made from them. With increase of temperature and pressure, the amount of non-tannins and saccharine matter increased markedly, so that finally an extract of bad quality was obtained. An unfavourable ratio between tannin and non-tannins and a high sugar-content, does not necessarily imply dishonest addition of saccharine matter, but may be due to the use of unsuitable materials, such as too young wood, or to a badly managed extraction in which the temperature has been raised too high or the boiling continued too long. The use of a too high pressure in the extraction of mallet bark had a marked effect on the leather tanned with it, the product being darker and having more of the character of wood than of leather.
—D. J. L.

Free sulphuric acid in leather; Notes on the determination of ——. E. Stiasny and C. D. Wilkinson. Collegium, 1912, 294—298.

The authors have examined the method proposed by Kohnstein (Collegium, 1911, 314; this J., 1911, 1174) which consists in extracting the finely divided leather with a strong solution of magnesium bicarbonate and estimating the magnesium sulphate in the usual way, after removing the excess of bicarbonate and organic magnesium salts by boiling, evaporating and igniting.

When barium chloride is present in the leather the following reaction takes place:—

$$BaCl_2 + MgH_2(CO_3)_2 = BaCO_3 + MgCl_2 + CO_2 + H_2O$$

and the magnesium chloride is only partly converted into insoluble magnesium hydrate in the subsequent ignition. A leather containing 23 per cent. of barium chloride showed more than 4 per cent. of free sulphuric acid by the method, although quite free from acid. If sodium chloride be present in the leather with free sulphuric acid the solution obtained on shaking with magnesium bicarbonate will contain both sodium chloride and magnesium sulphate and the mixture will behave like sodium sulphate and magnesium chloride when evaporated and ignited:—

$$MgSO_4 + 2NaCl + H_2O = Mg(OH)_2 + Na_2SO_4 + 2HCl.$$

A sample of leather containing sodium chloride which contains 1·3 per cent. of free sulphuric by the Procter and Searle method was found to contain only 0·16 per cent. by Kohnstein's method showing the method to be useless when chlorides are present. The extraction of the acid by magnesium bicarbonate is very incomplete, a sample of leather was extracted three times successively and the amount of acid removed then was only half that found by the Procter and Searle method. In the method proposed by Stiasny (this J., 1901, 1026) for estimating free sulphuric acid by oxidation of the leather with fuming nitric acid it was recommended to allow a correction of 0·25 per cent. of the hide substance for the sulphur contained naturally in the leather and oxidised to sulphuric acid. It has been found by Moerner that only 4·8—7·6 per cent. of the expected amount of sulphur was found as sulphuric acid, the majority being converted to $CH_3{\cdot}SO_3H$, which gives no insoluble barium salt. No allowance therefore should be made for the sulphur in the hide-substance.—D. J. L.

Butyric acid in the tannery. T. Salomon. Collegium, 1912, 284—287.

The value of butyric acid as a deliming agent depends upon the solubility of its calcium salts in water compared with that of those of other organic acids such as lactic and formic, and also on its very slight swelling action on the hide at ordinary temperatures. One of the greatest objections raised in the case of butyric acid, is to its solvent action on hide substance, but experiments made by treating hides with butyric acid with larger quantities and for longer time than is usual in practice, showed that the maximum dissolved hide substance amounted to only 0·13 per cent. Comparative tests with this acid and other deliming agents at equivalent strengths, were made by allowing them to act on hide for six days and gave the following results:—

	Dissolved hide substance per cent.
Water	0·45
0·8 per cent. butyric acid	0·20
Hydrochloric acid	0·18
Formic acid	0·36
Sulphuric acid	0·60

Tests were also made by leaving hide in contact with various deliming agents for several months. In all cases the hides had become putrefied and destroyed, but the hide treated with butyric acid had the least bacterial and micro-organic growth, and was least destroyed, so that the acid seemed to act to some extent as an antiseptic. The abnormal fermentation which sometimes takes place in the drenches in hot weather in which a butyric takes the place of the lactic fermentation has generally been supposed to damage the skins by the butyric acid produced, but it is not proved that the fermentation process producing butyric acid is, of itself, of a harmful nature.—D. J. L.

Sulphonated oils as used in the tannery; Analysis of ——. U. J. Thuau. Collegium, 1912, 280—284.

Sulphonated fatty acids are determined by adding 25 c.c. of hydrochloric acid to 5—10 grms. of the oil and 25 c.c. of water in a strong glass flask and hermetically sealing. The flask and contents are heated to 140°—150° C. in an air or oil bath for an hour cooled, 50 c.c. of water added, and the fatty acids collected on a filter. The sulphuric acid is determined in the filtrate in the usual way. Taking the molecular weights of oxystearosulphuric and ricinosulphuric acid as 380 and 370 the amount of sulphonated fatty acids is found by multiplying the figure found for sulphuric acid and percentage of oil by 4·738. In sodium sulpho-ricinates with 50 per cent. of water, the percentage of sulphonated fatty acids varies between 15 and 20. If free sulphuric acid be present, it must be titrated and deducted from the total sulphuric acid. It is determined by treating the oil with soda, evaporating, igniting and determining the sodium sulphate in the ash. *Total fatty matter*, is estimated by weighing 4 grms. of the oil in a tared dish, adding 20 c.c. of water and, if the mixture is not clear, adding ammonia till slightly alkaline; 15 c.c. of sulphuric acid and the same volume of water are added and 6—8 grms. of stearic acid and boiled till the fatty matter is clear. After cooling the cake of fat is dried and weighed and the percentage of fatty matter found by deducting the weight of stearic acid. A typical analysis of a sodium sulphoricinate is as follows:—

		per cent.
Water and volatile matter (ammonia)		53·6
Ash (mineral matter)		0·6
Fatty matter	Sulphonated fatty acids	16·3
	Neutral oil	29·5
		100·0

—D. J. L.

Tannic acid, ethyl gallate, and the supposed ester of tannic acid. H. C. Biddle and W. P. Kelley. J. Amer. Chem. Soc., 1912, 34, 918—923.

The authors consider that the optical activity of tannic acid is due to the presence of glucose as impurity and not as an inherent constituent of the molecule, because they find that when yeast (*Saccharomyces cerevisiae*) is allowed to develop in sterile tannic acid solutions, the optical activity is destroyed simultaneously with the glucose, whilst unchanged tannic acid is left together with some gallic acid. Manning (this J., 1910, 1261) states that he had isolated a definite crystalline compound of tannic acid, which he asserted contained glucose, thus confirming the glucoside nature of the tannins. The present authors state that Manning's work is incorrect, Manning's compound being nothing but ethyl gallate, which they find begins to melt at 145° C. and does not completely melt until 158° C. The authors suggest that ethyl gallate possesses two crystalline forms, one with a higher and the other with a lower melting point.—G. M.

Extracts of cellulose. [*Tanning extracts from sulphite-cellulose waste lyes.*] L. Sody. J. Amer. Leather Chem. Assoc., 1912, 7, 373—381.

Cellulose extracts when examined by Procter's filter-bell method show from 20 to 30 per cent. of tannin and from 20 to 37 per cent. of non-tannins, but with Loewenthal's permanganate method the figure for tannin is only about one-sixth as high. For the detection of cellulose extract in genuine tanning extracts, the author has found most satisfactory the permanganate titration method and the aniline test recommended by Procter (this J., 1909, 293). The loss of tannin, as indicated by the hide powder method, when cellulose extract is mixed with a tanning extract, is confirmed (see Yocum and Faust, this J., 1912, 36). Comparative tanning tests were made with quebracho extract, cellulose extract, and mixtures of the two, strips of hide being placed in the liquors and after standing for some hours, shaken for 30 hours, then washed, and soaked in water for 15 minutes. At this stage all the samples appeared completely tanned, but after smoothing, lightly oiling on the grain, and drying, it was found, on examining cut sections, that only the piece treated with quebracho extract had been properly tanned; all the other pieces showed a distinct line in the middle, which was more pronounced the higher the proportion of cellulose extract employed. Moreover, in proportion as the relative amount of non-tannins in the extract was increased by addition of cellulose extract,

the *rendement* or yield of leather decreased. The author considers that the addition of cellulose extract has a deleterious effect on drum tannage with other extracts. In vat tannage the cellulose extract may give rise to the acids necessary for the plumping of the hides, but through weakening of the liquors, may diminish the yield of leather. Cellulose extract may be used for re-tanning leather in place of such other extracts as cutch and gambier, and may advantageously replace glucose and molasses. It is also useful for correcting the disagreeable brown colour imparted to leather by quebracho, mangrove, and divi-divi, but the re-tanned leather should not be exposed to light during drying, as this darkens the colour.
—A. S.

Gelatin ; Action of water vapour on ——. W. D. Bancroft. J. of Phys. Chem., 1912, **16**, 395—406.

The author discusses the results obtained by Von Schroeder (this J., 1904, 1227), showing that the water in swollen gelatin has a higher vapour pressure than that of pure water, and concludes that this fact is a necessary consequence of the cellular structure of gelatin. When gelatin swells in water, a certain quantity of water is adsorbed by the cell walls, but water also passes into the interior of the cells. Owing to their curvature the microscopic globules of water within the cells have a higher vapour pressure than water in the mass, and hence swollen gelatin loses water when placed in air saturated with water vapour. From the results obtained by Von Schroeder with regard to the vapour pressure of water in gelatin soaked in $N/100{,}000$ and $N/1{,}000{,}000$ solutions respectively of a sulphate, it would be possible to calculate approximately the size of the water globules in a gelatin jelly, on the assumption that the water content of gelatin in equilibrium with saturated water vapour represents the water adsorbed by the cell walls.—A. S.

Patents.

Puering and drenching skins ; Process of ——. O. Röhm, Second Addition, dated Jan. 13, 1912, to Fr. Pat. 387,950, Mar. 9, 1908 (see Eng. Pat. 5377 of 1908; this J., 1908, 581).

The goods are delimed by means of acid or by any other treatment and then submitted to the action of pancreatic extract in a separate bath. It is thus possible to work with a pancreatic solution always of the same alkalinity and strength. Mineral matter is removed from the surface of the skin by the deliming bath, and the pancreatic solution is thus able to act upon the grain of the skin uniformly at all points.—D. J. L.

"*Rhus Pentaphylla*"*; Use of* —— *for the manufacture of tanning or dyeing extracts.* P. L. Marty and F. M. Pradon. Fr. Pat. 439,784, Jan. 25, 1912.

The wood of *Rhus pentaphylla*, more commonly called *tizerah* or *tezera*, is reduced to a fine state of division, extracted with water and the extracted evaporated. The final product may be liquid, pasty or solid, and is decolourised or not according as the extract is intended for tanning or dyeing.—D. J. L.

Tanning of fish-skins and the like. Skindfabriken Unicum, K. Bendixen, P. Bendixen and Co. Fr. Pat. 440,092, Feb. 13, 1912.

The skins, after soaking down, are put in a solution of arsenic or sodium sulphide or a mixture of the two for 3 days and then in lime liquor for 3 days. They are then agitated for 5 minutes in a solution of hydrochloric acid followed by a treatment with an infusion of hen-dung and "chemical mordant." They are then tanned by a vegetable tannage or by chrome and finished in the usual manner or given a subsequent treatment with sumac or quebracho. They may also be oil-dressed, in which case the skins are limed, rinsed in warm water and dried by wringing; they are then oiled with whale oil, stocked and dried. They are then put in warm water for 12 hours, washed in soda solution till the grease is entirely removed, dried, and staked. Shark-skins for chamoising are treated, before liming, with a solution of arsenic or sodium sulphide or a mixture of the two.—D. J. L.

Leather ; Treatment of —— *to render it impermeable and increase its adhesive properties.* G. G. Johnston. Fr. Pat. 440,105, Feb. 13, 1912. Under Int. Conv., Aug. 12, 1911.

While applicable to all kinds of leather the process is adapted particularly to the treatment of chrome leather for boot and shoe soles, for the purpose of increasing their water-resisting power and rendering them less liable to slip on wet surfaces. The leather is degreased and the grain removed by buffing to increase the absorptive power. It is then dipped in varnish which may be good carriage varnish, copal, etc. The excess is removed and the leather dried at successively decreasing temperatures in order to evaporate first the oily parts of the varnish and allow the gummy residue to adhere to the fibres. The varnish used may also be composed of resinous gums or similar products mixed with raw or boiled linseed oil. The grain may also be removed from the skin in the green state or when partly tanned.—D. J. L.

XVI.—SOILS ; FERTILISERS.

Patents.

Ammoniacal residues [gas purifiers] ; Process of treating —— *with a view to increasing their agricultural value.* Soc. Gouthière et Cie. and P. Ducancel. Fr. Pat. 439,365, April 4, 1911.

The ammoniacal residues of coal-gas purifiers contain sulphur and thiocyanates, which render them unsuitable for fertilising purposes; by treating the residues with carbon bisulphide, carbon tetrachloride, or other sulphur-solvent, and subsequently with warm water, the noxious ingredients are removed and the resulting material may be advantageously used as a manure.—O. R.

Fertilising agent, Process for the manufacture of —— *from atmospheric nitrogen.* O. Frank and O. Fincke. Fr. Pat. 439,244, Jan. 22, 1912.

Air is passed over copper heated to 800°—900° C. in a gas-tight chamber, and the resulting nitrogen is brought into contact with a mixture of silicon and/or iron with an alkaline-earth oxide, heated to 1000°—1050° C. in a suitable furnace. Suitable mixtures are 6 parts of lime and 10 parts of silicon, and 8 parts of lime, 3 parts of silicon, and 2 parts of iron. The resulting nitrides are dustless, non-poisonous, and non-hygroscopic, and may be applied directly for fertilising purposes.—O. R.

Manures, fertilisers, insecticides, and the like ; Improvements relating to ——. R. Berk, London. Eng. Pat. 13,504, June 6, 1911.

Tablets, ready for dissolving in water, are prepared from suitable manures, insecticides, fungicides, or the like, in combination with one or more of the following binding agents: lime, salt, sugar, glue, or gelatin, and the ground powders are compressed into tablets of the desired weight by means of a Colson or other tablet-making machine.
—O. R.

Emulsions of mineral hydrocarbons. [Insecticide. Vines.] G. Galabert. First Addition, dated April 8, 1911, to Fr. Pat. 425,694, April 11, 1910 (this J., 1911, 970).

The glue, chalk, hydrochloric acid, and sodium or potassium sulphide are eliminated from the material described in the first patent and a fatty body together with sodium or potassium hydrate or carbonate substituted. Ten kilos. of fat or oil formed into an emulsion with suitable sodium or potassium salts are added while still warm to 30 litres of potassium or sodium resinate made from 10 kilos. of resin or colophony and the whole made up to 60 litres. The mixture is then heated to 100° C. in an autoclave for one hour with 8 kilos. of benzene, 16 kilos. of nitrobenzene, 12 kilos. of petroleum, and 4 kilos. of carbon bisulphide.—H. H.

Arsenical preparations for use as insecticides in viticulture, etc. Les Établissements Poulenc Frères. Fr. Pat. 440,100, April 24, 1911.

Lead arsenate, or a mixture of equivalent proportions of lead oxide and arsenious oxide, is dissolved in alkali hydroxide solution; on the addition of water a gelatinous precipitate of lead arsenate separates. A similar gelatinous precipitate is also obtained by the addition of copper sulphate solution. The precipitate adheres to the leaves when the mixture is sprayed on to the plants. Glycerin, glucose, sodium thiosulphate, lactic acid, etc., may be added to the mixture.—W. P. S.

XVII.—SUGARS; STARCHES; GUMS.

Sugar beet: Size and quality of the ——. H. Briem. Centralbl. Zuckerind., 1912, 20, 1501.

It is generally acknowledged that the size of the beet exerts a considerable influence not only upon the sucrose content, but also upon the ease with which work may be carried out in the factory. Analytical figures are now given in support of this in the case of 6 roots of different sizes, these being as follows:—

	1	2	3	4	5	6
Weight of the root in grms.	1120	1217	652	390	171	76
Dry substance, per cent.	19·32	20·03	20·35	21·24	24·00	23·36
Brix of the juice	17·30	17·50	18·00	18·75	20·50	19·55
Sucrose, per cent.	14·35	14·45	15·45	15·90	18·25	17·85
Quotient of purity	82·9	82·5	80·2	84·2	89·0	91·3
Total nitrogen, per cent.	0·406	0·401	0·379	0·379	0·365	0·285
Amide and ammoniacal nitrogen, per cent.	0·0347	0·0347	0·0441	0·0291	0·0223	0·0185
Objectionable nitrogen, per cent.	0·1390	0·1414	0·1364	0·1257	0·0885	0·0734

It is apparent that in the case of the large roots the sucrose and purity values are very appreciably lower, and that the total nitrogen, the amide and ammoniacal nitrogen, and the detrimental nitrogen are notably higher. Figures are also given showing that with an increase in the weight of the root, the total ash, and the sodium and potassium increase in about the same proportion as the total nitrogen content. This is most marked in the case of sodium, so that a root weighing 1740 grms. contains 3·3 times as high a percentage of this element as one of 278 grms. With phosphoric acid however the reverse holds, the figures for roots of 1820 and 267 grms. being 0·238 and 0·403 per cent. respectively.—J. P. O.

Sugar beet: Non-proteins in nitrogenous substances of the ——. K. Smolenski. Z. Ver. deut. Zuckerind., 1912, 791—807.

The author has studied previously (this J., 1911, 101) the nature of the non-protein nitrogenous compounds contained in the juice of roots grown in Russia, and was able to identify vernine, allantoïne, asparagine, glutamine, and betaïne, but tyrosine and choline were absent. Continuing this work, he has now more closely examined the substances that are precipitated from expressed Russian beet juice by mercuric nitrate, after previous defecation with basic lead acetate, and has separated 0·005 per cent. of allantoïne and 0·01 per cent. of asparagine in this way; but glutamine, vernine, tyrosine, choline, trigonelline and lysine could not be identified in the particular juice examined. The presence of asparagine and allantoïne appears to be characteristic of the juice from Russian factories, especially in dry seasons, as is also the absence of glutamine, which is generally present in French, German, and Austrian beets, but replaced in the Russian product by asparagine. Betaïne was also separated, the maximum amount obtained being 0·2 per cent. When vernine occurs in the normal juice of the sugar beet, it is probably originally present as a nucleo-protein, whilst allantoïne appears to be present in the beet in the form of a readily decomposable compound, the identity of which has not been determined.—J. P. O.

Cane: Milling of —— considered in relation to the volume occupied by the fibre. N. Deerr. Bull. No. 38. Report of Work of Exp. Stat. of the Hawaiian Sugar Planters' Assoc., May, 1912.

For the purpose of studying the behaviour of cane fibre under pressure, the author has conducted a number of experiments, imitating the conditions of milling as closely as possible, and using either a Riehlé or Olsen machine, which make provision for the determination of the amount of expressed juice and remaining fibre. It was noticed that the amount of juice expressed, increased with the degree of fineness of the chopped cane, the figures obtained for the expressed juice with the coarsest and finest material being 58·3 and 64·4 per cent. respectively. It was also observed that the pressure at which juice began to flow from bagasse was not a measure of the pressure used. When chopped cane was subjected to great pressure, and then repressed after removal of the pressure, a further supply of juice was obtained, the flow commencing at a much lower pressure than that to which the material had originally been subjected. It is suggested that the solid particles form spaces which are occupied by juice which is not expelled until the material is released from pressure and rearranged. It is, at any rate, an argument for multiple crushing at lower pressures, as a more effective means of obtaining juice than a few crushings at a high pressure. In order to obtain information on the question of thick and thin feeds, the amount of juice obtained from different amounts of chopped cane and bagasse under constant pressures was determined. It was found that with chopped cane, as well as with bagasse, a decrease of the layer of material is accompanied by an increase in the amount of juice expressed, it thus being apparently advantageous to employ thin layers of material in milling. As a result of experiments for the purpose of establishing a relationship between pressure and quantity of juice expressed, it was observed that the sum of the volume of expressed juice and remaining residue is constant, every decrease in the volume of the material being accompanied by an outflow of exactly the same volume. From these experiments, and others made at higher pressures, the author deduces the statement that "at pressures up to 60 lb. per sq. in., the volume of bagasse varies inversely as the 2·5th root of the pressure; at pressures between 5,000 and 12,000 lb. per sq. in., the volume of bagasse varies inversely as the 5th root of the pressure; and the quantity of juice obtained from chopped cane varies as the 12th root of the pressure." Applying the results obtained to the actual process of milling, it is concluded that the pressure exerted by the layer of bagasse in its passage between the top and front roller of a standard 3-roller mill is small as compared with that exerted in its passage between the top and back roller, and probably amounts to about one-fortieth, with settings such as are in common use. Hence, the strains in the conventional 3-roller mill are symmetrical, and as much metal is used in the feed side and in the front roller as in the delivery side and in the back roller. It would therefore appear that these experiments indicate that the front roller should be regarded solely as a feed roller, and would point to a 2-roller mill with a small feed roller as being the rational design for the later mills of a train.—J. P. O.

Glucosides of alcohols: Syntheses of —— with the aid of emulsin. E. Bourquelot and M. Bridel. Comptes rend., 1912, 155, 86—88.

By exposing a solution of glucose in 85 per cent. alcohol to the action of a small quantity of emulsin for some time β-ethylglucoside is formed in solution. In the same way from methyl alcohol and propyl alcohol, β-methyl- and β-propylglucosides can be obtained. In each case the glucoside can be easily separated in a pure state on removing the alcohol, as a colourless crystalline solid. β-Ethylglucoside has only been obtained previously in the form of a syrupy liquid. It appears probable from these experiments that emulsin also possesses the power of synthesising the natural glucosides which it is known to decompose.—W. H. P.

Lævulose; Production of —— by a biochemical method. A. Fernbach and M. Schoen. Comptes rend. 1912, **155**, 84—86.

The authors have discovered an anaerobic organism which they call *gommobacter*, which acts on cane sugar in a 5 to 10 per cent. solution, producing a viscous milky solution and an evolution of carbon dioxide and hydrogen. In the solution is found a gummy substance, which does not reduce Fehling's solution. The authors consider that this gum is analogous to one already isolated from another source by Von Lippmann (Ber. 1881, **14**, 1509). When hydrolysed by boiling with dilute acid, however it assumes the reducing and rotatory power corresponding to lævulose. The weight of the gum obtainable is practically equal to half the weight of cane sugar taken. The authors conclude therefore that the gum is a lævulan. It is not possible to bring about this change with *gommobacter* by any other sugar. Although the cane sugar is apparently inverted, the lævulose acted on to produce the gum and the dextrose decomposed, neither invert sugar nor lævulose itself will produce the gum. Apparently nascent lævulose is necessary.—W. H. P.

Molasses of the 1911-12 [*French beetroot*] *campaign, compared with that of the* 1910-11 *campaign.* E. Saillard. Circ. hebd. syndic. fabr. sucre, France, Supplement No. 1204, 1912.

On comparing the molasses (a) of the 1911-12 French beetroot campaign with that (b) of the 1910-11 campaign, the following figures for the nitrogen content expressed as a percentage of the dry matter were obtained: total nitrogen, (a) 2·62, (b) 2·00; albuminoid nitrogen, (a) 0·34, (b) 0·17; amide and ammoniacal nitrogen, (a) 0·09, (b) 0·04; and objectionable nitrogen (a) 2·19, (b) 1·79. Figures for the direct polarisation and sucrose contents, expressed as percentages of the molasses, were: acid direct polarisation, (a) 49·62, (b) 48·41; ordinary (alkaline) direct polarisation, (a) 47·73, (b) 47·41; sucrose, using the acid direct polarisation, (a) 48·57, (b) 46·96; sucrose, using the ordinary (alkaline) polarisation, (a) 47·14, (b) 46·23. It is thus seen that as the nitrogen content increases, the difference between the acid and ordinary direct polarisations increases, and further that both acid and ordinary polarisations approach more closely to the corresponding Clerget values. Other figures, likewise expressed as a percentage of the molasses, are: true purity, (a) 62·56, (b) 64·57; apparent purity, (a) 61·11, (b) 61·81; saline coefficient, (a) 5·35, (b) 4·90; ratio of ash to organic matter, (a) 2·18, (b) 1·72. It is emphasised that to judge the degree of exhaustion of a molasses from its purity alone is untrustworthy. In some molasses with an apparent purity of 61—62 the saline coefficient was 5·4, whereas in other cases with the same purity value the saline coefficient was 6·3. To a certain purity there is no corresponding coefficient, but the relationship between the two varies according to the season, the climatic conditions, the manuring, etc., and to a certain extent is also dependent upon the nitrogen content. Much less sulphurous and sulphuric acids were present in the molasses of 1911-12 than in that of 1910-11, due to the fact that the roots of 1911-12 contained more amide and ammoniacal nitrogen, and gave juice that lost the greater part of its alkalinity during evaporation, only a small amount of sulphurous acid being then required to bring the alkalinity to the usual figure. The colour of the 1911-12 molasses was about 1·5 times that of the 1910-11 product, which fact is accounted for by the greater proportion of reducing sugars present in the former, dark coloured products thus being formed during defecation, and also by the lesser extent to which sulphitation had been carried.—J. P. O.

Patents.

Sugar: Process for the manufacture of ——. Guanica Central. Fr. Pat. 440,242, Feb. 16, 1912. Under Int. Conv., Feb. 21, 1911.

After a part of the juice has been extracted from sugarcanes or beetroots by pressure, the remaining pulp is dried in an atmosphere from which the oxygen has been removed. The gas employed for drying the pulp may be obtained by passing air through a furnace and filtering the resulting gases. The dried pulp does not undergo decomposition and the sugar contained in it may be extracted subsequently.—W. P. S.

XVIII.—FERMENTATION INDUSTRIES.

Malting. Part II. The production of diastase during flooring. A. R. Ling. J. Inst. of Brewing, 1912, **18**, 436—458.

In a study (this J., 1908, 1033) undertaken to ascertain the distribution of diastase in the barley corn at successive stages of the malting process, it was necessary first to devise a method for the determination of the diastatic power of small portions of material consisting of sections of various parts of the corns and excised tissues. The samples were ground to fine powder and 0·25 grm. was weighed out, digested for 3 hours in a 200 c.c. measuring flask with about 20 c.c. of water, then treated directly with 100 c.c. of a 2 per cent. starch solution and kept at 70° F. for one hour. The action was arrested by the addition of 10 c.c. of N/10 sodium hydroxide, the contents of the flask were made up to the mark and titrated against 5 c.c. of Fehling's solution. (see Ford and Guthrie, this J., 1908, 239; Baker and Hulton, *ibid*, 1908, 368). The results thus obtained were in good agreement with those found by the Lintner-Ling method using an extract from 25 grms. of ground grain. The barley corns were cut into three, approximately equal, transverse sections, corresponding to the proximal, median and distal regions. The experiments on steeping showed that there is no increase in the diastatic power of the grain during the steeping process, whether with aeration or not, but that an increase of activity takes place in the proximal region, corresponding to an apparent migration of the diastase to that portion, counterbalanced by a decrease at the distal end. The embryo of the resting barley corn is devoid of diastase, and remains so during the steeping process. After steeping for 3 days, with daily changes of water, the grain was germinated at a temperature ranging from 45° to 50° F., rising to 70° F. on the last day of withering. During the "flooring" process there is a general increase of diastatic power throughout the corn, the activity of the proximal end increasing more rapidly and in a far higher proportion than that of the other regions. By excising the region of the absorptive epithelium it was shown that the main quantity of the diastase is localised in the neighbourhood of this tissue. The increase of diastase begins at the "chitting" stage and continues steadily during the period of active growth, being particularly marked at the withering stage, especially towards the end when the temperature rises. Whilst these observations show that the main secretion of diastase is the result of the metabolic activity of the vital tissues (epithelium and aleurone layer), it would appear also that diastase is formed simultaneously by a kind of autodigestion process in the endosperm itself, doubtless as the result of proteolysis, particularly in the withering stage. This subsidiary process was investigated by excising portions from the centre of the endosperm at a point removed from the biologically active tissues. It was also confirmed independently by digesting barley flour made up in a dough and determining the increase in diastatic power. The author's observations as to the dual mechanism of the formation of diastase are in accordance with investigations made by Stoward (Annals of Botany, 1911, **25**, 800, 1147) on the effect of anæsthetics on germinating grain. On the practical side, the author's work emphasises the practical importance of efficient withering in combination with cool germination.—J. F. B.

Yeast; Production of volatile acids by —— in the re-fermentation of wines. C. von der Heide and E. Schwenk. Biochem. Zeits., 1912, 42, 281—288.

In normal wines small quantities of volatile acid, from 0·01 to 0·04 grm. per 100 c.c., may be present as the result of the normal activity of the yeast. In the process of re-fermentation of wines, rich in acid but poor in alcohol, by the addition of sugar and yeast, the proportion of volatile acid increases appreciably. If the process be properly conducted this increase should not amount to more than 0·02—0·04 grm.; but in other cases it may rise to 0·09—0·12 grm., or the wine may turn completely sour. In practice, this undesirable result is particularly liable to occur if the quantity of yeast added with the sugar be insufficient. The authors have made a series of experiments, working with sterilised media and pure yeast, in order to determine the influence of the quantity of yeast, the proportion of alcohol and the proportion of sugar on the production of volatile acids during the process of re-fermentation, at a temperature of 20°—25° C. over a period of 10 weeks. The analyses showed, contrary to expectation, that the production of volatile acids was totally unaffected by varying the quantity of yeast sown. Further, the proportion of alcohol initially present in the wine treated had no appreciable influence on the production of volatile acid. The production of volatile acid during re-fermentation increased with the production of alcohol over and above that initially present, but not in direct proportion. Although the above experiments show that with pure fermentations the production of volatile acid is uninfluenced within very wide limits by the quantity of yeast sown, in practice there is no doubt that a deficient quantity of yeast is a principal cause of sourness. This is because the wines subjected to re-fermentation are already considerably infected by bacteria, which on the addition of sugar are liable to resume their activity unless sufficient yeast be present to dominate the fermentation by the rapid production of alcohol. The authors' experiments further showed that with small sowings of yeast, the quantity of sugar left unfermented at the end was always greater than with large sowings, particularly when the quantity of alcohol produced was large; this residual sugar favours instability of the wine. —J. F. B.

Alcoholic ferments; Influence of uranium salts on ——. E. Kayser. Comptes rend., 1912, 155, 246—248.

Pure yeast inoculated on a platinum wire into saccharine solutions containing small quantities of uranium salts, or of uranates, is able in a few generations to become accustomed to the salts and to cause vigorous fermentation. The uranates are more toxic than uranium phosphate or nitrate. In exceedingly small quantity the uranium salts exert a stimulating action on the yeast. Invertase is more sensitive to the poison than zymase. A yeast which has been habituated to uranium salts shows less diminution in activity when fermenting in their presence than a yeast which is not so habituated. The addition of asparagine removes the difference between the two yeasts. Yeast juice prepared by Lebedeff's method behaves exactly as the fresh yeast when in presence of uranium. Just as in the case of manganese salts very small quantities of uranium salts accelerate action.—E. F. A.

Alcoholic fermentation. II. S. Kostytschew and E. Hübbenet. Zeits. physiol. Chem., 1912, 79, 359—374. (See also this J., 1912, 553.)

For the characterisation of an intermediate product of alcoholic fermentation, two conditions must be fulfilled; the substance must be formed in the fermentation of sugar, and it must yield ethyl alcohol under the action of yeast. In the first communication (*loc. cit.*) it was shown that acetaldehyde conforms to the first of these conditions, this substance being produced in the fermentation of sugar solutions, when zinc chloride is present in order to protect the aldehyde from further change. The authors have now investigated the reduction of acetaldehyde to alcohol by the action of the reductases present in living yeast cells and in various preparations containing active enzymes derived from yeast. Large quantities of aldehyde are inimical both to living yeast and the proteins of yeast juices; it was necessary therefore to add the aldehyde in small portions at a time. After fermentation, the excess of aldehyde was separated by means of sodium bisulphite, and the alcohol produced was determined in the distillates. In each case, the quantity of alcohol produced by autofermentation in presence of water only was determined as a control. It was definitely proved that acetaldehyde is reduced by the enzymes of yeast to ethyl alcohol, and that this reduction is not dependent on the presence of formic acid as stated by Schade (see *loc. cit.*). The reducing power of the yeast gradually becomes exhausted under the conditions adopted, but it was ascertained that the first small portion of aldehyde added had completely disappeared in the course of a few hours. It is possible that the acetaldehyde is derived from pyrotartaric acid, which has been suggested by Neuberg as another intermediate product of alcoholic fermentation. If this be the case, the production of carbon dioxide would be accounted for, according to the equation—

$$CH_3.CO.COOH = CH_3.COH + CO_2.$$—J. F. B.

Alcohols and alcoholic hydroxyl groups; A colour reaction of ——. L. Rosenthaler. Chem.-Zeit., 1912, 36, 830.

When alcohols or substances containing alcoholic hydroxyl groups are heated with diazobenzene sulphonic acid in presence of sodium or potassium hydroxide, a red colouration is developed. The alcohol may be mixed with 4 parts of 0·5 per cent. sulphanilic acid solution (prepared with hydrochloric acid) and 1 part of 0·7 per cent. sodium nitrite solution, and then heated on the water-bath with excess of alkali hydroxide. The red colouration appears after about half a minute when 0·25 grm. of ethyl alcohol or glycerol is present. Heat is not necessary for the reaction, but accelerates it. When the reaction is carried out without heat the colour remains longer than when heat is applied. When acid is added the colouration disappears, but is restored on addition of alkali. Phenylhydrazine-*p*-sulphonic acid gives similar reactions to sulphanilic acid. It is possible by aid of this reaction to detect 2·5 mgrms. of ethyl alcohol and 0·01 grm. of glycerol. Methyl and ethyl alcohols, ethyleneglycol, glycerol, mannitol, erythritol, dulcitol, and inositol give raspberry-red colourations, propyl and isopropyl alcohols yellowish red, butyl alcohol red, amyl alcohol bright rose, and quercitol red-brown. The hydroxy-acids give analogous reactions; malic acid gives rapidly a brown colouration without heating, citric acid a pink colour after a long time, and tartaric acid no colouration unless heated. The reaction may thus be used as a test for malic acid in presence of other hydroxy-acids; 0·01 grm. of malic acid may be detected by this method, a pink colour appearing after about 20 minutes; the presence of tartaric and citric acids does not interfere with the test.—T. F. B.

Wort and beer; Precipitation of phosphoric acid in ——. L. Adler. Z. ges. Brauw., 1912, 35, 325—328.

Contrary to the statement of Windisch and Reiser (this J., 1912, 654), it is found that on treating beer or wort with a solution of calcium chloride in presence of sodium hydroxide, at the boiling temperature, part of the phosphoric acid remains in solution, and that the amount precipitated is the same as that thrown down by magnesia mixture. It is possible that the portion of the precipitate thrown down by calcium chloride which is soluble in cold water, is a phytin (*loc. cit.*), but according to the author's previous investigations, beer does not contain a perceptible quantity of phytin.—L. E.

Alcoholic fermentation ; Influence of the nitrogenous nutrient on the production of ethyl acetate in ——. E. Kayser. Comptes rend., 1912, **155**, 185—187.

Two film yeasts derived from molasses in Réunion and from bananas, were grown in solutions containing sucrose, inorganic salts and the same weight of nitrogen in a variety of forms. After 15 days the solutions were analysed. Both yeasts gave most ester in presence of protein nitrogen but whereas the molasses yeast preferred peptone and ammoniacal nitrogen to amine and amino acid nitrogen, with the banana yeast the reverse was the case. A comparison of the weight of ester formed per gram of yeast showed in the case of the molasses yeast 0·6 grm. for leucine and 0·9 grm. for glycine. With the other yeast 4·1 grms. of ester were obtained with leucine and 2·7 grms. with glycine. The differences between the two yeasts are thus considerable.—E. F. A.

Sulphates in solution [*Wine*] ; *Physico-chemical determination of* ——. A. Bruno and P. T. d'Auzay. Ann. Chim. Analyt., 1912, **17**, 243—246.

The authors find that the method proposed by Dutoit and Duboux for determining the sulphate-content of wine (this J., 1908, 871 ; 912) is not trustworthy, since, owing to the presence of other substances in the wine (potassium hydrogen tartrate, organic acids, etc.), the point of minimum conductivity does not necessarily correspond to complete precipitation of the sulphates by the barium hydroxide. Further, on treatment with successive portions of barium hydroxide solution, a solution of potassium sulphate does not exhibit a minimum conductivity, whilst a solution of potassium hydrogen sulphate exhibits a minimum conductivity when only half the sulphuric acid has been precipitated.—L. E.

Alcohol : The germicidal power of ——. Foerster *See* XIXb.

XIXa.—FOODS.

West African cocoa. Bull. Imp. Inst., 1912, **10**, 239—247.

Three samples of cocoa beans produced at Serabu, Sierra Leone, proved to be of saleable quality, but would have fetched better prices if the beans had been more thoroughly and uniformly fermented. The sample composed of beans which had been fermented for the longest period (6 days) was valued at about 54s. per cwt. at Liverpool (Oct., 1911).

The cocoa industry of the Gold Coast is in a flourishing condition, but the quality of the cocoa is capable of improvement. Comparative experiments carried out by the Botanical and Agricultural Department of the Gold Coast indicated that whilst "claying" (dusting the fermented beans with finely powdered red clay) may prevent the formation of mould to some extent, by absorbing and assisting in the dissipation of traces of moisture, the best method of avoiding mouldiness is to dry the beans thoroughly after fermentation, or after washing ; if necessary, artificial driers should be used. In the preparation of cocoa beans, a fermentation process is usually employed. Fickendey has suggested that this process might be dispensed with, if the beans, after removal of the pulp, were subjected to a change of temperature, either by heating to 50°—60° C. for 24 hours, or by cooling to 0°—1° C. for 3 hours, in order to destroy the embryo without injuring the enzymes, chiefly oxydases, present in the bean. A comparison of cocoas prepared by the different methods showed that the fermented products were superior to the unfermented samples, but the samples prepared by the methods suggested by Fickendey were superior to that prepared by merely washing and drying, and it is considered that these new methods are sufficiently promising to warrant further trials.—A. S.

Phosphorus ; Inorganic —— in plant substances. An improved method of determining. R. C. Collison. J. Biolog. Chem., 1912, **12**, 65—72.

The following method enables accurate estimations to be made of the inorganic phosphorus in plant substances high in organic matter and which as in the extracts of leguminous seeds, give extracts which are difficult to filter. Ten grms. of the sample very finely ground is extracted with 300 c.c. of 94 to 96 per cent. alcohol containing 0·2 per cent. of hydrochloric acid, the flask being shaken at frequent intervals for three hours. The extract is filtered and 250 c.c. are made just alkaline to litmus paper with ammonia. This is allowed to stand from 8 to 12 hours, the clear liquid decanted as far as possible and filtered. The precipitate is collected and washed with a little alcohol which has been made just ammoniacal. It is allowed to dry completely and then shaken with 100 c.c. of 0·5 per cent. nitric acid until the paper and precipitate are broken up. After standing the liquid is filtered and 75 c.c. are precipitated with acid molybdate solution in the usual way. The final result represents the amount of inorganic phosphorus in 6·25 grms. of the original sample. The pyrophosphate may be reprecipitated if the final solutions are highly coloured. Experiments are quoted to show that phosphate added to such materials as soy beans, rice polish or corn germ is completely recovered by this method. Its advantages are the prevention of enzyme and bacterial decomposition during extraction and the rapid filtration of the extracts.—E. F. A.

Milk samples ; Preservation of —— for analysis [*with potassium bichromate*]. X. Rocques. Annales des Falsifications, 1912, **5**, 338—342.

Potassium bichromate, as used in France in the "Service de la Repression des Fraudes," in the proportion of 1 grm. per litre of milk, is an excellent preservative for keeping samples for analysis. It is important, however, that it should be added to the milk as soon as possible, since the lactic acid of sour milk has a marked reducing action on the preservative. If alteration is already evident in the sample before the bichromate can be added, the subsequent analysis should be performed as soon as possible. On keeping, a sour milk will entirely reduce the bichromate present, and so destroy its antiseptic action.—J. O. B.

Patents.

Milk substitute called "vegetable milk" ; Process for the production of ——. A. Wyler. Fr. Pat. 439,781, Jan. 25, 1912. Under Int. Conv., Jan. 10, 1912.

A solution is prepared by dissolving 0·76 grm. of "salt" in 83·25 grms. of water ; 15·99 grms. of this solution are then mixed with 6·14 grms. of lactose, 8·52 grms. of vegetable fat, and 1·33 grms. of albumin, and the mixture is emulsified. The remainder of the saline solution is then added.—W. P. S.

Starchy and nitrogenous materials in breweries and distilleries ; Saccharification of —— [*for use in bread-making*]. J. Ducreux. First Addition, dated Jan. 30, 1912, to Fr. Pat. 425,714, Feb. 8, 1911 (this J., 1911, 974).

A mixture of soluble starch and dextrin is heated to a suitable temperature with a diastatic mash prepared from cereals, tubers, legumes, etc. The mass obtained is then added to dough prepared for bread-making. The addition of the product is stated to increase the size of the loaf, render the dough more elastic, and preserve the freshness of the bread. The flavour of the bread depends on the kind of diastatic mash employed.—W. P. S.

XIXb.—WATER PURIFICATION ; SANITATION.

Sand filters ; Bacterial penetration in slow ——. G. E. Willcomb. J. Gas Lighting, 1912, **119**, 106.

At Albany (N.Y., U.S.A.) the sand of the secondary filters has been examined by withdrawing samples from definite depths in the beds by a special boring device. 100 grms. of the sample were shaken with 100 c.c. of distilled water on the sand engine for one minute and the mixture then diluted to 1 litre. The turbidity of the suspension was read, and the organic nitrogen and the oxygen consumed were determined. In this way, penetration into the sand of silt, bacteria and organic matter could be determined, and the limiting depth of penetration was found to be 10 inches. In practice, when the penetration is found to reach this amount, the top 10 inches of the bed is removed, washed and replaced. In this way the resulting turbidity of the sand is kept below 800, and the organic nitrogen below 0·35 part, and the oxygen consumed below 5·5 parts, per 10,000 grms. of dry sand. This is practically a clean sand.—J. H. J.

Water; Electrolytic treatment of ——. G. D. van Arsdale. Eng. and Mining J., 1912, **94**, 69—70.

THE treatment consists in subjecting the water, in a wooden tank, to the action of an electric current passing between two series of iron or aluminium plates attached to opposite sides of the vessel. Both the anodes and the cathodes (especially the former) are attacked, the metallic hydroxide produced becoming suspended in the water and eventually subsiding as a sludge. It is stated that, partly by occlusion by the hydroxide and partly by direct electrolysis, a considerable proportion of the dissolved salts and the whole of the organic constituents of the water are deposited with the sludge; the conditions of voltage, duration of treatment, etc., are determined for each water, the maximum degree of softening obtainable by this means being different in every case. In the treatment of a water having 40 degrees of hardness (the softening of which by chemical methods was impracticable by reason of the large amount of soluble salts introduced thereby) 73 per cent. of the total solids—originally 22·39 grains per U.S. gallon —were removed by this means, the lime and magnesia being reduced from 6·85 and 1·84 to 1·137 and 0·420 grains per gallon respectively. The cost of the treatment as originally conducted was very high but not prohibitive under the circumstances, the water being required for works at an isolated place in Mexico. The author is of opinion that the process could be successfully employed in many cases and at reasonable cost for softening hard water and for the purification of doubtful water for drinking purposes.—W. E. F. P.

Water; Purification of boiler-feed —— and treatment with permutite. E. E. Basch. Chem.-Zeit., 1912, **36**, 769—770.

ALTHOUGH boiler-feed water is softened, it cannot be said to be purified by treatment with "permutite," (or artificial zeolites; see this J., 1907, 711 and 1251), since the salts which cause incrustation are merely replaced by soluble ones (*e.g.*, sodium carbonate and sulphate). On evaporation, the water becomes rich in these soluble salts and must be removed periodically; much heat is thus lost and the cost of treatment with permutite is greatly increased. According to Cribb and Arnaud (this J., 1905, 848), water containing more than a certain proportion of alkali does not attack iron, and according to Heyn and Bauer (this J., 1908, 569), the presence of a considerable quantity of sodium carbonate in water retards the rusting of iron. The conditions that obtain in boilers, however, are much more complex than those under which the experiments of these workers were made. According to recent experiments, sodium chloride prevents the protective influence of sodium carbonate on iron, and practical experience has shown that water that has been treated with permutite is liable to froth in the boiler owing to the presence of alkali, besides causing corrosion.—L. E.

Drinking-water in pipes; Disinfection of —— by bleaching powder. H. Bruns. J. Gasbeleucht., 1912, **55**, 649—656.

THE author gives a full account of previous work on this subject together with large scale experiments of his own. He observed that the use of bleaching powder produces an unpleasant smell and taste in water, most people being able to detect the taste of 1 part of available chlorine in 200,000—500,000 parts of water. This taste may be removed by the use of a quantity of sodium thiosulphate equal to 50—70 per cent. of the weight of bleaching powder added, but the thiosulphate must not be added until the chlorine has been allowed to act from a quarter to a half hour. Experiments were made on the Ruhr water supply, an unfiltered river water. The bleaching powder was dissolved in large tubs and added daily to several thousand cubic metres of the unfiltered water in the proportion of about 1 : 500,000, but it was found that either the bacteria were not completely killed or a taste of chlorine remained in the water. The treatment was then applied to another water supply, a filtered water, in which 12,000 cubic metres were treated daily with sufficient bleaching powder to give 1 part of available chlorine to 1·5 million parts of water. The number of bacteria present was very greatly reduced, all *B. prodigiosus* and *B. coli* being removed. Any taste of chlorine could be removed by adding a little of the unsterilised water. With the amount of bleaching powder added reduced to one-half, the results were not good. In consequence of an outbreak of typhoid fever, the treatment of the Ruhr water had to be taken up again, and this time greater precautions were used to have the bleaching powder solution of constant strength and to add it accurately to the flowing river water, every suitable mechanical device being employed. About 30 to 40 thousand cub. m. of water were treated daily by the addition of 1·5—2 grms. of bleaching powder per cub. m., equal to 0·5—0·66 grm. of available chlorine. After half an hour's action, sodium thiosulphate was added, corresponding to 50 per cent. of the weight of bleaching powder used. This process was continued for three and a half months. The coli test in the treated water usually resulted in a negative result in 100 c.c., and thermophile bacteria were reduced to one-fifth. The typhoid epidemic rapidly abated after the inauguration of the treatment, and no complaints were made by consumers. Subsequent to this, the treatment was applied to other places, of which some notes are given. The cost of the process for treating daily 10,000 cub. m. of water can be stated generally to be from one-tenth to two-tenths of a pfennig per cub. m.—J. H. J.

Air; New apparatus for sampling ——, for dust. E. J. Laschinger. J. Chem. Met. and Min. Soc., S. Africa, 1912, **12**, 443—447.

Two kinds of apparatus are described for effecting the rapid separation of dust from air containing only small quantities of suspended matter (and therefore necessitating the filtration of large air samples). In the first apparatus, two aspirator tanks (each of 50 litres capacity between the upper and lower gauge marks) are employed in combination, water being alternately drawn from each tank into the other by means of a hand pump. Openings are provided in the top of each vessel for the filtering tube (through which the air passes as the water is withdrawn) and for a vacuum gauge. By means of the latter the time required for the equalisation of the internal and external pressures is saved; the reading is noted when the water reaches the lower mark of the tank, and the gauge is then quickly withdrawn. The volume of air drawn through the collecting tube by each emptying of the tank is ascertained by simple calculation, the barometric reading, reading of the vacuum gauge and the volume of water withdrawn being known. When sugar is employed as the collecting medium (see following abstract), the time occupied by a single operation is about 5 minutes.

In the second apparatus, designed with a view to portability for work underground, the air is drawn first through the collecting tube, then through a standard orifice into a receiver by means of a suction pump worked by hand. The rate of flow of air through the orifice (and, consequently, the total volume passing in a given time) is ascertained by calculation from the atmospheric temperature and pressure, the pressure within the receiver, the difference of pressure between the two sides of the orifice plate and the area of the orifice. The author considers that, by this method of measurement and with an accurately calibrated apparatus, the error in the calculated result should not exceed 2 per cent.—W. E. F. P.

[Air]. Note on dust determination by filtration through sugar. A. McA. Johnston. J. Chem. Met and Min. Soc., S. Africa, 1912, **12**, 442—443.

THE determination of dust in mine or surface air is made by aspirating a known volume (from 50 to 200 litres or

more) of the air through a layer of damp sugar, 2 in. thick, contained in a small glass separator; no definite rate of aspiration is stated, but 200 litres per half-hour is not regarded as too rapid. The filter bed is composed of coarsely crushed, pure, cane sugar from which the fine powder has been removed by sifting through a 90-mesh sieve, the material being moistened in the separator with just sufficient water to promote adherence of the dust without causing the sugar to cake. At the conclusion of the aspiration the contents of the separator are washed out with water, the solution being filtered through a tared filter or Gooch crucible; a blank determination is made upon the sugar if necessary. The author has obtained higher and more consistent results by this means than by the employment of other filtering media.
—W. E. F. P.

Disinfectants; Standardisation of ——. Note on the Rideal-Walker phenol control. J. T. A. Walker and J. M. Weiss. J. Franklin Inst., 1912, **174**, 101—112.

PHENOL crystals usually contain appreciable amounts of cresols (*e.g.*, from 1·1 to 12·0 per cent. in four samples examined) and as cresol has about three times the bactericidal efficiency of phenol, the standardisation of disinfects by comparison of their bactericidal effect with that of phenol may be rendered inaccurate. The titration of phenol with bromine is insufficient as a test for determining the purity thereof with respect to cresol, but the proportion of cresol in phenol which is otherwise pure may be determined from the depression of the solidifying point. It is recommended that no phenol having a solidifying point below 40° C. should be employed for bacterial tests.—H. H.

Alcohol; The germicidal power of ——. R. Foerster. Woch. für Brau., 1912, **29**, 405.

THE action of alcohol as a germicide has not, so far, been perfectly clear. Koch and other investigators have stated that strong alcohol is only an imperfect germicide, whilst moderately diluted alcohol acts more thoroughly. Schumburg (Deutsch. med. Woch., 1912, No. 9) has now cleared up this apparent anomaly. In Koch's experiments suspensions were employed of bacteria which had previously been dried on silk threads, glass beads or cover glasses. The result was that the action of the alcohol was limited; the exposed portions of the bacteria were coagulated by the strong alcohol and the coagulation protected the interior portions from attack. The treated specimens remained capable of subsequent development. On the other hand, moderately diluted alcohol, when allowed to act for a longer time, caused no such coagulation and penetrated the mass, gradually killing all the germs. Schumburg has performed experiments both with dried and free-moving bacteria in alcohol of various strengths. In the former case he has confirmed Koch's views as to the inefficiency of strong alcohol, whilst in the case of fresh bacteria, strong alcohol causes instantaneous death, in consequence of its dehydrating and coagulating properties. Weaker solutions kill less rapidly and are only efficient when allowed to act for a longer time. Alcohol should therefore find an extended application as a preliminary disinfectant in surgery, owing to the ease with which it may be procured and the fact that it has no injurious action on the skin.—J. F. B.

PATENTS.

Sterilising and purifying liquids and regenerating perishable liquids and materials; Process and apparatus for ——. D. L. V. Browne and J. Masson, Paris. Eng. Pat. 21,332, Sept. 27, 1911.

THE liquid, etc., is subjected to the action of a weak current of electricity, insufficient to produce electrolysis, developed by means of electrodes of aluminium or aluminium alloys arranged parallel to one another at a short distance apart. This destroys micro-organisms and causes flocculation of insoluble particles. The electrodes of aluminium alloys may also contain small or minute quantities of other substances, such as iron, carbon, silicon or bismuth, with the object of producing "a partial radioactive action." The process and apparatus may be used for sterilising water, milk, waste liquors, and solid substances immersed in liquid media; for maturing or ageing wines and spirits, and preventing lactic and other fermentations therein; for clarifying beers, etc.; for cleaning, bleaching and degumming rubber and fibrous materials such as cotton; and for cleansing sugars and sugar juices.—C. A. M.

Colloidal liquids; Process of sterilisation particularly applicable to ——, apparatus used in the process, and products obtained thereby. L. Lematte. Fr. Pat. 439,870, Feb. 8, 1912. Under Int. Conv., Feb. 11, 1911.

THE liquid is passed through a shallow channel or chamber, the lower side of which is provided with a cooling jacket. The upper side of the chamber consists of a quartz plate and above this is suspended a lamp capable of emitting ultra-violet rays. The lamp may be enclosed in a reflecting casing, and means are provided for tilting the lamp in order to start it working.—W. P. S.

Sewage sludge; Process and apparatus for obtaining uniformly decomposed ——. Wasser- und Abwasser-Reinigung Ges. m. b. H. Fr. Pat. 439,758, Feb. 6, 1912. Under Int. Conv., Feb. 15, 1911.

THE sewage is allowed to flow through a tank provided with a number of partitions extending from the top to nearly the flat bottom of the tank. The inlet is at the top of one end and the outlet for the liquid portion of the sewage is at the upper part of the opposite end. The sludge is removed by means of a pipe which extends upwards from a sump at the outlet end of the tank. Valved openings are provided in the partitions in order to regulate the level of the liquid in the different compartments.—W. P. S.

Arsenical preparations for use as insecticides. Fr. Pat. 440,100. *See* XVI.

Improvements relating to manures, fertilisers, insecticides, etc. Eng. Pat. 13,504. *See* XVI.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Hydrastis; Cultivation of ——. J. L. Stingel. Amer. J. Pharm., 1912, **84**, 299—300.

THE statement that hydrastis has become practically extinct in many places, led the author to try practical experiments in cultivation, etc. (Cleveland School of Pharmacy, U.S.). He was able to grow the plant in abundance, but he observed that cattle are a destructive factor and make sad havoc of it. In growing it, shade is an important condition. The author concludes that with the progress of civilisation the plant has diminished, and if collected, as heretofore, without regard to season or preservation, will soon become extinct. "The scarcity of this valuable drug cannot be entirely attributed to lack of plants or to extinction, but to other conditions, which tend to prevent identification at the time of collection." The only feasible solution of the present hydrastis problem is to be found in rational cultivation.

Aloïn from Natal aloes; Constitution of ——. E. Léger. Comptes rend., 1912, **155**, 172—175.

NATAL aloes contain a mixture of at least two aloïns which differ by about 1 per cent. in the amount of carbon which they contain. These are homonataloïn and nataloïn. The former, which is the less soluble in alcohol, yields on hydrolysis *d*-arabinose and thus resembles barbaloïn and isobarbaloïn (see this J., 1910, 649, 898).—E. F. A.

Liquid parsley apiols (commercial); Characters and adulterants of ——. L. Lutz and G. Oudin. Annales des Falsifications. 1912, **5**, 343—348.

Fractional distillation affords a useful means for detecting adulteration in commercial apiol. Genuine *green apiol* gives a trace of distillate below 100° C. due to water and alcohol. Then a few drops of liquid lighter than water appear, gradually increasing as the temperature rises to 200° C. but still small in amount. Practically nothing comes over between 200° and 240°, and actual distillation does not commence below 260° C. Genuine *yellow apiol* gives practically no distillate below 230° C.; only a slight amount comes over below 245°. Actual distillation commences at about 260° C. *Essential oil of parsley* gives very little distillate below 180° C. Distillation commences at 181° and proceeds with successive rises of temperature. *Apiolines* only give a few drops of distillate at 260° C.; distinct distillation begins at 270° and the major fraction distils between 270°—280° C. *Green apiol from parsley refuse* (stems, leaves, aborted fruits, &c.) cannot be distilled without decomposition. A little water comes over at 100° C. At 125° C. a distillate with an acrid, disagreeable odour comes over very slowly, separating into two layers, up to 175° C. Then decomposition ensues with a tarry or carbonaceous residue. *Yellow apiol from parsley refuse*, prepared by saponification, behaves like genuine yellow apiol. Adulteration with *turpentine oil* or with *chloroform*, is readily detected by the characters of the lower-boiling fractions. As a rule, apiolines and yellow commercial apiols are of better quality than green apiols. The authors are not in favour of admitting a limit for the sp. gr. of commercial apiols lower than 1·090, since a lower figure would permit the admixture of essential oil of parsley.—J. O. B.

Java coca (Erythroxylon Novo-granatense); The alkaloids of ——. A. W. K. de Jong. Rec. Trav. Chim. Pays-Bas, 1912, **31**, 249—255.

The alkaloids of Java coca were digested on the water bath with concentrated hydrochloric acid. A number of organic acids were produced, and the following were isolated: α-, β- and δ-truxillic acids, an acid melting at 150° C. (probably protococaic acid), an acid melting at 190° C. (probably β-cocaic acid), benzoic acid, cinnamic acid, and allocinnamic acid, also considerable amounts of a gummy acid.—F. Shdn.

Quinine tannate; Preparation of ——. K. Feist. Apoth.-Zeit., 1912, **27**, 567.

In Rozsnyay's method of preparing quinine tannate, which has been adopted by the German Pharmacopœia, a solution of quinine sulphate is treated with tannin followed by ammonia, and the precipitate washed with water. The compound thus obtained, however, invariably has a bitter taste, owing to some of the quinine sulphate being retained by the amorphous precipitate of quinine tannate and not coming in contact with the ammonia. A preparation free from sulphate may be obtained by intimately mixing 31 grms. of pure anhydrous quinine with 75 grms. of tannin and 50 grms. of alcohol, drying the paste, with frequent stirring and with exclusion of light, first at 30° to 40° C. and finally at 100° C., and powdering the mass. For the determination of the quinine and in testing for foreign bases the use of chloroform or carbon tetrachloride is recommended instead of ether as prescribed by the German Pharmacopœia, and it is also preferable in the latter tests to convert the quinine into hydrochloride instead of sulphate.—C. A. M.

Caffeine; New method for determining ——. G. Costes. Ann. Chim. Analyt., 1912, **17**, 246—249.

To determine residual caffeine in coffee that has been subjected to a process for removing this compound, the following method is proposed:—In the case of samples containing 0·2—0·3 per cent. of caffeine, 20 grms. of the ground material are treated in a porcelain dish with 15—20 c.c. of sulphuric acid (66° Bé.) in small portions, the mixture being shaken after each addition. The whole is heated on the water-bath for 10—15 minutes, treated with about 200 c.c. of boiling water, boiled for 10 minutes, and filtered rapidly. The filtrate is collected in a porcelain dish containing a quantity of sodium hydroxide insufficient to neutralise the acidity, and concentrated; the residue and filter (cut into small pieces) are treated with about 150 c.c. of boiling water, boiled for 5 minutes, and filtered as before, a third extraction with boiling water (100 c.c.) then being made. The united filtrates are made slightly alkaline with sodium carbonate, quickly concentrated to about 200 c.c., cooled, and, if necessary, rapidly filtered. The liquid is then successively extracted with 50, 35, and 30 c.c. of chloroform; the solution of caffeine thus obtained is distilled until its volume is reduced to 3—4 c.c., and then transferred to a glass vessel, 1—2 c.c. of chloroform being used for rinsing. To purify the caffeine, the solution is treated with 2 c.c. of sulphuric acid, heated on the water-bath for 10 minutes, diluted, and filtered, the residue being washed 5 or 6 times with very small quantities of boiling water. The filtrate is made slightly ammoniacal, cooled, and extracted with chloroform (25, 20 and 15 c.c.). The extract is evaporated, care being taken to avoid spirting, and the residue is dried at about 100° C. for half an hour, and weighed. This residue, however, does not contain more than about 93 per cent. of caffeine, and if greater accuracy be required, the nitrogen-content must be determined, the weight of nitrogen multiplied by 3·464 giving the weight of caffeine. For purposes of manufacturing control, the original sulphuric acid extract need not be neutralised, larger quantities of chloroform (100, 100, and 75 c.c.) being used for extraction; the extraction is not complete in this case, but the error thus introduced is compensated for by that due to the impurity of the final residue of caffeine. The above method is also applicable to untreated coffee, in which case 5 grms. of the ground material are treated with 5 c.c. of sulphuric acid, as the first step.—L. E.

Alkaloidal salts; Direct titration of acids in ——. A. B. Lyons. Amer. Pharm. Assoc., June, 1912, 525. Pharm. J., 1912, **89**, 99.

If 0·301 grm. of crystallised morphine be dissolved in 12 c.c. of $N/10$ hydrochloric acid, and Methyl-red indicator be added, it will require just 10 c.c. of $N/50$ alkali to change the colour of the solution to yellow. If now there be added 10 c.c. of neutral chloroform, and the mixture be shaken, the indicator will be taken up by the chloroform, leaving the aqueous solution colourless. On adding volumetric alkali to the mixture, gradually, with shaking, no apparent change will be produced until enough of the alkali has been added to more than saturate the whole of the combined acid present. As soon as there is excess, the aqueous solution will appear yellow instead of colourless after shaking. The quantity of volumetric alkali required to produce this effect (in this case 50 c.c. $N/50$) is a measure of the amount of combined acid, and so of the amount of alkaloid present. The effect of the chloroform is, it is said, to withdraw the alkaloid from the aqueous solution as fast as it is set free by the alkali. When chloroform is used for the solvent and Methyl-red for the indicator, the end reaction is reasonably sharp with morphine, quinine, and strychnine.

Morphine in combination with other opium alkaloids; Quantitative investigation on the variations in the toxicity of ——. H. Cæsar. Biochem. Zeits., 1912, **42**, 316—324.

Straub (this J., 1912, 700) had found that although narcotine is practically non-poisonous itself, it possesses the property of increasing the toxicity of morphine in a remarkable degree. The author has tested this effect quantitatively and found that, whereas the average fatal dose of morphine alone (for mice) was 0·40 mgrm. per grm. of body-weight, the fatal dose of a mixture of equal parts of morphine and narcotine was 0·23 mgm. of morphine. Moreover this influence of narcotine is a variable one, according to the proportions of the two alkaloids. The curve expressing this relationship shows two high points. With 0·2 part of narcotine to 1 of morphine there is a point at which the mean fatal dose is 0·31 mgrm.

of morphine ; the curve then descends until, at 0·5 part of narcotine to 1 of morphine, the influence of the narcotine is *nil.* The other high point occurs with equal parts, after which an increase in the proportion of narcotine produces less effect. A similar study of mixtures of morphine and papaverine is complicated by the fact that both constituents are toxic and in different ways. With a mixture of equal parts, there was no decrease in the total fatal dose, but with 1 part of morphine and 0·2 of papaverine there was an apparent decrease of 25 per cent., which however, owing to the complicated physiological action of the poisons, cannot positively be considered as a mutual increase in specific toxicity. With the triple mixture of 1 part of morphine, 0·2 of narcotine and 0·1 of papaverine, no increase in total toxicity was observed beyond that due to the influence of the narcotine on the morphine ; but with the system 1 part of morphine, 0·5 part of narcotine and 0·1 of papaverine the total toxicity was double that of that calculated from the sum of the single constituents.—J. F. B.

Arsenic in salvarsan and neosalvarsan ; Determination of ——. F. Lehmann. Apoth.-Zeit., 1912, 27, 545—546.

0·2 GRM. of the salvarsan or neosalvarsan is put in a conical flask with 5 c.c. of water ; 10 c.c. of concentrated sulphuric acid and 1 grm. of finely powdered potassium permanganate are added, and the whole shaken round and allowed to stand for 5 minutes. The excess of manganese peroxide is removed by the addition of 5—10 c.c. of officinal hydrogen peroxide (Ger. Pharmac.). The excess of the latter is destroyed by the careful addition of 1 per cent. permanganate solution till there is a permanent colouration. The liquid is decolourised by means of a crystal of oxalic acid, and water added till the volume is about 75 c.c. After the addition of 2·5 grms. of potassium iodide, the mixture is allowed to stand for an hour and the free iodine titrated by means of thiosulphate solution (see this J., 1911, 508).—F. SHDN.

Disturbing factor in opium assays. C. H. La Wall. Journ. Amer. Pharm. Assoc., May, 1912, 411. Pharm. J., 1912, 89, 75.

A SAMPLE of high assaying opium (about 21 per cent. morphine) which had been largely diluted with milk sugar, was submitted to the author for analysis, along with some of the original material, the directions being to assay by the U.S.P. method. The amount of morphine in the original sample is far in excess of that contemplated by the assay process, and some difficulty was encountered in getting a pure morphine, on account of the large bulk of the precipitate, but closely agreeing duplicates were obtained. On assaying the milk sugar sample, however, most astonishing results were obtained, for an amount of crude morphine corresponding to nearly 40 per cent. of morphine in the original sample was indicated, and would naturally have been reported as pure morphine, had it not been that titration of the residue with tenth normal acid gave results showing that milk sugar, when present in such an abnormal proportion as that given above, separates with the morphine in the assay process, and being soluble in lime water is liable to be reported as morphine. The possibility of such an admixture should be recognised in the next official assay process.

Calcium cinnamate ; Influence of calcium benzoate on the solubility of ——. A. W. K. de Jong. Rec. Trav. Chim. Pays-Bas, 1912, 31, 256—257.

TWO HUNDRED c.c. of a solution saturated with calcium benzoate at 26° C. were heated with 1 grm. of calcium cinnamate. On cooling, the double salt of calcium cinnamate and benzoate crystallised out. 100 c.c. of the mother liquor were found to contain 2·755 grms. of calcium benzoate and 0·071 grm. of the cinnamate. The presence of the double salt increases the solubility of calcium benzoate. —F. SHDN.

Savin ; Constituents of oil of ——. J. W. Agnew and R. B. Croad. Analyst, 1912, 37, 295—298.

AFTER hydrolysing by boiling with alcoholic potassium hydroxide, a sample of oil of savin was fractionated. A yield of 16·0 per cent. of sabinene was obtained, which boiled at 162°—164° C., had the sp. gr. 0·8468 at 20° C. and $[\alpha]_D = -42{\cdot}5°$ at 15° C. The lævo-rotation is unusual. Sabinol was also separated from the oil, the amount obtained being 17·0 per cent. This alcohol boiled at 208°—209° C., had the sp. gr. 0·9391 at 15° C., and $[\alpha]_D = +17{\cdot}04°$ at 15° C. The oil contained 31·0 per cent. of resin and 7·0 per cent. of acids. Several other samples of savin oil were fractionated, but the yield of sabinene was less than that obtained from the first sample.—F. SHDN.

Tetraformal-trisazine ; Preparation of —— *from formaldehyde and hydrazine hydrate, and its use as a reducing agent in analytical chemistry.* K. A. Hofmann and D. Storm. Ber., 1912, 45, 1725—1730.

To 50 c.c. of hydrazine hydrate cooled by ice, 50 c.c. of 35 per cent. formalin are slowly added, and after an hour a further 30 c.c. of formalin. The mixture is allowed to stand in a crystallising dish, covered, for a couple of days, when about 27 grms. of crystals are obtained. These are drained by suction, washed with alcohol, dissolved in water, and precipitated by alcohol and ether. This substance is tetraformal-trisazine,

$$\begin{array}{c} \mathrm{HN{\cdot}CH_2{\cdot}N{\cdot}CH_2{\cdot}NH} \\ \mathrm{H\dot{N}{\cdot}CH_2{\cdot}\dot{N}{\cdot}CH_2{\cdot}\dot{N}H} \end{array}$$

Its aqueous solution precipitates silver from the nitrate, as a white precipitate, which rapidly (especially on warming) becomes a brilliant mirror adhering to the glass. Palladium is similarly precipitated, gold as a dark-coloured powder. In alkaline solution (it is very stable towards alkalis) it reduces cupric salts to cuprous oxide, mercury, gold, silver salts to metal. Molybdates, selenites, tellurites are not affected by the alkaline solution, even hot, but are reduced on the further addition of ammonium chloride. Acids destroy the substance, separating hydrazine and precipitating a polymer of formalazine $(CH_2N_2CH_2)n$. Its reducing actions, less violent than those of hydrazine, suggest it as a valuable reagent in analytical separations. —J. T. D.

Parathymol ; Oxidation of ——. *Dehydroparathymol.* H. Cousin and H. Herissey. Comptes rend., 1912, 155, 215—217.

THE authors have oxidised parathymol (1-methyl-3-isopropyl-4-hydroxybenzene) with ferric chloride and with a glycerin extract of *Russula delica* in the same way as they have previously treated other phenolic substances (this J., 1908, 245, 767 and 870). The product dehydroparathymol crystallises in colourless needles, melts at 96°—97° C., is insoluble in water, soluble in ether, alcohol, chloroform, glacial acetic acid, and dilute alkalis. It gives no colouration with ferric chloride, but forms a benzoyl ether with benzoyl chloride.—W. H. P.

Methyl alcohol as a by-product in the manufacture of wood cellulose. Bergström. *See* under V.

PATENT.

Diphenylarsinic acid, its nitro-, amino-, hydroxy-, and aminohydroxy-derivatives, and their reduction products ; Process for preparing ——. L. Paris and A. Perrier. Fr. Pat. 440,128, Feb. 13, 1912.

PURE triphenylarsine is prepared by adding sodium to a mixture of bromobenzene and arsenious chloride in benzene solution, and heating under a reflux condenser for some time, finally distilling off the excess of benzene. The triphenylarsine is converted into a chloride by saturating a cooled chloroform solution of the substance with dry chlorine : when the chloride is heated carefully to temperatures not exceeding 190° C., chlorobenzene and a chloride of diphenylarsine are formed ; the latter is converted into the trichloride by saturating with chlorine in chloroform solution, and by boiling the product with water diphenylarsinic acid is produced. Dinitrodiphenylarsinic acid is prepared by nitration with a mixture of fuming nitric acid and sulphuric acid ; the dinitro-derivative is reduced with tin and dilute hydrochloric acid.

he solution is filtered and evaporated to dryness, the esidue is dissolved in alcohol, and the tin is separated by precipitation with alcoholic soda: the alcoholic solution ogether with the alcoholic washings of the tin precipitate, s acidified by hydrochloric acid and evaporated to dryness, and the product is dissolved in the minimum amount of dilute hydrochloric acid and the tetra-aminotetraphenylarsine precipitated by exact neutralisation with soda. This tetra-amino derivative is converted into the corresponding tetrahydroxy derivative ("tetraphenolarsine") by diazotisation in cooled sulphuric acid solution: the tetrahydroxy compound may be nitrated by means of a cooled nitrating mixture, and the nitro derivative converted by reduction (*e.g.*, by means of alkali hydrosulphite) into tetra-aminotetrahydroxytetraphenylarsine. The claims also cover the production of analogous compounds in which the arsenic is replaced by a metalloid of the same group, *e.g.*, antimony.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Tungstic acid; Photochemical properties of ——. A. F. Wasilieff. J. Russ. Phys. Chem. Soc., 1912, 44, 819—835.

In presence of various reducing agents, for example, cellulose, and under the influence of sunlight, tungstic acid undergoes change with formation of a blue colouration. According to Sabanéeff (Z. anorg. Chem., 1896, 12, 231, and 1897, 14, 354), the action of hydrochloric acid on sodium tungstate gives, not colloidal tungstic acid as Graham stated, but sodium metatungstate: $4Na_2WO_4+6HCl=Na_2O,4WO_3+6NaCl+3H_2O$. The author's investigations on the influence of sunlight in presence of dextrose on the initial product of this reaction indicate, however, that this light-sensitive product is probably not sodium metatungstate. The initial product undergoes change into one which shows no photochemical properties at a velocity corresponding with the equation of a reaction of the first order; rise of temperature brings about the reverse change. The probable nature of this change is discussed.—T. H. P.

Photographic images; The development of ——. W. H. Caldwell, Morar Lodge, Inverness-shire. Eng. Pat. 14,744, June 21, 1911.

The object of this invention is to provide a process of developing exposed photographic films in such a way that the silver halide dissolved by the developer shall not be reduced instantaneously, as in the known developers, but shall have time to travel to all the "unit portions" of silver halide which have been affected by light, and shall be reduced to silver in contact with each of such "unit portions," thus effecting much better development in the case of over-exposed images. For this purpose it is proposed to use as the developer an aromatic hydrazine in conjunction with an alkali bisulphite in solutions acid to litmus; for example, equal molecular proportions of phenylhydrazine and sodium bisulphite may be used. Since phenylhydrazine has an irritant action on the skin, it may be replaced by *o*- or *p*-bromophenylhydrazine or *o*- or *p*-tolylhydrazine. By regulating the strength of the developer any desired gradation may be produced. It is stated that this mode of development may be applied to the films or surfaces described in Eng. Pat. 1689 of 1908 (see this J., 1909, 259), to produce results of the correct scale of density, however prolonged the exposure may have been.—T. F. B.

XXIII.—ANALYTICAL PROCESSES.

Pyrometers. F. Rogers, Sheffield. Eng. Pat. 6364, March 14, 1912.

The temperature-measuring device of a pyrometer is enclosed in a protecting sheath, through which a current of cooling fluid (air) is passed in order to reduce the temperature of the measuring device and of the portion of the sheath within the furnace. In the case of thermocouples, the current of cooling air is passed around the cold junction before being led around the hot junction enclosed in the protecting sheath.—A. S.

Mercury pump: A simple automatic ——. F. M. C. Johnson. J. Amer. Chem. Soc., 1912, 34, 909—910.

The apparatus to be exhausted is attached to E (see Fig. 1). D is shown in detail in Fig. 2. By exhausting through S by a water pump, the mercury rises in L, C, and O, and falls in F, so as to open communication between E and F. When the mercury in L reaches the level x_1, the mercury in the cup, N (Fig. 2), is drawn up through C into Q, so that air enters through C; consequently the mercury falls in L, O, K, and rises in D and F, the gas in F being expelled through B, H, A, K, S. When the mercury in L sinks to x_2, the mercury in D has risen until it just cuts off the air entrance to C by covering the lower edge of the inverted cup, P (Fig. 2), then overflowing into the cup, N, it fills up C. The air supply through C being thus cut off, the mercury again rises in L, O, C, and falls in D, F, A, so that the cycle is repeated every 30—60 seconds. The pump has been in satisfactory use for four years and has the advantage that entry of dust and oxidation of mercury are avoided, since no outer air passes through the mercury used.—G. M.

Fig. 1.

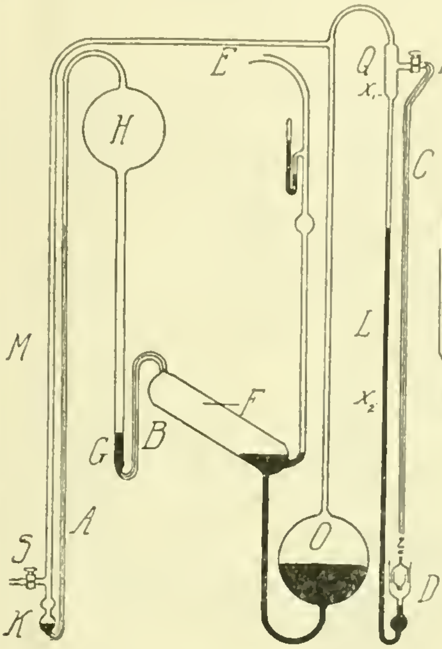
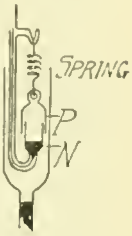


Fig. 2.



Crucible and muffle furnaces; Spirally heated —— *for laboratory work requiring temperatures up to* 1600° *C.* A. Verneuil. Bull. de la Soc. d'Encouragement, 1912, 111, 792—802.

The furnaces described are of the injector type fired with gas and compressed air by means of Schloesing burners. The crucible furnace comprises a thick-walled, open, vertical cylinder mounted upon a square base. The horizontal passage for the flame, formed by a groove in the bottom of the cylinder wall and a corresponding depression in the top of the square base, is tangential to the circle of the furnace cavity and is of greater diameter at the interior than at the exterior extremity. The maximum diameter of the conical or other crucible employed is only a few mm. less than the diameter of the heating chamber; the crucible, placed upon a cylindrical block is centrally disposed within the chamber and maintained in this position by means of three projections upon the upper part of the wall. By means of a circular lid adapted to rest upon short vertical pegs suitably disposed at the top of the cylinder, the furnace is covered but not closed, the products of combustion escaping through the space between the cylinder and the lid. The muffle furnace is practically the crucible furnace employed in a horizontal position; the muffle chamber is formed by the conical crucible, and, the space between the mouth of the latter and the cylinder wall being closed, a series of channels is provided in the upper part of the wall for the escape of the products of combustion from the heating chamber.—W. E. F. P.

Iodine: Determination of —— in the presence of other halogens and organic matter. E. C. Kendall. J. Amer. Chem. Soc., 1912, **34**, 894—909. (See also this J., 1910, 784.)

IODINE is oxidised to iodic acid by sodium hypochlorite, the excess of hypochlorite destroyed by phenol or benzene, and the iodic acid is then determined by adding excess of potassium iodide in acid solution and titrating the liberated iodine with thiosulphate in the usual way:—$HIO_3+5HI=3I_2+3H_2O$. (1) When the iodine is present as free iodine or as a soluble iodide, the neutral solution is acidified with phosphoric acid, excess of sodium hypochlorite solution added to oxidise all the iodine, a few c.c. of phenol solution added to destroy all unchanged hypochlorite or free chlorine, the solution made alkaline with potassium hydroxide, then acid with phosphoric acid, potassium iodide is added in excess, and the liquid is then titrated with thiosulphate. (2) If bromides are present benzene is added before adding the sodium hypochlorite and the solution boiled with powdered pumice. The benzene reacts with the liberated bromine or excess of hypochlorite to form bromo- and chloro-benzenes, which are volatilised. The colourless solution is cooled, potassium iodide added, and titration with thiosulphate carried out. Chlorides do not affect the method. (3) If organic matter and interfering elements are present, the substance is fused with potassium hydroxide and a little sodium nitrate at a low temperature until the organic matter has burnt away; the melt is dissolved in water, sodium bisulphite and chloroform (which prevents foaming of the liberated carbon dioxide) are added to destroy any nitrite, and titration effected according to method (1) above. If a large excess of organic matter is present, more nitrate is added, the excess being removed after fusion by gallic acid; after heating and cooling, dissolving in water, adding chloroform and sodium bisulphite solution, acidifying with phosphoric acid, boiling with a little bromine water, adding sodium salicylate and excess of potassium iodide, titration is effected with sodium thiosulphate Results are quoted which show that the methods are rapid and accurate.—G. M.

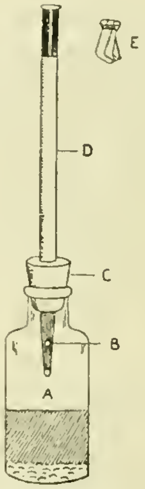
Fluoride analyses. P. Drawe. Z. angew. Chem., 1912, 25, 1371—1372.

THE author recommends the addition of anhydrous copper sulphate, to act as a dehydrating agent, in the determination of fluorine as silicon fluoride (as in Fresenius' method), and that the temperature be maintained at about 200° C., a Sarnström flask being employed as the reaction vessel. The fluoride, silica, and copper sulphate are introduced into the flask, and this is then filled with pure dry air, after which concentrated sulphuric acid is added through the side tube. Very finely powdered and well ignited felspar is employed in place of the usual quartz, and it is important that only a slight excess be employed, since, otherwise, a very resistant silicon oxyfluoride may be formed. Air is led through the apparatus for 3 hours after the decomposition is complete, heating being discontinued. Good results have been obtained with 0·3—0·4 grm. of fluoride (fluorspar), 0·5—0·6 grm. of felspar, 5 grms. of anhydrous copper sulphate, and 50 c.c. of strong sulphuric acid.—F. SODN.

Arsenic in official substances and preparations; Limit te for ——. Suppl. Report to Pharm. Comm. of Gen Med. Council, June, 1912. Arsenic test for propose Brit. Pharmacopœia.

THE Pharmacopœia Committee of the General Medica Council has just issued a Supplementary Report of th Committee of Reference in Pharmacy on the most suitabl limit-test for arsenic in official substances and preparation and the limits for arsenic that may reasonably be adopted. The report has been prepared by C. A. Hill, at the request of the Committee of Reference. The introduction to the text contains the annexed sketch of the apparatus to be employed. It is recommended that this illustration should be given in the Pharmacopœia. The report proceeds to give the following description also proposed for insertion:—

ARSENIC. *Apparatus.*—A wide-mouthed bottle capable of holding about 120 c.c. and fitted with a rubber bung through which passes a glass tube. The latter—made from ordinary soft glass tubing—has a total length of 200 mm. and an internal diameter of 5 mm. (external diameter 7 mm.) and is open at both ends. The upper end is slightly widened to a diameter of 8 mm., while the lower end is drawn out to about 1 mm. diameter and a hole about 2 mm. diameter blown in the side of the tube where it is constricted (see figure).



THE APPARATUS (scale quarter-size).

A, wide-mouthed bottle; B, orifice in glass tube; C, indiarubber stopper; D, roll of lead filtering paper inside tube; E, cap of mercuric-chloride paper to fit over tube with indiarubber band.

Lead Papers.—Pieces of thin white filter-paper 100 mm. by 40 mm. soaked in a 10 per cent. aqueous solution of lead acetate and dried.

Mercuric-chloride Papers.—Circles of smooth white filter-paper 5½ cm. diameter soaked in a saturated aqueous solution of mercuric chloride, and dried. *Note.*—The mercuric-chloride papers should be stored in a stoppered bottle in the dark. If exposed to sunlight the mercuric compound becomes reduced, and when utilised in an arsenic test affords a lighter-coloured stain.

REAGENTS. *Hydrochloric Acid.*—This should not contain more than 0·1 part per million of arsenic (As_2O_3) as shown by the "Control Test" (see under), and should be free from iron.

Sulphuric Acid.—Ten grammes tested as described under "Acidum Sulphuricum," but omitting the stannated hydrochloric acid A.T. and adding 0·2 c.c. of stannous-chloride solution A.T. should give no visible stain.

Nitric Acid.—Ten c.c. treated as described under "Acidum Nitricum" should give no visible stain.

Stannous-chloride Solution.—Prepared from the B.P. solution by adding an equal volume of hydrochloric acid, boiling down to the original bulk and filtering. This should respond to the test for arsenic given below:—

Bromine Solution.

Bromine	30 grammes
Potassium bromide	30 grammes
Water to	100 c.c.

This should respond to the test for arsenic given below.

Arsenic Solution.

Hydrochloric solution of arsenic, B.P.	1 c.c.
Water to	1000 c.c.

This solution should be freshly prepared.

One c.c. of this diluted solution contains 0·00001 gramme (= one hundredth of one milligramme) As_2O_3.

Zinc.—Granulated zinc. This should conform to the arsenic requirement involved in the "Control Test" (see under) and should be free from iron.

Potassium Chlorate.—Five grammes tested as described under "Potassii Chloras" should give no visible stain.

Calcium Hydroxide.—Five grammes tested as described under "Calcii Hydras" should give no visible stain.

Citric Acid.—Ten grammes tested as described under "Acidum Citricum" should give no visible stain.

Stannated Hydrochloric Acid.

(Hydrochloric acid containing stannous chloride):

Stannous-chloride solution	1 c.c.
Hydrochloric acid to	100 c.c.

Brominated Hydrochloric Acid.

(Hydrochloric acid containing bromine):

Bromine solution	1 c.c.
Hydrochloric Acid to................	100 c.c.

By a variable method of procedure suitable to the particular needs of each case there is prepared from the substance to be tested a solution, which may or may not contain the substance to be tested, but in every case contains the whole of the arsenic (if any) originally present in that substance. It is this solution—hereinafter referred to as "the operative solution"—which is introduced into the actual test.

General Test.—A strip of the lead paper is rolled up and placed in the glass tube so that the upper end is not less than 2 cm. below the top of the tube.

A piece of the mercuric-chloride paper is now placed over the top of the tube and secured by means of a rubber ring. The tube is inserted in the rubber bung.

The operative solution of the substance, prepared as specified, is placed in the wide-mouthed bottle and 10 grammes of zinc added. The rubber bung with glass tube attached is quickly placed in position so that the lower end of the tube is clear above the surface of the liquid and the hole in the constricted portion of the tube is clear below the bottom of the bung. The action should be allowed to proceed for thirty to forty minutes, the mercuric-chloride paper not being exposed to strong sunlight.

Note.—The action may be accelerated by standing the apparatus on a hot plate, care being taken that the mercuric-chloride paper remains quite dry throughout the duration of the test.

The yellow stain which is produced on the mercuric-chloride paper if arsenic be present, is compared, by daylight, with stains produced by operating in a similar manner with known quantities of the arsenic solution.

The comparison of the stains should be made at the completion of the test, and those used for comparison should be freshly prepared. The stains fade upon keeping.

Standard Stain.—Prepare a solution by adding to 50 c.c of hot water 10 c.c. of stannated hydrochloric acid and 1 c.c. of arsenic solution. The resulting solution. when treated as described in the "General Test," will yield a stain on the mercuric-chloride paper hereinafter referred to as the "Standard Stain."

"*Control Test*" *for Hydrochloric Acid.*—To 50 c.c. of the hydrochloric acid to be tested add 0·2 c.c. of bromine solution, evaporate on a water-bath until reduced to 15 c.c.. add 50 c.c. of hot water and 5 drops of stannous-chloride solution, and with this solution carry out the "General Test" described above. The stain produced on the mercuric-chloride paper should not be deeper than that given by 10 c.c. of the same hydrochloric acid with 5 drops of stannous-chloride solution, 0·4 c.c. of arsenic solution, and 50 c.c. of hot water, showing that the proportion of arsenic present in the hydrochloric acid does not exceed 0·1 part per million.

Test for Stannous-chloride Solution.—To 10 c.c. of the stannous-chloride solution add 6 c.c. of water and 10 c.c. of hydrochloric acid and distil 16 c.c. To the distillate add 5 c.c. of hot water and a few drops of stannous-chloride solution and with this solution carry out the "General Test" described above. The stain produced on the mercuric-chloride paper should not be deeper than the Standard stain, showing that the proportion of arsenic present does not exceed 1 part per million.

Test for Bromine Solution.—Evaporate 10 c.c. of the bromine solution on a water-bath nearly to dryness, add 50 c.c. of hot water, 10 c.c. of hydrochloric acid, and sufficient stannous-chloride solution to reduce the remaining bromine, and with this solution carry out the "General Test" described above. The stain produced on the mercuric-chloride paper should not be deeper than the Standard stain, showing that the proportion of arsenic present does not exceed 1 part per million.

"*Control Test*" *for Zinc.*—Add 10 c.c. of stannated hydrochloric acid to 50 c.c. of hot water, and with this solution and 10 grammes of zinc proceed as with the "General Test," but allow the action to continue for one hour. No visible stain should be produced on the mercuric-chloride paper: limit of arsenic in the zinc.

LIMITS OF ARSENIC.

The report proceeds to give special directions for applying the test to determine the amount of arsenic in each of the following named pharmaceutical chemicals, and fixes the limits. The names of the substances and the maximum amount of arsenic permitted in each (in *parts per million*) are given :—

Acidum Aceticum, 2 parts.
Acidum Acetylsalicylicum, 2 parts.
Acidum Benzoicum, 2 parts.
Acidum Boricum, 5 parts.
Acidum Citricum, 2 parts.
Acidum Hydrobrom Dil., 5 parts.
Acidum Hydrochloricum, 5 parts
Acidum Lacticum, 5 parts.
Acidum Nitricum, 5 parts.
Acidum Phosphoricum Concentratum, 5 parts.
Acidum Salicylicum, 2 parts.
Acidum Sulphuricum, 5 parts.
Acidum Sulphurosum, 5 parts.
Acidum Tartaricum, 2 parts.
Alumen, 5 parts.
Ammonii Benzoas, 2 parts.
Ammonii Bromidum, 5 parts.
Ammonii Carbonas, 2 parts.
Ammonii Chloridum, 5 parts.
Ammonii Phosphas, 5 parts.
Antimonii Oxidum, 1000 parts.
Antimonii Nigrum Purificatum, 1000 parts.
Antimonium Sulphuratum, 1000 parts.
Antimonium Tartaratum, 500 parts.
Bismuthi Carbonas, 2 parts.
Bismuthi Oxidum, 2 parts.
Bismuthi Salicylas, 2 parts.
Bismuthi Subnitras, 2 parts.
Borax, 5 parts.
Calcii Carbonas Præcip., 5 parts.
Calcii Chloridum, 5 parts.
Calcii Glycerophosphas, 5 parts.
Calcii Hydras, 5 parts.
Calcii Hypophosphis, 5 parts.
Calcii Iodidum, 5 parts.
Calcii Lactas, 5 parts.
Calcii Phosphas, 5 parts.
Calx, 5 parts.
Cerii Oxalas, 5 parts.
Creta Præparata, 5 parts.
Cupri Sulphas, 10 parts.
Ferri Carbonas Saccharatus, 5 parts.
Ferri et Ammonii Citras, 5 parts.
Ferri et Quininæ Citras, 5 parts.
Ferri Glycerophosphas, 5 parts
Ferri Phosphas, 5 parts.
Ferri Phosphas Sacch., 5 parts.
Ferri Sulphas, 2 parts.
Ferri Sulphas Exsicc., 5 parts.
Ferrum, 200 parts.
Ferrum Redactum, 200 parts.
Ferrum Tartaratum, 5 parts.
Glucosum, 2 parts.
Glycerinum, 4 parts.
Liquor Ammoniæ Fortis, 0·5 part.
Liquor Ferri Acetatis, 5 parts.
Liquor Ferri Dialysatus, 5 parts.
Liq. Ferri Perchlor. Fort., 10 parts.
Liq. Ferri Pernitratis, 5 parts.
Liq. Ferri Persulphatis, 5 parts.
Liq. Magnesii Carb., 0·2 part.
Lithii Carbonas, 5 parts.
Lithii Citras, 2 parts.
Magnesia Levis, 5 parts.
Magnesia Ponderosa, 5 parts.
Magnesii Carb. Levis, 5 parts.
Magnesii Carb. Pond., 5 parts.
Magnesii Glycerophosphas, 5 parts.
Magnesii Sulphas, 5 parts.
Phosphorus, 200 parts.
Potassii Acetas, 5 parts.
Potassii Bicarbonas, 5 parts.
Potassii Bromidum, 5 parts.
Potassii Carbonas, 2 parts.
Potassii Chloras, 5 parts.
Potassii Citras, 2 parts.
Potassii Glycerophosphas, 5 parts.
Potassii Iodidum, 5 parts.
Potassii Nitras, 5 parts.
Potassii Sulphas, 5 parts.
Potassii Tartras, 2 parts.
Potassii Tartras Acidus, 2 parts.
Soda Tartarata, 2 parts.
Sodii Benzoas, 2 parts.
Sodii Bicarbonas, 2 parts.
Sodii Bromidum, 5 parts.
Sodii Carbonas, 2 parts.
Sodii Carb. Exsicc., 5 parts.
Sodii Chloridum, 2 parts.
Sodii Citras, 2 parts.
Sodii Glycerophosphas, 5 parts.
Sodii Hypophosphis, 5 parts.
Sodii Iodidum, 5 parts.
Sodii Nitris, 5 parts.
Sodii Phosphas, 5 parts.
Sodii Salicylas, 2 parts.
Sodii Sulphas, 2 parts.
Sodii Sulphis, 5 parts.
Sodii Sulphocarbolas, 5 parts.
Strontii Bromidum, 5 parts.
Sulphur Præcipitatum, 5 parts.
Sulphur Sublimatum, 5 parts.
Zinci Acetas, 5 parts.
Zinci Carbonas, 10 parts.
Zinci Chloridum, 5 parts.
Zinci Oxidum, 10 parts.
Zinci Sulphocarbolas, 5 parts.
Zinci Sulphas, 5 parts.
Zinci Valerianas, 5 parts.

Microchemical reactions of the constituents of paper. Kollmann. *See* V.

Determination of nitric and nitrous acids in acetic acid solution. Orton and Gray. *See* VII.

Determination of arsenious acid with potassium permanganate in presence of hydrochloric acid. Moser and Perjatel. *See* under VII.

Separation of arsenic from antimony and other metals, with methyl alcohol in a current of air. Moser and Perjatel. *See* under VII.

Compound of cuprous-sodium thiosulphate with acetylene-cuprous acetylide. Bhaduri. *See* VII.

Hydrazine and hydroxylamine; Action of —— on ferricyanides and new methods for determining hydrazine and ferricyanides. Ray and Sen. *See* VII.

Ultraphosphates. Some salts of extreme anhydride stages of phosphoric acid. Kroll. *See* VII.

Quantitative determination of thorium, especially in monazite sand by means of sodium hypo-phosphate. Rosenheim. *See* VII.

Rapid analysis of kaolin. Ladd. *See* VIII.

Technical methods for analysing [Portland] cement. Hentschel. *See* IX.

Electrolytic determination of manganese, and its separation from iron. Golblum and Gunther. *See* X.

Electrolytic determination of molybdenum. Fischer and Weise. *See* X.

Method for the analysis of platinum alloys. Arnold. *See* X.

The heat test for Chinese wood oil. Browne. *See* XII.

Determination of volatile fatty acids. Edelstein and v. Csonka. *See* XII.

Impurities in zinc oxide. Process for rapid examination of zinc oxide paints. Kohn-Abrest. *See* XIII.

Determination of free sulphuric acid in leather. Stiasny and Wilkinson. *See* XV.

Alcohols and alcoholic hydroxyl groups; A colour reaction of ——. Rosenthaler. *See* XVIII.

Physico-chemical determination of sulphates in solution [wine]. Bruno and d'Auzay. *See* XVIII.

Improved method of determining inorganic phosphorus in plant substances. Collison. *See* XIXA.

Milk samples; Preservation of —— for analysis [with potassium bichromate]. Rocques. *See* XIXA.

Sampling air for dust. Laschinger. *See* XIXB.

[Air]. Dust determination by filtration through sugar. Johnston. *See* XIXB.

Disturbing factor in opium assays. La Wall. *See* XX.

Determination of arsenic in salvarsan and neosalvarsan. Lehmann. *See* XX.

New method for determining caffeine. Costes. *See* XX.

Direct titration of acids in alkaloidal salts. Lyons. *See* XX.

Preparation of tetraformal-trisazine from formaldehyde and hydrazine hydrate, and its use as a reducing agent in analytical chemistry. Hofmann and Storm. *See* XX.

XXIV.—MISCELLANEOUS ABSTRACTS.

Radiations which are active in the photochemical synthes of quaternary compounds, in the polymerisation of vario gases, and in the photolysis of acetone. D. Berthelot an H. Gaudechon. Comptes rend., 1912, **155**, 207—21 (See also this J., 1910, 724, 725, 754 and 904, and 1911 108, 377, 1086 and 1471.)

FORMAMIDE can be synthesised from an equimolecula mixture of carbon monoxide and ammonia by means o ultraviolet radiation. The synthesis takes place mos readily in the extreme ultraviolet ($\lambda < 0{\cdot}2\mu$), rather mor slowly in the middle ultraviolet ($0{\cdot}2$ to $0{\cdot}3\ \mu$) and not a all in the initial ultraviolet ($0{\cdot}3$ to $0{\cdot}4\ \mu$) or in sunlight The reverse process of decomposition is also promoted b ultraviolet radiation, but the state of affairs is complicated by further reactions. The liquid becomes yellow probably owing to the formation of hydrogen cyanid and subsequently of substances similar to azulmic acid. Finally all the nitrogen is found in the form of these complex substances and the residual gas consists of two parts of carbon monoxide and 1 part of carbon dioxide. This decomposition takes place very slowly in daylight, and much more readily in the mean ultraviolet. The photochemical conditions for the formation and decomposition of formamide are thus quite similar to those for formaldehyde from carbon monoxide and hydrogen. The polymerisation of cyanogen takes place very slowly in sunlight, much less rapidly than in mean ultraviolet radiation. Acetylene does not change at all in sunlight, but a brown deposit is produced quite rapidly in the mean ultraviolet (after the rays of the lamp have passed through water) and very rapidly in the extreme ultraviolet (when the rays have passed only through air). The photolysis of pure acetone, producing ethane and carbon monoxide, which does not take place at all in sunlight, is one of the most rapid reactions in the ultraviolet. The conditions in aqueous solution are somewhat different. In this case sunlight produces a slow evolution of gas containing 95 per cent. of methane. In ultraviolet radiation, methane is still produced to a small extent, but the main products are again ethane and carbon monoxide.—W. H. P.

Books Received.

LECTURES DELIVERED AT THE CENTENARY CELEBRATION OF THE FIRST COMMERCIAL GAS COMPANY TO SELL GAS AS AN ILLUMINANT. Held at the Franklin Institute, Philadelphia, Pa., April 18th and 19th, 1912. Edited and published by the American Gas Institute, 29, West 39th Street, New York City.

8vo volume, containing 174 pages of subject matter, with 43 illustrations.

ANALYSIS OF METALLURGICAL AND ENGINEERING MATERIALS. A Systematic Arrangement of Laboratory Methods. By HENRY WYSOR, B.S., Asst. Professor of Analytical Chemistry and Metallurgy in Lafayette College. The Chemical Publishing Co., Easton, Pa. 1912. Price $2.00. Williams and Norgate, 14, Henrietta Street, Covent Garden, London, W.C. 1912. Price 12s. 6d.

QUARTO volume, containing 82 pages of subject matter. This consists of series of analytical methods, largely illustrated, and preceded by laboratory arrangements and preparations, the idea being "an effort to raise the efficiency of students' work in the laboratory." The book is so arranged and compiled, that it is possible to revise or add without disturbing the part not affected so by the change. (Printed only on alternate pages, alternate pages being left blank.) There are 10 illustrations, and tables of atomic weights, gravimetric factors, and a bibliography of standard text books, and papers. I. Introduction. General laboratory directions, etc. II. Sampling ores by hand. III. Specific gravity of solids. IV. ANALYSIS of limestone. V. Of Portland cement. VI. Of oal and Coke. VII. Of Iron ore. VIII. Of Chrome-ron ore. IX. Of Manganese ore. X. Of Copper ore and matte. XI. Of Lead ore and furnace product. XII. Of Zinc ore. XIII. Of Iron and steel works cinders. XIV. Of Iron. XV. Of Alloy steel. XVI. Of Ferro-manganese and iron rich in manganese. XVII. Of Brass and bronze. XVIII. Of Soft bearing metal. XIX. Of Water. XX. Of Producer gas. XXI. Calorimetry of coal, coke, and oil. XXII. Calorimetry of gases. XXIII. Examination of lubricating oil. XXIV. Examination of the microstructure of iron and steel. XXV. Heat treatment of metals.

The Gas Light and Coke Co., 1812—1912. 4to. 1912. Presentation volume. (In Library of Society.)

An account of the progress of the Company from its incorporation by Royal Charter in the year 1812 to the present time, with an Appendix giving some of the engineering and chemical history of the Company.

Bulletin of the Imperial Institute. Vol. X. No. 2. July, 1912. Price 2s. 6d.

This issue of the Bulletin contains the result of investigations in connection with the tobacco industry of Ceylon, new gutta-yielding plants from the Gold Coast, rubber from Northern and Southern Nigeria, silk and fibres from India, cotton and sisal hemp from Papua, oils, oil-seeds and edible beans from Hong Kong, and cocoa from West Africa; also notices respecting the commercial uses of the cocoanut, the cultivation of cigar tobacco, shea nuts and shea butter, rubber-tapping experiments in Southern Nigeria, and economic developments in the Belgian Congo, etc.

Supplementary Report of the Committee of Reference in Pharmacy to the Pharmacopœia Committee of the General Medical Council. The most suitable limit test for Arsenic in official substances and preparations and the limits for Arsenic that may reasonably be adopted. June, 1912. Printed for the Medical Council by Messrs. Spottiswoode and Co., 5, New Street Square, London. E.C. Price 1s. (See page 748).

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*New Books.

[The Roman numerals in thick type, here and under "Dissertations," refer to the similar classification of abstracts under "Journal and Patent Literature" and in the "List of Patent Applications."]

I. *Chalkley*, A. P.: Diesel engines for land and marine work; with an introductory chapter by Dr. Rudolf Diesel. N.Y., Van Nostrand. 11+226 p. il. diagrs., O. 1912. $3 n.

IIA. *Braunkohlenindustrie:* Die deut. I. Bd. 3 Lfg. Halle, Knapp. 1912. M. 2.

Craig, E. H. C.: Oil-Finding. An Introduction to the Geological Study of Petroleum. Illust. 8vo, pp. 208. E. Arnold. London. 1912. Net 8s. 6d.

Harger, J.: The Prevention of Explosions in Mines. A Paper read before the Manchester Geological and Mining Society. (Excerpt from the Transactions of the Institution of Mining Engineering.) 8vo, pp. 36. The Institute. London. 1912.

Hicks, J. A.: The Laboratory Book of Mineral Oil Testing. 2nd Ed. Revised. With Introduction by Sir Boverton Redwood. Cr. 8vo. C. Griffin. London. 1912. Net 2s. 6d.

Kratz, A. P.: Tests of a Suction Gas Producer. 8vo, Chapman and Hall. London. 1912. Net 2s. 6d.

Mavor, S.: Die maschinelle Kohlengewinnungsarbeit m. besond. Berücksicht. der Grubenverhältnisse in Süd-Wales. Von Betriebsleit. Ob.-Ingen. Alois Holan übers. u. vorgetragen. (IV, 88 S. m. Abbildgn. u. 1 farb. Taf.) gr. 8°. Witkowitz, Amende and Holan. 1912. Cloth M. 6.

Tonge, J.: The Principles and Practice of Coal Mining. Cr. 8vo, pp. 372. Macmillan. London. 1912. 3s. 6d.

IV. *Schultz*, G.: Farbstofftabellen. 5. Afl. v. Schultz u. Julius. 1. Lfg. Berl., Weidmann. 1912. M. 3.

V. *Knepscher*, W.: Die Appretur der Seiden. Halbseiden- u. Samtgewebe. (VII, 39 S. m. 24 Abbildgn) 1912. Cloth M. 1.80.

König, J., u. F. *Hühn*, Drs.: Bestimmung der Zellulose in Holzarten u. Gespinstfasern. (V, 63 S.) Lex 8°. Berlin, Verlag f. Textil-Industrie. 1912. M. 4.

Main, W.: Le celluloïd et ses succédanés (Encyclopédie scientif. des aide mémoire), 15 fig., in-8°. Gauthier-Villars. Paris. 1912. Cart 3 fr.

VII. *Hintze*, Prof. C.: Handbuch der Mineralogie. 27. Lfg. I. Bd. Elemente, Sulfide, Oxyde, Haloide, Carbonate, Sulfate, Borate, Phosphate. 15. Lfg. (S. 2241—2400 m. 29 Abbildgn.) gr. 8°. Leipzig, Veit and Co. 1912. M. 5.

Hoffmann, M. K.: Lexikon der anorganischen Verbindungen. Unter Berücksicht. v. Additionsverbindgn. m. organ. Komponenten. Mit Unterstützg. der deutschen chem. Gesellschaft hrsg. im Auftrage des Vereins deutscher Chemiker. (In deutscher. engl., französ. u. italien. Sprache.) Lex. 8°. Leipzig, J. A. Barth.

II. Bd. Aluminium bis Xenon, Nr. 56—81, Bibliographien, Tl. VI—XII. Abteilung Aluminium bis Eisen, Nr. 56—60. 1. u. 2. Lfg. (VI, 144 u. 6 S.) 1912. M. 8.

X. *Crane*, W. R.: Exploitation des mines metalliques. Méthodes d'extraction des minerais, trad. et augm. par Albert F.-J. Bordeaux, 65 fig., in-8°. Dunod et Pinat. Paris. 1912. Cart 10 fr. 50.

Darstellung, Gemeinfassliche, des Eisenhüttenwesens. Hrsg. vom Verein deutscher Eisenhüttenleute in Düsseldorf. 8. Aufl. (XII, 404 S. m. Abbildgn. im Text u. auf 1 Taf., eingedr. Kurven u. 4 farb. Kurventaf.) gr. 8°. Düsseldorf, Verlag Stahleisen. 1912. Cloth M. 5.

Hulet, J.: Album général des aciers et fers profilés français. Aciers et fers marchands. Tôles et larges plats. Barêmes, fig., in-16. Dunod et Pinat. Paris. 1912. 15 fr.

—— Album général des produits métallurgiques français. Aciers et fers profilés. Tôle et métal déployé. Produits galvanisés. Tubes en fer et en acier. Tuyaux et colonnes en fonte. Cuivre, plomb, zinc. Barêmes généraux, fig., in-16. Dunod et Pinat. Paris. 1912. Cart. 10 fr.

Sammlung berg- u. hüttenmännischer Abhandlungen. gr. 8°. Kattowitz, Gebr. Böhm.

Flegel, Dr. K.: Frankreichs Eisenerze. [Aus: "Berg-u. hüttenmänn. Rundschau."] (31 S. m. 1 Taf.) 1912. M. 1.60.

Werndl: Die Roheisen-Selbstkosten in den Industrie-gebieten Südwestdeutschland, Niederrheinland-Westfalen u. Oberschlesien. [Aus: "Berg- u. hüttenmänn. Rundschau."] (25 S.) 1912. M. 2.

XI. *Morecroft*, J. H., and F. W. *Hehre*: A Short Course in the Testing of Electrical Machinery. 8vo. Constable. London. 1912. Net 6s.

Weber, R. H.: Die Magnetisierbarkeit des Ferrisulfats. (Aus: "Sitzungsber. u. Abhdlgn. d. naturforsch. Gesellsch. zu Rostock."] (12 S.) gr. 8°. Rostock, H. Warkentien. 1912. 12. b. 30 Pf.

XII. *Cult of the Coconut (The)*: A Popular Exposition of the Coconut and Oil-palm Industries. Illust. 4to. Curtis, Gardner. London. 1912. Net 2s. 6d.

XIII. *Fleury*, P.: The Preparation and Uses of White Zinc Paints. Cr. 8vo, pp. 278. Scott, Greenwood. London. 1912. Net 6s.

XIV. *Wolf-Czapek*, K. W.: Der Kautschuk. Seine Gewinnung u. Verarbeitg. (132 S. m. 50 fig.) kl. 8vo, Berlin, Union Zweigniederlassg. 1912. Cloth M. 4.

XVII. *Teyssier*, R. : La sucrerie (Encyclopédie scientif. des aide-mémoire). 3 fig., in-8°. Gauthier-Villars. Paris. 1912. Cart 3 fr.

XIXA. *Li-Yu-Ying* et L. *Grandvoinnet* : Le soja, sa culture, ses usages alimentaires, thérapeutiques agricoles et industriels, fig., 3 pl., in-8°. A. Challamel. Paris. 1912. 5 fr.

XX. *Biechele*, Dr. M. : Pharmazeutische Übungspräparate. Anleitg. zur Darstellg., Erkenng., Prüfg. u. stöchiometr. Berechng. v. offizinellen chemisch-pharmazeut. Präparaten. 3. verb. Aufl. (VI, 264 S. m. 6 Fig.) 8°. Berlin. J. Springer. 1912. Cloth M. 6.

Geinitz, R. : Vergleichende Versuche üb. die narkotischen u. desinfizierenden Wirkungen der gangbarsten aetherischen Oele u. deren wirksame Bestandteile. Gekrönte Preisarbeit. [Aus dem Institute f. Pharmakologie u. physiolog. Chemie.] [Aus : "Sitzungsber. u. Abhandlgn. d. naturforsch. Gesellsch. zu Rostock."] (66 S.) gr. 8°. Rostock. H. Warkentien. M. 1.50.

XXII. *Bianchi*, G. : Nozioni fondamentali sulla teoria degli esplosivi. Torino, 8°. fig., p. 128, con 1 tav. 1912. Lire 3.

XXIII. *Pechmann*, H. v. : Tafeln zur qualitativen chemischen Analyse, rev. v. O. Piloty. Zum Gebrauche im chem. Laboratorium des Staates zu München. Als Mscr. gedr. 13. Aufl. (40 S.) 8°. München. (M. Rieger). 1912. M. 1.60.

Städeler u. *Kolbe's* Leitfaden f. die qualitative chemische Analyse. Neu bearb. v. Prof. H. Abeljanz. 14., verm. Aufl. (152 S.) 8°. Zürich, Art. Institut Orell Füssli. 1912. Cloth M. 3.

XXIV. *Transactions and Proceedings of the Geological Society of South Africa.* Vol. 14. 17 Plates. Roy. 8vo, sd., pp. 131. Wesley. London. 1912. Net 42s.

Wang (*Chung Yu*) : Bibliography of the Mineral Wealth and Geology of China. Cr. 8vo, pp. 63. C. Griffin. London. 1912. Net 3s.

* Dissertations.

[Prices vary, ranging from two to three shillings.]

IIA. *Bergter*, F. : Der zeitliche Verlauf der Absorption von Gasen durch Holzkohle. Rostock. 1911. 54 S. 8°.

Seemann, H. : Messung der Strom-Spannungs-Charakteristik n Gasen, die mit Roentgenstrahlen ionisiert sind. Königsberg. 1912. 73 S. 8°.

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VII. *Faasch*, H. : Ueber die spezifische Wärme von wässerigen Salzlösungen. Rostock. 1911. 56 S. m. 37 Tab. u. 6 Taf. i. Text. 8°.

Stoll, O. : Ueber die spezifische Wärme von elektrolytischem Sauerstoff und die theoretische Berechnung des mechanischen Wärmeäquivalentes. Marburg. 1911. 39 S. 8°.

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Rieck, O. : Ueber 1-Meta-tolyl-3-methyl-5-pyrazolon und seine Derivate. Rostock. 1911. 39 S. 8°.

Stern, O. : Zur kinetischen Theorie des osmotischen Druckes konzentrierter Lösungen und über die Gültigkeit des Henryschen Gesetzes für konzentrierte Lösungen von Kohlendioxyd in organischen Lösungsmitteln bei tiefen Temperaturen. Diss. Breslau. 1912. 35 S. 8°.

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XXIII. *Lindner*, H. : Untersuchungen über gefärbte Bunsenflammen. Leipzig 1911. 58 S. 8°.

XXIV. *Rubbel*, A. : Ueber Perlen und Perlbildung bei Margaritana margaritifera nebst Beiträgen zur Kenntnis ihrer Schalenstruktur. Marburg. 1911. 49 S. 8°.

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Kelber, L. C. : Ueber die Einwirkung von Schwefelkohlenstoff und Aetzkali auf Ketone. Erlangen. 1912. 66 S. 8°.

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* Compiled by H. Grevel and Co., 33, King Street, Covent Garden, London, W.C., from whom all the works in the preceding lists can be obtained.

Journal of the Society of Chemical Industry.

No. 16, Vol. XXXI. AUGUST 31, 1912. No. 16, Vol. XXXI.

Yorkshire Section.

Meeting held at Queen's Hotel, Leeds, on Monday, March 25th, 1912.

MR. GEORGE WARD IN THE CHAIR.

THE REACTION BETWEEN SODIUM THIOSULPHATE AND A MIXTURE OF POTASSIUM BICHROMATE AND SULPHURIC ACID. A CONTRIBUTION TO THE CHEMISTRY OF CHROME TANNAGE.

BY PROF. EDMUND STIASNY AND B. M. DAS.

Introduction.—In the so-called two-bath chrome tannage the hides or skins are first treated with a solution of potassium bichromate containing various amounts of mineral acid; the bichromate acid which is taken up by the hide is subsequently reduced in a second bath, the reducing agent being in nearly all practical cases sodium thiosulphate. The products of reduction are basic chromium sulphates, and it has been shown in a previous paper[1] that even by the use of hydrochloric acid basic chromium sulphates (and not basic chromium chlorides) are the tanning principle, the oxidised thiosulphate providing the necessary sulphate ions. Hence, in order to simplify the investigation of the second bath, sulphuric acid can be used instead of hydrochloric acid.

There are three different ways of making the reaction mixture:

(1) The bichromate solution is mixed with a sufficient quantity of sulphuric acid, and thiosulphate solution is added to this mixture until the reduction is complete. It is this mode of action of the three reagents which has been studied in the present paper.

(2) The bichromate solution is mixed with the thiosulphate solution and sulphuric acid is added to this mixture. The processes going on in this case are quite different from those in case 1, brown chrome-dioxide (*i.e.*, insoluble basic chromic chromate) being first formed, and then gradually converted into chromic sulphate by means of the mineral acid. These processes deserve more elucidation,[2] as they play an important part whenever insufficient acid is present in the second bath.

(3) The thiosulphate solution is mixed with sulphuric acid, and the bichromate solution is added to this mixture. Even this mode of procedure is of practical interest, because a number of chrome tanners put the hides or skins, when they come from the first bath, into such a freshly made mixture of thiosulphate and mineral acid.

There are obviously two processes to distinguish in this case, viz., the action of acid on thiosulphate, and the subsequent reducing action of the products of this action on bichromate.

As regards the first part of the process, one usually finds the following equation given to illustrate the action of sulphuric acid on thiosulphate:—

$$Na_2S_2O_3+H_2SO_4=Na_2SO_4+SO_2+S+H_2O.$$

This reaction, though it explains the main part of the process, does not cover the whole problem, as other reactions are going on simultaneously, and—under certain conditions—can play a very considerable part in the whole process. These side reactions are characterised by the formation of sulphuretted hydrogen[3] (which can be observed by its smell) and of sodium tetrathionate[4] and sodium pentathionate.[5]

G. Vortmann (*loc. cit.*) tries to explain this complicated reaction by assuming that thiosulphuric acid is formed as a primary product of the action of mineral acid on sodium thiosulphate. This thiosulphuric acid then decomposes into sulphur dioxide, sulphuretted hydrogen and oxygen, the latter oxidising either the before named products or the thiosulphuric acid present in excess. The formation of sulphur, sulphuric acid,[6] and tetrathionic acid is thus explained:—

$$Na_2S_2O_3+H_2SO_4=H_2S_2O_3+Na_2SO_4$$
$$H_2S_2O_3=SO_2+H_2S+O$$
$$H_2S+O=H_2O+S \text{ (main reaction)}$$
$$SO_2+O=SO_3$$
$$2H_2S_2O_3+O=H_2S_4O_6+H_2O.$$

Vortmann found up to 20 per cent. of the thiosulphate converted into tetrathionic acid. It may be mentioned that this formation of tetrathionic acid as well as of other thionic acids can be explained by the secondary action of the sulphur dioxide formed on thiosulphate. According to Villiers[7] this reaction can be expressed by the equation, $2Na_2S_2O_3+3SO_2=Na_2S_4O_6+Na_2S_3O_6$.

Anyhow, the action of mineral acids on sodium thiosulphate is by no means a simple process. Some experimental work may perhaps be mentioned here that was carried out by one of us five years ago in conjunction with Mr. M. Bachorz, when studying the influence of a small amount of arsenious acid on this reaction. The results were surprising, as tetrathionates form the principal product of the reaction if a small amount of arsenious acid is added to the hydrochloric acid, while an acid free from arsenic produces but very small amounts of tetrathionates. This explains the bad results, sometimes obtained by practical chrome tanners, who use a hydrochloric acid with considerable arsenic in it for two-bath tannage.

Working hypothesis.—As has been mentioned above, our present paper will only deal with the reaction (or reactions) going on, when thiosulphate is allowed to act upon a mixture of bichromate and sufficient sulphuric acid. A previous paper[8] led us to expect that this process is a rather complex one, and we were prepared to find it consist of several single processes, the nature of which we wished to investigate. *A priori* there are three different ways of oxidising sodium thiosulphate, which have to be considered in discussing possible explanations of the process.

(a) $2Na_2S_2O_3+O=Na_2S_4O_6+Na_2O$

(b) $Na_2S_2O_3+4O=Na_2SO_4+SO_3$

(c) $Na_2S_2O_3+O=Na_2SO_4+S.$

Equation (a) illustrates the mildest form of oxidation, as we find it in the action of iodine or ferric chloride.[9] Equation (b) shows the most energetic form of oxidation, as produced by nitric acid, *aqua regia*, and also by potassium permanganate,[10] and of iodine in strongly alkaline solution.[11] Equation (c) indicates any oxidation of thiosulphate, in which the sulphur dioxide liberated by the action of a mineral acid acts as the reducing agent. There may also be processes in which thiosulphate is directly oxidised in this way.

If we assume that one or more of these three equations are needed for the explanation of the action of thiosulphate on a mixture of potassium bichromate, and sulphuric acid, and if in the above equations we substitute for oxygen such a mixture, then we arrive at the following three equations. which have to guide us in our subsequent investigation :—

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[1] Der Gerber, 1902, No. 664.

[2] See also Kopp, Chemical News, 1864, **2**, p. 16.

[3] See G. Vortmana, Ber., 1889, **22**, 2307; also Antonio Longi, Gazz. chim., 1896, 119, and Seyewetz and Chicandard, Bull. Soc. Chim., 1895, **13** (3), 11, who explain the process by dividing it into two parts, viz., $2Na_2S_2O_3+H_2SO_4=Na_2SO_4+2NaHS_2O_3$, and $2NaHSO_3=Na_2SO_4+SO_2+H_2S+S$.

[4] G. Vortmann *loc. cit.*

[5] G. Chancel and E. Diacon, Comptes rend., 1863, **56**, 710.

[6] Vaubel (Ber., 1889, **22**) claimed that sulphuric acid is one of the products, but Vortmann could not confirm this statement.

[7] Comptes rend., 1889, **108**, 402; see also Berthelot, Comptes rend., 1889, **108**, 971, and Hans Hertlein, Z. physikal. Chem., 1896, **19**, 287.

[8] Stiasny, Collegium, 1908, p. 345.

[9] Popp, Z. Chemie, 1870, (2), 6, p. 330.

[10] Bruegelmann, Z. analyt. Chemie, 1884, 24.

[11] Abel, Z. anorg. Chemie, 1902, **74**, 395.

$$\text{(A)}\ K_2Cr_2O_7 + 6H_2SO_4 + 6Na_2S_2O_3 = K_2SO_4 + 2CrOHSO_4 + 3Na_2S_4O_6 + 3Na_2SO_4 + 5H_2O.$$

$$\text{(B)}\ 4K_2Cr_2O_7 + 9H_2SO_4 + 3Na_2S_2O_3 = 4K_2SO_4 + 8CrOHSO_4 + 3Na_2SO_4 + 5H_2O.$$

$$^{12}\text{(C)}\ K_2Cr_2O_7 + 3H_2SO_4 + 3Na_2S_2O_3 = K_2SO_4 + 2CrOHSO_4 + 3Na_2SO_4 + 3S + 2H_2O.$$

Preliminary qualitative examination.—First of all some qualitative experiments were made in order to obtain information on the general course of the reactions, and to find out the relative amounts of reagents necessary to produce complete reduction, without excess of any of them, but with sufficient acid to avoid the separation of insoluble basic chromic sulphate. Subsequently the time was observed, necessary for complete reduction, and the influence of solution, excess of acid and of thiosulphate on the speed of the process. These qualitative tests were made with normal potassium bichromate, normal sulphuric acid, and half-normal thiosulphate, the bichromate solution being first added to sulphuric acid and diluted to the desired degree with water, after which the thiosulphate solution was run in quickly and shaken up. The end of the reduction, which was carried out at ordinary room-temperature, was shown by the following reaction, which indicates unreduced bichromate even in presence of thiosulphate. Five to ten drops of the reaction mixture were placed in a test tube, and after adding ammonia until slightly alkaline, the mixture was heated to boiling, filtered, and the filtrate slightly acidified with acetic acid, using a drop of phenolphthalein as indicator ;[13] then some starch solution was added and any thiosulphate present removed by the careful addition of a few drops of $N/10$ iodine solution, the small excess of which was again eliminated by a few drops of very dilute (about $N/100$) thiosulphate solution. The decolourised solution was now acidified with hydrochloric acid, and any unreduced bichromate thus allowed to liberate iodine from the potassium iodide (previously formed by the first solution of iodine).

Only a small selection of these qualitative tests is collected in Table I., but sufficient to justify the following conclusions :—

(1) Considerable time is necessary for complete reduction under the working conditions ; hence a quantitative study of the process seems hopeful.

(2) Increased dilution diminishes the speed of the reaction.

(3) Excess of thiosulphate increases the speed of the reaction.

(4) Excess of sulphuric acid seems to accelerate the early stages of the reduction (change of colour from red to green), but considerably retards the complete reduction. This behaviour rather favours the expectation of complexity in the reaction.

(5) In no case could separation of sulphur be observed, except where both acid and thiosulphate were used in excess.

(6) A slight though distinct smell of sulphuretted hydrogen was noticeable in all cases.[14]

To obtain a complete understanding of the process, however, it was necessary to have a quantitative analysis of the reaction mixture at various stages of the process. Such a following up of a process made it necessary to stop the reaction at any desired moment, and to discover means of determining the unreduced bichromate, reduced chrome salts, free sodium thiosulphate, and tetrathionate which may be present in the reaction mixture.

TABLE I.

Normal potassium bichromate.	Normal sulphuric acid.	Water.	Semi-normal thio-sulphate.	Time necessary for complete reduction.
c.c.	c.c.	c.c.	c.c.	
10	10	0	13	5 days
10	10	100	13	14 ,,
10	10	0	11	15 ,,
10	10	0	12	15 ,,
10	10	0	13	5 ,,
10	12	0	12	13 ,,
10	12	0	13	12 ,,
10	12	0	14	20 hrs.
10	10	100	13	14 days
10	15	100	13	24 ,,
10	20	100	13	28 ,,
10	12	0	14	20 hrs.
10	13	0	14	3 days
10	14	0	14	5 ,,

For stopping the reduction process, the following three methods were found available :—

1. Addition of alkali.
2. Precipitation of the chromates by barium salts.
3. Rapid reduction of the chromates by ferrous salts.

The effect of strong dilution can also be utilised. This does not stop the process, but makes it so slow that aliquot parts of the mixture can be taken for single determinations, without allowing the time of manipulation to influence the composition of the mixture to any perceptible extent.

Quantitative methods of analysis of the reacting mixture.—It must be remembered that the following substances may be present in the same mixture : Potassium bichromate, bichromic acid, sulphuric acid, basic chromic sulphates, thiosulphate, tetrathionate, sulphates of sodium and potassium, and finally sulphur (in colloidal solution) and pentathionate.

Determination of the reduced and unreduced chromium compounds.—An aliquot part of the reacting mixture (after diluting to 500 c.c.) was pipetted into a beaker containing dilute ammonia, which stops the reduction and precipitates the reduced chromium as chromium hydroxide. The gravimetric estimation of the latter is then carried out in the ordinary way. The amount of unreduced chromium can be calculated by difference, knowing the amount of bichromate originally taken for the experiment. It can also be determined directly by the method described in the qualitative examination, using the filtrate of the ammonia precipitation to which after slight acidification with acetic acid a little iodine is added to remove thiosulphate, and (after eliminating any excess of iodine) acidifying with hydrochloric acid and finally titrating the iodine which is thus liberated.

Determination of unconsumed thiosulphate.—An aliquot part of the reacting mixture (made up to 500 c.c.) was pipetted into a beaker containing a mixture of about equivalent parts of ammonia and ammonium chloride. This mixture will stop the reaction and precipitate the chromium, but its alkalinity is too slight to act on the tetrathionate, which with distinctly alkaline reagents is converted into thiosulphate. By slightly acidifying with acetic acid a clear solution is obtained, from which we hoped to precipitate the chromates (and sulphates) by means of barium chloride and to determine the thiosulphate in the filtrate of the above precipitation by titrating with $N/10$ iodine. The results, however, were always too low, and it was found that the barium sulphate *in statu nascendi* caused this loss by absorbing considerable amounts of thiosulphate. Similar observations of adsorption or occlusion of different substances by barium sulphate are well known.[15] Table II. proves that only when barium sulphate is formed in the liquid are such losses observed.

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[12] Equation (C) can, as has been mentioned above, be divided into two processes, viz., the action of acid on thiosulphates, and the subsequent action of the sulphur dioxide thus produced on the bichromate.

$$3Na_2S_2O_3 + 3H_2SO_4 = 3Na_2SO_4 + 3SO_2 + 3S + 3H_2O$$

$$K_2Cr_2O_7 + 3SO_2 + H_2O = K_2SO_4 + 2CrOHSO_4$$

$$K_2Cr_2O_7 + 3Na_2S_2O_3 + 3H_2SO_4 = 3Na_2SO_4 + K_2SO_4 + 2CrOHSO_4 + 3S + 2H_2O$$

[13] A small excess of acetic acid is harmless, as no reaction between bichromate and thiosulphate or between bichromate and potassium iodide is started in the time given.

[14] See also Longi, *loc. cit.*

[15] Richards, Z. physik. Chem., 1904, 29.

Kund Estrup and E. B. Anderson, Kolloid-Zeitschr., 1912, 10, 161.

TABLE II.

To 5 c c. *N*/10 thiosulphate solution were added	c. c. *N*/10 iodine	
	used.	expected.
Chrome alum solution	5	5
Barium chloride solution	5	5
Freshly precipitated chromium hydroxide	5	5
A mixture of ammonia and ammonium chloride	5	5
A mixture of ammonia, ammonium chloride, and chrome alum	5	5
Chrome alum and barium chloride	4·5	5
Sodium sulphate and barium chloride	2	5
Freshly precipitated barium sulphate	5	5

The difficulty which arose by this adsorption of thiosulphate could be avoided by adding a known amount of *N*/10 iodine to the solution before precipitating with barium chloride. The excess of iodine could thus be titrated back with *N*/10 thiosulphate, without filtering off the insoluble barium salts. Table III. shows the correctness of this method by some figures, chosen from a much larger number of experiments that were carried out with equally good results.

TABLE III.

	The analysed mixture was made up of	c.c. *N*/10 thiosulphate	
		used	calculated.
1.	5 c.c. *N* 10 thiosulphate 2 c.c. chrome alum solution (10 per cent.)	5·0	5·0
2.	1 c.c. *N*–potassium bichromate 2 c.c. chrome alum solution 5 c.c. sodium tetrathionate solution 5 c.c. *N*/10 thiosulphate, added after neutralising the above mixture with ammonia and ammonium chloride	5·0	5·0
3.	20 c.c. *N*-potassium bichromate 24 c.c. *N*-sulphuric acid 16 c.c. water 24 c.c. *N*/2 thiosulphate After standing one hour	1·5	Duplicate : 1·5

Example 3 illustrates the close agreement of duplicates, made on actual reaction mixtures.

The unconsumed portion of thiosulphate, which can be thus determined, deducted from the amount of thiosulphate originally taken for the experiment, gives the figures for the consumed (oxidised) thiosulphate.

Determination of the sodium tetrathionate formed during the process.—Our method was based on the action of a strong potassium carbonate solution on sodium tetrathionate. Gutmann,[16] who studied the action of different alkalis on tetrathionate, expresses the action of potassium carbonate by the following equation :—

$$4Na_2S_4O_6+5Na_2CO_3=7Na_2S_2O_3+2Na_2SO_4+5CO_2.$$

Our experiments, which were carried out by heating 100 c.c. of the solution containing tetrathionate with 30 c.c. of a 40 per cent. solution of potassium carbonate for one hour on the steam bath, allowing to cool, acidifying with a 25 per cent. acetic acid, and titrating with iodine, lead us to a different result. In all cases we found that the iodine value of the solution after such treatment agreed with the amount of iodine necessary to produce the tetrathionate originally present. Table IV. gives a few of the many similar results which we obtained.

TABLE IV.

cc. *N*/10 iodine for obtaining the tetrathionate starting from thiosulphate.	c.c. *N* 10 iodine † used according to the method given above.	c.c. *N*/10 iodine calculated according to Gutmann's equations.
9·9	10·0	8·65
10·0	10·15	8·75
10·0	10·15	8·75

† The values of this column are slightly higher than those of the first column ; this can be explained by the fact that the thiosulphate from which we started contained traces of tetrathionate. When 10 c.c. of this thiosulphate solution was treated with potassium carbonate in the above way, the number of c.c. *N*/10 iodine finally used was also 10·15.

It would not be correct to explain the agreement between the first and second columns in Table IV. by assuming that each molecule of tetrathionate is converted into two molecules of thiosulphate. This becomes clear if the treatment with potassium carbonate is repeated several times, the iodine value showing a gradual diminution, which surely cannot be explained on the above hypothesis. We have, however, not investigated the chemical nature of these reactions,[17] nor have we gone into the question of the discrepancies between Gutmann's results and our own.

For the purpose of this paper, we were satisfied with the behaviour of tetrathionate when first treated with potassium carbonate under the above conditions. As a supplementary proof of the correctness of the results in Table IV. we made a similar experiment starting from pure sodium tetrathionate.[18] 25 c.c. of our tetrathionate solution gave on oxidising with bromine (in alkaline solution) and precipitating with barium chloride, 0·3862 and 0·3866 grm. of barium sulphate corresponding to 0·11205 grm. of sodium tetrathionate. 25 c.c. of the tetrathionate solution, after the treatment with potassium carbonate required 8·3, 8·3, 8·35, 8·35 c.c. *N*/10 iodine; and calculating from that on tetrathionate, assuming that $1Na_2S_4O_6$ corresponds to 2 I, the figure 0·112 grm. is found, which is in very good concordance with the figure found gravimetrically.

Having thus convinced ourselves of the reliability of the method, we had to apply it to our reaction mixtures. The reduction was in this case stopped by quickly reducing the chromates by means of ferrous sulphate and a little sulphuric acid. It remains now to remove the reduced chromium together with the iron salts and to determine the tetrathionate by the potassium carbonate method. Several attempts to do both simultaneously did not give satisfactory results, and we finally adopted the following mode of procedure, which proved quite reliable. The solution to be analysed was pipetted into a 200 c.c. flask and reduced with ferrous sulphate and sulphuric acid ; after a few minutes standing, a 10 per cent. sodium hydroxide solution was carefully added from a burette until a few drops phenolphthalein (previously added) showed a slight alkaline reaction. Then the slight soda excess was removed by a drop or two of hydrochloric acid and subsequently the solution made faintly alkaline with ammonia.[19] After making up to the mark with water, thoroughly mixing, and filtering, 100 c.c. of the filtrate were heated for one hour on the steam bath together with 30 c.c. of a 40 per cent. potassium carbonate solution. The liquid after cooling and slightly acidifying with acetic acid was titrated with *N*/10 iodine. Table V. gives some results obtained by reducing various amounts of bichromates by means of ferrous sulphate and sulphuric acid, adding tetrathionate and applying the above method of analysis.

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[16] Ber., 1908, **41**, 300.

[17] The action of potassium carbonate on tetrathionate possibly leads to a mixture of thiosulphate and other products, reacting with iodine, so that the total iodine consumed agrees with the iodine value of the tetrathionate from which we started. But while the thiosulphate is reconverted into tetrathionate, the other products react in different ways (being perhaps oxidised to sulphates), so that on repeating the process a lower iodine value will be found.

[18] This salt was prepared according to "Laboratory Methods of Inorganic Chemistry," by Biltz, Hall, and Blanchard, p. 132. It is stated there that the amount of water of crystallisation varies, but is approximately $2H_2O$ for $Na_2S_4O_6$. We found 10·4 per cent. water in our salt, while $Na_2S_4O_6+2H_2O$ requires 11·6 per cent.

[19] By this mode of procedure a complete precipitation of chromium and iron salts is obtained, in such form that filtration is easy.

TABLE V.

c.c. normal bichromate.	c.c. tetrathionate solution.	c.c. $N/10$ iodine used.	c.c. $N/10$ iodine calculated.
5	25	8·3	8·3
10	25	8·3	8·3
15	25	8·3	8·3
15	25	8·3	8 3

In addition to the above tests the following experimental proof was obtained of the correctness of the method :—20 c.c. N-bichromate were mixed with 24 c.c. N-sulphuric acid and 24 c.c. $N/2$ thiosulphate added, and the mixture after the addition of 50 c.c. tetrathionate solution allowed to stand for 3 hours. Another mixture was made in analogous way with 50 c.c. of water instead of the tetrathionate solution. Both liquids were analysed and the difference of the tetrathionate figures found by the above method was in very good concordance with the figure corresponding to 50 c.c. of the tetrathionate solution.[20]

Moreover, it was found that in all cases where duplicates have been made, these duplicates were in good concordance.

Application of the above methods to the quantitative analysis of the reacting mixture.—The following mixtures were prepared by running the solutions in the order given below from burettes into a 500 c.c. flask, which after well mixing is kept at a low temperature (surrounded by a running stream of cold water) for different intervals, *viz.*, 5 mins., 20 mins., 60 mins., 4 hrs., 24 hrs. After these times the flasks were filled up to the mark with water, well shaken and aliquot parts taken for the quantitative determinations as described above. One mixture was diluted and analysed immediately after its preparation.

Mixtures used for analysis.

c.c. N-bichromate.	c.c. N-sulphuric acid.	c.c. water.	c.c. $N/2$ thiosulphate.
20	24	16	24 (see Table VI.)
20	24	100	24 (see Table VII.)
20	24	300	24 (see Table VIII.
20	48	100	24 (see Table IX.)
20	24	100	48 (see Table X.)

TABLES VI.—X.

	Potassium bichromate		Thiosulphate		Tetrathionate formed in grms. of $Na_2S_2O_6$	Chromium reduced in per cent. of total chromium.
	reduced in grms. of Cr.	unreduced in grms. of Cr.	consumed in grms. of $Na_2S_2O_35H_2O$	unconsumed in grms. of $Na_2S_2O_35H_2O$		
Table VI.						
After 0 minutes	0·0812	0·0147	0·5168	0·0784	0·2297	80·6
,, 5 ,, ...	0·0845	0·0114	0·5367	0·0585	0·2393	84·9
,, 20 ,, ...	0·0657	0·0103	0·5563	0·0389	0·0457	88·5
,, 60 ,, ...	0·0690	0·0069	0·5724	0·0228	0·2513	90·9
,, 4 hours	0·0700	0·0060	0·5875	0·0077	0·2531	92·2
,, 24 ,, ...	0·0729	0·0031	0·5927	0·0025	0·2546	96·0
Table VII.						
After 0 minutes	0·0528	0·0231	0·5147	0·0806	0·2223	69·6
,, 5 ,, ...	0·0571	0·0188	0·5285	0·0687	0·2267	75·2
,, 20 ,, ...	0·0593	0·0166	0·5446	0·0506	0·2261	78·1
,, 60 ,, ...	0·0828	0·0131	0·5670	0·0282	0·2429	82·8
,, 4 hours	0·0667	0·0092	0·5826	0·0127	0·2449	87·8
,, 24 ,, ...	0·0698	0·0061	0·5897	0·0055	0·2477	92·0
Table VIII.						
After 0 minutes	—	—	0·5119	0·0833	—	—
,, 5 ,, ...	0·0559	0·0201	0·5181	0·0771	0·2199	73·6
,, 20 ,, ...	0·0575	0·0184	0·5372	0·0580	0·2287	75·8
, 60 ,, ...	0·0622	0·0138	0·5597	0·0354	0·2389	81·9
,, 4 hours	0·0644	0·0095	0·5801	0·0151	0·2431	87·5
,, 24 ,, ...	0·0886	0·0073	0·5875	0·0077	0·2442	91·7
Table IX.						
After 0 minutes	0·0581	0·0178	0·5461	0·0491	0·2484	76·6
,, 5 ,, ...	0·0598	0·0162	0·5538	0·0414	0·3540	78·8
,, 20 ,, ...	0·0639	0·0121	0·5711	0·0241	0·2635	84·1
,, 60 ,, ...	0·0655	0·0101	0·5850	0·0102	0·2671	86·3
,, 4 hours	0·0682	0·0077	0·5875	0·0077	0·2684	89·9
,, 24 ,, ...	0·0683	0·0076	0·5902	0·0050	0·2697	90·0
Table X.						
After 0 minutes	0·0609	0·0151	0·6305	0·5605	0·2644	80·2
,, 5 ,, ...	0·0635	0·0125	—	—	—	83·6
,, 20 ,, ...	0·0681	0·0078	0·6826	0·5084	0·2849	89·7
,, 60 ,, ...	0·0718	0·0041	0·6900	0·5010	0·3001	94·6
,, 4 hours	—	—	0·7322	0·4588	0·3193	—
,, 24 ,, ...	0·0759	0·0000	0·7595	0·4315	0·3316	100·0

The analytical figures obtained are collected in the Tables VI.—X. and need no further explanation. It may, however, be mentioned that nearly every figure of Table VII. has been verified by duplicate analysis, while in the other tables such duplicates have only been made occasionally. The last column of these tables shows what portion of the bichromate (in percentage of the original amount) was reduced. From this column it can be seen that the greater part of the process goes on very rapidly, so that 70—80 per cent. of the bichromate is reduced immediately after mixing the components. It is the remaining 20—30 per cent. of the process which goes on with a measurable and gradually diminishing speed. It can further be seen from this column, that dilution lowers the speed of both the initial portion and of the later phases of the reaction. Excess of thiosulphate, on the contrary, increases the speed of both parts of the reaction, while excess of sulphuric acid distinctly accelerates the initial portion of the reaction and considerably retards the completion of the process. (The qualitative observations had already shown this; see p. 754.)

In Table XIB. the figures which show these regularities are put together.

As to the analytical figures of Tables VI.—X., the first question to be answered is whether these figures agree with the assumption of one single equation, or if they make it necessary to assume that the process is a complex one, consisting of two or more single reactions,

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[20] This result also shows that the tetrathionate formed during the process is an end product and is not attacked by the chromate-sulphuric acid mixture.

This is also confirmed by J. Myers (J. prakt. Chem., 1870, **108**, 123); a different view is held by A. Longi, *loc. cit.*

From Table XIB. it can be seen that the latter alternative is correct: the figures in this table are gram-molecules divided by the number of gram-molecules of reduced bichromate. Hence the ratio of molecules which have reacted with one another is given in this table, and it is obvious that no simple chemical reaction can explain these kind of figures. Full figures are only given for Table VII., while average figures are given for the other tables.

Table XIa.

Percentage bichromate reduced.	Influence of dilution.			Influence of excess of acid.		Influence of excess of thiosulphate.	
	$+16H_2O$ see table VI.	$+100H_2O$ see table VII.	$+300H_2O$ see table VIII.	$+24H_2SO_4$ see table VII.	$+48H_2SO_4$ see table IX.	$+24Na_2S_2O_3$ see table VII.	$+48Na_2S_2O_3$ see table X.
After 0 min.	80·6	69·6	—	69·6	76·6	69·6	80·2
,, 5 ,,	84·9	75·2	73·6	75·2	78·8	75·2	83·6
,, 24 hours	96·0	92·0	91·7	92·0	90·0	92·0	100·0

Table XIb.

The figures correspond to—	Molecules bichromate reduced.	Mol. thiosulphate consumed.	Mol. tetrathionate formed.
Table VII.—			
After 0 mins.	1	4·00	1·63
,, 5 ,, ...	1	3·87	1·53
,, 20 ,, ...	1	3·85	1·53
,, 60 ,, ...	1	3·79	1·49
,, 4 hours	1	3·66	1·42
,, 24 ,, ...	1	3·54	1·37
Average values for—			
Table VI.	1	3·50	1·41
,, VII.	1	3·78	1·49
,, VIII.	1	3·83	1·49
,, IX.	1	3·77	1·60
,, X.	1	4·18	1·64

From the full figures corresponding to Table VII. it can be seen that the two or more processes, which go on simultaneously have no constant share of the total process as this goes on. The same deduction can be shown from the full figures of the other tables.

It remains now to split up these compound reactions into their single components.

In trying to do so we come back to the three equations given in a previous paragraph, viz. :—

$$\text{(A)}\ K_2Cr_2O_7 + 6H_2SO_4 + 6Na_2S_2O_3 = K_2SO_4 + 2CrOHSO_4 + 3Na_2SO_4 + 3Na_2S_4O_6 + 5H_2O.$$

$$\text{(B)}\ 4K_2Cr_2O_7 + 9H_2SO_4 + 3Na_2S_2O_3 = 4K_2SO_4 + 8CrOHSO_4 + 3Na_2SO_4 + 5H_2O.$$

$$\text{(C)}\ K_2Cr_2O_7 + 3H_2SO_4 + 3Na_2S_2O_2 = K_2SO_4 + 2CrOHSO_4 + 3Na_2SO_4 + 3S + 2H_2O.$$

Equation A is the only one which explains the formation of tetrathionate. If therefore we start from the tetrathionate figures experimentally found and calculate the bichromate, and thiosulphate which correspond to this tetrathionate, we can split up the complete reaction into equation A and a remaining part. The calculation is very simple, as equation A shows the ratio of $K_2Cr_2O_7 : Na_2S_2O_3 : Na_2S_4O_6$ to be 1 : 6 : 3 or 1/3 : 2 : 1; hence we have to apply to the tetrathionate figures of Table XIB. the factors 2 and 1/3 in order to get the gram-molecules of bichromate and thiosulphate respectively, which have reacted according to equation A. Table XII. gives the figures thus calculated and the last column shows the share of equation A in the composite reaction.

The share of equation A being thus determined and eliminated, we have now to deal with the remaining part of the reaction. It must again and by similar reasoning as before be discovered if this remaining part of the reaction can be explained by a single equation.

Table XIII. gives the number of molecules of thiosulphates which have reacted with one mol. bichromate, and these figures indicate that the remaining part is still a complex one.

Table XIII.

The figures correspond to—	Mol. bichromate reduced	Mol. thiosulphate consumed
	in the remaining part of the reaction after eliminating equation A.	
Table VII.—		
After 0 mins.	1	1·62
,, 5 ,, ...	1	1·65
,, 20 ,, ...	1	1·61
,, 60 ,, ...	1	1·61
,, 4 hours	1	1·56
,, 24 ,, ...	1	1·47
Average values of—		
Table VI.	1	1·28
,, VII.	1	1·59
,, VIII.	1	1·71
,, IX.	1	1·22
,, X.	1	1·99

Table XII.

The figures correspond to—	Mol. bichromate reduced,	Mol. thiosulphate consumed,	Mol. tetrathionate formed,	Share of equation A in the composite reaction.
	according to equation A.			
Table VII.				per cent.
After 0 mins.	0·5433	3·26	1·63	54·3
,, 5 ,, ...	0·5100	3·06	1·53	51·0
,, 20 ,, ...	0·5100	3·06	1·53	51·0
,, 60 ,, ...	0·4967	2·98	1·49	49·7
,, 4 hours	0·4733	2·84	1·42	47·3
,, 24 ,, ...	0·4567	2·74	1·37	45·7
Average values for—				
Table VI.	0·470	2·82	1·41	47·0
,, VII.	0·498	2·98	1·49	49·8
,, VIII.	0·498	2·98	1·49	49·8
,, IX.	0·533	3·20	1·60	53·3
,, X.	0·548	3·28	1·64	54·8

Table XIII. shows that there is no single molecular ratio between bichromate and thiosulphate in this remaining part of the reaction, and that the ratio is influenced by dilution, excess of acid, and excess of thiosulphate. We have now again to split up this remaining composite reaction in its components, but we have no such starting point as before, when we were able to calculate the share of the equation A from the tetrathionate figures.

Equation C would seem to present such a clue by the amount of sulphur which it contains. But no sulphur could be determined or even observed in our experiments[21] and another mode of procedure must therefore be chosen.

The two equations, B and C, to which we must return are distinguished by the different molecular ratio between bichromate and thiosulphate.

In equation B this ratio is 4 : 3 or 1 : 0·75
In ,, C ,, ,, is 1 : 3.

The ratio expressed in Table XIII. is in all cases between these two limits, and therefore allows us to calculate the share of B and C in the composite reaction by the following simple calculation (where M is the share of B, and N the share of C in per cent.).

Example : $M+N=100$
and $0{\cdot}75M+3N=1{\cdot}59\times 100$ (1·59 is taken from Table XIII. as average value for Table VII.).
Hence $M=62{\cdot}7$ and $N=37{\cdot}3$.

After elimination of equation A, the remaining part of the reaction is distributed between 62·7 per cent. of equation B and 37·3 per cent. of equation C.

If similar calculations are made with the other figures of Table XIII. and if the share of equation A is also taken into consideration, the figures of Table XIV. are obtained which show the share of the three equations A, B and C in the composite reaction.

TABLE XIV.

The figures correspond to—	Share of equation A	Share of equation B	Share of equation C
	in the composite reaction.		
Table VII.—	per cent.	per cent.	per cent.
After 0 mins. ..	54·3	28·0	17·7
,, 5 ,, ..	51·0	29·4	19·6
,, 20 ,, ..	51·0	30·3	18·7
,, 60 ,, ..	49·7	31·1	19·2
,, 4 hours ..	47·3	33·7	19·0
,, 24 ,, ..	45·7	35·5	18·8
Average values of—			
Table VI.	47·0	40·3	12·7
,, VII.	49·8	31·5	18·7
,, VIII.	49·8	28·7	21·5
,, IX.	53·3	37·3	9·4
,, X.	54·7	20·4	24·9

Before discussing the figures of Table XIV. more evidence must be given for the equations B and C playing a part in the complex process. First we have to show that sulphur is formed as indicated by equation C, though this sulphur does not produce any precipitation, or even any opalescence. It can nevertheless be easily proved that sulphur has been formed. A portion of this sulphur is present in form of a colloidal solution, and the remaining and greater portion of this sulphur has reacted *in statu nascendi* with the tetrathionate forming pentathionate.[22]

To prove the presence of sulphur in colloidal solution, a mixture of 20 c.c. *N*-bichromate, 24 c.c. *N*-sulphuric acid, 100 c.c. water and 24 c.c. *N*/2 thiosulphate was allowed to stand for 24 hours and then shaken out six times with carbon bisulphide. The carbon bisulphide layers were collected in a weighed flask, the solvent distilled off, and the last traces removed by a current of air; the flask was then dried in the steam oven, allowed to cool in the desiccator and weighed. The residue (7·6 mg.) was proved to be sulphur not only by its appearance but also by forming sulphuric acid when oxidised with *aqua regia*.

The presence of such colloidal sulphur was to be expected from the experience of previous workers. Debus[23] found such colloidal sulphur (which he called δ-sulphur) in Wackenroder's liquid; Engel[24] stated that solutions of colloidal sulphur of considerable strength can be obtained by the action of hydrochloric acid on thiosulphate, and Raffo[25] and others have recorded similar observations. Besides, it is quite possible that the presence of colloidal basic chromium sulphates increases the stability of such colloidal sulphur solutions.

The formation of pentathionate, which accounts for the greater part of sulphur formed according to equation A, could be shown by two tests. The first, given by Debus in his classical paper on Wackenroder's solution (*loc. cit.*), consists in the separation of sulphur by addition of sodium hydroxide and distinguishes pentathionate from tetra- and tri-thionate and from thiosulphate

In our case we had to add an excess of sodium hydroxide in order to redissolve the chromium hydroxide primarily formed; a distinct separation of sulphur could be immediately observed and the residue after extracting with carbon bisulphide and evaporating the solvent, was easily identified as sulphur by its appearance and by burning with the well-known blue flame and the strong smell of sulphur dioxide.

Another test, used by Colefax,[26] is carried out by the addition of ammoniacal silver nitrate solution, which produces a white precipitate, gradually turning black. To apply this reaction we had first to remove the reduced chromium; this was done by the mixture of ammonia and ammonium chloride which is so slightly alkaline that it does not react with the pentathionate (in the time taken by the test) but completely precipitates the chromium sulphates. The filtrate (which is obtained clear, when a little barium sulphate is added to the liquid) gives them very distinctly the above reaction with ammoniacal silver nitrate.

The pentathionate, it may be mentioned, is quite stable in acid solutions, while it is unstable in neutral ones (see also Debus), and we could get positive results with both tests applied to our reaction mixtures, even after standing for two months.

The assumption of equation C taking part in the complex reaction being proved, we thought it desirable to obtain additional evidence of the correctness of the figures in Table XIV. and of the whole general explanation of the process. This independent verification is based on the fact, that the amount of sulphate produced according to the equations A, B, and C, can be calculated and this figure compared with the figure obtained by actual experiment. We see that no sulphates are formed in equation A, further that two sulphate-ions are produced from one thiosulphate molecule in equation B and that one sulphate-ion is formed from one thiosulphate molecule in equation C. Taking now the share of A, B, and C, in any one special case it is easy to calculate the amount of sulphate formed in the mixture. The concordance of such a figure with the figure experimentally found was indeed satisfactory, considering the number of analytical examinations on which the respective figures are based. The calculated figure was 69·2 mg. SO_4, the figure actually found 64·7 mg. SO_4.

Returning now to the figures of Table XIV., the foundation of which we hope to have proved, we can state the following conclusions which may be regarded as a short summary of the results of our investigation :—

1. The reduction of a bichromate sulphuric acid mixture by means of thiosulphate can be explained as a complex process, consisting of three single reactions (see equations A. B, and C).

---

[21] It will be shown later that equation C is really represented in the composite reaction, and why the sulphur escapes observation.

[22] This secondary reaction does not interfere with the method used for the determination of sodium tetrathionate, because the latter is reformed, when the pentathionate is treated with potassium carbonate; it then reacts further in the way described above.

[23] *loc. cit.*

[24] Comptes rend., 1891, **112**, 866.

[25] Kolloid Zeitschrift, 1908, 2, 318.

[26] J. Chem. Soc., 1892, Trans., p. 196, *see also* Debus, *loc. cit.*, p. 297—8.

2. The proportional influence of these single reactions depends on the conditions of the process, viz., dilution, amount of acid and of thiosulphate. Dilution increases slightly the share of equation A, diminishes considerably the share of B, and increases considerably the share of C (see Table XIV.; average figures of VI., VII., VIII.).

Excess of acid increases the share of the equations A and B and greatly diminishes the share of C (see Table XIV.; average figures of VII. and IX.).

Excess of thiosulphate increases the shares of A and especially that of C while it diminishes the share of B (see Table XIV.; average figures of VII. and IX.).

3. Seventy to eighty per cent. of the process takes place too quickly for the speed to be measured, and it is the last stages which have furnished the time measurements described in the present paper.

4. Very little sulphur is present in the reduced liquor; the sulphur formed according to equation C has to a great extent reacted upon the tetrathionate (the pentathionate thus formed being now identified) and is partially present in a colloidal form. It is very probable that most of the sulphur produced in two-bath tannage is not a product of the reduction process but of the direct action of mineral acid on thiosulphate; and it is not only the excess of acid which reacts with an excess of thiosulphate, but also the reduced chromium salts which by the neutralising action of an excess of thiosulphate are rendered more basic.

In conclusion, we leave to others the drawing of directly practical conclusions, but express the hope that the chemical changes of the two-bath chrome tannage have been made somewhat clearer by the above investigations, and that useful methods have been elaborated for the detection and estimation of the various possible constituents of second-bath liquors.

Discussion.

Mr. G. **Ward** said he had noticed that potassium bichromate was sometimes mixed with ordinary alum. Was this done to moderate the intensity of the reaction, and what difference was there in the results obtained in the process with potassium bichromate and those obtained with chrome alum?

Dr. H. **Ingle** in studying the action of water on sulphur compounds, notably on sulphur chloride, was surprised to find a colloidal form of sulphur produced together with considerable quantities of tetra- and di-thionates. He thought this sulphur might be related to that produced in Dr. Stiasny's experiments. In the standardisation of sodium thiosulphate against a mixture of potassium bichromate, potassium iodide, and acid, could any error get into the results by direct action between the bichromate and thiosulphate?

Mr. T. **Fairley** asked it the differences in Dr. Stiasny's results and those of other investigators obtained when mixtures of tetrathionates and potassium carbonate were boiled, could be accounted for by differences in the degree of dilution?

Mr. J. W. **Cobb** was surprised at the low reaction velocities in the work and asked if any general explanation of this could be given.

Dr. **Stiasny**, in reply, said that mixtures of bichromate and alum were used when it was desired to have combination tannages. These had a great role to play in the future. The alum combined with the bichromate, forming basic aluminium sulphate and bichromic acid, both of which were taken up by the hide. The addition of chrome alum to the bichromate bath had a similar effect and produced a combined one- and two-bath chrome tannage. The reaction between thiosulphate and a mixture of bichromate, acid, and potassium iodide was quite different from the reaction dealt with in the paper, as in the former case the thiosulphate reacted with the iodine previously liberated and not with the bichromate directly. There was no doubt that the basis of their iodometric analysis was correct and simple.

With regard to the action of potassium carbonate on tetrathionate, he had not gone into the question of explaining the differences in the results obtained by him and Gutmann, but intended to do so and to clear up the reactions, which took place under different conditions.

As to the slowness of the reaction, only the last 20—30 per cent. of the bichromate was reduced at a measurable rate; and months had often to elapse before completion of the reaction. The amounts of acid or of thiosulphate (or of both) were chosen so that no excess was present, so that the final stages of the reaction, which was not an ionic reaction, were going on with minute quantities and at great dilutions.

Obituary.

BENJAMIN EDWARD REINA NEWLANDS.

Benjamin Edward Reina Newlands, youngest son of the Rev. William Newlands, A.M. (Glasgow), was born in Southwark, January 23rd, 1842, and educated at home and at St. Saviour's Grammar School. After studying chemistry under Prof. A. W. Hofmann in 1862, he became assistant to Prof. C. W. Heaton at Charing Cross Hospital, and in 1863 to Prof. Way, chemist to the Royal Agricultural Society. At the end of that year he became chemist to Messrs. James Gibbs and Co., at Victoria Docks, and from 1869 to 1873 managed these works. From 1873 he was manager of James Duncan's Sugar Refinery at Victoria Docks, which was then the most important in Europe. In 1886, he started business in partnership with his brother, the late John A. R. Newlands, as consulting chemists in London. He was a Fellow of the Institute of Chemistry, in which he served either as a Member of Council or Vice-President, from 1884 to 1901.

Since the formation of the Society of Chemical Industry in 1882, he was with the exception of two or three years, either a Member of Council (1889), a Vice-President (1890), or Chairman of the London Section (1895—1896), and since 1889 he has been a member of the Publication Committee.

He was a holder of the Humane Society's bronze medal for saving life, an inventor of various chemical and engineering processes, the author of several papers on technical subjects, and joint author of a standard work on sugar, a new edition of which has just been published.

[*The bulk of the foregoing notes were dictated by Mr. Newlands shortly before his death, it is believed, for the use of the Society.*]

There was one characteristic of the late Mr. Newlands which may be mentioned. He was a lover of old prints—especially alchemical ones—and for years it had been his custom to send his friends, as Christmas cards, excellent copies of the choicer kinds. A very fine collection of them was exhibited at the International Exhibition at St. Louis in 1904, which was awarded a medal. In the circles of chemical industry, as well as in all social gatherings, Benjamin Newlands was one of the most beloved of men, in whom humour and kindliness of heart were most happily combined.

Mr. Newlands had few equals in conversation: nevertheless, his eminently practical nature had earned for him the designation of the "apostle of commonsense." He was a most liberal-minded man and generous friend, especially to the unfortunate among the chemical fraternity. His burial took place at Chingford Mount Cemetery, and was attended by many representatives of chemical and other associations with which he was connected. He died on Wednesday, the 7th of August, and his death comes as a break in many friendships.

Journal and Patent Literature.

Patent Specifications may be obtained by post by remitting as follows:—

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German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

Patents.

Raising or forcing water or other liquids. B. C. Joy and P. St. G. Kirke, London. Eng. Pats. 7391, Mar. 23, and 20,474, Sept. 15, 1911.

In internal combustion pumps of the kind in which the explosive gases act directly upon the surface of the liquid, and no return flow of liquid is allowed to occur owing to the presence of a non-return valve in the delivery pipe, the combustible gases are compressed in an auxiliary chamber by a part of the liquid propelled on an explosion stroke and are admitted in a compressed condition to the combustion space at the top of the forcing chamber, at a moment when the liquid is at its highest level therein and unable to escape owing to the inlet and outlet valves being shut. The main delivery valve, which opens outwards, is arranged vertically above the valve leading to the auxiliary compressing chamber, which opens inwards, and these valves are so connected that the auxiliary valve is lifted from its seat by the opening of the main valve, but can itself open independently when the main valve is shut. By this means a portion of the liquid propelled from the combustion chamber is always admitted to compress gas in the auxiliary chamber (whence it passes into a storage reservoir), but as soon as the force of the explosion has expended itself and the main delivery valve has closed, the auxiliary valve is free to remain open, allowing a return flow of liquid from the auxiliary chamber towards the combustion chamber, whereby a fresh charge of combustible gas is drawn into the auxiliary chamber. At the same time this arrangement of valves enables the compressed combustible mixture to be admitted to the combustion chamber at a pressure greater than that of the delivery head without opening the delivery valve, since the pressure exerted upon the delivery valve is partially balanced by that acting in the opposite direction upon the smaller auxiliary valve. The exhaust gases from the combustion chamber escape through an exhaust valve which opens by its own weight or by a spring as soon as the pressure falls sufficiently inside the chamber, and is closed by a float as soon as the liquid entering the chamber from the supply tank reaches its proper level. Ignition may be effected by a hot tube or other device.—H. H.

Raising or forcing water. Siemens Bros. Dynamo Works, Ltd., London, and W. F. Vernon, Stafford. Eng. Pat. 15,468, July 3, 1911.

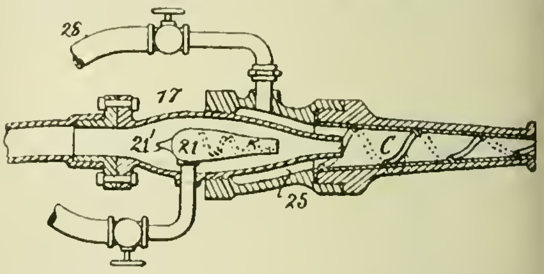
In internal combustion pumps such as described in Eng. Pats. 20,736 of 1906, 18,594 of 1907, and 27,753 of 1910 (compare this J., 1912, 626), a separate mixing and ignition chamber is arranged to open into the top of the water-forcing chamber, with a by-pass leading from the one to the other, so that, on the return flow of the water column, a body of air which has been drawn into the by-pass is injected into the mixing chamber at the moment when the float cuts off the main communication between the forcing chamber and the mixing chamber, thus securing a thorough admixture of the combustible charge prior to ignition. In a modification the by-pass is replaced by a differential liquid fuel pump, operated by the pressure changes in the apparatus, which injects a spray of fuel into air which has been previously introduced into the mixing chamber.
—H. H.

Compression of gases, and their utilisation for motive power and other purposes; Apparatus for effecting the ——. J. A. Hart, Blackburn. Eng. Pats. 11,080 and 11,081, May 8, 1911.

In multistage injectors used for compressing gases and vapours, in which a portion of the gas from each stage is carried away by a side passage and re-introduced into the stream of gases at a subsequent stage, loss of energy is avoided by making the side passages approximately parallel to the main conduit and so constructing all junctions that the minimum loss of energy takes place.
—W. H. C.

Mixing comminuted solids and liquids and delivering same in the form of a jet; Apparatus for ——. E. A. Faller, New York, U.S.A. Eng. Pat. 15,753, July 6th, 1911.

The finely divided solid material is conveyed by a current of air from the reservoir along the tube, 21, into the mixing chamber, 17, where it is mixed with a second supply of air delivered with a spiral motion through the jet, 21′. From the jet of the chamber, 17, the attenuated mixture is discharged into the spiral mixing jet, C, where it comes into contact with the liquid which enters through the pipe, 28, into the chamber, 25.—W. H. C.



Drying and impregnating machine. Dryers Ltd., Manchester. From A. W. Brown, Johannesberg, S. Africa. Eng. Pat. 16,991, July 25, 1911.

A steel chamber, preferably cylindrical, is surrounded externally by insulated steam pipes, this form of heating being used so that no internal steam leakage can take place. The chamber can be closed by means of a cover held to the body of the chamber by means of hinged clamps, the strain from which is taken up by heavy continuous rings fixed round the chamber and the cover. A separate inner lining, or a trolley tank, may be placed in the chamber, which is so fitted with pipe connections that it can be used for drying or impregnating in the usual way.—J. A.

Drying ovens and the like. W. Fairweather London. From Iris Isolirstoff Ges. m. b. H., Hamburg, Germany. Eng. Pat. 21,467, Sept. 29, 1911.

The oven consists of a vertical shaft in which the materials to be dried are supported on a series of superposed vertical perforated trays, so that the heating medium, which enters the bottom of the shaft, is caused to pass below and above each of the objects to be dried by the disposition of the latter in a zig-zag series on the trays. The articles to be dried are introduced on a tray at the top and at the same time the lowest tray is removed with the dried article.

During the removal of the bottom tray, the remainder are supported by pawls from a framework operated by sliding weights.—W. H. C.

Indicating the level of liquids in tanks and the like; Apparatus for ——. C. E. von Auken, New York, U.S.A. Eng. Pat. 27,383, Dec. 6, 1911.

In order that any oscillation in the tank may not affect the indication of the gauge, the tube which dips into the former is made to pass down through the centre of the liquid, and, further, is formed of a spiral of flexible tube, so that it can be adjusted to containers of varying depth without substantially altering the volume of liquid in the tube.—W. H. C.

Measuring gases, vapours and liquids; Apparatus for ——. H. Liese, Hamburg, Germany. Eng. Pat. 27,467, Dec. 7, 1911. Under Int. Conv., Dec. 9, 1910.

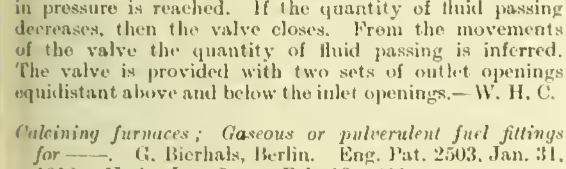
When fluids pass through a constriction in a pipe or main, the pressure on the opposite sides of the constriction will vary with the quantity of fluid passing, and, conversely, if the pressure difference between the opposite sides is to remain constant, the area of the cross-section of the constriction must be made to vary with the quantity of fluid passing and if the amount of this variation be measured, the quantity of fluid passing through the main can be inferred. The apparatus consists of a hollow cylindrical slide-valve through which the fluid to be measured passes. The valve is connected with a bell floating in a closed chamber, so that the pressure within the bell is the same as that within the hollow valve, that is the same as in the main before the valve, and the pressure in the float chamber exterior to the bell is the same as that in the main behind the valve. The bell is also connected with an indicating device. If the quantity of fluid passing through the main increases, then the difference in pressure increases and the valve automatically opens wider until the normal difference in pressure is reached. If the quantity of fluid passing decreases, then the valve closes. From the movements of the valve the quantity of fluid passing is inferred. The valve is provided with two sets of outlet openings equidistant above and below the inlet openings.—W. H. C.

Calcining furnaces; Gaseous or pulverulent fuel fittings for ——. G. Bierhals, Berlin. Eng. Pat. 2503, Jan. 31, 1912. Under Int. Conv., Feb. 13, 1911.

Gaseous or powdered combustible is forced into a rotary or other calcining furnace through a rectangular nozzle having a number of vertical parallel slits therein, so that the combustible issues in a number of thin parallel jets. The air supply is adapted to pass across the face of the nozzle in a direction parallel to the slits, thus securing an intimate admixture of fuel and air. In an example, the air supply passes upwards from the end of a rotary cooling drum arranged immediately below the calcining drum.—H. H.

Tunnel kilns. A. Ramen, Helsingborg, Sweden. Eng. Pat. 4386, Feb. 21, 1912.

The combustible gas for heating a tunnel kiln is introduced by means of passages formed in the sides of the kiln and flat nozzles, o, formed in a bridge-piece crossing the middle of the kiln, so that air is drawn by injector action into the kiln from the opening, d, leading to the cooling chamber, and passes both above and below the bridge-piece, thus securing an efficient admixture of air and combustible gas.—H. H.



Rotary drum furnaces. P. Pfeifer, Berlin. Eng. Pat. 5867, Mar. 8, 1912.

A rotary drum furnace for use with granular or lump fuel is provided with air nozzles arranged obliquely to the axis of the drum in such a manner that jets or streams of air impinge against the slowly moving fuel upon the inner drum surface and effect complete combustion of the glowing parts of the fuel. The automatic fuel-feed device is preferably arranged at the closed face of the drum, and the air jets directed against the fuel through the open end, the upper part of which serves as the outlet for the combustion gases. The air nozzles may be made adjustable in all directions, and the one which is directed against the freshly fed fuel may be replaced by a nozzle for directing the blazing flame of fired coal dust against the fuel to increase the efficiency of combustion.—H. H.

Filters. Deutsche Filtercompagnie, G.m.b.H., and V. Kobelt, Berlin. Eng. Pat. 5983, Mar. 9, 1912.

A filter bed is built up of a large number of separate hollow blocks, preferably square, with grooves and perforations to establish communication between the different parts, and each block containing granulated or small-sized filling material. The blocks may be formed of sifted volcanic material bound together by a suitable binding agent, and volcanic material may suitably be used as the filling substance. The blocks may either stand alone, or they may be packed into a walled chamber. —H. H.

Evaporating and concentrating apparatus. J. E. Dunn, Philadelphia. Eng. Pat. 15,990, July 10, 1911. Under Int. Conv., July 18, 1910.

See U.S. Pat. 995,776 of 1911; this J., 1911, 879.—T. F. B.

Distillation; Column apparatus for use in ——. H. A. Gasser, Wiesbaden, Germany. Eng. Pat. 20,927, Sept. 21, 1911. Under Int. Conv., March 3, 1911.

See Fr. Pat. 431,323 of 1911; this J., 1912, 321.—T. F. B.

Furnace. J. Salessky, Moscow, Russia. U.S. Pat. 1,033,949, July 30, 1912.

See Eng. Pat. 14,510 of 1910; this J., 1911, 1121.—T. F. B.

Agglomerating materials; Process of ——. P. Claes, Brussels. U.S. Pat. 1,034,203, July 30, 1912.

See Fr. Pat. 411,128 of 1909; this J., 1910, 932.—T. F. B.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Chemical reactions at high pressures. [*Formation of coal.*] Bergius. J. Gasbeleucht., 1912, **54**, 748.

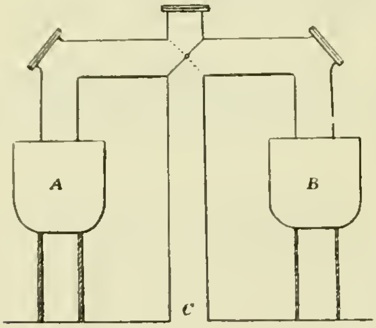
By means of a specially constructed bomb, bored out of a block of steel, heated in an electrical furnace, carbon and water were found to react at about 350° C., producing carbon dioxide and hydrogen in the proportions of 1 : 2 by volume. Peat, and also cellulose, heated in the same apparatus, to temperatures of 250°—340° C., produced a substance which on further continued heating at 340° C. yielded a material both in appearance and composition resembling natural bituminous coals. As in natural coal-formation, gases were evolved, chiefly carbon dioxide and methane. The longer the duration of the experiment, and the higher the temperature, the higher was the percentage of carbon and the lower that of oxygen in the resulting coal. From the rate of increase of reaction-speed with temperature (64 hours at 310° were equivalent to 8 hours at 340°), the author calculates that the formation of natural coal at the ordinary temperature must have required about eight million years.—J. T. D.

Peat for power purposes; Utilisation of ——. H. V. Pegg. Inst. Mech. Eng., Belfast. July 31, 1912. J. Gas Lighting, 1912, **119**, 395—396.

A GAS producer at Portadown supplying about 250 B.H.P. has been found to give good results when working with peat which has not been subjected to any preliminary treatment for reducing the amount of moisture therein, the latter varying roughly from 18 to 70 per cent. according to the weather conditions. The only difficulty experienced was in cleaning the gas from tar, but the difficulty was overcome by means of an ample water-spray using about 7 gals. of water per B.H.P. per hour. The engine valves required cleaning about once a week, and the whole plant was cleaned at the same time, although it was found possible to run the producer for three weeks without cleaning. The tar does not find a ready sale owing to the pyroligneous odour which cannot be removed either from the tar or the oils distilled therefrom. A saving of over 50 per cent. in the fuel bill was effected by running the factory on peat instead of coal, the peat consumption being about 50 tons per week. From peat containing 44·6 per cent of carbon, 5·42 per cent. of hydrogen, and 18·98 per cent. of moisture, a gas was obtained of the following character: carbon dioxide, 10·6 per cent.; carbon monoxide, 21·0; hydrogen, 13·0; methane, 3·7; total combustible, 37·7 per cent.; calorific value, 144·0 B.Th.U.—H. H.

Coke-oven gas for town purposes. A. Douglas. J. Gas Lighting, 1912, **119**, 323.

IT is found that when the period of carbonisation of coal in coke ovens is about 30 hours, the gas evolved between the second and sixteenth hours is of fairly constant composition and is almost if not quite as good as that produced in ordinary retorts, while the first portion, which contains most of the water vapour, and the last portion are of poor quality. It is therefore proposed to use two gas-collecting or hydraulic mains, A, B, connected with the coke ovens by pipes, C, having two-way valves at the top, so that the poor and rich gas can be collected separately and the latter employed for town purposes while the former is used for heating the ovens. Two qualities of tar are also obtained, one being much richer than the other and comparatively free from water. It is suggested that in some cases the whole of the gas produced in coke ovens might be used for town purposes, the ovens being heated by producer gas.—H. H.



A. Collecting Main for Poor Gas. C. Gas from Oven. B. Collecting Main for Rich Gas.

Heat of combustion of bagasse from Hawaiian cane. Norris. *See* XVII.

Mineral oil fields in Egypt. Board of Trade J., Aug. 1, 1912. [T.R.]

DURING 1911 the work of exploration in the Egyptian oilfields was pushed forward with energy. The one area which appears to have proved to be productive on a commercial scale is that comprising the peninsula of Jemsa. Nine wells have been completed in this area, most of them yielding oil of good quality, and in satisfactory quantities; other wells are being sunk, tanks of large capacity are being erected, and preparations are being made to market the crude product at an early date.

Exploratory work is in progress at Zeitia, by a company which has also carried on work by means of borings at Ras Bahar to the north of Jemsa, Ras Dhib, and on Gaysoon Island. Another company has continued its work on the Island of Jubal, around the north end of which strong evidences of oil occur in the sea. Encouraging indications have also been met with from time to time during boring operations on the island. On the mainland to the south of Jemsa some work has been done, whilst on the opposite side of the Gulf of Suez, on the coast of Sinai, indications of oil have been met with in borings at Abu Zenima.

PATENTS.

Fuel; Process of making artificial ——. O. A. Ford, Portland, Me., Assignor to M. J. Thompson, Kennebunk, Me. U.S. Pat. 1,031,255, July 2, 1912.

VEGETABLE matter is heated and disintegrated while hot. The mass is then heated further so as to convert the moisture into steam and liquefy the pitchy constituents, and the hot mass is pressed into blocks, transferred to a cooling press, and kept under pressure until cold.—A. T. L.

Fuel and process of producing same from lignocellulose. M. F. Ewen and G. H. Tomlinson, Chicago, Ill., Assignors to Standard Alcohol Co., New York. U.S. Pat. 1,032,391, July 16, 1912.

FINELY-DIVIDED lignocellulose is hydrolysed under heat and pressure, the soluble products (sugars) are extracted, and the residue is dried. The product consists of relatively hard, granular, and non-absorptive particles.—A. T. L.

Gas and coke; Manufacture of ——. A. Rollason, Long Eaton, Derby. Eng. Pat. 21,374, Sept. 28, 1911.

IN order to reduce both the time and temperature of carbonisation and to produce coke of a better quality from coal containing a high percentage of volatile matter or which becomes semi-fluid during carbonisation, from 3 to 6 per cent. of coke breeze or coke dust and from one-half to 2 per cent. of lime are well mixed with the coal and the mixture finely ground before charging into the retorts.—W. H. C.

Carbonising oven with vertical heating flues. Stettiner Schamottefabrik A.-G. vorm. Didier. Ger. Pat. 247,103, March 11, 1911.

EACH heating flue communicates at its lower end with three channels controlled by a common rotary damper and through these channels, in turn, the heating gases and air are introduced and the waste gases led off. The damper has an opening through which the heating gases pass to the flue and its lower part fits in a vertical conduit of greater width than that of the upper part of the damper, so that an annular passage is formed, which serves alternately for the introduction of air into the heating flue and for the discharge of the waste gases therefrom.—A. S.

Acetylene generator for welding plant. N. J. Anderson and The Anderson Manufacturing Co., Tulsa, Okla., U.S.A. Eng. Pat. 4855 of 1912, date of Appl., July 4, 1911.

A GENERATOR for use with welding torches of the type described in Eng. Pat. 1944 of 1911, comprises a tank with water supply and gas outlet fittings and with a cleaning aperture, and a carbide container screwed into the cover of the tank. The carbide is fed into the tank by depressing a spring-controlled rod which carries a valve for closing the lower end of the container. The rod passes through a gland in the cover of the container and is worked by a lever at the top of the apparatus. Means are provided whereby the charging aperture of the container cannot be opened without first opening a safety-valve on the gas outlet pipe of the generator, so as to discharge the gases at a distance from the generator.—A. T. L.

Gaseous fuel; Apparatus for producing ——, particularly for use in welding metals. N. J. Anderson and The Anderson Manufacturing Co., Tulsa, Okla., U.S.A. Eng. Pat. 15,537, July 4, 1911.

An acetylene generator and an oxygen generating retort, described in Eng. Pats. 4855 and 4860 of 1912, respectively see preceding abstract, and page 774), are combined with a washer for the acetylene, and a storage tank for oxygen, and the acetylene and oxygen are led separately to a welding tool, such as described in Eng. Pat. 1944 of 1911. The oxygen and acetylene pipes are each provided with a check-valve, a pressure-regulator, and a pressure-gauge.—A. T. L.

Gas; Economic process of producing ——. M. Mauran, Niagara Falls, and J. H. MacMahon, La Salle, N.Y. U.S. Pat. 1,031,017, July 2, 1912.

In generating a gas by the action of a catalytic agent on a fluid mass of gas-yielding material, the liquid is caused to flow at first upwards to hasten the release of the evolved gases, and when the material is partially spent it is caused to flow laterally and finally downwards, to facilitate further the evolution of gas.—A. T. L.

Gas; Process of producing ——. F. E. Fink, Bucyrus, Ohio. U.S. Pat. 1,031,781, July 9, 1912.

A gas-producer of greater height than the normal is charged with a deep bed of bituminous coal or other fuel sufficient to last the whole day or several days. The top layer of fuel is ignited and more coal is added until a sufficient depth of incandescent fuel is obtained for gas-making. The producer is then worked with an up-draught, the blast being admitted beneath the fuel bed, so that the incandescent zone descends as the fuel is consumed.—A. T. L.

Gas producer. J. H. Grissinger, Wellington, Ohio. U.S. Pat. 1,031,846, July 9, 1912.

The apparatus, which is for the purpose of converting oil into a fixed gas, comprises a furnace, a retort chamber, and a fixing chamber. The retort chamber contains a series of vertical retorts, side by side, each retort having sinuous or zig-zag walls. The retorts are wider towards the base and the heating flues between adjacent retorts are wider towards the top. A mixture of oil and air is discharged through atomisers into the lower end of each retort. The gas is led from the upper end of each retort to the rear end of the horizontal fixing chamber, which is arranged above the retorts, and is heated by the furnace gases.—A. T. L.

Producer-gas; Manufacture of ——. J. A. Singmaster, Palmerton, Pa. U.S. Pat. 1,033,127, July 23, 1912.

The producer comprises a cylindrical body with a series of horizontal partitions, and a central rotating column with projecting arms for agitating the fuel, which rests in a relatively thin layer on the partitions, and travels from one partition to another down through the producer. Air is admitted at the lower part of the producer and travels upwards in a sinuous path between the partitions, which act as baffles.—A. T. L.

Gas producer. O. Tressin and F. H. Hedemann. Ger. Pat. 247,199, Jan. 18, 1911.

The producer is provided with two concentric, semi-cylindrical, vertical grates, the space between which forms the gas-producing chamber. A slow up-and-down motion is imparted to the grates to facilitate the downward passage of the fuel. Below the sole of the producer are flues through which air, preheated by passing around the gas-producing chamber, flows to the combustion chamber where the producer gas is burned.—A. S.

Gases produced by distilling coal; Separation of tar and ammonium chloride contained in ——. F. J. Brougham, London. From Solvay et Cie., Brussels. Eng. Pat. 2857, Feb. 3, 1912.

See Fr. Pat. 439,509 of 1912; this J., 1912, 711.

Sulphur in coal gas or like gases into sulphuretted hydrogen, Furnace for heating apparatus for converting the ——. C. C. Carpenter, London. Eng. Pat. 6672, March 18, 1912.

The preheater and container described in Eng. Pat 29,473 of 1910 (this J., 1911, 1150) are placed in a furnace and the heating medium is introduced at a point situated between them. The furnace is provided with two outlet flues which can be controlled by dampers so that the distribution of the heat between the preheater and the container can be adjusted as desired.—W. H. C.

Sulphur liberated in the distillation of coal; Process for the recovery of the whole of the ——. Chemische Industrie A.-G. and F. Wolf. Ger. Pat. 248,001, July 12, 1910.

The sulphur taken up by the gas-purifying material, is converted into sulphur dioxide, which is mixed with the waste furnace gases, and the latter are subsequently treated for the recovery of the whole of the sulphur dioxide contained therein.—A. S.

Bitumen compounds; Synthetic Trinidad lake ——. T. Marriott, London. Eng. Pat. 16,125, July 12, 1911.

Natural bitumens, preferably refined, are heated and 2 parts of bitumen mixed with 1 part of kaolin. From 3 to 9 per cent. of "flux" may be added to give the required consistency in making special products for insulating purposes.—B. N.

Oils and the like; Apparatus for the destructive distillation of mineral ——. J. Laing, Musselburgh. Eng. Pat. 23,446, Oct. 24, 1911.

The patent relates to apparatus of the kind described in Eng. Pat. 4120 of 1890 (this J., 1891, 534) comprising a boiler divided into compartments by partitions not reaching to the bottom, each compartment being connected with a condenser which delivers to the next compartment. To ensure steady working, a trap is provided beneath each condenser, with means for drawing off water from the distillate, and the oil in the trap overflows through a down-pipe which has a bend immersed in the liquid in the boiler and delivers above the surface of that liquid. —A. T. L.

Petroleum; Utilising acid sludge from refining ——. J. C. Black and M. L. Chappell, Assignors to Standard Oil Co., Richmond, Cal. U.S. Pat. 1,031,413, July 2, 1912.

In order to obtain sulphuric anhydride from the sulphur in the sludge, the latter is heated to effect partial decomposition, the liquid hydrocarbons are then washed out from it, and the residual sludge is again heated to a temperature not above 425° F., while air is blown through it. The air, charged with sulphur dioxide and the gaseous products from heating the sludge, is purified and washed with a solvent of hydrocarbons, and is then passed over a catalytic material.—A. T. L.

Peat; Process for drying raw ——. H. Brune and H. Horst, Frankfort, Assignors to E. Abresch, Neustadt on Hardt, Germany. U.S. Pat. 1,033,779, July 30, 1912.

See Eng. Pat. 20,145 of 1911; this J., 1912, 63.—T. F. B.

Coal; Apparatus for the destructive distillation of ——. H. Clarke, London, and J. A. Campbell, Ilford. Eng. Pat. 13,145, May 31, 1911.

See Fr. Pat. 438,019 of 1911; this J., 1912, 527.—T. F. B.

Gas-retorts; Method of heating vertical ——. H. W. Woodall and A. M. Duckham. U.S. Pat. 1,031,606, July 2, 1912.

See Eng. Pat. 9494 of 1910; this J., 1911, 609.—T. F. B.

Gaseous fuel from liquid hydrocarbons; Means for producing ——. A. W. Southey, Edgware, Assignor to Producers, Ltd., London. U.S. Pat. 1,031,881, July 9, 1912.

See Eng. Pat. 29,501 of 1910; this J., 1912, 116.—T. F. B.

IIB.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

PATENTS.

Solid carbonaceous materials; Obtaining various products from —— [by distillation]. L. Del Monte Y. Aldama, Staines, Middlesex. Eng. Pat. 18,659, Aug. 18, 1911.

THE claim is for preheating the inert gas, which is passed through the retort during carbonisation or distillation to act as a carrying medium, to a temperature approximately the same as that to which the contents of the retort are subjected.—W. H. C.

Tungsten; Manufacture of articles [filaments, etc.] of ——. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 15,586, July 4, 1911.

THE article formed of tungsten or the tungsten oxide before reduction is mixed with about five per cent. of calcium carbide, or other carbide capable of reacting with water, and heated to a temperature just below the softening point of the carbide. This treatment is said to render the tungsten both stronger and softer.—W. H. C.

Electrode for illuminating purposes. I. Ladoff, Cleveland, Ohio, Assignor to W. D. Edmonds, Booneville, N.Y. U.S. Pat. 1,033,762, July 23, 1912.

AN arc light electrode consisting essentially of compressed and partially fused ilmenite ore.—A. T. L.

Tungsten filaments for incandescent electric lamps; Manufacture of ——. A. Lederer, Vienna, Assignor to Westinghouse Lamp Co., Pennsylvania. U.S. Pat. 1,034,018, July 30, 1912.

SEE Eng. Pat. 3610 of 1910; this J., 1910, 1294.—T. F. B.

III.—TAR AND TAR PRODUCTS.

Water-gas tar for killing weeds. J. Gas Lighting, 1912, **119**, 332.

EXPERIMENTS made by the Conestoga Traction Co., of Lancaster, Pa., U.S.A., upon 160 miles of railway track show that a sprinkling of water-gas tar is an effective weed killer and prevents the growth of fresh weeds. About 3000 gals. of tar were sprinkled on each mile of track.—H. H.

Cresols; The bromine and iodometric methods for the volumetric determination of ——. C. M. Pence. J. Ind. Eng. Chem., 1912, **4**, 518—520.

EXPERIMENTS are described showing that *o*- and *p*-cresol cannot be determined by a bromine method similar to that used for the determination of phenol. *m*-Cresol can, however, be determined in this way. For example, using 20 c.c. of *m*-cresol, 50 c.c. of $N/10$ bromine, and 5 c.c. of concentrated hydrochloric acid, allowing to stand for 1½ hours, then adding 10 c.c. of a 20 per cent. solution of potassium iodide and allowing to stand for 1—2 hours, all the *m*-cresol is converted into tribromo-*m*-cresol; if 175 c.c. of water be added, the bromination is complete in ½ hour. When iodine acts upon *o*- and *p*-cresols, di-iodo-compounds are formed, and this reaction is used as the basis of the following method of determining these two isomerides. 2—2·5 grms. of the cresol are dissolved in water to which 10 c.c. of $N/2$ sodium hydroxide have been added, and the solution is diluted to 1 litre. 25 c.c. of the solution are treated in a stoppered vessel with 9 grms. of sodium acetate and 50 c.c. of $N/10$ iodine solution, and after standing for 1 hour, the solution is diluted with 100—200 c.c. of water, a few c.c. of chloroform added to dissolve the precipitated di-iodocresol, and the excess of iodine titrated with $N/10$ thiosulphate: 1 c.c. of $N/10$ iodine is equivalent to 0·002681 grm. of cresol. *m*-Cresol does not yield a di-iodo-compound under these conditions, hence the method cannot be applied to mixtures containing *m*-cresol.—A. S.

Diphenylnitrosamine; Decomposition of —— by heat. [Preparation of nitric oxide.] Marqueyrol and Florentin. Bull. Soc. Chim., 1912, **11**, 804—805.

WIELAND (Annalen, 1911, **381**, 200) has shown that aromatic nitrosamines are decomposed by heat, in the absence of air, with disengagement of nitric oxide in theoretical quantity. The authors had already noticed this in connection with diphenylnitrosamine and now add some further facts. They found that the decomposition is effected in boiling benzene in a current of carbon dioxide, when the products of decomposition contain diphenylamine and diphenyldihydrophenazine. The dry substance can be decomposed in a vacuum at 75°, 60°, and 40° C., when nitric oxide is given off fairly rapidly at first, then very slowly, and can be measured by the increase of pressure in a manometer. The reaction forms a convenient method of preparation of nitric oxide, for the dry substance has only to be heated in an oil-bath to 180°—190° C., when nitric oxide of 99·7 per cent. purity is obtained.—J. H. J.

Pyridine bases as a denaturing agent for alcohol. Kraemer. *See* XVIII.

PATENTS.

Chlor-anthraquinones and derivatives thereof; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 28,166, Dec. 14, 1911.

IN order to obtain anthraquinone compounds containing one or more chlorine atoms combined with the anthraquinone residue, a current of chlorine is passed through a heated mixture of the corresponding nitro-anthraquinone compound with trichlorobenzene. Several examples are given as illustrations of the process.—W. H. C.

Anthracene derivatives; Process for preparing ——. J. Meyer. Ger. Pat. 247,187, March 25, 1911.

PRODUCTS which may be used in the preparation of dyestuffs are produced by heating at high temperatures anthraquinone or its derivatives with methylketones, in presence of acid condensing agents, such as sulphuric acid, phosphorus chloride or oxychloride, phosphoric anhydride, or zinc chloride. Among the methylketones which may be used are acetone, acetophenone, and *m*-nitroacetophenone, and of the anthraquinone derivatives, 1- or 2-chloro-, 1- or 2-amino-, and 2-methylanthraquinone, as well as anthraquinone itself.—T. F. B.

1-Aminoanthraquinone-2-carboxylic acid and its derivatives; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 247,411, Jan. 5, 1911.

ANTHRAQUINONE-2-CARBOXYLIC acid substituted in the 1-position with a negative group, or a derivative thereof, is treated with ammonia or a primary or secondary amine, preferably in presence of copper or a copper compound, and in presence of a substance which will combine with the acid eliminated. The products may be used in the preparation of dyestuffs.—T. F. B.

Anthraquinone derivatives containing sulphur; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 247,412, May 14, 1911.

THE disulphides or mercaptans of diarylketone-*o*-carboxylic acids are treated with condensing agents, such as sulphuric acid or chlorosulphonic acid; when disulphides are employed the anthraquinone-disulphides may be reduced to the corresponding mercaptans.—T. F. B.

Indophenolic condensation products ; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Bruning. Ger. Pat. 246,714, Dec. 16, 1910.

Methylene-carbazole is treated with *p*-nitrosophenol or its substitution products in concentrated sulphuric acid solution ; the indophenolic compounds thus formed may be converted into the corresponding leuco-compounds by treatment with alkali sulphide in the usual manner. The condensation of formaldehyde compounds of aromatic amines with nitrosophenols has not previously been effected.—T. F. B.

a-Isatin-anilide : Production of a transformation product of ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 246,715, May 25, 1911.

When a-isatin anilide is heated with benzoyl chloride, a bright yellow, well characterised substance is produced, which is a valuable intermediate product for the preparation of dyestuffs.—T. F. B.

Organic sulphur compounds ; Process for preparing ——. Knoll und Co. Ger. Pat. 247,186, April 23, 1910.

Organic compounds, with the exception of those of the diphenylamine series, are converted into sulphur derivatives by heating them with sulphur in presence of a small quantity of iodine or an iodine-yielding substance : the iodine acts as a catalytic agent. Many organic compounds may be treated in this manner, for example, those of the benzene, naphthalene, anthracene, and phenanthrene series.—T. F. B.

Meta- and para-cresol ; Process for the separation of ——. F. Hoffmann-La Roche und Co., Grenznach, Germany. Eng. Pat. 25,166, Nov. 11, 1911. Under Int. Conv., Jan. 25, 1911.

See Fr. Pat. 434,534 of 1911 ; this J., 1912, 277.—T. F. B.

Sulphonic acids from polysulphonic acids of the naphthalene series : [Electrolytic] production of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 28,173, Dec. 14, 1911.

See Fr. Pat. 438,737 of 1912 ; this J., 1912, 579.—T. F. B.

IV.—COLOURING MATTERS AND DYES

Leucobases and colouring matters from diphenylethylene ; Oxidation of the tetramethylated cyclohexylidenic base with lead peroxide. P. Lemoult. Comptes rend., 1912, **155**, 355—358.

Schmidlin and von Escher (Ber., 1912, **45**, 889) have concluded that the author's base, $C_6H_{10}:C[C_6H_4{\cdot}N(CH_3)_2]_2$ (see this J., 1912, 634 and 712) is no more a leuco-base than is $C_6H_{11}.CH[C_6H_4{\cdot}N(CH_3)_2]_2$. The author has shown (this J., 1912, 580) that the latter compound when oxidised with chloranil gives Malachite Green, and must therefore be described as a leuco-base. He now shows that the former substance oxidised with chloranil or lead peroxide also gives colouring matters and is therefore also a leuco-base. With lead peroxide, the oxidation can be carried out in three stages, each requiring one molecule of lead peroxide. With the first molecule there results a solution of a blue colouring matter. This solution slowly loses its colour and deposits a colourless precipitate of the formula, $C_6H_8:C[C_6H_4{\cdot}N(CH_3)_2]_2$, m. p. 169° C. The original base melts at 144° C. This second base on treatment with another molecule of lead peroxide behaves in the same manner, giving a blue solution which slowly loses its colour, becoming transformed into an insoluble colourless substance melting at 228° C. The composition of this last body has not been determined, but, although on further oxidation it gives a bluish green colour, it is not identical with the leuco-base of Malachite Green.
—W. H. P.

Colouring matters of the flowers of the Cedrela toona. A. G. Perkin. Chem. Soc. Proc., 1912, **28**, 198.

These flowers, which constitute an Indian dyestuff of minor importance, yield a minute amount of a red, crystalline colouring matter, $C_{15}H_{18}O_3$, identical with the nyctanthin obtained by Hill (this J., 1907, 1081) from the flowers of *Nyctanthes arbor tristis.* This melts at 285°—287°, and not 234°—235° C., as given by Hill, and in dyeing and other properties closely resembles, but is not identical with, the bixin of annatto (*Bixa orellana*). The presence of quercetin contaminated with a trace of an allied colouring matter as glucosides, and of a sugar, $C_{12}H_{22}O_{11}$ have also been detected, and to the former the main dyeing properties of the flowers appear to be due.

Patents.

Bases and colouring matters : Manufacture of ——. H. H. Hodgson and the Lord Mayor, Aldermen and Citizens of the City of Bradford, Bradford. Eng. Pat. 15,446, July 3, 1911 and Nov. 24, 1911.

Sulphur is caused to react with a mixture of *o*-toluidine and *o*-toluidine hydrochloride, "whereby a new base is obtained." The yield is said to be nearly quantitative, and the product is probably a dithio-*o*-toluidine ; it can be diazotised and then combined with "an azo dyestuff component" to form dyestuffs of value. Similar compounds can also be prepared from aniline, *m*-toluidine, *p*-toluidine and *o*-anisidine. Example : 50 parts of o-toluidine, 25 parts of *o*-toluidine hydrochloride and 25 parts of sulphur are heated together as 185° C. for 2—3 hours. The mixture is rendered slightly alkaline and the excess of *o*-toluidine is distilled off in steam. The residue is then extracted with hot dilute hydrochloric acid, and, on cooling, crystals separate which when purified melt at 226°—227° C.—P. F. C.

Mono- and di-aminosulphon-amides derived from β-naphthylamine suitable for the production of organic colouring matters ; Manufacture of a series of new aromatic ——. Read, Holliday and Sons, Ltd., and J. Turner, Huddersfield, and G. T. Morgan, London. Eng. Pat. 17,465, Aug. 1, 1911.

Benzenesulphonyl- and toluene-*p*- (or *o*-) sulphonyl-β-naphthylamine and analogous compounds can be nitrated to yield mono- and di-nitro-derivatives, which can be readily reduced to the corresponding amino-compounds suitable for the production of dyestuffs. The patentees claim, as new articles of manufacture, the dinitro-derivatives of benzenesulphonyl-, toluene-*p*- (and *o*-) sulphonyl-β-naphthylamine and their homologues ; the mono- and di-nitro-derivatives of α- and β-naphthalenesulphonyl-β-naphthylamine ; the dinitro-derivatives of benzenedisulphonyl-bis-β-naphthylamine and of the isomeric naphthalenedisulphonyl-bis-β-naphthylamines ; the alkyl derivatives, reduction products, and sulphonic acids of the compounds mentioned, and the reduction products of the mono-nitro-derivatives of arylsulphonyl-β-naphthylamines, excepting 2-benzenesulphonyl-1·2-naphthylenediamine (Chem. Soc. Trans., 1910, 1704, 1714).—A. S.

Azo colouring matters ; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 25,903, Nov. 20, 1911.

By combining the diazo compound obtainable from 4-chlor-2-aminophenol (or one of its substitution products) with a sulphonic acid of 1·8-acidyl-aminonaphthol, dyestuffs are produced which upon subsequent treatment with a bichromate give rise to blue to violet blue shades of good fastness to light, fulling, potting and carbonising.
—P. F. C.

Azo dyestuffs suitable for lake-making ; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 248,010, May 11, 1911. Addition to Ger. Pat. 241,723, Nov. 11, 1910.

Diazo- or diazoazo-compounds which contain no nitro or sulphonic groups, but one or more halogen atoms, are used in place of those mentioned in the principal patent (see this J., 1912, 119). The products are extremely fast to light.—T. F. B.

Compounds of the anthraquinone series; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 10,835, Feb. 8, 1912.

Compounds identical with, or similar to those produced by the process described in Eng. Pat. 18,240 of 1911 (this J., 1912, 678), may be obtained by condensing an anthraquinone derivative containing in the positions, 1 and 2, either two mercapto groups or one mercapto and one amino group, with a 1-halogen-anthraquinone or a derivative thereof in which the position, 2, is occupied by another group, such as a methoxy, carboxyl, aldehydic, or amino group. Similar compounds are also obtained by treating an o-halogen-aminoanthraquinone with a 1-mercapto-anthraquinone. The products may be employed as colouring matters or for the preparation of colouring matters.—T. F. B.

Condensation products of the anthraquinone series containing sulphur; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 248,996, Aug. 10, 1911.

Vat dyestuffs dyeing fast shades are obtained either by condensing negatively-substituted anthraquinone-acridones or anthraquinone-thioxanthones with mercapto-compounds, or by condensing amino- or mercapto-arylanthraquinone-carboxylic acids, substituted with a mercapto grouping, with the corresponding acridone or thioxanthone derivatives.—T. F. B.

Vat dyestuffs of the anthracene series; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 248,170, July 6, 1911. Addition to Ger. Pat. 237,236, June 8, 1910 (see this J., 1911, 1153).

The acetyl compounds of aryl-1-aminoanthraquinone-2-carboxylic acids are heated either alone or in presence of an indifferent solvent, with or without addition of an acid condensing agent. The formation of the dyestuff takes place in many cases more readily by this method than by the process described in the principal patent.—T. F. B.

Vat dyestuffs of the anthraquinone series; Process for preparing ——. Badische Anilin und Soda Farbik. Ger. Pat. 248,997, Aug. 20, 1911.

Acylamino-anthraquinones or their derivatives, containing halogen substituents in the acyl group, are condensed with amino-anthraquinones or their derivatives to form vat dyestuffs, hydro-halogen acids being eliminated. —T. F. B.

Vat dyestuffs of the anthraquinone series and a process of dyeing therewith; Manufacture of new ——. A. G. Bloxam, London. From Chemische Fabrik Griesheim-Elektron, Frankfort-on-Maine, Germany. Eng. Pat. 8422, April 9, 1912.

New vat dyestuffs of the anthraquinone series can be obtained by the action of diazo-anthraquinones upon such amines of the aromatic series as are not suitable for combining to form normal azo-dyestuffs or by the action of aromatic diazo compounds upon amino-anthraquinones. The new compounds probably have the general formula $R_1—N=N—NR_3·R_2$ wherein R_1 and R_2 are aromatic radicals of which at least one belongs to the anthraquinone series, whilst R_3 may be any other residue such as a methyl group. Diazo-amino-anthraquinones may also be obtained by treating a salt of a diazo-anthraquinone with alkaline or feebly acid agents and by the hydrolysis of the salts which a diazo-anthraquinone forms with weak acids. The new compounds are very stable in the cold to alkaline reducing agents. They can be transformed into leuco-compounds which can be fixed upon the fibre without a mordant and yield, by subsequent oxidation, dyeings ranging from yellow to orange of very good fastness. Examples are given illustrating the preparatio and application to the fibre of these new dyestuffs. —P. F. C.

Benzoquinone derivatives; Manufacture of new —— O. Imray, London. From Farbwerke vorm. Meiste Lucius, und Brüning, Hoechst on Maine, Germany. Eng Pat. 8886, April 15, 1912.

Dinaphthylamino-benzoquinones and their derivative when heated alone or preferably in solvents of a hig boiling point are transformed into new compounds whic are probably related to tripheodioxazine. The trans formation is facilitated by the presence of metallic halides Other di-aryl-amino derivatives of benzoquinones which ar halogenised in the quinone nucleus may be used in thi process. The new compounds are intense in colour an can be used as pigment dyestuffs or they may be converte by sulphonation into acid dyestuffs. These acid dyestuff may also be produced by heating disulphonaphthylamino benzoquinones with condensing agents.—P. F. C.

Vat [anthracene] dyestuffs; Process for preparing —— Farbwerke vorm. Meister, Lucius, und Brüning. Ger Pat. 248,469, April 13, 1910.

4-Amino-anthraquinone-1-thioxanthone (see Fr. Pat 425,742; this J., 1911, 947) is converted into vat dyestuffs by treatment with acylating agents.—T. F. B.

Vat dyestuffs of the anthraquinone series; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 249,225, Nov. 11, 1908.

The hydrogen atoms of anthraquinonyl-mercaptans are replaced by radicals which do not contain groups soluble in alkali, and which are neither aryl radicals nor acyl derivatives; the substituent radicals may be acetylenic, ethylenic, alkyl, benzyl, or anthraquinonyl groups, introduced by means of dichloro-ethylene, ethylene bromide, benzyl chloride, or halogen-anthraquinones. The products are insoluble in alkalis, but are converted into vats by alkali hydrosulphites; they have a great affinity for wool.—T. F. B.

Vat dyestuffs; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 248,583, Nov. 18, 1910.

When carbazole or one of its derivatives or analogues is heated to high temperatures with sulphur chloride, without addition of a diluent, yellowish-brown dyestuffs are produced, which can be applied to cotton and wool in the vat; they may also be dyed on cotton from sodium sulphide solutions. They differ considerably from the products obtained from carbazole and sulphur chloride in presence of a diluent, the latter having practically no affinity for textile fibres.—T. F. B.

Vat dyestuffs of the indigo series; Manufacture of ——. O. Imray, London. From Society of Chemical Industry in Basle, Basle. Eng. Pat. 9940, April 26, 1912.

The vat dyestuffs obtained by halogenating the products of the action of aromatic acid chlorides on indigo or its derivatives (see U.S. Pat. 997,766 of 1911; this J., 1911, 1007) are converted into new dyestuffs, which dye animal and vegetable fibres reddish-yellow to orange-yellow shades in alkaline vats, by treating them with sulphydrates, hydrosulphites, or compounds of similar action, in the absence of alkali hydroxide and, preferably, in presence of an organic solvent or diluent miscible with water. *Example.* Twenty parts of the dyestuff obtained by brominating the product of the action of benzoyl chloride on indigo, are suspended in 200 parts of 95 per cent. alcohol, the mixture is heated to boiling under a reflux condenser, and 60 parts of a solution containing 48 per cent. of sodium hydrogen sulphide are added. The mixture is boiled for one to two hours and filtered into water at 50°—60° C.; the dyestuff then separates, and when precipitation has been completed by introduction of air, it is filtered. It dyes reddish-yellow shades. —T. F. B.

Vat [anthracene] dyestuff; Process for preparing a ——. L. Cassella und Co. Ger. Pat. 247,416, July 23, 1911.

When anthracene is heated with sulphur chloride to temperatures not greatly exceeding 220° C., a compound is obtained which differs entirely in its tinctorial properties from that obtained by heating at higher temperatures; the latter dyes cotton yellowish-olive shades from the vat, whilst the new dyestuff produces brownish-red shades on cotton from the blue-violet vats.—T. F. B.

Dyestuffs of the sulphine [sulphide] series; Process for preparing blue ——. L. Cassella und Co. Ger. Pat. 247,688, June 23, 1911.

The condensation products from *m*-dinitrochlorobenzene and the leuco-indophenols from carbazoles and nitrosophenols are heated with alkali polysulphides. When aqueous solutions of polysulphides of normal sulphur content are used, or when the condensation products are melted with sulphur, blue dyestuffs soluble in dilute alkali sulphide solutions are formed. By using polysulphides of high sulphur content, preferably in alcoholic solution, the dyes produced are only soluble with difficulty in alkali sulphides; they furnish yellowish-brown vats with hydrosulphites, in which cotton is dyed indigo-blue to pure blue shades, of great fastness to light, washing, and bleaching.—T. F. B.

o-Hydroxyazo dyestuffs; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 247,647, May 3, 1911.

The diazo compounds of *o*-aminophenolsulphonic acids or their substitution products are combined with *m*-aminobenzidine. The dyestuffs thus produced furnish on animal fibres brown shades after chroming, which are faster to potting than those produced by other *o*-hydroxyazo dyestuffs.—T. F. B.

Aminobenzoyl compounds [of nitroamines]; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 247,818, May 2, 1911.

The condensation products from nitrobenzoylchlorides with nitroamines may be reduced by means of alkali sulphydrates to the corresponding aminobenzoyl compounds, $NO_2.Ar.NH.CO.C_6H_4.NH_2$, which are of use as azo dyestuff components; the dyestuffs prepared from them are generally more yellow in shade than those obtained from the isomeric nitrobenzoylarylenediamines produced by condensing nitrobenzoyl chlorides with acidyldiamines and saponifying the products.—T. F. B.

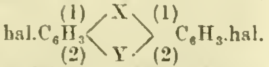
Thiazine derivatives of the anthraquinone series; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 248,169, May 10, 1911.

o-Aminoanthraquinone-mercaptans are condensed with halogen-anthraquinones, or *o*-amino-halogen-anthraquinones are condensed with anthraquinone-mercaptans or their substitution products, and the resulting products are oxidised. The dyestuffs obtained in this manner are probably derivatives of dianthraquinonylhydrothiazine, and are useful as blue vat and pigment colours.—T. F. B.

Arylamino-anthraquinone derivatives; Process for preparing vat-dyeing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 248,655. July 9, 1910. Addition to Ger. Pat. 175,069, Jan. 10, 1905 (see Fr. Pat. 362,140 of 1906; this J., 1906, 752).

Halogen-benzene derivatives of the formula,

$hal.C_4H_4.X.C_6H_4.hal.$, or.



$$hal.C_6H_3\overset{(1)}{\underset{(2)}{<}}\begin{matrix}X\\Y\end{matrix}\overset{(1)}{\underset{(2)}{>}}C_6H_3.hal.$$

(where X represents oxygen, sulphur, or NH; Y is a radical with two free valencies to each atom, such as CO or NH), are condensed with two mols. of aminoanthraquinones or their derivatives.—T. F. B.

Halogen-indigos; Process for preparing ——. E. Kunz. Ger. Pat. 248,262, July 4, 1911.

Indigo is suspended or dissolved in a nitro-hydrocarbon containing in solution a salt of pyridine or quinoline with a hydrohalogen acid, and the mixture is submitted to electrolysis: the product is then cooled and the halogen-indigo filtered off and purified in the usual manner. To obtain solutions of sufficient conductivity, the nitrobenzene should contain about 10 per cent. of the pyridine salt (compare Ger. Pat. 239,672; this J., 1911, 1373).
—T. F. B.

Vat dyestuffs of the anthracene series; Manufacture of ——. A. G. Bloxam, London. From Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. Eng. Pat. 13,618, June 7, 1911.

See Fr. Pat. 430,439 of 1911; this J., 1911, 1306.—T. F. B.

Condensation products of the anthraquinone series; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pats. 18,158 and 19,325, Aug. 10 and 29, 1911.

See Fr. Pat. 438,606 of 1912; this J., 1912, 581.—T. F. B.

Anthraquinone vat dyes and process of making them. M. Isler, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,032,215, July 9, 1912.

See Eng. Pat. 18,240 of 1911; this J., 1912, 678.—T. F. B.

Anthraquinone vat dyes and process of making same. M. Isler, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,032,216, July 9, 1912.

See Eng. Pat. 10,835 of 1912; preceding.—T. F. B.

Azo colouring matters; Manufacture of —— and application of the same to the fibre. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 18,357, Aug. 14, 1911.

See Fr. Pat. 434,152 of 1911; this J., 1912, 223.—T. F. B.

Indigo and indigoid dyestuffs in a finely divided form; Process for manufacturing ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 18,589, Aug. 17, 1911. Addition to Eng. Pat. 18,761, Aug. 9, 1910.

See Ger. Pat. 242,532 of 1910; this J., 1912, 278.—T. F. B.

Sulphur [sulphide] dyestuffs; Manufacture of solid, stable leuco-alkali preparations of ——. Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 4510, Feb. 22, 1912. Under Int. Conv., April 24, 1911.

See Fr. Pat. 440,061 of 1912; this J, 1912, 712.—T. F. B.

Monoazo dyestuffs; Black —— and process of making same. F. Scholl, Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,032,433, July 16, 1912.

See Fr. Pat. 435,789 of 1911; this J., 1912, 326.—T. F. B.

Ortho [hydr] oxyazo colouring matters, Manufacture of ——. Kalle und Co., A.-G., Biebrich on Rhine, Germany. Eng. Pat. 20,073, Sept. 9, 1911. Under Int. Conv., March 21, 1911. Addition to Eng. Pat. 20,072 of 1911, dated Dec. 9, 1910.

See Fr. Pat. 434,405 of 1911; this J., 1912, 327.—T. F. B.

Diazotised nitranilines; Process for producing stable solutions of ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 2037, Jan. 25, 1912. Under Int. Conv., Oct. 20, 1911.

See Fr. Pat. 439,535 of 1912; this J., 1912, 712.—T. F. B.

Cotton [azo] dye; Blue ——. H. Jordan and W. Neelmeier, Leverkusen, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,032,412, July 16, 1912.

See Eng. Pat. 27,861 of 1910; this J., 1912, 66.—T. F. B.

Azo dye. A. Zart, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,032,797, July 16, 1912.

See Eng. Pat. 19,545 of 1910; this J., 1911, 1108.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Cellulose; Dispersoid chemistry of ——. *I.* P. P. von Weimarn. Z. Chem. Ind. Kolloide, 1912, **11**, 41—43.

Starting from his general theory of the peptisation process for the production of dispersoid (colloidal) solutions (*Grundzüge der Dispersoidchemie*, 1911), the author has found that different kinds of cellulose (filter-paper, pure cotton wool) can be converted into a gelatinous, plastic condition or into a dispersoid (colloidal) solution by simple treatment with aqueous salt solutions, if certain conditions of concentration, pressure, temperature, and duration of action, varying according to the nature of the salt, be maintained. The more soluble the salt and the greater its capacity of forming hydrates, the more readily soluble (peptisable) is the cellulose in the solution; hence it is generally advisable to increase the solubility by increasing the pressure or temperature, or both. In carrying out this peptisation process, a vessel is filled with water, the cellulose, *e.g.*, filter-paper (3 grms. per 100 c.c. of water) is introduced, and a suitable salt (lithium chloride, calcium bromide, manganese thiocyanate, etc.) is added, whilst the contents of the vessel are heated. After a time the conversion of the cellulose into a gelatinous plastic condition begins and may be accelerated by agitating the mixture. When the desired condition has been attained, the heating and addition of the salt are stopped, the mixture is cooled, the solution decanted from the precipitate deposited, and the latter washed with water, alcohol, etc., to remove the adsorbed salt or product of hydrolysis of the latter. The decanted solution and the wash-liquors are used instead of water for the peptisation of a further quantity of cellulose. Instead of cooling and waiting for a precipitate to deposit, the mixture may be diluted with water, and the gelatinous cellulose separated by filtration. If a dispersoid (colloidal) solution is desired, the heating and addition of the salt are continued until peptisation is complete: from the colloidal solution, hydrated cellulose can be recovered in different forms by means of various coagulating agents. The hydrated cellulose prepared by this method, on account of its high degree of dispersion, is highly reactive. With certain salts, *e.g.*, sodium iodide, calcium bromide, iodide, and thiocyanate, strontium iodide and thiocyanate, barium thiocyanate, etc., the process can be carried out at atmospheric pressure, but with other salts, *e.g.*, sodium, potassium and barium chlorides, etc., increased pressure is necessary. With a concentrated solution of sodium chloride, peptisation of cellulose begins at about 170° C. and 8 atmospheres pressure. In order to prevent decomposition of the cellulose, as far as possible, it is preferable to work at a moderate temperature and increase the solubility of the salt by increasing the pressure. With saturated solutions (at the boiling temperature under atmospheric pressure), peptisation of cellulose proceeds rapidly with lithium chloride, bromide, iodide, and nitrate, sodium iodide, strontium iodide and thiocyanate, calcium bromide, iodide, and thiocyanate, barium and manganese thiocyanates, etc. Solutions of cellulose containing only about 1 per cent. of the latter set to transparent or semi-transparent jellies on cooling, and if the jellies are left exposed to the air, the salts effloresce, and a skeleton jelly of hydrated cellulose is left. With other salts, which effect peptisation only on more prolonged heating, degradation of the cellulose to substances of lower molecular weight also takes place. Cellulose which has been swollen by soaking in concentrated saline solutions can be subsequently peptised much more readily than untreated cellulose.—A. S.

Paper-making materials in Java. H. G. Havik. Papierfabrikant, 1912, **10**, 859—861.

Bamboo.—The bamboo is very abundant in Java, the principal species being *apus* and *andong*. For a mill producing 1500 tons of cellulose from 3 years' stems, an area of 420 hectares (1040 acres) would have to be planted. In the large towns, bamboo is worth 10—20 Gulden (17—34s.) per ton of air-dry weight. From the apus bamboo the author obtained 50 per cent. of half-stuff on digestion with 19 per cent. of sodium hydroxide, calculated on the dry weight, for 6 hours under 3 atmospheres pressure. From the andong bamboo, with 15 per cent. of soda under a pressure of 4½ atmospheres for 8 hours, a yield of 49 per cent. of pulp was obtained. The pulps were not suitable for bleaching but gave excellent unbleached papers; the length of the fibres ranges from 1·6 to 4·6 mm.; average 2·7 and 3·0 mm.

Alang-alang grass.—This grows in great abundance and spreads very rapidly, attaining a height of 1·5 metre in a period of 5 weeks. The author obtained a yield of only 29·3 per cent. of cellulose on digestion with 9 per cent. of sodium hydroxide for 5 hours under 5 atmospheres' pressure: the pulp was not easily bleached. The author's experience with this grass is at variance with the favourable results recorded by Cross and Bevan, who obtained 55 per cent. of a cellulose which bleached easily. Length of fibre 0·5—2·5 mm., average 0·8 mm.

Maize straw is obtained in Java, often as a second crop after rice; the production of the straw is in excess of its utility. After cutting out the knots, the straw was digested with 21 per cent. of soda, under 3—4 atmospheres for 5 hours; the yield amounted to 22—23·2 per cent. of pulp not easily bleached; the paper made was of excellent strength. Length of fibre 1—3 mm.; average 1·5 mm.

Albizzia Moluccana.—The author has prepared sheets of paper from the cellulose pulp of this wood, as also from the mechanical pulp, blending them with other Javan fibres, and concludes that Albizzia wood is a useful and valuable paper-making material.—J. F. B.

Sulphite wood-pulp waste liquors; Acetic and formic acids in ——. M. Hönig. Chem.-Zeit., 1912, **36**, 889—890.

The waste liquors from the digestion of wood by the sulphite process contain acetic and formic acids both in the free state and in combination with calcium; the proportion of free acid is always greater than that of the combined. In the waste liquors examined by the author, the total quantity of acetic and formic acids found ranged from 2·151 to 9·078 grms. per litre. On the assumption that 1 cb. m. of waste liquor corresponds to 100 kilos. of cellulose, the daily production of volatile organic acids in a wood pulp mill may be calculated. If 100 kilos. of cellulose are assumed to be derived from 300 kilos. of raw wood, the yield of volatile acids works out at from 0·72 to 3·03 per cent. of the weight of the wood. The proportion of formic to acetic acid varies according to circumstances: in two liquors it was 1 : 5·60 and 1 : 5·78, whilst in a third it was 1 : 13·6. In the analysis of the liquors, for the separation of the volatile acids, the vapours produced in the distillation, before they enter the condenser, are passed through a flask containing a milk of calcium or barium carbonate maintained in gentle ebullition. In this way a complete separation of the organic acids from the volatile aldehydes is effected, whilst most of the sulphurous acid is precipitated. The solution containing the salts of the organic acids is filtered, concentrated to 100 c.c., treated in the cold for 4 hours with a little hydrogen peroxide to oxidise the residue of sulphurous acid, and the excess of peroxide destroyed by manganese or lead peroxide. The solution of the barium salts is divided into two parts, in one of which the total volatile acid is determined, and in the other the formic acid is determined gravimetrically by mercuric chloride and sodium acetate. If a solution of the neutral lead salts be evaporated and the residue extracted with alcohol, the lead formate remains insoluble, whilst the soluble portion contains the acetate; no other volatile organic acids are present.—J. F. B.

Patents.

Flax; Process of preparing ——. G. H. Campbell, London. Eng. Pat. 14,717, June 21, 1911.

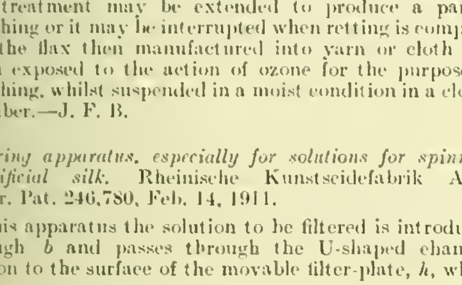
Flax stems or straw are first broken in a breaking machine, either dry or preferably after damping or spraying with water, so as to soften the fibres without affecting the woody portions. The broken flax, either in the condition in which it leaves the breakers, or after undergoing the operations of scutching, hackling, spinning and weaving, is then treated in a combined retting and bleaching bath, containing a peroxide, such as sodium peroxide, either hot or cold. After suitable treatment, the material is washed and dried and submitted to a mechanical operation to remove the loosened shive. This may be done by a breaking machine having much finer grooves or teeth than the ordinary machine for breaking unretted flax, or else by scutching or beating machines.—J. F. B.

Flax; Process of preparing ——. G. H. Campbell, London. Eng. Pat. 14,718, June 21, 1911.

The process consists of the chemical retting of flax by the action of ozonised air and moisture in a closed space. If performed with immersion in water or a dilute solution of alkali carbonate, the unretted material is steeped therein and a stream of ozonised air is passed through the liquid. The treatment is continued for 3 to 6 hours until the incrusting material or shive becomes sufficiently brittle to be readily disintegrated and separated from the fibres. The treatment may be extended to produce a partial bleaching or it may be interrupted when retting is complete and the flax then manufactured into yarn or cloth and again exposed to the action of ozone for the purpose of bleaching, whilst suspended in a moist condition in a closed chamber.—J. F. B.

Filtering apparatus, especially for solutions for spinning artificial silk. Rheinische Kunstseidefabrik A.-G. Ger. Pat. 246,780, Feb. 14, 1911.

In this apparatus the solution to be filtered is introduced through *b* and passes through the U-shaped channel, *d e*, on to the surface of the movable filter-plate, *h*, which is provided in the cover of the filter-casing. To change the filter-plate it is only necessary to remove the upper part, *f*, of the casing.—T. F. B.



Methyl alcohol from waste products of the caustic soda cellulose process; Method of producing ——. H. O. V. Bergström and O. Fagerlind, decd., Stockholm, Sweden. U.S. Pat. 1,032,982, July 16, 1912.

Methyl alcohol is produced from the waste products of the digestion of wood by the soda process by condensing the vapours formed in the digester during certain stages of the process, fractionally distilling the condensed liquid obtained and treating the fractions containing methyl alcohol with chemicals adapted to remove the impurities. The fractional distillation may be effected by means of the vapours coming from the digester, and if desired, the treatment with chemicals may precede the re-distillation of the liquid. (See also this J., 1912, 714.)—J. F. B.

Paper; Manufacture of hand-made ——. W. A. J. Foster and W. Taylor, Eynsford, Kent. Eng. Pat. 24,802, Nov. 7, 1911.

In the manufacture of hand-made paper it is necessary to draw off a quantity of water from the vat corresponding to the quantity of paper pulp taken out on the mould, in order to maintain a constant consistence of the stuff in the vat. This is generally performed by withdrawing a portion of the liquid stuff, fibres and water together, and using this liquid for diluting the stuff coming from the storage chests. According to this invention, water only, without the fibres, is withdrawn from the vat, by fitting an ordinary perforated drum-washer, preferably in the shallow portion of the vat. In this way the necessity of circulating fibres together with the diluting water is obviated and the work of the strainers is relieved.—J. F. B.

Paper [from bamboo]; Production of ——. W. A. R. M. McRae and N. Malcolmson, London. Eng. Pat. 14,871, June 26, 1911.

Bamboo, previously prepared as described below, is digested with water containing lime in the proportion of 5·25 per cent. of the dry weight of the material, for a period of 4—16 hours under a steam pressure which may range up to 100 lb. per sq. in. The preparatory treatment consists of any or all of the following steps: selection of the canes, removal of the knots, crushing, bruising or splintering, chipping and shearing. The digested material is then preferably allowed to mellow, and is disintegrated and washed for conversion into paper pulp.—J. F. B.

Paper [from megasse]; Production of ——. W. A. R. M. McRae and N. Malcolmson, London. Eng. Pat. 26,043, June 26, 1911.

Crushed megasse from sugar cane is digested with water containing lime in the proportion of 5—25 per cent. of the dry weight of the material, for a period of 4—16 hours under a steam pressure which may range up to 100 lb. per sq. in. The digested material is preferably allowed to mellow before being thoroughly washed in a "potcher" in order to remove impurities which would be deleterious in the subsequent operations. The mass is then disintegrated in the kollergang and converted into paper pulp in the usual manner.—J. F. B.

Old papers, paper-stock, straw, etc.; Process for bleaching ——. J. H. Melchers, Decatur, Ill. U.S. Pat. 1,032,229, July 9, 1912.

The process of bleaching consists in pulping the material, treating it with an alkali sulphide or calcium sulphide, neutralising the solution with oxalic acid and subsequently treating with "hyposulphurous acid."—J. F. B.

Paper; Process of sizing ——. S. R., W. L. and J. B. Wagg, Appleton, Wis. U.S. Pat. 1,032,973, July 16, 1912.

A triple process of sizing is specified consisting in treating the material in the form of wet pulp with a solution of resin size, drying the subsequently formed web; immersing the dried web in a solution of starch size and drying the sized web; immersing this web in a separate bath of glue size and finally drying it gradually by circulating a current of warm air around it, *e.g.*, on slowly revolving skeleton drums.—J. F. B.

Parchment-paper; Manufacture of a new kind of ——. E. Fues, Hanau, Germany. U.S. Pat. 1,033,757, July 23, 1912.

Parchment paper is produced by treating suitable raw material with a highly diluted acid solution at a temperature of 100° C. The treatment may be varied by the combined action of a solution of acid and formaldehyde. The resulting paper is relatively hard, translucent and resistant to the action of water, acids and alkalis.—J. F. B.

Wool and other fibre drying machine. A. Sowden, Shipley. U.S. Pat. 1,032,713, July 16, 1912.

See Eng. Pat. 26,800 of 1910; this J., 1911, 1248.—T.F.B.

Thread; Lustrous ——. P. Benrath, Mulheim, and E. Damm and O. Stephani, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,031,616, July 2, 1912.

See Fr. Pat. 408,370 of 1909; this J., 1910, 624.—T. F. B.

Cellulose films; Manufacture of ——. J. E. Brandenberger, Thaon les Vosges, France. Eng. Pat. 20,119, Sept. 11, 1911. Under Int. Conv., Nov. 15, 1910.

See Fr. Pat. 434,104 of 1910; this J., 1912, 225.—T. F. B.

Copper oxide ammonia cellulose solution for use in producing artificial threads and the like; Process for the manufacture of ——. E. de Haën, Chem. Fabrik "List," Seelze, Germany. Eng. Pat. 27,835, Dec. 11, 1911. Under Int. Conv., March 10, 1911.

See Fr. Pat. 436,968 of 1911; this J., 1912, 485.—T. F. B.

Paper; Manufacture of partly translucent ——. Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 23,632, Oct. 25, 1911. Under Int. Conv., Oct. 26, 1910.

See Fr. Pat. 435,589 of 1911; this J., 1912, 382.—T. F. B.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Bleaching of Tussah silk. B. Friedman. Tex. Col., 1912, 34, 173.

1. *Degumming.*—10 lb. of Cocoa Bensoap (cocoanut oil soap containing about 10 per cent. of "benzine") are dissolved in 100 gals. of soft water at 105° to 120° F., and 1½ to 2 lb. of sodium perborate, dissolved in cold water, added. The material is introduced and the temperature gradually raised to 140° to 160° F. Skeins are left for 3 to 4 hours, and piece goods for 5 to 6 hours, in the latter case, the liquor being circulated, from the bottom of the bath and over the goods, by means of pumps. If made up to its original bulk with soft water, the liquor may be used again in a future operation to give the material a preliminary treatment at the boil for 2 to 3 hours, after which the silk is treated in a fresh bath as described above. 2. *Decolourising.*—"Six to 10 per cent. (in volumes)" hydrogen peroxide is employed; this is made slightly alkaline with ammonia, and heated to 85° to 105° F., and the silk entered, means being employed to keep it submerged. When the bleach is satisfactory, the material is drained, rinsed in warm and then in running water, and left for 3 to 4 hours in a solution of oxalic acid (10 lb. in 100 gals. of water) at 160° F. The peroxide may be brought to its original bulk, and again used as a preliminary bath, the material being then placed in a fresh peroxide bath as strong as "10 to 12 per cent. (in volume)." 3. *Final bleach.*—To destroy the yellowish tint remaining, the acidulated goods are thoroughly rinsed, and placed in a solution of "Hydrosulphite" (10 lb. to 100 gals. of water) at 85° F. for 12 to 24 hours, the temperature being kept constant. The goods are thoroughly rinsed in soft water, and dried at as low a temperature as possible. The hydrosulphite bath may be used repeatedly if restored to its original strength.—B. N.

Calico printing; Development of —— *since the discovery of the artificial dyestuffs.* E. Noelting. Z. angew. Chem., 1912, 25, 1601—1610.

Historical address.

Patents.

Bleaching process. E. L. Maupai, New York. U.S. Pat 1,032,151, July 9, 1912.

The material to be bleached is immersed in a cold bath containing about 3 per cent. of potassium permanganate and 1 per cent. of sulphuric acid, proportioned to the weight of the material; it is afterwards immersed in a bath containing about 2·5 per cent. of sodium nitrite and 3 per cent. of sulphuric acid, proportioned to the weight of the material, and finally washed. Alternatively the order of the chemical treatments may be reversed. —J. F. B.

Bleaching, dyeing, and like processes; Kiers for ——. S. Mycock, Manchester. Eng. Pat. 12,399, May 23, 1911.

The discharge pipe conveying liquor to a kier for bleaching, dyeing, or the like, instead of being fixed, contains an internal pipe, which can be raised or lowered by means of a screw, lever, or the like, a spreader or deflector being attached to the end of the movable pipe.—O. R.

Dyeing loose textile goods; Process and apparatus for ——. O. Imray, London. From Meister, Lucius, und Brüning, Hoechst a/Main, Germany. Eng. Pat. 2547, Jan. 31, 1912.

The loose material is dyed in a continuous operation by first liberating the entangled bubbles of air from the material by subjecting it to pressure as it enters the dye-bath, and then alternately squeezing the material and allowing it to become loose again whilst in the liquor. For this purpose, the material is carried loosely between bands, travelling horizontally, consisting of slats spaced suitably apart, and pressed together at one or more points by squeezing rollers, but otherwise kept apart by suitable guide rollers. The squeezing rollers have teeth corresponding in cross-section with the cross-section of the spaces between the slats, so that the material is uniformly pressed by the teeth engaging in these spaces. The conveying bands may be formed of cross-bars carried on chains, so that when the latter travel on the outer side of the guide rollers at each turning of the conveying bands, the cross-bands come close together, thus forming an uninterrupted surface which permits a uniform squeezing of the material between the conveying bands. The guide rollers are mounted in cells or cavities in blocks fixed to the sides of the vessel, so as to prevent clogging of the bearings by means of fibres. After the material has left the bath, it is squeezed whilst still on the conveying band, so as to cause it to leave this band as it passes over a guide roller to be engaged by the delivery rollers.—B. N.

Dyeing apparatus. L. P. Hart, Philadelphia, Pa. U.S. Pat. 1,033,584, July 23, 1912.

The apparatus comprises a tank for containing dye-liquor, imperforate open-ended cylinders for conducting the material to be dyed into contact with the dye, the interiors of the cylinders communicating with the tank at points removed from the material, and means for conducting the dye to a point within the cylinder, whereby a thorough mixture is attained.—J. F. B.

Dyeing, steaming, bucking, bleaching, and impregnating cotton fabrics; Apparatus for ——. S. M. Krosnowski, St. Petersburg. Eng. Pat. 26,097, Nov. 22, 1911.

See U.S. Pat. 1,020,294 of 1912; this J., 1912, 382.—T.F.B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Hydrocyanic acid; Products of explosion of ——. G. Salomone. Gaz. chim. ital., 1912, 42, I., 617—622.

Although numerous cases of explosions of anhydrous hydrocyanic acid have been reported, little of a definite character is known with regard to the nature of the products of explosion. From the fragments of glass left after the explosion of a glass bottle containing 100 grms. of hydrocyanic acid, the author collected about 18 grms. of a brown solid substance, which when heated yielded hydrocyanic acid, ammonia, and carbon monoxide. By prolonged extraction with anhydrous ether, 11 grms. of the brown substance yielded 7 grms. of a compound crystallising in colourless prisms and having the same percentage composition as cyanic acid. A molecular weight determination by the cryoscopic method in benzene indicated that the compound is a pentapolymeride of cyanic acid. This pentacyanic acid, $H_5C_5N_5O_5$, is soluble in ether and benzene insoluble in water and alcohol. It melts at 118·5° C., and the liquid darkens on heating to a higher temperature and decomposes at 370° C., with evolution of white vapours of cyanic acid; at a still higher temperature it detonates violently, and a distinct odour of bitter almonds becomes apparent. The tripotassium and silver salts, $C_5H_2K_3N_5O_5$, $6H_2O$, and $C_5H_2Ag_3N_5O_5 + H_2O$, respectively, of the pentacyanic acid were prepared. A. S.

Perbromic acid; Non-existence of ——. P. W. Robertson. Chem. News, 1912, **106**. 50.

Attempts to prepare perbromic acid or its salts by the following methods all gave negative results:—1. The action of bromine on potassium perchlorate, in presence of potassium bromide to remove any liberated chlorine, even in sealed tubes at 250° C. 2. Heating mixtures of potassium bromate and lead peroxide. 3. The action of bromine on sodium periodate. In view of this, and the experience of previous workers in this field, the author concludes that perbromic acid cannot exist.—J. T. D.

Alkali periodates; Reactions of ——. V. Auger. Bull. Soc. Chim., 1912, **11**, 731–737.

Contrary to the experience of Garzarolli-Thurnlackh (this J., 1902, 143), the author finds that periodate is not formed by the action of ozone upon a solution of potassium iodide. By the interaction of a neutral alkali periodate and of an iodide, there is an immediate liberation of one-twelfth of the iodine that would be set free by the addition of an acid—

$$3NaIO_4+2NaI+3H_2O = 2Na_2H_3IO_6+NaIO_3+2I.$$

But immediately afterwards a secondary reaction sets in—

$$2Na_2H_3IO_6+2I = 3NaIO_3+2NaI+3H_2O,$$

and the quantity of free iodine rapidly diminishes, until after about an hour not more than 40 per cent. of the amount first liberated is left. The different results obtained in the study of this reaction by Garzarolli-Thurnlackh (*loc. cit.*) and by Péchard (this J., 1899, 609—610; 1900, 767) are attributable to errors caused by the atmospheric carbon dioxide.—C. A. M.

Ammonia; A colour reaction of ——. P. Thomas. Bull. Soc. Chim., 1912, **11**. 796—799.

The author has studied a reaction discovered by Berthelot in 1859, in which a pure blue colour is developed on adding excess of phenol and a little sodium hypochlorite to a dilute solution of ammonia or its salts. The test may be made quantitative as follows: Into a series of test-tubes are measured known quantities, 5 c.c. down to 0·1 c.c., of a 1 in 10,000 solution of ammonium chloride, the volumes made up to 5 c.c., then 1 c.c. of a 4 per cent. solution of phenol added, and finally 1 c.c. of a dilute solution of sodium hypochlorite. On mixing, a blue colour develops. The solution in which the ammonia is to be estimated is treated in the same way, and the two colours compared. The sensitiveness is equal to that of the Nessler test. The reaction is also given strongly by glycocoll and some of the primary amines.—J. H. J.

Sodium nitrate industry; The Chilian ——. B. Diaz-Ossa. Bull. Soc. Ind. du Nord de la France, 1912, **40**, 359—372.

This industry began to develop in 1830, when the first exportations to Europe took place; and though its progress has been slow, it has been steady, so that in 1911 the exports amounted to 2,487,000 tons, equivalent to 350,000 tons of nitrogen, and valued at £21,000,000, apart from an export duty of £6,400,000. As by-products, the industry yields iodine (of which 500 tons, valued at £400,000, were exported in 1911), potassium perchlorate, sodium chloride, etc. There are 160 works, employing 40,000 workmen, and consuming annually about 600,000 tons of coal; the region contains in all about 170,000 inhabitants, all dependent, directly or indirectly, upon the nitrate industry. The nitrate region extends from 19° 30′ to 26° S. latitude, and forms a narrow strip about 15 miles from the Pacific coast, having a mean altitude of 3000 feet above sea level. Travelling from the coast, the land rises to the "Coast Cordilleras," between which and the "Cordilleras of the Andes" is a valley running north and south; the nitrate deposits are found on the eastern slopes of the coast Cordilleras, dipping into this valley. The region has not yet been explored with any approach to completeness; but even in the portion now known there is nitrate enough for a century's consumption at the present rate. The salt is found in beds, impregnations and efflorescences, and in cavities in the limestone. Only the beds are as yet worked; a bed usually shows five strata, which in descending order, are:—1. *Chuca*, consisting of quartz with anhydrous sodium and calcium sulphates; 2. *Costra*, containing nitrate up to sometimes 18 per cent., and generally similar in character to—3. *Caliche*, of very varying colour, saccharoidal fracture, density about 2·0, containing sodium nitrate, chloride, and sulphate as chief constituents, also potassium chloride, calcium sulphate and nitrate, magnesium chloride, sulphate, and nitrate; it contains, also, iodates of sodium and calcium. Analyses of samples of caliche and of costra showed:—

	Caliche. 1.	Caliche. 2.	Costra.
Sodium nitrate	30	35	17
,, chloride	32	6	2
,, sulphate	8	2	72
Calcium sulphate	8	2	2
Other salts	2	5	6
Insoluble	14	50	1
	100	100	100

The strata below the caliche—4. *congelo*, chiefly chlorides and sulphates, and 5. *coba*, stony, with little salt of any kind—are of little importance. The caliche is transported to the works, where it is first crushed fine, then submitted to systematic lixiviation in series of (usually 6) heated tanks, so arranged that the denser solutions displace the less dense, and the fresh water meets with the nearly exhausted material; the concentrated liquor runs off at a temperature about 110° C., into "decantation tanks," and the residue is washed, the washings going into special reservoirs to be introduced in due course into the system. In the decantation tanks the liquors, supersaturated with sodium chloride, deposit that salt and suspended matters, and then pass to the "crystallisers," of 20 to 25 sq. metres surface, and 2 to 3 metres deep, having sloping bottoms. After some days, during which both cooling and evaporation occur, the crystals are fished out on to draining boards by the side of the vessels, whence they are taken away to drying floors. The salt contains 95—96 per cent. of nitrate, 1—3 of chloride, 0·5—1·0 of sulphate and other salts, 2 of moisture. The residues cannot be very perfectly washed, and carry away a considerable amount of nitrate. With 6 dissolving tanks, 5 operations can be carried out in the 24 hours; 80—150 litres of water, and 25 kilos. of coal are used per 100 kilos. of nitrate obtained. To produce 5000 tons per month from 20—25 per cent. caliche, there are needed about 32,000 cub. ft. capacity of dissolving tanks, and 214,000 cub. ft. of crystallisers. A plant of this size will cost £100,000. The cost of production of nitrate, shipped in sacks on the Chilian coast amounts at least to 0·88 fr., and may be taken as averaging "1 fr. per kilo." The cost is made up as follows:—Labour 19 per cent., coal 11, other materials 6, administration, etc., 3, depreciation 9, transport and commissions 11, export duty 41.—J. T. D.

Thorium; Volumetric method for the determination of —— in the presence of other rare earths. Analysis of monazite sand. [Preparation of diphenylcarbazide.] F. J. Metzger and F. W. Zons. J. Ind. Eng. Chem., 1912, 4, 493—495.

The method proposed depends upon the fact that under suitable conditions of temperature and acidity, thorium is quantitatively precipitated as normal thorium molybdate (ratio Th : Mo = 1 : 2·017—2·03) by ammonium molybdate, whilst other rare earths are not precipitated. Working at the ordinary temperature, the solution should contain 20 c.c. of glacial acetic acid to 300 c.c. of water, and 1 grm. of sodium acetate should be added to neutralise any mineral acid present. The end-point of the titration with ammonium molybdate solution (about 20 grms. per litre) is ascertained by spot tests on a white tile with diphenylcarbazide indicator (0·5 grm. of diphenylcarbazide dissolved in 200 c.c. of 95 per cent. alcohol and allowed to stand at least two weeks before using) (see this J., 1904, 205). For the analysis of monazite sand, 1 grm. of the powdered material is heated for several hours with 10—15 c.c. of concentrated sulphuric acid in a porcelain crucible, and after cooling, the mixture is introduced into about 700 c.c. of water cooled to near 0° C. After standing for several hours, preferably overnight, the solution is filtered, the residue washed thoroughly with cold water, and the filtrate nearly neutralised with dilute ammonia and treated with 50 c.c. of a cold saturated solution of oxalic acid. After standing overnight, the oxalates are filtered off, washed with dilute oxalic acid solution, the precipitate and paper transferred to a beaker and heated to boiling with 20—25 c.c. of a concentrated solution of potassium hydroxide. After diluting and filtering, the precipitated hydroxides are washed with hot water and dissolved in hot dilute nitric acid, the solution evaporated to dryness on the water-bath, and the residue moistened with a few c.c. of water and again evaporated to dryness. The residue is now dissolved in 300 c.c. of water and 20 c.c. of glacial acetic acid, with addition of 1 grm. of sodium acetate, and the solution titrated with ammonium molybdate until a pink colouration is obtained with the diphenylcarbazide indicator.

Preparation of diphenylcarbazide. A mixture of 23 grms. of phenylhydrazine and 7 grms. of urea is heated for 6 hours at 160°—170° C. under a reflux condenser, and after cooling, the product is warmed with 50 c.c. of ether for 1 hour, the ether decanted, the residue warmed with a further 50 c.c. of ether for 2 hours, and the ether decanted. The residual diphenylcarbazide is dissolved in alcohol and re-precipitated by water, these operations being repeated a second time. The diphenylcarbazide is then washed and dried at 105° C. It is white when first prepared, but turns brownish-yellow on keeping. All apparatus must be kept scrupulously clean, as a trace of impurity causes the indicator to turn pink.—A. S.

Thorium; Transformations of the active deposit of ——. E. Marsden and C. G. Darwin. Proc. Roy. Soc., 1912, A.87, 17—29.

Experiments undertaken with a view to discovering the genetic arrangement of the various products of the active deposit of thorium, especially the nature of the transformations which take place in the product or products generally included under the name thorium C (compare Rutherford and Geiger: Phil. Mag., 1911, 22, 621, and this J., 1911, 128), have shown that of the atoms of thorium C, 35 per cent. emit α-particles of range 4·8 cm. and become converted into atoms of thorium D, while the remaining 65 per cent. emit β-particles and disintegrate into atoms of a very short-lived α-ray product thorium C_2 (range 8·6 cm.). The transformations are regarded as of unusual interest, in that the case furnishes undoubted evidence of atoms of a single kind of matter having two distinct modes of disintegration.—F. Sodn.

Uranyl nitrate; Decomposition of —— by heat. P. Lebeau. Bull. Soc. Chim., 1912, 11, 737—740.

On heating uranyl nitrate decomposition begins at about 100° C., with the production of nitric acid and uranic hydroxide. As soon as the melting point is reached, a partial dehydration of the mass takes place with the formation of an anhydrous nitrate, which also undergoes decomposition. This accounts for the formation of the mixture of uranic anhydride and its hydroxide observed in the decomposition of the melted salt.—C. A. M.

Ozone; Determination of ——. E. Czakó. J. Gasbeleucht., 1912, 55, 768—772.

Attention is drawn to some errors liable to occur in the determination of ozone by potassium iodide in neutra and acid solutions, and the use of an alkaline solution as proposed by Lechner is recommended. A Bunte gas burette is used, the top being fitted with a cup and short exit tube connected by a three-way tap. To make an estimation the burette is filled with water and inverted and the upper end is connected by a mercury seal with the glass tube from the gas holder. The burette is filled with about 100 c.c. of the gas to be examined by allowing the water to run off through the exit tube at the lower end. After the volume of gas taken has been read in the usua way, the remaining water is run off and about 10 c.c. of an alkaline solution of potassium iodide (equal volumes of $N/5$ potassium iodide and $N/5$ caustic potash) allowed to enter. This solution is then carefully shaken up in the burette for three minutes, after which it is run out into a flask and the burette washed out with water. The solution with the washings is now acidified with 10 c.c. of $N/5$ sulphuric acid and the iodine titrated with $N/100$ sodium thiosulphate. A table is given showing the close agreement between the results of duplicate analyses of samples of gas containing less than one per cent. of ozone. The method answered well also on a sample containing 6—7 per cent. of ozone, more concentrated reagents being employed. For samples containing very small amounts, a large volume of the gas must be passed through an absorption bottle filled with glass beads moistened with the alkaline iodide solution. The method is simple, quick and exact.—J. H. J.

Calcium cyanamide production at Niagara Falls. Oil. Paint, and Drug Rep., July 29, 1912. [T.R.]

The American Cyanamide Company has entered into contracts for the extension of its calcium cyanamide plant at Niagara Falls, Ont., in addition to new machinery, at a cost of approximately $500,000, which will more than double the present capacity of the factory. This company uses the Frank and Caro process. At present the company employs 6,000 electric horsepower. It began the manufacture of cyanamide in January, 1910, and during that year exported to the United States product valued at $211,202. In 1911 the value of the cyanamid shipped to the United States was $338,774, and, judging from exports during the present year, the increase will be much greater.

Decomposition of diphenylnitrosamine. [Preparation of nitric oxide.] Marqueyrol and Florentin. *See* III.

Patents.

Acetic acid; Manufacture of ——. G. W. Johnson, London. From Chem. Fabr. Griesheim-Elektron, Frankfort-on-the-Maine, Germany. Eng. Pat. 17,424 July 31, 1911.

Acetaldehyde is submitted to oxidation, in the presence of acetic acid or a chlorine derivative of acetic acid (such as, mono-, di-, or tri-chloracetic acid), or acetic anhydride, or the homologues of these compounds. For example, air or oxygen is introduced, with brisk stirring, into a mixture of 200 kilos. of glacial acetic acid and 10—20 kilos. of acetaldehyde, at 70°—100° C., and, when the greater part of the aldehyde, which is rapidly oxidised, has been converted into acetic acid, a further quantity is added and the oxidation proceeded with. Or, the acetic acid may be distributed over a filling material, in towers, and a mixture of aldehyde and oxygen or air passed through the mass. The addition of a suitable catalyst, such as vanadium pentoxide, uranium oxide, roasted ferroso-ferric oxide, etc., greatly facilitates the reaction.—F. Sodn.

Oxalic acid; Production of ——. F. A. Lidbury, Niagara Falls, N.Y. U.S. Pat. 1,031,074, July 2, 1912.

Sodium oxalate is treated with hydrochloric acid, in the presence of water, in such a manner that solid sodium chloride and a solution of oxalic acid are produced, this being conveniently effected by employing an excess of concentrated hydrochloric acid (at 70° C.), and the oxalic acid is recovered from the mother liquor (*e.g.*, by cooling). Sodium hydroxide and a fresh supply of hydrochloric acid are then obtained from the sodium chloride, and the former is used for the preparation of sodium oxalate, which, together with hydrochloric acid, is added to the mother liquor, so as to produce a further yield of oxalic acid.—F. Sodn.

Acid-distributor. T. L. Briggs, Flushing, N.Y., Assignor to General Chemical Co., New York. U.S. Pat. 1,032,657, July 16, 1912.

The apparatus (for distributing a liquid at the top of an absorption- or washing-tower) consists of an externally-fluted, conical spreader, below which a perforated plate is disposed; the latter is provided with cavities corresponding to the points of discharge of the spreader, each cavity being formed around a perforation or discharge-tube in the plate.—W. E. F. P.

Sulphur burners, pyrites kilns, and the like; Process for burning the sublimed or subliming sulphur in ——. H. H. Niedenführ. Ger. Pat. 249,330, Oct. 4, 1910.

The gases, after leaving the kiln or the combustion chamber, are led, together with excess of air, preferably preheated, through hot metal tubes. The air is preheated in the combustion chamber of the kiln, and thus serves to moderate the excessive heat developed therein by the combustion of the sulphur. In the apparatus described, the grate in the combustion chamber is constructed of tubes, through which is led the air subsequently used for the combustion of the sublimed sulphur.—A. S.

"Salt"; Manufacture of ——. J. H. Webster, Carrickfergus, Ireland, and International Salt Co., Ltd., London. Eng. Pat. 20,706, Sept. 19, 1911.

Salt is agitated whilst melted, by forcing air through it, or by mechanical means, or both, and is subsequently caused to pass slowly and quietly through a chamber in which the solid and discolouring matters settle, so that pure white salt is continuously discharged therefrom. In some cases a preliminary settling chamber is provided, into which the molten salt is run, before being submitted to agitation, and an apparatus is described in which the salt is first introduced into a melting chamber, from which it passes by one or more ports to a chamber, wherein the heavier impurities are deposited, and then successively into an agitating chamber and a settling chamber, as indicated above; the chambers are comparatively shallow, their upper portions being in free communication with each other, and the molten salt overflows from one to the next, through channels in the dividing walls, these channels being preferably disposed at points which are not opposite each other, so that the flow may be circuitous.—F. Sodn.

Drying surfaces for salt works and the like. Hannoversche Steinholzfabrik "Fama" Ges. m. b. H. Ger. Pat. 247,007, June 4, 1911.

In order to prevent the "burning on" or contamination of the salt or the like, the drying surface is made of so-called "stone-wood" ("Steinholz"), or artificial wood with a basis of asbestos.—A. S.

Bleaching powder; Apparatus for the manufacture of ——. C. W. Marsh, Greenwich, Conn., U.S.A. Eng. Pat. 6251 of 1912, date of appl., Aug. 29, 1911.

A number of bleach-chambers are connected in series by conduits through which the chlorine gas passes from one chamber to the next. Individual chambers of the series are provided with coolers, *e.g.* a set of pipes cooled by air or water, disposed outside the chambers, and by means of fans and suitable connections, a local circulation of a portion of the chlorine gas through a chamber and the cooler connected therewith is established.—A. S.

Magnesia; Manufacture of ——. E. G. Zies, Assignor to The Standard Lime and Stone Co., Baltimore, Md. U.S. Pat. 1,031,502, July 2, 1912.

Dolomite, magnesian limestone, or crude magnesite is calcined, and the dry calcined material intimately mixed with a solution of calcium chloride, which is equivalent to the quantity of magnesium oxide present; carbon dioxide is then passed into the mixture, and the soluble magnesium chloride separated from the calcium carbonate, or calcined dolomite is added, so as to convert the magnesium chloride into hydroxide (calcium chloride being re-formed), and the insoluble magnesium compound separated from the soluble calcium compound.—F. Sodn.

Aluminium, carbon, and nitrogen; (1) *Compound of ——.* (2) *Process of producing ammonia.* S. Peacock, Chicago, Ill., Assignor to E. I. du Pont de Nemours Powder Co. U.S. Pats. 1,031,581 and 1,031,582, July 2, 1912.

Claim is made (1) for a compound having the formula, $Al_2C_3N_6$, capable of reacting with steam, at high pressures, to give ammonia, and (2) for a process of producing ammonia by subjecting this nitride to the action of steam, at a pressure of about 5 atmos., the substance, which may be mixed with water, being preferably in a finely divided state.—F. Sodn.

Cyanogen and its compounds; Process for obtaining ——. J. Bueb, Dessau, Germany. U.S. Pat. 1,032,988, July 16, 1912.

Gases and vapours produced during the carbonisation of nitrogenous substances, such as distiller's waste, are separated into "cyanisable and non-cyanisable constituents," and the former are treated so as to effect their transformation into cyanogen compounds, the process described consisting in cooling the gases and vapours, in order to liquefy such as are condensable, and then washing the gases with the condensate so obtained, liberating the nitrogenous substances contained in the washing fluid, and treating the cyanisable gases. —F. Sodn.

Lead compounds [lead hydroxide]; Production of —— [from lead fume]. L. S. Hughes, Chicago, Ill., Assignor to Picher Lead Co., Joplin, Mo. U.S. Pat. 1,033,405, July 23, 1912.

A thin paste of lead sulphate, an alkali compound, and water is triturated, so as to effect an exchange of bases, and the alkali sulphate formed is subsequently dissolved by adding water. The process refers specially to the production of lead hydroxide from lead sulphate (contained, for example, in furnace fumes of smelting and refining plants) by triturating, in a grinding mill, with a concentrated solution of an alkaline base (of which the sulphate is soluble), and then adding water to the mass, while continuing the operation of the mill, so as to prevent crystallisation therein. (See also this J., 1912, 444.) —F. Sodn.

Cream of tartar; Process for preparing ——. G. Fermaud. Ger. Pat. 247,452, July 16, 1911.

Crude tartaric materials are extracted by means of hot aqueous solutions of aluminium chloride or nitrate; owing to the use of concentrated solutions, economy of fuel and motive power is effected, whilst the product is obtained in a pure condition, requiring little decolourisation.—T. F. B.

Alkali tartrate solutions from crude tartaric materials; Process for preparing ——. M. B. Vogel Chem. Fabrik. Ger. Pat. 248,163, April 10, 1910.

Solutions of normal alkali sulphites or of alkali bisulphites are active solvents of tartar, both in the form of calcium tartrate or cream of tartar. When normal sulphites are used, the calcium is precipitated at once; when bisulphites are employed it is precipitated on boiling. The filtrate from the calcium sulphite is free from calcium salts and contains the whole of the tartaric acid as alkali tartrate; the tartaric acid may be recovered from this by addition of an acid: for this purpose it is advantageous to use sulphur dioxide, since the solution then contains a sulphurous acid salt which can again be used for the process described.—T. F. B.

Ammonium sulphate: Production of neutral —— by liquoring (washing) of the crude salt. M. Wendriner. Ger. Pat. 247,808, April 22, 1910.

The crude ammonium sulphate is washed with an ammoniacal saturated solution of ammonium sulphate. —A. S.

Hydrogen peroxide; Manufacture of stable solid mixtures yielding —— on treatment with water. Chem. Werke vorm. Dr. H. Byk. Ger. Pat. 247,988, March 12, 1910. Addition to Ger. Pat. 243,368, April 15, 1908.

In place of the partially dehydrated perborates mentioned in earlier patents (Ger. Pats. 243,368 and 245,221), partially dehydrated percarbonates or peroxides, with the exception of those of the alkali metals, are used, in admixture with acid substances, to give stable products capable of yielding hydrogen peroxide on treatment with water.—A. S.

Potash salts containing magnesium chloride; Process for the continuous solution of crude ——. A. Wernicke. Ger. Pat. 247,989, Sept. 22, 1908.

The apparatus, which works on the counter-current principle, is divided into a number of compartments, and from one of the intermediate compartments, a quantity of the solution is withdrawn, and treated directly for the recovery of potassium chloride by crystallisation. The remainder of the solution passes on to the first compartment, where, by the action of the crude potash salts continuously introduced, nearly the whole of its content of potassium chloride is converted into artificial carnallite, which is subsequently recovered by cooling the solution. —A. S.

Potassium chloride; Apparatus for the continuous liquoring (washing) of —— on the counter-current principle. A. Wernicke. Ger. Pat. 248,162, June 7, 1908.

The apparatus comprises a trough divided into compartments by partitions, which have portions cut away in their upper edges. Conical drums, mounted on a common shaft, rotate in the several compartments, and on the outer walls of the drums, pieces of sheet iron are wound helically to form conveyors for moving forward the separated potassium chloride, whilst boxes or cups provided with perforations, are also fitted on the inner and outer sides of the drums, so that the rotation of the latter causes the potassium chloride and the mother liquor to travel continuously in opposite directions, and any sludge mixed with the potassium chloride is thrown up and carried away by the mother liquor.—A. S.

Double formates and double acetates of trivalent titanium, soluble in water; Process for preparing crystalline ——. Kunheim und Co., and A. Stähler. Ger. Pat. 248,251, July 7, 1911.

Excess of a saturated solution of an alkali, ammonium, or alkaline-earth formate or acetate is added to a concentrated solution of a salt of trivalent titanium, and the crystalline product is isolated with exclusion of air; by this means the double formates or acetates are obtained. —T. F. B.

Barium nitrate; Manufacture of ——. Chem. Werke vorm. Dr. H. Byk. Ger. Pat. 249,489, Sept. 14, 1910. Addition to Ger. Pat. 198,861, Aug. 11, 1907 (this J., 1908, 940).

Barium carbonate and calcium nitrate are stirred together in the presence of water at the ordinary temperature A yield of 90 per cent. of the theoretical quantity of barium nitrate is stated to be obtained. Strontium carbonate is scarcely attacked at all under similar conditions.—A. S.

Gas [hydrogen]; Apparatus for generating —— and obtaining salts as by-products. S. P. Eastick, London. Eng. Pat. 10,228, April 27, 1911.

The apparatus, which is intended specially for the generation of hydrogen by the action of zinc on dilute sulphuric acid, consists of a generating chamber, with false bottom, on which rests the metal to be acted upon, and a liquid-collecting chamber situated below. The acid is delivered by gravitation into contact with the metal at a point near to, but above, the false bottom, and the salt solution produced runs through into the collecting chamber. An electrode may, if desired, be immersed in the liquid, within or below the reaction chamber, so that the apparatus may serve also as an electric cell. An apparatus described by way of example comprises 3 superposed chambers contained within a single casing, the uppermost (containing zinc) and the intermediate chamber being provided with porous or perforated false bottoms. Acid is conducted to the first chamber by a pipe which reaches down through the upper layers of zinc, into a cage having lateral perforations, and any excess of pressure forces the acid back in the supply pipe, but the zinc sulphate solution produced, percolates into the lowermost chamber. A zinc rod or plate, to act as electrode, is placed above the false bottom in the first chamber and a copper electrode in the intermediate chamber, so that, with the descending liquid, an electric cell, suitable for electro-plating work, etc., is produced, this also ensuring the decomposition of any free acid in the spent liquid.—F. Sodn.

Hydrogen; Process for the continuous production of ——. N. Caro. Ger. Pat. 249,269, Aug. 30, 1910.

In the manufacture of hydrogen by alternately passing steam over iron, and water-gas over the iron oxide thus formed, portions of the water-gas are burned in different parts of the reaction-chamber, so that in addition to the reduction of the iron oxide, a superheating of the reduced iron is effected. It is claimed that by working in this manner, the gas-making period can be considerably prolonged.—A. S.

Oxygen generator particularly for use with welding plant. N. J. Anderson and The Anderson Manufacturing Co., Tulsa, Okla., U.S.A. Eng. Pat. 4860 of 1912, date of appl., July 4, 1911.

The apparatus comprises an oxygen-generating retort, a separate washing tank, and a separate storage cylinder, with non-return check-valves between the retort and the washer, or between the washer and storage chamber, or both. The retort consists of a cylinder mounted on a concave seating above a source of heat and held in place by bars which encircle it. The retort is surrounded by a hood provided with openings for the escape of the products of combustion and for the passage of the gas-exit pipe of the retort. The form of check-valve described consists of a valve casing provided with a partition. A spring-controlled disc valve is mounted in the casing, the stem sliding in a central perforation in the partition. The oxygen forces its way through against the action of the spring, which forces the disc against its seating in the event of back-pressure.—A. S.

Electrolytic process [for generating oxygen]. C. J. Reed, Philadelphia, Pa. U.S. Pat. 1,032,623, July 16, 1912.

Oxygen is generated by electrolysing a solution of sulphuric acid, using an anode of lead with a film of lead peroxide on its surface, and a cathode containing lead sulphate which undergoes chemical reaction without evolution of gas. The cathode after reduction to metallic lead is removed, and utilised by restoring it to its original condition of lead sulphate. This is accomplished by an electrochemical reaction in a second receptacle containing a metallic sulphate, such as nickel sulphate, as electrolyte. —B. N.

Carbon ; Method of treating ——. W. A. Smith, Assignor to International Acheson Graphite Co., Niagara Falls, N.Y. U.S. Pat. 1,032,246, July 9, 1912.

A COMMERCIALLY uniform product is prepared from carbon by passing an electric current through a body of carbonaceous material, between terminals connected with a source of polyphase current, the body being advanced in a direction substantially transverse to the lines of current flow. The evolved gases may be burnt around the charge, which is subsequently cooled below its temperature of combustion in air.—F. Sodn.

Nitric acid ; Manufacture of ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Bruning, Höchst on Maine, Germany. Eng. Pat. 15,918, July 10, 1911.

SEE Fr. Pat. 432,990 of 1911 ; this J., 1912, 127.—T. F. B.

Nitric acid ; Method of concentrating ——. H. Pauling, Assignor to Salpetersäure-Industrie Ges., Gelsenkirchen, Germany. U.S. Pat. 1,031,864, July 9, 1912.

SEE Eng. Pat. 22,322 of 1910 ; this J., 1911, 84.—T. F. B.

Nitric acid ; Process of concentrating ——. H. Pauling, Assignor to Salpetersäure-Industrie Ges., Gelsenkirchen, Germany. U.S. Pat. 1,031,865, July 9, 1912.

SEE Eng. Pat. 22,320 of 1910 ; this J., 1911, 84.—T. F. B.

Hard crystalline materials [bauxite, etc.] ; Manufacture of —— for use as abrasives or for other purposes. J. Pettigrew and E. Gerbel-Strover, London. Eng. Pat. 17,541, Aug. 1, 1911.

SEE Fr. Pat. 436,916 of 1911 ; this J., 1912, 432.—T. F. B.

Nitrogenous compounds [cyanamides] from metallic carbides ; Process for the manufacture of ——. G. Scialoja, Rome. Eng. Pat. 22,231, Oct. 9, 1911. Under Int. Conv., Oct. 8, 1910.

SEE Fr. Pat. 434,953 of 1911 ; this J., 1912, 334.—T. F. B.

Tin oxidising furnaces. K. von Olszewski, Dresden, Germany. Eng. Pat. 23,367, Oct. 23, 1911.

SEE U.S. Pat. 1,028,595 of 1912; this J., 1912, 647.—T.F.B.

Atmospheric nitrogen ; Process for fixing —— by autoxidation. K. Kaiser, Wilmersdorf, Germany. Eng. Pat. 24,035, Oct. 30, 1911. Under Int. Conv., Dec. 24, 1910.

SEE Fr. Pat. 135,397 of 1911 ; this J., 1912, 385.—T. F. B.

Air-nitrogen ; Process of binding and utilising ——. A. Sinding-Larsen, Assignor to Storm, Bull, and Co., Christiania. U.S. Pat. 1,031,477, July 2, 1912.

SEE Fr. Pat. 431,182 of 1911 ; this J., 1911, 1382.—T. F. B.

Borax (borax glass) ; Process for the preparation of anhydrous ——. Chem. Fabr. Grünau, Landshoff und Meyer, A.-G., and P. Brand, Grünau, Germany. Eng. Pat. 25,167, Nov. 11, 1911. Under Int. Conv., March 2, 1911.

SEE Ger. Pat. 241,893 of 1911 ; this J., 1912, 128. Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 12,985 of 1885.—T. F. B.

Cream of tartar ; Manufacture of ——. J. M. Périgny and F. B. Chabert, Lyons, and A. F. Pégaz, Villefranche, France. Eng. Pat. 25,573, Nov. 16, 1911. Under Int. Conv., Nov. 19, 1910.

SEE Fr. Pat. 431,223 of 1910 ; this J., 1912, 230.—T. F. B.

Aluminium nitride ; Process of manufacturing ——. O. Serpek, Assignor to Soc. Générale des Nitrures, Paris. U.S. Pat. 1,030,929, July 2, 1912.

SEE Eng. Pat. 12,601 of 1910 ; this J., 1911, 361.—T. F. B.

Asbestos ; Purification of ——. W. R. Whitney, Schenectady, Assignor to General Electric Co., New York. U.S. Pat. 1,031,498, July 2, 1912.

SEE Eng. Pat. 16,960 of 1911 ; this J., 1912, 431.—T. F. B.

Crystals containing mesothorium ; Process of making ——. F. Soddy, Glasgow. U.S. Pat. 1,031,593, July 2, 1912.

SEE Eng. Pat. 25,504 of 1910 ; this J., 1911, 1115.—T. F. B.

Furnace for heating apparatus for converting the sulphur in coal gas into hydrogen sulphide. Eng. Pat. 6672. *See* IIA.

Utilising acid sludge from refining petroleum. U.S. Pat. 1,031,413. *See* IIA.

Producing endothermic compounds [oxides of nitrogen] from their components. U.S. Pat. 1,033,126. *See* XI.

VIII.—GLASS ; CERAMICS.

Clay ; [Liquefying] properties of ——. G. Keppeler. Chem.-Zeit., 1912, 36, 884.

CLAYS differ materially in their action when a small quantity of alkali is added to them. A slip of Zettlitz kaolin becomes stiff while one of Löthain clay flows. The difference is attributed to the amount of humic acids the clays contain. If humic acid be added to Zettlitz kaolin, it responds like the other to the influence of caustic soda. In slip-casting, therefore, the addition of humic acid may be as necessary as that of soda. The author also discusses the colloid theory of plasticity.—H. H. S.

Enamels containing antimony ; Testing of ——. R. Rickmann. Zeits. angew. Chem., 1912, 25, 1518—1519.

ANTIMONY salts being poisonous and metantimonates (*e.g.* leuconin) not so, it becomes of importance to identify each in an enamel. The sample is boiled for half an hour with 4 per cent. acetic acid or 2 per cent. tartaric acid. Antimony salts go into solution and are titrated with potassium permanganate solution, standardised against an antimony solution of known strength. The metantimonates are not attacked by this treatment. —H. H. S.

PATENTS.

China clay and the like ; Drying of ——. J. F. Pagen, Liverpool. Eng. Pat. 14,647, June 21, 1911.

THE claim relates to a method for securing an uniform heating of drying floors for china clay and similar materials. The fire employed heats one part of the floor directly, and the remaining parts indirectly by means of steam tubes.—J. H. L.

China-clay ; Preparation of ——. A. G. Salamon, London, and C. J. Grace, Steyning, Assignors to The Exploration Co., Ltd., London. U.S. Pat. 1,032,862, July 16, 1912.

SEE Eng. Pat. 2295 of 1909 ; this J., 1909, 1130.—T. F. B.

Clay and like plastic substances ; Apparatus for separating granular admixtures from ——. M. Bohn, Nagykikinda, Austria-Hungary. U.S. Pat. 1,033,377, July 23, 1912.

SEE Fr. Pat. 414,455 of 1910 ; this J., 1910, 1206.—T. F. B.

Glass-furnace. G. H. Baillie, London. U.S. Pat. 1,032,177, July 9, 1912.

SEE Fr. Pat. 418,555 of 1910 ; this J., 1911, 87.—T. F. B.

Quartz ; Manufacture of hollow bodies from ——. F. Wolf-Burckhardt, Biebrich, Germany. U.S. Pat. 1,031,900, July 9, 1912.

SEE Eng. Pat. 1362 of 1911 ; this J., 1912, 130.—T. F. B

IX.—BUILDING MATERIALS.

Portland cement ; German and Russian standards for ——. A. Moye. Tonind.-Zeit., 1912, 36, 1213—1215.

The specified strengths of Russian and German cements are not strictly comparable, since the Russian standards relate chiefly to tensile strengths, whereas the German standards refer mostly to crushing strengths ; the importance of the latter is, however, given due consideration in the Russian specification, in that the proportion of crushing to tensile strength for any cement after 28 days, should be not less than 8 : 1, where the tensile strength does not exceed 18 kilos. per sq. cm., and not less than 7·5 : 1, where the tensile strength exceeds that figure. In the case of neat cement, after 28 days under water, the Russian specification for crushing strength is only one-half of the German standard, the figures being 100 and 200 kilos. per sq. cm. respectively. —O. R.

	Russian specification.	German specification.
Clinkering	" To the sintering point "	" At least to the sintering point "
$\frac{\text{Silica + alumina + ferric oxide}}{\text{lime}}$	$\frac{1}{1\cdot7}$ to $\frac{1}{2\cdot2}$	$\frac{1}{1\cdot7}$
Magnesia	maximum 3 per cent.	maximum 5 per cent.
Sulphuric anhydride	,, 1¾ per cent.	,, 2½ per cent.
Specific gravity after drying at 120° C.	minimum 3·05	not specified
Time of setting	initial set, minimum 20 minutes final set, minimum 1 hour, maximum 12 hours	initial set, minimum 1 hour
Fineness	residue on 900-mesh per sq. cm. screen, (thickness of wire 0·1 mm.) maximum 10 per cent. residue on 4900-mesh per sq. cm. screen, (thickness of wire 0·05 mm.) maximum 50 per cent.	residue on 900-mesh per sq. cm. screen, (thickness of wire 0·222 mm.) maximum 5 per cent.

Cement production of the United States. U.S. Geological Survey, July, 1912. [T.R.]

	1910.		1911.	
	Quantity.	Value.	Quantity.	Value.
	Barrels.	Dollars.	Barrels.	Dollars.
Portland cement	76,549,951	68,205,800	78,528,637	66,248,817
Natural cement .	1,139,239	483,006	926,091	378,533
Pozzuolana cement	95,951	63,286	93,230	77,786
Total	77,785,141	68,752,092	79,547,958	66,705,136

Barrel = 380 lb.

Patents.

Cement compositions for making concretes and the like. C. O. Stinebaugh, Seattle, Wash., U.S.A. Eng. Pat. 19,183, Aug. 26, 1911.

A binder, such as cement, is incorporated with a " porous base of carbonaceous matter," such as charcoal, and blood, a suitable mixture being 8 parts of cement, 3 parts of charcoal, 1½ parts of blood, and 1 part of water.—O. R.

Concrete and other compositions. J. H. Punchard, London. Eng. Pat. 25,553, Nov. 16, 1911.

Waste silicious sand, washed out of china clay, is employed as the aggregate, and either Portland cement, solidified tar, pitch or bitumen as the binding material. For concrete bricks, slabs, etc., 1 part of cement, 2 to 3 parts of fine sand and 4 parts of coarse sand, and for paving setts, insulating tubes, etc., 10 per cent. of tar or bitumen, 10 per cent. of fine sand and 80 per cent. of coarse sand are employed.—B. N.

Raising and forcing semi-fluid mixtures of materials such as cement, lime, and the like ; Methods of and means for ——. J. von Vass, Dresden, Germany. Eng. Pat. 142, Jan. 2, 1912. Under Int. Conv., Jan. 2, 1911.

A pump for forcing semi-fluid mixtures such as cement, lime, etc., is provided with an air vessel or mixing chamber containing a stirrer and adapted to be supplied with compressed air which mixes with the semi-fluid substance and serves to propel the mixture through a flexible transmission pipe and to spray the jet issuing from the end of such pipe against the working surface to be covered. The pump may be of the valved piston type, or a diaphragm pump operated by fluid transmission from a reciprocating piston may be employed, the valves for the semi-fluid substance being operated mechanically in the latter case. —H. H.

Bricks and the like ; Manufacture of ——. W. N. Jones J. R. R. Thomas, and P. Lloyd, Ammanford, Carmarthen, and J. F. Burns, Ystradygynlais, Brecon. Eng. Pat. 5082, Feb. 29, 1912.

Claim is made for the use of blue Lias or Aberthaw lime as an ingredient of lime-shale bricks, prepared according to the methods used in the manufacture of sand-lime bricks.—O. R.

Wood ; Process for preserving ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 16,433, July 17, 1911.

See Ger. Pat. 240,988 of 1910 ; this J., 1912, 283.—T. F. B.

Slabs, bricks, and the like from blast furnace slag ; Manufacture of light ——. C. H. Schol, Allendorf, Germany. Eng. Pat. 26,704, Nov. 29, 1911.

See Fr. Pat. 437,595 of 1911 ; this J., 1912, 538.—T. F. B.

X.—METALS ; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Drying air for blast furnaces. B. Walter. Proc. Eng. Soc. W. Penn., May, 1912. Eng. and Min. J., 1912, 94, 161.

A method for drying air for blast-furnace use consists in passing the air through screens over which water runs at 34° F. and leaves at about 39°. This reduces the humidity (neglecting entrained vapour) to about 2·75 grains per cb. ft. The air is then run over brine screens, the brine entering the apparatus at temperatures below 0° C. The advantages of the method are that no energy is expended in freezing moisture in the air, and no time lost in defrosting the apparatus.

Carbon in iron, steel, etc.; Employment of phenolphthalein as double indicator [of carbon dioxide] in the determination, by direct combustion, of ——. P. Brès. Monit. Scient., 1912, 11, 501—502.

Advantage is taken of the facts that: (1) in concentrated solutions, the colour produced by the addition of an alkali hydroxide to phenolphthalein is completely discharged by an excess of the reagent, whereas that produced by an alkali carbonate is not affected by an excess of the latter; (2) a very dilute solution of potassium hydroxide, tinted pink by phenolphthalein, is decolourised by a trace of free carbonic acid. For the absorption of carbon dioxide, a mixture composed of 80 grms. of soda-lime 100-mesh), 20 grms. of sawdust, 0·3 grm. of phenolphthalein and 20 c.c. of potassium hydroxide solution (36° Bé.) is employed, this being loosely packed into one limb of a U-tube, the other arm of which is filled with calcium chloride, as usual. By the absorption of carbon dioxide, the excess of potassium hydroxide is gradually converted into carbonate, and the mixture becomes red, the colour, it is stated, advancing evenly down the column as long as carbon dioxide is present in the gas passing through. As a precaution against possible loss, the gas emerging from the absorption tube is made to pass through a small washing bottle containing a very dilute solution (1 in 100,000) of potassium hydroxide tinted a pale rose colour by phenolphthalein. It is stated that the colour of this solution is immediately discharged by traces (0·0002 grm.) of carbon dioxide.—W. E. F. P.

Metals; The wet oxidation of ——. Part II. The rusting of iron. B. Lambert. Chem. Soc. Proc., 1912, 28, 197—198.

The work published by the author and a collaborator (this J., 1910, 456) on the corrosion of commercial forms of iron has been criticised. It is suggested (1) that all traces of carbonic acid had probably not been removed from the apparatus used; (2) that there is a serious objection to the use of quartz vessels, since the quartz might dissolve to a sufficient extent to play the same part as is usually attributed to carbonic acid by the supporters of the acid theory of corrosion; (3) that water prepared by distillation from strong solutions of barium hydroxide probably contains traces of carbonic acid. The experiments have been repeated with additional precautions and refinements which have been devised to test the validity of these objections. The results of the experiments go to show that the objections have no foundation in fact, and that it may be considered as established beyond any reasonable doubt that commercial forms of iron will always undergo corrosion when exposed to the action of water and oxygen, even in the complete absence of carbonic acid or any other acid. An electrolytic theory of the corrosion of iron, based on the differences in solution tension of different parts of the metal, was discussed. Some further properties of pure iron were described, in particular its behaviour towards solutions of copper salts. Pure iron can be exposed to the action of saturated solutions of copper sulphate or copper nitrate at the ordinary temperature without copper being deposited on the iron, but exposure to extremely dilute solutions of copper chloride will cause the immediate deposition of copper on the iron.

Iron; Corrosion of —— in pure water and air combined. W. R. Fleming. J. Ind. Eng. Chem., 1912, 4, 480—486.

The author has repeated Friend's work on the action of pure water and air combined on iron (this J., 1910, 882), in which pure water vapour was caused to condense on iron suspended in pure air, and finds that the failure of the iron (genuine open hearth iron and ordinary mild open hearth steel) to rust is due to temperature conditions and to the rapid changing and renewal of the pure condensed water. Experiments with the same apparatus under different conditions showed that iron or steel will rust in pure water and air combined if the temperature of the metal and of the water is not below 22° C., provided the same water remains on the metal for a sufficient length of time. If the temperature of the metal and water is about 55° C., rust is developed rapidly, and the rate of corrosion increases still more if the temperature is further increased. Even if the same water be allowed to remain on the metal for an indefinite period, no rusting takes place if the temperature be kept sufficiently low. These results show that the "acid" theory of corrosion is untenable, for under suitable conditions iron will rust in pure water and air combined, but they can be readily explained by the electrolytic theory, increase of temperature causing an increase of the solution pressure of the iron.—A. S.

Iron and steel pipe; Relative corrosion of —— as found in service. W. H. Walker. J. Ind. Eng. Chem., 1912, 4, 486—488.

Samples of pipes were taken from systems (hot and cold water feed systems, live and exhaust steam lines, hot water and steam heating apparatus, etc.) in which wrought iron and steel pipes had been used together, and the two kinds of pipes were examined as to relative durability by cleaning from scale and rust by means of ammonium citrate solution and then measuring the ten deepest pits per unit distance of length. In 64 different cases it was found that in 17 the corrosion of both iron and steel was negligible, in 20 the iron was inferior and in 18 superior to the steel, and in 9 cases the corrosion of the iron and steel was about equal. Incidentally it was confirmed that practically no corrosion takes place if oxygen be excluded from the water, and that the so-called "acid corrosion test" (exposure of the metal to 20 per cent. sulphuric acid for 4 hours) is worthless for the purpose of judging the durability of iron or steel under service conditions. —A. S.

Gold; Solubility in nitric acid of ——, contained in certain copper-alloys (copper-bullions). E. Keller. Bull. Amer. Inst. of Mining Eng., July 1912, No. 67, 681—694.

In the assay for gold of a number of castings of copper-bullion (containing 89½ per cent. and upwards of copper and from 0·07 to about 23 oz. of gold per ton), the results obtained by the "all fire" method (scorification with lead, followed by cupellation) were in every case considerably higher than those indicated by the "combination" method (treatment with nitric acid, scorification of the insoluble residue with lead and subsequent cupellation of the latter), the loss incurred by the employment of the latter process being ascribed to the solubility of a portion of the gold in nitric acid. By the examination of a number of prepared and other samples it was found that the proportion of soluble gold diminished as the rate of cooling of the alloy increased, attaining a minimum (generally about 2 per cent. of the total) when the molten bullion was quenched (granulated) in cold water. The highest amount of soluble gold found was 0·0017 per cent. of the total bullion, and this amount was not augmented when either the gold- or the impurity-content of the bullion was increased. No definite relation between gold-solubility and impurity content was established, the former being more dependent upon the rate of cooling than upon the quality or quantity of impurity present. In explanation of the phenomena observed, the theory is advanced that, by slow cooling, a portion of the gold in the bullion combines with some or all of the accompanying elements forming compounds soluble in nitric acid; that the formation of these compounds occurs through a narrow range of temperature above the freezing point; and that at higher temperatures the gold compounds dissociate, the gold remaining in the uncombined state (and being therefore insoluble in nitric acid) when the bullions are quenched at these temperatures. The presence of small proportions of soluble gold in quenched samples is ascribed to the impossibility of instantaneously chilling the bullion all though by quenching.—W. E. F. P.

Silver; Structural forms of ——. II. Hair-silver. V. Kohlschütter and E. Eydmann. Annalen, 1912, 390, 340—364. (See also this J., 1912, 188 and 589.)

The authors have investigated the conditions of formation of the fibrous varieties of silver which are found native in contact with silver sulphide at Kongsberg, Freiberg i. S., and other places, and which can also be obtained artificially by decomposing the sulphide in various ways. The sulphide is the only compound from which true hair silver can be obtained, though Liversedge obtained slight indications of a similar formation by reduction of silver chloride with hydrogen (Chem. News, 1877, **35**, 68). The filaments are always found to grow singly or in bundles from particles of silver sulphide. The growth or extension apparently takes place by the addition of material at the base, and in the artificial preparations it is at the beginning of the decomposition that the most pronounced growth is observed. The fibres can be obtained artificially by heating silver sulphide in hydrogen, oxygen, air or steam, *in vacuo* alone or in contact with another metal. The effect of temperature on the reaction cannot be stated simply, but the usual temperature of formation of hair silver, about 350° C., is well below the melting point of either silver or silver sulphide. Compact or crystalline specimens of sulphide do not give rise to the hair formation so readily as powdered amorphous preparations, and from this point of view too high a temperature is to be avoided. The artificial methods of preparation lead to the conclusion that the filaments can be formed by the simple dissociation of silver sulphide under suitable conditions, and that the action is more rapid when the sulphur is progressively removed by oxygen or hydrogen or by a metal. In their explanation of the mechanism of the process, the authors assume that the low crystallisation temperature of silver sulphide (267° C.), as compared with those of the oxide and halogen compounds, is evidence that the sulphide can volatilise to some extent undecomposed at relatively low temperatures. The silver is assumed to be produced as the result of a gas reaction by the decomposition of this volatilised sulphide. The resulting silver being in a "pseudo-gaseous" state, much below its boiling point, is deposited. Under the special conditions which govern such cases it is found that the silver will separate most readily, if not exclusively, on any small particles of metal already present. In this way the existence of centres of growth is explained. Since the layer of sulphide vapour over the solid material will be very thin, the separation of further silver is likely to take place below that already deposited, and so there results the gradual expulsion of a fine hair or filament.—W. H. P.

Copper-zinc alloys; Electrical properties of ——. L. Norsa. Comptes rend., 1912, **155**, 348—350.

The author has measured the electrical conductivity, the temperature coefficient of resistance, the thermoelectric power referred to lead, and its variation with temperature, for the whole range of copper-zinc alloys. The results are shown graphically and the curves indicate the existence of compounds, CuZn and $CuZn_2$. The curves relating to thermoelectric power show a definite maximum for $CuZn_6$, which is also indicated by a point of slight inflexion in the curves relating to conductivity.—W. H. P.

Aluminium-zinc alloys; Thermal expansion of ——. W. Smirnoff. Comptes rend., 1912, **155**, 351—352.

The author has determined the mean coefficient of linear expansion between 25° and 250° C. for the whole range of aluminium-zinc alloys. The results agree with previous thermal and micrographic analysis and indicate the existence of the compound, Al_2Zn_3. It is found that all alloys, into whose composition crystals of this compound enter, show a sharp change in coefficient of expansion at 260°—270° C. For an alloy of composition, Al_2Zn_3, this change is accompanied by a sudden increase in length amounting to 0·26 per cent.—W. H. P.

Aluminium-copper-zinc; The liquidus curves and constitutional diagram of the ternary system ——. (*Rich copper alloys.*) H. C. H. Carpenter and C. A. Edwards. Int. Zeits. Metallog., 1912, **2**, 209—242.

This examination of the ternary system aluminium-copper-zinc has been confined to those alloys which are likely to be of industrial importance, *i.e.*, those containing from 40 to 100 per cent. of copper and those containing up to 16 per cent. of aluminium on the copper-aluminium side of the diagram and up to 60 per cent. of zinc on the copper-zinc side. The liquidus curves have been determined and the constitutional diagram has been established from the liquidus down to 400° C. It now becomes possible therefore to predict how much of the α or of the $\alpha+\gamma$ constituent an alloy of any composition will contain and what temperature it will have to be quenched from if the β constituent is to be maintained. Microphotographs are given of annealed and quenched specimens of the various types of alloys. It was found that no true ternary compound or eutectic is deposited from the liquid alloys. The eutectoid line corresponding to the inversion $\beta \rightarrow \alpha+\gamma$ is a smooth curve and appears to fall regularly from 570° C. on the copper-aluminium to 470° C. on the copper-zinc side. The thermal inversions corresponding to this are much stronger in the rich aluminium than in the rich zinc alloys. In passing from alloys rich in aluminium to those rich in zinc, it is to be expected therefore that the mechanical properties will vary progressively and uniformly without exhibiting a marked change at any point. Two main factors determine the mechanical properties of a given alloy:—(1) structure, and (2) the specific influence of the elements zinc and aluminium. The great influence of structure is illustrated by the fact that the tenacity of the saturated copper-zinc α constituent, containing 36 per cent. of zinc, and that of the saturated copper-aluminium α constituent containing about 9·4 per cent. of aluminium are nearly the same. Cavalier has stated that there is equivalence as regards structure between 1 per cent. of aluminium and 6 per cent. of zinc, but the authors show that the coefficients of equivalence are different for the α and β constituents, being 5·5 for the former and 6·5 for the latter. The specific effects of the metals have been demonstrated by Cavalier, whose results indicate the possibility of obtaining ternary alloys which will unite the high tenacity of the rich zinc with the ductility of the rich copper brasses. —T. St.

Lead; "Coalescence" in metallic ——. H. Baucke. Int. Zeits. Metallog., 1912, **2**, 243—257.

The growth of certain crystals at the expense of others (coalescence) in the case of lead has been ascribed by Rosenhain to an electrolytic effect wherein the eutectic acts as electrolyte. The author has shown that coalescence of rolled lead takes place by immersion in dilute acids, such as acetic acid (5 per cent.) or alcoholic nitric acid (5 per cent.) more rapidly than was described by Ewing and Rosenhain (this J., 1900, 1115). The coalescence is sometimes energetic, with formation of large crystals, the metal becoming brittle. It has not been found possible by this "etching" method to control the extent of coalescence. With lead-foil the action is very rapid, and tubes of lead often show vigorous coalescence. Coalescence precedes and makes possible rapid corrosion of lead. The examination of corroded lead showed that the unattacked portions consisted of normal-sized grains. —T. St.

Quartz thermometer; Beckmann ——, *and the determination of antimony in lead-antimony alloys.* K. Friedrich. Metallurgie, 1912, **9**, 446—449.

The Beckmann quartz-glass thermometer is described, and tables are given showing its calibration by means of the solidifying point of pure lead, and the eutectic point of alloys containing respectively 2, 4, 6, 8, and 10 per cent. of antimony. These percentages are marked on the thermometer with their corresponding temperatures, and the thermometer may be used to estimate the antimony in lead-antimony alloys.—A. H. C.

Lead, cadmium, bismuth, and tin; Quaternary alloys of ——. N. Parravano and G. Sirovich. Gaz. chim. ital., 1912, **42**, I., 630—716.

In 1860 Wood found that tin, cadmium, lead and bismuth, when mixed in certain proportions, formed an alloy which melted at about 70° C. Following upon a discussion of the method of applying thermal analysis to systems of four components (see Gaz. chim. ital., 1911, **39**, II., 654;

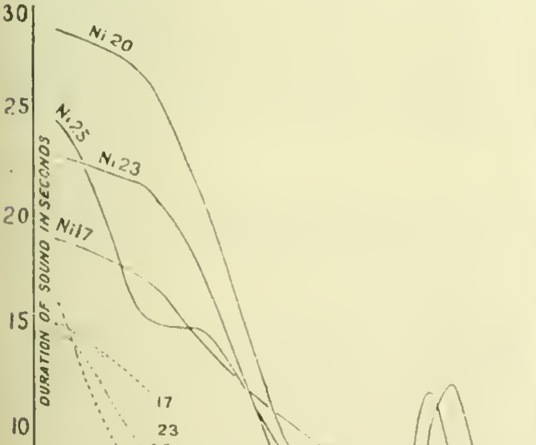
1912, **40**, I., 113, 333), the authors have studied the solidification of the quaternary alloys of tin, cadmium, lead, and bismuth. The present paper is divided into four sections: (1), a summary of the principal characters of the binary and ternary systems of which the quaternary system is composed; (2), a theoretical discussion of the characters of the quaternary system; (3), an account of the experimental work and results; (4), the equilibrium diagram of the alloys, in the form of horizontal and vertical projections of the tetrahedron used to represent the quaternary system. Although the four metals are capable of forming solid solutions, one in another, to a limited extent, the behaviour of the quaternary alloys indicates that as the temperature falls, this solubility diminishes, and that at the eutectic temperature, the solids in equilibrium are the nearly pure metals. The quaternary eutectic melts at about 70° C., and contains 10·10 per cent. of cadmium, 13·13 of tin, 27·27 of lead, and 49·50 of bismuth. The paper is accompanied by twelve photomicrographs.—A. S.

Tungsten; Preparation of metallic ——. G. Erhard. Metallurgie, 1912, **9**, 441—446.

The various methods of obtaining metallic tungsten are discussed, and it is concluded that the preparation of tungstic acid is the best intermediate stage. The purified sodium tungstate obtained by fusion of the ore with 60 per cent. sodium carbonate was treated with hydrochloric acid containing 6 per cent. of nitric acid, and the tungstic acid thoroughly washed to remove alkaline salts. After completely drying 100 kilos. of tungstic acid were mixed with 14·1 kilos. of pure charcoal, and 2 kilos. of rosin, and heated to a temperature of 1400° C. in a crucible the lid of which was carefully luted. The agglomerated metal was then finely ground and elutriated in the usual manner, when a product containing 96·5 per cent. of pure metal was obtained.—A. H. C.

Alloys; Duration of sound in —— *as a function of temperature.* F. Robin. Rev. Mét., 1912, **9**, 618—637. (See also this J., 1910, 492.)

Bars of bronzes, brasses, nickel alloys, and various metals were suspended, and curves are given in which the length of the duration of sound is plotted against temperature. The curves show a regular fall in the case of the pure metals used, whilst those for the alloys of copper and nickel show a change at a temperature of 100° C. German silver showed a sudden rise in the duration of sound at 320° C. and being strongly marked on the curve (see fig.) indicating a transformation point at this temperature which has been suspected but which is not shown with any distinctness in the curves of electrical resistance at different temperatures. This transformation point was present in all the copper-nickel alloys examined. The zones of temperature corresponding to a cessation in duration of sound, vary with the metals and their alloys, sometimes coinciding with the fall in elasticity, and yet not always coincident with the drop in hardness.—A. H. C.



Ore drying; Abrasion and dust losses in ——. C. F. Dietz and D. V. Keedy. Bull. Amer. Inst. of Mining Eng., July, 1912, No. 67, 717—738.

Remarking that the dust losses incurred by drying ores (in driers of either the stack or the rotary cylinder type) are usually regarded as negligible, the authors quote examples in which from 3 to 10 per cent. of the material treated was lost in this manner. It is pointed out that owing to the greater friability of metallic minerals as compared with gangue materials, and to the fact that all driers act as "tumbling mills" in which the ore is more or less pulverised, this loss generally represents a greater proportion of the assay value of the ore than is indicated by the weight percentage of the dust. In a test made upon nearly a ton of complex zinc-iron ore (sulphides and oxides in a quartzose gangue), it was found that after the charge had been passed through a cylindrical, rotary drier (30 ft. long, 4 ft. in diameter and set at a pitch of ½ inch to the foot) 12·3 per cent. of the material was sufficiently fine to pass a 16-mesh screen; the zinc mineral was found to have suffered 1½ times as much abrasion as the total ore. As regards the recovery of dust losses, a detailed account is given of the operation of a system in which the dust collected by suction from the various parts of a "dry" mill was ultimately discharged into a centrifugal apparatus provided with fine water sprays or steam jets; the system was installed and operated at a low cost and yielded highly satisfactory results.—W. E. F. P.

Behaviour of aluminium towards beer, water, and air. Schönfeld and Himmelfarb. *See* XVIII.

Copper production of Japan in 1911. Board of Trade J., Aug. 1, 1912. [T.R.]

The "Bulletin Commercial" (Brussels) of 27th July states, on the authority of the Belgian Consul at Yokohama, that the total production of copper in Japan in 1911 amounted to 51,708 tons, valued at 26,938,000 yen, being an increase of 2,562 tons in quantity and 1,119,000 yen in value over the production in 1910, and an increase of 13,734 tons as compared with 1909. More than half the copper is got from the three principal mines, *viz.*, Ashio, Besshi, and Kosaka. The Hidate mine is also making great progress, and turned out 5,674 tons last year, or more than seven times the quantity turned out by this mine in 1907. (N.B.—Yen = 2s. 0½d.)

Patents.

Iron; Method for purifying —— *and manufacturing steel.* H. A. Brassert, Braddock, Pa. U.S. Pats. 1,032,653 to 1,032,655, July 16, 1912.

The purification of the iron and its subsequent conversion into steel are effected in a covered receptacle in which the superheated metal is subjected to the action of suitable metallic oxides and fluxes, while blasts of air are directed upon the surface of the bath; when the metal is sufficiently pure, the requisite additions are made for the production of steel of the quality desired. The initial temperature and weight of the charge of molten iron are such as to enable the subsequent operations to be conducted without the aid of external heat.—W. E. F. P.

Ores; Treating ——. E. Kerr Pittsburgh, Pa. U.S. Pat. 1,032,007, July 9, 1912.

THE process consists in "heating iron ore to not less than 400° F., forcing heated steam and air alternately into contact with the heated charge, mechanically separating the reduced iron from other solid ingredients, mixing the metal with carbon, and melting the same."—B. N.

Zinc; Electrodeposition and refining of ——. U. C. Tainton, Manchester, and J. N. Pring, Chester. Eng. Pat. 7235, Mar. 23, 1911.

THE metal is deposited from a solution of a zinc salt (sulphate) containing from 10 to 30 per cent. of (sulphuric) acid and from 0·1 to 1·0 per cent. of a colloid agent (gum tragacanth). A high current density (up to 300 amp. per sq. ft. of cathode surface) is employed and it is stated that the metallic deposits produced are smooth, lustrous and of fine quality. The electrolyte, primarily intended for the deposition of zinc upon metallic surfaces, may be employed in the refining of zinc and also for secondary batteries or accumulators in which a zinc cathode is used. Claim is also made for the process of obtaining zinc from ores by treatment of the latter with acid and deposition of the metal from the resulting solutions by the above means.—W. E. F. P.

Ores; Treatment of ——. Murex Magnetic Co. Ltd. and A. A. Lockwood, London. Eng. Pats. 13,208, June 1, and 26,860, Nov. 30, 1911. (See also this J., 1911, 430.)

THE crushed ore is agitated with a solution of a silicate either before or simultaneously with a magnetic paint consisting of oil mixed with magnetite. The paint attaches itself selectively to one of the constituents of the ore. This constituent can then be separated by treatment in a wet magnetic separator. Using a paint made with residuum oil, with sulphide ores containing lead and zinc, the lead sulphide becomes coated in preference to the zinc, the gangue and iron pyrites. A second similar separation may then be made after slightly acidifying the remaining mixture. Sometimes the zinc sulphide and sometimes the iron pyrites will follow the gangue. By using a suitable paint, as for example, by replacing some of the residuum oil by a fatty oil, the gangue may be separated, leaving the metalliferous particles as a concentrate. Five examples of the treatment of specific ores are given.—T. ST.

Alloys; Method of, and apparatus for, casting metals and metallic ——. J. S. Critchley, London, and H. A. A. Dombrain, Sydenham. Eng. Pat. 14,568, Dec. 19, 1911.

AN ordinary crucible furnace heated by petroleum burners is connected by a flue provided with dampers with a mould-heating oven placed by its side. The burners are arranged so that they can be partially or wholly concentrated on either the crucibles or the oven. A roller-way transporter rotating round a fixed centre is also provided for conveying the heated mould from the oven to the pouring stage adjacent to the crucibles for pouring the metal.—A. H. C.

[*Tin*]. *Metals; Production of* ——, *from their ores.* J. Härdén and Electric Furnaces and Smelters Ltd., London. Eng. Pat. 15,824, July 7, 1911.

THE ore (*e.g.* tinstone), mixed or not with small proportions of carbonaceous matter and suitable flux, is charged into the upper end of an inclined, rotatory cylinder in which it is subjected to the action of a reducing gas while heated by means of one or more long electric arcs. The electrodes are parallel to the long axis of the cylinder and the intensity of the arcs is regulated to effect the production of molten metal from the ore without liquefying the gangue.—W. E. F. P.

Tin plates and the like; Preparation for cleaning ——. C. Gibbons, Port Talbot, Wales. Eng. Pat. 19,841, Sept. 6, 1911.

NINE parts by bulk of powdered calcium sulphate are mixed with one part of sawdust and ground together in a mill for use in cleansing tin plates from grease and dust, and to impart a good polish.—A. H. C.

Tin and tin-containing materials and other products; Treatment of ——. Elektrochem. Fabr. Kempen-Rhein Dr. Brandenburg und Weyland, Kempen-Rhein, Germany. Eng. Pat. 21,447, Sept. 28, 1911. Under Int. Conv., Sept. 29, 1910.

THE material to be treated for the removal of the tin by means of the alternate action of a hot caustic potash solution and air, is contained in two receptacles which are suspended at the opposite ends of a pivoted balance beam. By the movement of the beam the material is alternately dipped into the reagent in the tank and brought into the air. The tank is provided with an inner hollow chamber in order to provide better aeration of the solution. The beam is also capable of being rotated horizontally in order that the material may be conveniently dipped into suitably situated washing tanks.—A. H. C.

Ferrous to ferric solutions; Oxidation of ——, *applicable to the extraction of copper and other non-ferrous metals from ores, mattes, residues, and the like.* A. McKechnie and F. G. Beasley, Birmingham. Eng. Pat. 15,849, July 8, 1911. Addition to Eng. Pat. 29,286, Dec. 14, 1909 (this J., 1910, 1391).

THE ferrous solution obtained in the precipitation of copper from copper sulphate solutions by metallic iron, or as a by-product in certain wet extraction processes, is subjected to rapid oxidation by air by heating in a closed vessel to a temperature above 100° C. and at a corresponding high pressure. The ferric solution so obtained can be used for the extraction of copper from a further quantity of the ore.—A. H. C.

Nickel-copper mattes; Method of treating ——. A. McKechnie and F. G. Beasley, Birmingham. Eng. Pat. 15,850, July 8, 1911.

"CONCENTRATED" mattes, consisting of copper and nickel sulphides free from iron, are heated with a suitable acid, such as sulphuric acid, in a closed vessel to a temperature exceeding 100° C. and at a correspondingly high pressure. The nickel sulphide is thus dissolved and the liberated hydrogen sulphide, under the high pressure which prevails, precipitates any copper which has also gone into solution. There thus results a solution containing all the nickel, and free from copper. It is preferable to roast the matte slightly before treatment with acid, in order to increase its porosity. If however such roasting leaves insufficient nickel sulphide to cause the precipitation of all the copper which is also dissolved, additional matte, preferably unroasted, may be introduced in order to make good the deficiency.—T. ST.

Nickel plating; Method of ——. W. Feuerhake, Frondenberg, Westphalia. Eng. Pat. 4125, Feb. 19, 1912.

IRON or steel articles are first galvanised in the usual manner and then electro-plated successively with copper and with nickel, with the object of rendering the articles rust-proof.—A. H. C.

Classifying ores; Apparatus for ——. Comp. d'Entreprises de Lavage de Minerais, Paris. Eng. Pat. 5235, March 1, 1912. Under Int. Conv., March 6, 1911.

A SERIES of perforated metal plates or metal gauze sieves are contained in a case the inclination of which can be varied and to which can be imparted a circular movement obtained by means of adjustable eccentrics actuated by a crank, the throw of which can be varied. The substances to be classified arrive on the upper sieve, above which is a sprinkling nozzle for projecting water on to the sieves to facilitate the classification. The number of vibrations given to the sieves can be varied from 800 to 1000 per minute.—A. H. C.

Aluminium alloys. G. J. Coles, Boston, Mass., U.S.A. Eng. Pat. 6583, March. 16, 1912.

AS a solder for aluminium, claim is made for an alloy containing approximately 11 per cent. of aluminium, 5 of nickel, 2 of manganese and 82 of tin.—W. E. F. P.

Aluminium solder. C. R. Erkens, Assignor to Simplex Aluminium Solder Co., Inc., New York. U.S. Pat. 1,033,565, July 23, 1912.

The process consists in melting together block tin, zinc, antimony, and a metal having a high degree of fluidity, adding a certain quantity of salicylic acid and calcium as a "cleansing" agent, and then "introducing a certain quantity of sulphur as a binding agent for the impurities, a small portion of the cleansing agent being retained in the alloy."—B. N.

Cleaning metal articles; Electrolytic process for ——. Langbein-Pfanhauser Werke, A.-G., Leipzig-Sellerhausen, Germany. Eng. Pat. 9609, April 23, 1912. Under Int. Conv., April 25, 1911.

The metal article (wire, strip, etc.) is made the anode in a neutral or alkaline electrolytic bath, preferably a nearly saturated solution of sodium chlorate at a temperature of from 30 to 70° C. By immersing only a short length of the wire, the distance between the treated wire and the cathode may be from 6 to 8 cm. and a current density of from 30 to 40 amps. per sq. dcm. may be employed. It is necessary that the wire should travel rapidly through the solution, a wire of from 2·0 to 3·5 mm. diam. requiring a speed of from 4 to 15 metres a minute, whilst the larger the diameter the lower the speed to be employed.—A. H. C.

[*Nickel, iron or cobalt*]. *Electrolytic process.* C. J. Reed, San Francisco, Cal., U.S.A. Eng. Pat. 9612, April 23, 1912.

In an electrolytic process for the deposition and recovery of magnetic metals, especially nickel, iron and cobalt, from solutions of the corresponding sulphates, an anode of spongy lead is employed. When about one-third of the spongy lead has become sulphated by the reaction, the electrode (after removal of the soluble impurities by washing in water) is regenerated by being used as the cathode, with an insoluble anode such as lead peroxide, in an electrolyte of dilute sulphuric acid, the resulting oxygen and sulphuric acid being recovered.—W. E. F. P.

Ores and similar materials; Method of sintering fine ——. J. G. West, jun., Wilkinsburg, Pa. U.S. Pat. 1,031,153, July 2, 1912.

A layer of the material is spread over the removable bottom of a suitable furnace and heated until sintering occurs, when fresh material is added in a continuous stream, the flow and distribution of which are so regulated that the surfaces of the falling particles become sufficiently fused to agglomerate upon the furnace bottom; the latter is periodically withdrawn for the removal of the agglomerated mass.—W. E. F. P.

Metals and alloys; [*Electrical*] *Process and apparatus for extracting and refining* ——. A. E. Greene, Chicago, Ill. U.S. Pat. 1,031,257, July 2, 1912.

The electric furnace comprises a vessel for containing a bath of molten metal; this vessel is composed of a main chamber and a channel-shaped auxiliary heating chamber, the latter consisting of two channels leading from different portions of the main chamber, and then returning thereto through a common channel. Means are provided for producing induced electric current-flow in the metal contained in the auxiliary chamber, and inclined tuyères are arranged above the mouth of the common channel, so as to blow gas downwardly upon the surface of the metal, and thus produce a continuous circulation of the metal from the main chamber through the auxiliary chamber.—B. N.

Ores; Reduction of ——. E. Thomson, Swampscott, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,031,490, July 2, 1912.

Molten iron is blown with an oxidising gas, such as air, or a blast rich in oxygen, so as to produce a highly-heated chemically active bath of iron oxide. Iron ore and carbon are charged into the bath, the carbon being in amount sufficient to reduce the combined quantity of iron oxide to metallic iron. A portion of the resulting metal is withdrawn, and the cycle repeated with the remaining portion. The iron, withdrawn from the bath, is treated whilst at a high temperature with appropriate substances to produce steel of desired quality.—B. N.

Smelting furnace. G. P. Gibson, Braddock, Pa. U.S. Pat. 1,032,599, July 16, 1912.

By means of vertical partitions which terminate above the inclined hearth, the body of the furnace is divided into a number of charge-receiving compartments, each provided with a separate heating burner. Provision is made for collecting the molten metal at the lower end of the hearth and for effecting a downward circulation of the products of combustion through each compartment and beneath the dividing walls.—W. E. F. P.

Smelting furnace. W. H. Dow, Piedmont, Cal. U.S. Pat. 1,032,745, July 16, 1912.

The inclined hearth of a cupola is connected upon the higher side with a combustion chamber and upon the lower side with a reducing chamber having a concave floor. Both chambers are provided with burners adapted to discharge towards the interior of the cupola; but the burners of the reducing chamber are arranged in two series, the members of one set alternating with those of the other and having their axes of direction inclined at a different angle, so as to produce a cross-discharge at the mouth of the chamber.—W. E. F. P.

Steel; Unmagnetisable ——. F. Kohlhaas, Dusseldorf, Germany, Assignor to International Steel, Ltd., Birmingham. Reissue No. 13,440, July 9, 1912, of U.S. Pat. 981,575, Jan. 10, 1911.

See this J., 1911, 135.—T. F. B.

Steel; Apparatus for the production of ——. H. Johnson, Assignor to Verdon Cutts and Hoult, Sheffield. U.S. Pat. 1,032,217, July 9, 1912.

See Eng. Pat. 26,551 of 1909; this J., 1910, 1458.—T. F. B.

Ore material; The sintering of fine ——. J. Cayley, New York. Eng. Pat. 23,038, Oct. 18, 1911. Under Int. Conv., June 8, 1911.

See Fr. Pat. 435,405 of 1911; this J., 1912, 395.—T. F. B.

Stannic oxide; Process for reducing ——. Z. Metzl, Rouen, France. Eng. Pat. 27,606, Dec. 8, 1911.

See Fr. Pat. 429,739 of 1911; this J., 1911, 1221.—T. F. B.

Electric furnace for smelting and reduction of ore. H. B. Lorentzen, Notodden, Norway. U.S. Pat. 1,030,904, July 2, 1912.

See Fr. Pat. 423,288 of 1910; this J., 1911, 630.—T. F. B.

Nickeling of aluminium or alloys containing aluminium; Process for direct ——. M. Chirade and J. Canac, Paris. U.S. Pat. 1,030,972, July 2, 1912.

See Eng. Pat. 24,019 of 1911; this J., 1912, 394.—T. F. B.

Smelting-furnace residues; Means for handling ——. E. Dor-Delattre, Liege, Belgium. U.S. Pat. 1,031,918, July 9, 1912.

See Eng. Pat. 3078 of 1911; this J., 1911, 902.—T. F. B.

Ores; Process of treating ——. W. Günther, Cassel, Germany. U.S. Pat. 1,032,400, July 16, 1912.

See Ger. Pat. 237,153 of 1910; this J., 1911, 1122.—T. F. B.

Converter for the separation of the fixed and volatile metals in complex ores. M. Collin, Paris. U.S. Pat. 1,033,062, July 16, 1912.

See Fr. Pat. 428,708 of 1910; this J., 1911, 1168.—T. F. B.

Metallurgical product [alloy for electrical purposes]. W. Rübel, Berlin. U.S. Pat. 1,033,352, July 23, 1912.

See Fr. Pat. 429,758 of 1911; this J., 1911, 1219.—T. F. B.

Gold from clay; Process for the extraction of ——. J. J. W. H. van der Toorn, The Hague, Holland. U.S. Pat. 1,033,359, July 23, 1912.

See Fr. Pat. 424,843 of 1911; this J., 1911, 903.—T. F. B.

Alkali metals; Manufacture of ——. H. Speketer and W. Hofmann, Griesheim, Assignors to Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. U.S. Pat. 1,034,320, July 30, 1912.

See Fr. Pat. 416,926 of 1910; this J., 1910, 1393.—T.F.B.

Apparatus for producing gaseous fuel, particularly for use in welding metals. Eng. Pat. 15,537. *See* IIA.

Acetylene generator for welding plant. Eng. Pat. 4855. *See* IIA.

Oxygen generator particularly for use with welding plant. Eng. Pat. 4860. *See* VII.

Production of lead compounds [from lead fume]. U.S. Pat. 1,033,405. *See* VII.

Protecting metal surfaces from corrosion. U.S. Pat. 1,031,377. *See* XIII.

XI.—ELECTRO-CHEMISTRY.

PATENTS.

Insulating compositions. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 21,987, Oct. 5, 1911.

POWDERED talc is mixed with gelatinous magnesium silicate, the mixture moulded under pressure, and fired at a temperature of about 1000° C.—B. N.

Endothermic compounds [oxides of nitrogen] from their components; [Electrical] Method of producing ——. W. Siebert, Rheinfelden, Germany. U.S. Pat. 1,033,126, July 23, 1912.

AN electric arc is formed in the centre of a vertical cylindrical electric furnace between electrodes, guided in holes in the furnace walls, so that they may be moved longitudinally whilst the points of the electrodes are kept in a horizontal plane. The gaseous constituents, *e.g.*, those contained in air, are forced through nozzles, distributed along the inner periphery of the furnace and placed at an acute angle thereto, at so great a speed as to produce within the furnace a violent swirl of gases capable of spreading the arc horizontally. A disc-shaped flame is formed, the heat of which brings about the combination of the gaseous constituents to form the endothermic compounds, such as nitrogen oxides. Means are provided for discharging the compounds formed from the furnace. —B. N.

Electro-osmotic processes. Ges. f. Elektro-Osmose m. b. H., Frankfort on Maine, Germany. Eng. Pat. 28,185, Dec. 14, 1911. Under Int. Conv., Sept. 28, 1911.

See Fr. Pat. 438,183 of 1911; this J., 1912, 619.—T. F. B.

Electro-osmose method; Apparatus for the ——. Ges. f. Elektro-Osmose m. b. H., Frankfort on Maine, Germany. Eng. Pat. 725, Jan. 9, 1912. Under Int. Conv., Oct. 2, 1911.

See Fr. Pat. 439,271 of 1912; this J., 1912, 708.—T. F. B.

Synthetic Trinidad lake bitumen compounds. Eng. Pat. 16,125. *See* IIA.

Electrolytic process [for generating oxygen]. U.S. Pat. 1,032,623. *See* VII.

Conductive ink. U.S. Pats. 1,034,103 and 1,034,104. *See* XIII.

XII.—FATS; OILS; WAXES.

Linseed; Chinese ——. C. Grimme. Chem. Rev. Fett-Ind., 1912, 19, 180—181.

YELLOW Chinese linseed (containing 21·5 per cent. of brown seed) yielded 38·4 per cent. of a light brown oil with an iodine value (Wijs) of 194·2, whilst brown seed yielded 30·8 per cent. of a dark brown oil with a harsher taste than the oil from the yellow seed. Its iodine value was 194. The other physical and chemical values of both oils were similar to those of normal linseed oil of the best quality.—C. A. M.

Chinese wood [tung] oil; Bacon's test of the purity of ——. H. W. Calef. Oil, Paint, and Drug Rep., July 15, 1912, 19.

ABOUT 10 c.c. of pure tung oil are placed in a test tube, ¾ inch in diameter and about 4 inches in length, and similar tubes are charged with the same oil adulterated to the extent of 10 per cent., and with the sample under examination. The three tubes are immersed for exactly nine minutes in an oil bath maintained at 280° to 285° C. (not more). The contents of each tube are then subjected to a comparative stabbing test with a small bright spatula, which is plunged in from top to bottom and withdrawn. In the case of pure tung oil the cut will be clean and appear as a straight line. In the presence of 5 per cent. of an adulterant, the oil will be softer, and the edges of the cut will have a feathery appearance, whilst with 10 per cent. the oil will be soft and paste-like, and with amounts of adulterant in excess of 12 per cent. will often remain fluid. (See also this J., 1912, 731.)—C. A. M.

Glycerol; Action of hydrogen peroxide on ——. J. Effront. Bull. Soc. Chim., 1912, 11, 744—747.

GLYCEROL is quantitatively oxidised to formic acid by hydrogen peroxide, glyceric and glycollic acids being formed as intermediate products. Each mol. of glycerol yields two mols. of formic acid, and the reaction may be used as a method of determining the former. Thus, on dissolving 10 grms. of 89·6 per cent. glycerin in 100 c.c. of water and distilling the solution with hydrogen peroxide (10 vol. solution), which was introduced gradually so that in all about 200 c.c. of distillate were obtained in an hour, the amount of formic acid found corresponded to 99·8 per cent. of the weight of glycerol taken.—C. A. M.

Vegetable oils; Denaturing of certain —— *in Australia.* Board of Trade J., Aug. 1 and 8, 1912. [T.R.]

A CUSTOMS By-Law (No. 220), dated 18th May, 1912, lays down the regulations regarding the denaturing of edible colza (rape seed) oil for purposes of entry under Tariff heading No. 234 (G) (viz., at 6d. per gall.), into the Commonwealth, as follows:—Edible colza (rape seed) oil, when denatured for church use as a burning oil, may be denatured by the addition to each 100 gallons of edible colza oil of not less than 5 gallons of approved blown rape seed oil and 10 ounces of birch tar oil. The blown rape seed oil should possess a viscosity of not less than 400 seconds at 212° F. when tested by means of Redwood's viscosimeter. The birch tar oil should have a specific gravity of not less than 0·926 at 20° C.

By-Law No. 226 provides that edible colza (rape seed) oil when intended for use in miners' safety lamps as a burning oil, may be denatured by the addition to each 75 gallons of edible colza oil of not less than 10 gallons of high test kerosene (300° test) and 15 gallons kerosene (150° test).

Under By-Law No. 231 "edible vegetable oils, n.e.i." and "China, sesame, and soya bean oils" may be denaturated by such methods as may be approved by the Comptroller-General. Oils so denatured may be delivered under Tariff headings Nos. 234 (a) or 234 (n) (viz., 6d. per gallon or free of duty), respectively. In accordance with this By-Law, the following formula has been approved by the Comptroller-General for the denaturing of soya bean oil for paint making:—5 gallons, turpentine substitute (mineral spirit); 10 gallons, crude rosin oil; 85 gallons, soya bean oil.

Soapstone ("Kheel") from the Crimea. Board of Trade J., Aug. 8, 1912. [T.R.]

The British Vice-Consul at Kertch has forwarded a sample of a kind of soapstone, known as "Kheel," found in the Crimea, chiefly in the neighbourhood of Batchi-Sarai. It has been suggested that this stone may be of commercial value; it is very largely used locally as soap and as an emollient, the stone being steeped in water and then crumbled to a smooth paste. The local price is about 3s. 4d. per cwt. The sample may be inspected by British firms at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

Patents.

Acidity of fats and oils; Process for neutralising the —— with solutions of alkalis or alkaline-earths. F. M. Berberich. Ger. Pat. 246,957, Feb. 7, 1912.

Hot solutions containing not more than about 0·1 per cent. of alkali or alkaline-earth are used, whereby, it is claimed, the formation of emulsions is largely or entirely prevented.—A. S.

Saturated fatty acids; Process for preparing —— from unsaturated acids and their esters. B. Wäser. Ger. Pat. 247,454, March 24, 1911.

Unsaturated fatty acids and their esters are treated with concentrated sulphuric acid, the excess of acid is washed from the product, and the resulting substance is reduced by means of electrolytically produced hydrogen. It is advantageous to carry out the reduction in alcoholic solution, no esters being formed. Lead cathodes may be used.—T. F. B.

Products similar to Turkey-red oils; Manufacture of —— from vegetable oils or their fatty acids, or derivatives or mixtures of the same. E. Schmidt. Ger. Pat. 245,902, Oct. 1, 1910.

The oils, or the fatty acids separated therefrom, are heated with persulphates at temperatures above 200° C. Castor oil when treated in this way yields a hydroxysulphoricinoleic acid having most of the properties of acid Turkey-red oils.—A. S.

Floating soap; Manufacture of —— by introduction of oxygen into the soap paste. C. P. Kroning, jun. Ger. Pat. 246,479, Nov. 19, 1910.

The hot soap paste, whilst in a fluid condition, is led through a perforated pipe enclosed in a casing supplied with oxygen under pressure. The oxygen passes through the perforations and becomes intimately mixed with the soap paste, which is kept in continuous agitation.—A. S.

Soaps with a high content of crude petroleum or petroleum distillates; Manufacture of ——. K. K. Priv. Oesterreichische Länderbank. Ger. Pat. 247,417, May 3, 1910.

Montanic acid or montan wax, or the distillates obtained in the manufacture of these substances, are added to the soap before the petroleum is incorporated with the latter. It is stated that after the addition of the substances mentioned, up to 200 per cent. of petroleum can be permanently incorporated with the soap, giving products which yield clear solutions with water even when strongly diluted.—A. S.

Potassium soaps giving a strong lather; Manufacture of stable solid ——. R. Worms. Ger. Pat. 248,657, June 3, 1910.

Neutral fats, or fatty acids, are saponified with potassium carbonate or caustic potash in presence of fats, especially animal waxes, of high melting point.—A. S.

Scouring composition. G. Ruth, Wandsbek Hamburg, Germany. Eng. Pat. 1938, Jan. 24, 1912. Under Int. Conv., July 26, 1911.

Powdered pumice, and or silicious chalk is incorporated with a mixture of a dilute solution of sodium silicate, glycerin, and a gelatinous material such as isinglass, gum tragacanth, or starch, or mixtures of these, at such a temperature that separation of the constituents does not take place. Small quantities of potash or soda soap may be added to assist in the production of the jelly-like consistence of the mass.—J. A.

Fats and oils; Bleaching ——. Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 3433, Feb. 10, 1912. Under Int. Conv., March 27, 1911.

See Fr. Pat. 431,291 of 1911; this J., 1911, 1396.—T. F. B.

Manufacture of sulphur-derivatives [caoutchouc-like and horn-like substances] from glycerin. Eng. Pat. 25,246. *See* XIV.

Preventing the formation of mustard oil in oil-cakes containing sinigrin or sinalbin. Ger. Pat. 247,427. *See* XIXa.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Lead-colour industry in Germany; Hygiene of the ——. Rambousek. Chem. Zeit., 1912, 36, 882–883.

Lead works in Germany produce 44·5 million marks worth of lead, of which one-third goes to the making of lead colours, chiefly white lead. The earliest attempts at the control of plumbism date from 1876, but the problem has not yet been solved. Substitutes for white lead are not successful, and the present position is that lead may be used in colour-making under certain precautions, some technical and some personal, regulated by the German Act of 1903. The chief technical precaution is the avoidance of dust. Personal precautions include medical examination and the supply of prescribed food and medicines. Alcohol is prohibited in the works. Respirators and special wearing apparel are furnished. As a result of the new Act plumbism has been reduced by 25 per cent. in the Cologne district. The author considers that the most essential problem is the education of the worker to a higher standard of cleanliness.—H. H. S.

Turpentine; Tests of the purity of oil of ——. R. Marcille. Bull. Soc. Chim., 1912, 11, 762–766.

The presence of 5 per cent. of the usual adulterants of oil of turpentine may be detected by determining the solubility in acetic acid of the sample and its products of fractional distillation. The solvent is prepared by adding 2 per cent. of water to glacial acetic acid, and it should dissolve in an equal volume of dry redistilled carbon bisulphide at 39° to 40° C. Five c.c. of the turpentine oil are introduced into a 25 c.c. gas burette graduated in tenths of a c.c., and the standard acetic acid is added little by little with constant shaking until a clear solution is obtained. The stoppered burette is then cooled in water until the liquid becomes turbid again, after which a little more acid is added, this process being repeated until the solution remains perfectly clear after five minutes' cooling. The total volume of liquid is then read, the temperature of the water taken, and the amount of solvent added to one volume of the turpentine is calculated.

a correction of 0·08 being made for each 1° C. by which the temperature differs from 15° C. Similar tests are made with the products of the fractional distillation of the sample into five fractions. Pure oils of turpentine dissolve in 3·7 parts of the acid, petroleum spirit and rosin oil in 22 parts, and benzene in 0·25 part. Further information is obtained by determining the amount of the oil absorbed by sulphuric acid, in comparison with an oil of turpentine of known purity.—C. A. M.

Resenes of resins and oleoresins. C. H. Herty and W. S. Dickson. J. Ind. Eng. Chem., 1912. **4**, 495—496.

In the following table are given the proportions of resenes (non-volatile unsaponifiable constituents of resins and oleoresins) in the resins (after removal of the volatile oil) obtained from different species of pines.

Species.	Local name.	Origin.	Percentage of resene.
Pinus Taeda	Loblolly pine	N. Carolina	4·10
,, *palustris*	Longleaf pine	Florida	5·67
,, *maritima*	Maritime pine	France	7·37
,, *heterophylla*	Cuban or Slash pine	Florida	7·38
,, *serotina*	Pond pine	Florida	7·65
,, *echinata*	Old field pine	N. Carolina	8·71
,, species unknown	——	Central America	8·94
,, *sabiniana*	Digger pine	California	9·66
,, *laricio*	"*Schwarzkiefer*"	Austria	14·05

In the resin from seven different trees of *P. palustris* the percentages of resene were 5·26, 5·95, 9·68, 7·45, 5·67, 5·45. and 6·22, and in the resin from seven trees of *P. heterophylla*, the percentages were 7·87. 7·36, 7·20. 7·25, 6·58, 7·84, and 7·00 respectively. Beginning in the early spring the oleoresins were collected from (1) a *P. palustris* tree and (2) a *P. heterophylla* tree respectively at regular periods of four weeks until the close of the season in the autumn, and in the resins prepared from these oleoresins the percentages of resenes were determined, with the following results: (1) 5·31, 5·44, 5·95, 6·02. 6·09, 6·53, 5·24; (2) 7·36, 7·67. 7·23, 8·17, 7·38. 7·43, 7·77. In freshly collected oleoresins in Florida, the following percentages of resenes were found:—*P. palustris*: 7·10, 3·84. 7·33: *P. heterophylla*: 6·83, 6·76, and 6·96 respectively. A sample of "scrape" (Gum Thus). the hardened mass which collects on the scarified surface of the tree as a result of the crystallisation of the resin acids of the oleoresin, was found to contain 3·14 per cent. of resene after removal of the volatile oil.—A. S.

Solubility of coloured resinates submitted to the action of light. Larguier des Bancels. *See* XXI.

Patents.

White lead; Manufacture of ——. Pigments Ltd., and W. P. Thompson. Liverpool. Eng. Pat. 15.198, June 29. 1911.

Lead monoxide such as is prepared according to Eng. Pat. 13.458 of 1908 (this J., 1909. 992) is agitated, under pressure, with brine and a small quantity of a catalyst such as acetic acid or lead acetate, carbon dioxide being at the same time passed into the mixture. When the reaction is complete. the brine is withdrawn and may be re-used whilst the white lead which has been produced may be mixed with linseed oil which causes a separation of entangled water and forms a paint ready for use, or the white lead may be obtained in the dry state by filter-pressing and if necessary washing and re-filtering the powder.—J. A.

Red lead; Manufacture of —— *by roasting lead oxide, lead carbonate, and the like.* Rheinische Maschinenfabr. Ges. m. b. H. Ger. Pat. 247,371, June 15, 1911.

The oxidising gas (oxygen, air, or the like) is used under increased pressure, whereby the oxidation of the lead oxide or carbonate is considerably accelerated.—A. S.

Protecting metallic surfaces from corrosion; Means for ——. G. Rigg, Palmerton, Pa., Assignor to New Jersey Zinc Co., New York. U.S. Pat. 1,031,377, July 2. 1912.

The rust-preventing coating of paint contains zinc oxide, associated with a complex orthotungstate capable of yielding to water sufficient of its tungstic acid in the combined state to give protection against rust.—B. N.

Ink, Conductive ——. (1) H. E. Goldberg, Assignor to R. P. Lamont, Chicago, Ill., (2) H. E. Goldberg. U.S. Pats. 1,034,103 and 1,034,104, July 30, 1912.

(1). A visible writing ink, forming a good electric conductor when dry, is composed of deflocculated graphite diluted with a volatile liquid. (2) A volatile liquid with a non-oxidising metal, such as silver, in colloidal form, diffused therein. The ink may also contain deflocculated graphite.—A. S.

Varnish; Manufacture of ——. T. Pittman, Shepperton, Middlesex. Eng. Pat. 21,503, Sept. 29, 1911.

Eight lb. of finely ground batavium gum (dammar gum) are dissolved in 6 pints of turpentine at the ordinary temperature, and the solution is mixed with 4 oz. of barium carbonate suspended in 6 oz. of turpentine. The mixture is heated gently in a steam-jacketed pan but not allowed to boil. When it appears homogeneous it is filtered hot and, after cooling, mixed with 1 pint of pale drying linseed oil, 1 pint of "extra pale" gold size, 1 oz. of camphor dissolved in turpentine or methylated spirit, 1 oz. of ether and 1 oz. of rectified petroleum spirit or commercial petrol. The product is practically colourless, can be used immediately after manufacture, and can be applied to fairly absorbent surfaces without previous sizing.—J. H. L.

Pitch pine oil, turpentine oil and the like; Process for refining raw ——. J. Schindelmeiser, Dorpat, Russia. Eng. Pat. 4775. Feb. 26, 1912 (Cp. Ger. Pat. 239,546 of 1910 and Eng. Pat. 14,315 of 1911; this J., 1911, 1398; 1912, 445).

The oil is heated under pressure, or for a prolonged period under a reflux condenser, with ammonia and a cyanide. By this treatment the impurities are converted into non-volatile substances, from which the unaltered pinene is subsequently separated by distillation.—J. H. L.

Oils and fats and compounds thereof [for paint purposes]. W. E. Lake, London. From W. N. Blakeman, New York. Eng. Pat. 9023. April 11, 1911.

See U.S. Pat. 989,227 of 1911; this J., 1911, 756. Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 1276 of 1875, 18,144 of 1896, 3344 of 1906, 1678 of 1907, and 25,771 of 1909.—T. F. B.

Lead pigments; Apparatus for the production of ——. J. W. Bailey. New York, Assignor to International Lead Co. U.S. Pat. 1,031,160, July 2, 1912.

See Fr. Pat. 413,508 of 1910; this J., 1910, 1120.—T. F. B.

Lakes from vegetable material containing the dye in the form of glucoside; Process for the manufacture of ——. E. Hagen. Breslau, Germany. Eng. Pat. 29,041, Dec. 23. 1911.

See Fr. Pat. 438,563 of 1911; this J., 1912, 650.—T. F. B.

Colour-lakes and process of making same. O. Stachlin and K. Zechentmayer, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,031,823, July 9, 1912.

See Ger. Pat. 224,442 of 1909; this J., 1910, 1120.—T. F. B.

Azo dyestuffs suitable for lake-making. Ger. Pat. 248,010. *See* IV.

XIV.—INDIA-RUBBER ; GUTTA-PERCHA.

Rubber ; Chemistry of ——. *V. Theory of vulcanisation of rubber. III.* D. Spence and J. Young. Z. Chem. Ind. Kolloide, 1912, **11**, 28—34.

The authors have studied the vulcanisation of white Ceylon Para rubber with 10 per cent. and 37 per cent. respectively of sulphur at 135° and 155° C., the results obtained being plotted in curves, with the percentages of combined sulphur as ordinates and the time of vulcanisation as abscissæ. The rubber was first freed from resin by extraction with acetone, and after the completion of the test, the sample was again extracted with acetone for 18 hours and then the combined sulphur determined by the electrolytic oxidation method (this J., 1912, 651). In the experiments with 10 per cent. of sulphur, the reaction proceeded smoothly to completion, no uncombined sulphur being left and the curve being free from kinks. A comparison of the results obtained at 135° C. with those obtained at 155° C. gave a temperature-coefficient of 2·65, which lies well within the limits of the values for chemical reactions. In the experiments with an excess (37 per cent.) of sulphur, the vulcanised rubber was found to have the composition, $C_{10}H_{16}S_2$, and even by prolonged heating it was found impossible to obtain more than 32 per cent. of combined sulphur. Experiments with balata gave almost exactly identical results with those obtained when using rubber. The authors consider that their results have placed the chemical character of hot vulcanisation beyond doubt, and state indeed that there are few chemical reactions which permit of such exact measurement and offer such great opportunities to the physical chemist.—A. S.

Vulcanised rubber ; Desulphurisation of ——. F. W. Hinrichsen and E. Kindscher. Z. Chem. Ind. Kolloide, 1912, **11**, 38—39.

In their previous work (see this J., 1912, 348) on the partial desulphurisation of vulcanised rubber by heating with alcoholic alkali in the presence of metals in an autoclave, the authors pointed out that the figures for combined sulphur in the treated rubber were probably too high, on account of the presence of inorganic combined sulphur. Further experiments have now been made, and an approximate estimation of the inorganic sulphur in the treated rubber (after extraction with acetone) effected by incinerating and determining the sulphur in the ash. Direct experiments showed that vulcanised rubber, when heated with oxides of the metals used to effect desulphurisation, left an ash containing no appreciable quantity of sulphur. Taking this inorganic combined sulphur into consideration, it was found that by heating with metals in presence of alkali for 2 hours at different pressures, the percentage of sulphur of vulcanisation in vulcanised rubber was reduced from 4·35 to 2·06, 1·96, 1·61 and 1·47 per cent. at 4, 6, 8, and 10 atmospheres pressure respectively. The character of the product also differed considerably according to the pressure attained in the treatment, the percentage of substances soluble in acetone being 25·40 in the original material, 56·86 after heating at 4 atmospheres pressure, 7·60 at 6, 2·78 at 8, and 26·67 at 10 atmospheres.—A. S.

Caoutchouc ; Determination of —— *as bromide by Hübener's method.* G. Hübener. Gummi-Zeit., 1912, **26**, 1711—1712.

Replying to the criticisms of Becker (this J., 1912, 693) the author suggests that the sticky product of bromination which is insoluble in chloroform, referred to, may be a bromination or an oxidation product of resin, since Becker does not state that the resins were removed by acetone extraction. Korneck has, however, shown that the error due to the presence of resins in Budde's process is very small, amounting to only about 0·25 per cent. by the volumetric and 1 to 1½ per cent. by the gravimetric method. It is pointed out also that in Budde's process a pure tetrabromide is not invariably obtained, but that the product of bromination often contains unaltered rubber and protein, as shown by Spence and Galletly (this J., 1911, 1075). On the other hand by means of bromine water, Utz has obtained bromides containing 70·21, 70·15, 70·18, 70·25, 70·12, and 70·12 per cent. of bromine, against the theoretical value of 70·18 per cent. In the case of reclaimed rubbers, having a relatively high acetone extract, the high proportion of product insoluble in chloroform arises not only from the extract but also from the vulcanised rubber present. The author has already observed that hard and soft rubber mixings form, with bromine water, bromides which go into the precipitate and increase the apparent rubber content as determined by the estimation of combined bromine. The method was therefore modified (this J., 1911, 224, 296) by introducing a preliminary extraction with acetone (or dichlorhydrin) ; and Spence and others have shown that the heating with nitric acid should be preceded by a fusion with sodium carbonate, and should not be too vigorous. Special experiments showed that the use of excess of bromine had no perceptible effect upon the amount of standard silver nitrate required in the final titration, whereas the samples extracted with acetone gave values for rubber 3½ per cent. lower than the unextracted samples. Hinrichsen and Kindscher (Chem. Zeit., 1911, No. 37 ; this J., 1911, 499) have shown that even highly purified rubber, prepared by Harries' method, gives rise to a small quantity of a sticky insoluble product with bromine. Unfortunately there is no means of determining the purity of the rubber employed. But Hinrichsen and Kindscher also showed that chloroform is a particularly good solvent for the bromide of vulcanised rubber. The author again points out that his process should only be used for vulcanised rubber samples.—E. W. L.

[*Rubber*]. *Para spots. A colloid-chemical phenomenon* R. Ditmar. Z. Chem. Ind. Kolloide, 1912, **11**, 36—37.

The author disagrees with Ahrens' view (see this J., 1912, 502) as to the nature of the so-called "Para spots," and is of the opinion that the cause of these is to be sought in the previous history of the rubber, in the coagulation process. "Para spots" are produced on vulcanising Para rubber and synthetic caoutchouc, both of which are characterised by a high degree of aggregation, but not with other rubbers of a high degree of dispersion. Para rubber is obtained from *Hevea brasiliensis* latex, in which, according to Fickendey, the globules of caoutchouc ("globuloids") have a diameter ranging from 0·5 to 2μ. On coagulation, coagula of different sizes (micro-coagula and macro-coagula) are produced, and on mixing with sulphur, the latter becomes unequally suspended, although this inequality is not apparent in the raw mixing. On vulcanisation, however, the colour of the vulcanised rubber varies according to the sulphur content, and the "Para spots" represent places in the rubber mass where, according to the sulphur content, there is a higher or lower degree of vulcanisation and hence a darker or lighter colour than in the surrounding material. In the case of synthetic caoutchouc, substances of differing degrees of polymerisation are produced from the isoprene, and this leads in like manner to inequality in the distribution of the sulphur. In the case of rubbers of a high degree of dispersion, there is not nearly so great a range in the size of the "globuloids" in the latex, and hence in the coagula produced, and so on mixing with sulphur, the latter becomes more uniformly distributed.—A. S.

Acrolein ; Preparation of ——. *See* XX.

Patents.

India-rubber ; Curing and manufacture [*coagulation*] *of* ——. A. Woosnam, London. From G. S. Brown, Talawakelle, Ceylon. Eng. Pat. 11,101, May 8, 1911.

Charcoal smoke is drawn by means of a fan through an apparatus wherein it is cooled down to about 75° F., and after washing with water, is delivered into a chamber where it is intimately mixed with the latex. Means are provided for keeping the water and excess smoke in circulation by means of pumps and fan respectively.—E. W. L.

Caoutchouc; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 23,723, Oct. 26, 1911.

See Fr. Pat. 438,778, of 1912; this J., 1912, 651.—E. W. L.

Glycerine; Manufacture of sulphur-derivatives from —— [*caoutchouc-like and horn-like substances*]. L. Lilienfeld, Vienna. Eng. Pat. 25,246, Nov. 13, 1911. Under Int. Conv., Nov. 12, 1910.

Dichlorhydrin is treated with stoichiometric proportions or an excess, of inorganic sulphides, preferably alkali sulphides, dissolved in water or alcohol. If concentrated or not too dilute solutions are used, solid bodies are obtained. The products separated from the mother liquor may be converted into solid, caoutchouc-like bodies by treating them with mineral acids, or substances which abstract water, or condensing or oxidising agents. By prolonged treatment with such agents the elasticity of the product is gradually removed and in the end a resin or horn-like substance results. Similar changes may also be effected by heat, applied either at atmospheric or increased pressure, in presence of a neutral diluting agent or an organic acid.—J. A.

Rubber; Processes for regenerating vulcanised ——. H. P. C. G. Debauge, Paris. Eng. Pat. 8992, April 16, 1912. Under Int. Conv., May 17, 1911. Addition to Eng. Pat. 7153, March 22, 1910.

See Addition of May 17, 1911, to Fr. Pat. 413,809 of 1910; this J., 1911, 1323.—T. F. B.

Artificial rubber; Process for the industrial manufacture of ——. G. Reynaud, Paris. U.S. Pat. 1,032,428, July 16, 1912.

See Fr. Pat. 419,860 of 1909; this J., 1911, 226.—T. F. B.

Process of producing (1) *piperylene,* (2) *isoprene,* (3) *erythrene, and* (4) *βγ-dimethylbutadiene*-1·3. U.S. Pats. 1,033,179, 1,033,180, 1,033,327, and 1,033,328. *See* XX.

XV.—LEATHER; BONE; HORN; GLUE.

Tannin analysis; Report of the Committee appointed to Revise the Official Method for ——. J. Amer. Leather Chem. Assoc., 1912, vii., 287—294. Leather World, 4, 571.

A special committee of the A.L.C.A. has revised the American official method of tannin analysis, both in wording and procedure, and has included the results of work done by individual workers as well as by members of the committee. The most important of these alterations are now given.

(1) *Raw and spent materials.*—In the preparation of the sample, and in the determination of the water, no departure from the present procedure is recommended. As to the amount of sample to be extracted, the present method calls for a solution for analysis containing between 0·35 and 0·45 grm. of tannin per 100 c.c., but the committee now believe that it is perfectly practicable to narrow the limits between 0·375 and 0·425 grm., without imposing unnecessary hardship upon the analyst, while bringing the strength of the analysis solutions in greater uniformity. This, in conjunction with the narrowing of the limits of the actual dry hide powder used in detannising, and the narrowing of the limit of the water-content of the wet hide (see below) should effect greater concordance in the non-tannin determination, since the proportion of hide to tannin must of necessity be more uniform in various laboratories, the fact being well established that the greater the proportion of hide to tannin, the less non-tannin returned. When extracting materials other than woods, bark, and spent residues, the time should be seven hours, and not six to eight hours, as previously given. Copper flasks must not be used, since this metal exerts a decidedly detrimental effect on tannin solutions after continued boiling. It has been suggested that tinned copper may not have the destructive action upon tannin solutions shown by copper, but further experiments must be undertaken to prove the point.

(2) *Analysis of extracts.*—For dissolving, it is recommended to wash into the flask with 900 c.c. of water at 85° C. The amount of sample to be taken for analysis has already been commented upon. For cooling solutions it is preferable to use water at 19° C. than at 15° C., the chance of precipitation being less. No change is made in the method for total solids. In regard to soluble solids, the temperature of the solution during filtration should not fall below 20° C., or rise above 25° C. In determining the non-tans, the wet hide powder must contain 71 to 74 per cent. of water, instead of 70 to 75 per cent., the limits previously prescribed. The limits of the dry hide should not be less than 12·2 or more than 12·8 grms. per 200 c.c., in place of 12 to 13 grms., as at present. The gelatin-salt test for the presence of tannin has been eliminated, it being of doubtful reliability.

(3) *Analysis of liquors.*—Under this heading there are no important changes from the present official method.

Patents.

Mocha or wash-leather; Manufacture of ——. M. Jirovsky, Berlin. Eng. Pat. 18,573, Aug. 17, 1911.

The skins are softened by soaking and then treated in a lye consisting of 250 kilos. of lime, 5 kilos. of potassium carbonate and 400 litres of water, which has been allowed to stand for 12 hours. After being immersed for 3 days, the skins are unhaired, rinsed in tepid water, again immersed for 5—6 hours, washed in cold water, clarified in a solution of 300 grms. of nitric acid in 100 litres of water, washed, smoothed, immersed in a solution of 1 kilo. of borax in 100 litres of water at 20° C., allowed to drain and dressed. In this way the skins can be made into mocha or wash-leather in 5—6 days.—J. R. B.

Quebracho extracts; Manufacture of ——. A. Redlich and G. Deutsch, Vienna. Eng. Pat. 7389, Mar. 26, 1912. Under Int. Conv., May 2, 1911.

In the manufacture of quebracho extracts phlobaphenes are produced. Phlobaphenes are almost insoluble in weak tanning solutions, but the solubility rises with increasing concentration and temperature. According to the present invention the phlobaphenes are separated from the clear tanning liquor by centrifugal action, the temperature being maintained constant at the point proper to the specific tanning operation, *e.g.*, 10°—15° C. for liquor tanning or 30°—40° C. for drum tanning.—J. R. B.

Tanning compound. B. W. Newman, Rocky Ford, Colo., Assignor to A. L. Turnipseed, Yampa, Colo. U.S. Pat. 1,034,283, July 30, 1912.

A mixture of ground chestnut oak bark (10 lb.), chicken dung (2 lb.), gum gambier (12 lb.), and water (10 galls.).
—A. S.

Glue and method of making the same. F. G. Perkins (G. S. Perkins, Executrix), South Bend, Ind., Assignor to Perkins Glue Co. Reissue No. 13,436, July 2, 1912, of U.S. Pat. 1,020,655, March 19, 1912.

See this J., 1912, 453.—T. F. B.

Manufacture of sulphur derivatives [*caoutchouc-like and horn-like substances*] *from glycerin.* Eng. Pat. 25,246. *See* XIV.

XVI.—SOILS; FERTILISERS.

Soil; Fertility of ——. A. D. Hall, Royal Institution. May 24, 1912.

The main factor determining fertility is the amount of nitrogen in the soil: this is subject to gains and losses which are under the control of the farmer. Under a

conservative system of farming, such as the Norfolk four-course rotation, the productivity of the land has remained pretty constant at about a level of 20 bushels to the acre from the time of Queen Elizabeth. The average yield of wheat over 10 year periods on the permanently unmanured plot at Rothamstead, is about twelve bushels to the acre. The removal of nitrogen in the crop is balanced by the amount which comes down in the rain, etc. In rich land the greater part of the nitrogen is wasted. In land allowed to run wild at Rothamsted the soil has gained nitrogen at the rate of 92 lb. per acre per annum. This explains the source of the vast accumulations of nitrogen in the old prairie soils, the increase being due to the development of azotobacter which derives from carbon compounds the energy required for nitrogen fixation. When sugar is applied to the land as a source of carbon for azotobacter, it must be applied in the autumn when the soil is hot. Sugar applied in the cold early spring gives a poor crop only, and putrefactive organisms develop instead of azotobacter. The serious losses of nitrogen in highly intensive agriculture, are due to bacteria, and the problem is to bring these under control as appears possible by partial sterilisation.
—E. F. A.

Phosphatic manures; Decomposition of —— in the course of a rotation. A. Müntz and H. Gaudechon. Comptes rend., 1912, **155**, 257—260.

A series of pot cultures were made with a three year rotation, the phosphatic manure being added at the beginning of the rotation. For each harvest the total weight of crop and the phosphorus in the crop were determined. The results indicate, alike for mono-, di- and tricalcium phosphates, that there is a considerable falling-off each year in the crop, which, in the third year, was no greater in all three cases than in control experiments in which no phosphate had been added to the soil. Similarly the amount of phosphate removed in the crop each year showed a marked falling-off and in the third year it was no greater than in the control experiments without phosphatic manure. In all, only 37 grms. of phosphate were removed out of 250 grms. originally added. The added phosphate thus loses its fertilising qualities in the soil and becomes inert like that originally present. In a rational system of manuring, phosphate must be added each year in small quantities according to the needs of the soil: it is useless to add it in large amount at the beginning of the rotation.—E. F. A.

Perchlorates and chlorates, nitrates and nitrites; Behaviour of —— in some biochemical experiments; and the reducing power of the root nodules of legumes (e.g., Vicia faba). U. Alvisi and M. Orabona. Gaz. chim. ital., 1912, **42**, I., 565—575.

Comparative experiments were made with water and with 0·2 per cent. solutions of potassium chlorate and perchlorate respectively; in some cases, also, with a 0·3 per cent. solution of ammonium perchlorate. Potassium chlorate was reduced to chloride by pepsin, papain, diastase, and by *Penicillium glaucum*. Potassium perchlorate was not reduced in any case. Ammonium perchlorate was not reduced by the three enzymes mentioned, but was reduced to a slight extent by *Penicillium glaucum*. Experiments with beans (*Vicia faba*) showed that the plants were less hardy in a 0·2 per cent. solution of potassium perchlorate than in water, thus justifying the opinion sometimes expressed that the small quantity of potassium perchlorate in Chile saltpetre may exert an injurious action on plants. Potassium chlorate, at first harmful, later exerted a favourable action, possibly owing to its slight antiseptic power. Experiments with the root nodules of beans confirmed the preceding results, in that the ClO'_4 anion was found to be more stable when combined with the $K^{\cdot}$ cation than when combined with the $NH^{\cdot}_4$ cation. Some experiments were also made with potassium nitrate and nitrite, and it was found that under certain conditions, the root nodules of beans are capable of reducing nitrates to nitrites and then to ammonia.—A. S.

Arsenic; Presence of —— in parasitic plants and their hosts. F. Jadin and A. Astruc. Comptes rend., 1912, **155**, 291—293.

Parasitic plants, like those growing directly in the soil, normally contain a small proportion of arsenic. A particular species although growing in different localities and on different hosts always contains about the same quantity of arsenic, in spite of the fact that the proportion in the various hosts shows considerable variation. This is clearly exemplified by mistletoe. There is no relation at all between the proportion of arsenic in the host and that in the parasite. The richness of the soil in arsenic does not have any preponderating influence on the amount of this element in the plants, which are able to absorb it in the necessary proportions irrespective of the amount in the soil. Results are quoted of the amount of arsenic in 19 parasitic plants and 12 host plants; there is considerable variation. In the case of mistletoe the arsenic amounts to 0·011 mgrm. in 100 mgrms. of the fresh plant.
—E. F. A.

Water-gas tar for killing weeds. See III.

Variations in the proportions of nicotine in various parts of the tobacco plant during growth. Chuard and Mellet. *See* XX.

Patents.

Manure; System for producing efficient fermentation of ——. G. Beccari, Florence, Italy. Eng. Pat. 7946, April 2, 1912. Under Int. Conv., April 12, 1911.

In order to prevent the usual serious loss of nitrogen during the fermentation of farmyard manure, a system is described consisting of a closed pit in which the manure is placed. The drainings are conveyed to a special well and air is introduced through sheet iron pipes thrust into the mass through openings in the side of the pit. The gases produced, including ammonium carbonate, rise into a small tower provided with horizontal perforated diaphragms on which vegetable earth is deposited. A rapid fermentation of the manure takes place and the temperature rises: the humidity can be regulated by watering with the drainings collected in the well. The gases formed are retained in the tower and oxidised to nitrates. When acid phosphates or calcium sulphate moistened with weak acid are used instead of earth, ammonium salts are obtained.
—E. F. A.

Fertiliser; Process of making ——. S. B. Newberry and H. N. Barrett, Baybridge, Ohio. U.S. Pat. 1,032,763, July 16, 1912.

See Fr. Pat. 430,997 of 1911; this J., 1911, 1400.—T. F. B.

Phosphorites; Art of converting ——. H. V. Dunham, Bainbridge, N.Y., Assignor to Nacirema Chemical Co. Vermont. U.S. Pat. 1,034,090, July 30, 1912.

See Eng. Pat. 19,043 of 1911; this J., 1911, 1325.—T. F. B.

XVII.—SUGARS; STARCHES; GUMS.

Crystal content of raw sugar; Determination of the ——. W. Meyer. Deutsche Zuckerind., 1912, **37**, 665—667.

For determining the crystal content of raw beet sugars, the author uses a process similar to that recently described by Herzfeld and Zimmermann (this J., 1912, 244), but less complicated, and consequently more suited for routine work in the factory. A small hand centrifugal, such as that used for the determination of coagulable substances in beet juices, but provided with a jacket, open above, so that the syrup discharged may be observed, is recommended. In place of the sediment glasses, conical filtering funnels of the form and dimensions shown (Fig. 1) are used, having a bottom consisting of wire gauze of fine mesh, and a well-fitting cover. Into one of these funnels, 25 grms. of the raw sugar, free from lumps, are weighed, and pressed down by a glass stopper (Fig. 2). After fixing the funnel in a suitable stand, 25 c.c. of covering liquor, prepared according to Herzfeld's directions, 334 grms. of refined sugar being dissolved in 166 grms. of water, are poured over the sugar, the vessel covered, and allowed to stand for one hour after the first few drops pass through the sieve bottom. The funnel is then placed in the centrifugal, the speed of which is gradually raised, the operation taking 10—11 minutes after the first few drops of syrup appear. During the 1911-12 campaign, determinations were made by this process, in each case washing requiring 1 hour, and machining 10 minutes, the results obtained in three of the samples examined being as follows: polarisation, (1) 95·15, (2) 94·80, (3) 95·00; ash, (1) 1·035, (2) 1·260, (3) 1·180 per cent.; rendement, (1) 89·98, (2) 88·50, (3) 89·10; and crystal content (1) 92·36, (2) 90·36, (3) 90·39 per cent. It is pointed out that the colour of the crystals obtained by this process must be noted, for, as is known, a dark sugar giving a white crystal is more valuable in the refinery than a light sugar yielding a more or less dark crystal. It is also stated that this process should be of use within certain limits in controlling the boiling process, for by determining the crystal content of the raw sugar it is possible to compute how much white crystal sugar a strike has given, calculation of the rendement from the sucrose and ash contents not being applicable here on account of the effect of the adhering syrup. This is best done by using, not the machined sugar, but the massecuite just before placing in the centrifugals.—J. P. O.

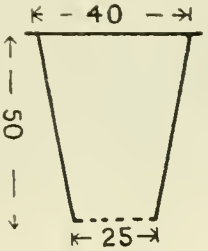


Fig. 1.

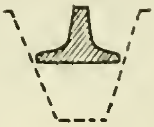


Fig. 2.

Bagasse; Heat of combustion of —— from Hawaiian cane. R. S. Norris. Bull. 40. Agric. and Chem. Series. Expt. Station, Hawaiian Sugar Planters' Assoc., 1912.

When burning bagasse for the production of steam in sugar factories, it is noticed that the efficiency of the furnaces may vary rather considerably. This is not due to the varying thermal value of this fuel, for, using the Atwater modification of the Berthelot bomb calorimeter, and the bagasse from a number of different varieties of cane of varying fibre content, grown in the Hawaiian Islands, the thermal value was found to be practically constant throughout, the maximum figure obtained being 8344 B.T.U. (4636 calories) and the minimum 8089 B.T.U. (4494 calories), a difference of only 3 per cent. Of the different varieties of cane used, Yellow Caledonia, Lahaina, Rose Bamboo, and many Hawaiian seedling canes, the two former have the highest fuel value, whereas Rose Bamboo has the lowest of all. In other experiments distinction was made between the thermal value of the bagasse, which may contain more or less unextracted sugar, and that of the fibre alone, which has a higher thermal value than sugar. The results obtained show that the dry bagasse from mills in the Hawaiian Islands has a thermal value that is about 100 calories less than the cane fibre, the average results in the cases of Yellow Caledonia and Lahaina canes being 8100 B.T.U. (4500 calories) and that of the fibre from the same canes, 8280 B.T.U. (4600 calories). It is pointed out that for practical purposes the amount of heat obtainable from a bagasse is not dependent solely on its thermal value, but also upon (a) its water content, and (b) the total heat carried away by the products of combustion and the excess of air in the furnaces. From the author's calculations it appears regarding (a) that with a bagasse of a water content of 45 per cent., and a stack temperature of 500° F., if the temperature of the water in the bagasse be 85° F., the loss of heat is 57 B.T.U. to raise the water to boiling point; 435 B.T.U. to convert it into steam; and 62 B.T.U. to raise the temperature of the steam to 500° F.; a total of 554 B.T.U. As to (b), the heat carried away by the products of combustion and excess of air, it is calculated that assuming the temperature of the air entering the furnace to be the same as that of the bagasse, viz., 85° F., this amounts to: loss from the combined water, 347; loss from water vapour, 18; loss from carbon dioxide, 87; loss from nitrogen, 238; and loss from excess air (100 per cent.), 302, a total of 992 B.T.U. Taking the average thermal value of the bagasse as 4455 B.T.U., the heat available for generating steam from 1 lb. is 4455—(554+992)=2909 B.T.U. Finally a table is given showing the net fuel values, *i.e.*, the thermal value less that heat lost by (a) the water content, and (b) the total heat carried away by the products of combustion in the cases of different water contents, some of these being as follows: 42 per cent., 3129 B.T.U.; 44, 2982; 46, 2835; 48, 2687; and 50, 2540.—J. P. O.

Betaine hydrochloride; A new process of obtaining —— from molasses. Separation of glycine, betaine and glutamic acid. Absence of betaine in the products of hydrolysis of proteins. H. Stoltzenberg. Ber., 1912, **45**, 2248—2252.

Molasses residues contain alkali salts, sugars, soluble non-sugars, glutamic acid, and betaine. On saturation with hydrogen chloride gas, the alkali salts are converted into chlorides and precipitated; glutamic acid forms the hydrochloride and is precipitated, the sugars form humus substances and also fall out of solution. The remaining solution, which contains betaine hydrochloride and non-sugars, is concentrated to a syrup and alcohol added, whereupon betaine hydrochloride is precipitated. From a mixture of glycine, betaine and glutamic acid, the last is precipitated on saturation of the solution with hydrogen chloride, and the betaine removed on evaporating the filtrate to a syrup and adding alcohol. About 75 per cent. of the amount of each constituent used is recovered by this process. Betaine has not been found among the products of hydrolysis of animal or vegetable proteins.—E. F. A.

Patents.

Starch-flour; Manufacture of ——. J. Kantorowicz. Breslau, Germany. Eng. Pat. 9082, April 17, 1912. Under Int. Conv., April 20, 1911.

Potato- or other starch is made into a pulp with cold water and poured on to heated cylinders or plates, whereby it is converted into paste and dried almost simultaneously. The flaky product, after grinding, forms a starch-flour soluble in cold water.—J. H. L.

Sugar; Process of crystallising ——. P. Kestner, Lille, and P. Lagrange, Paris. U.S. Pat. 1,031,559, July 2, 1912.

See Fr. Pat. 394,493 of 1908; this J., 1909, 212.—T. F. B.

Organic coloring-matter [caramel]; Method of producing ——. M. Wechsler, Kensington, Assignor to Gillman and Spencer (1902), Ltd., London. U.S. Pat. 1,031,602, July 2, 1912.

See Eng. Pat. 13,225 of 1910; this J., 1911, 1226.—T. F. B.

Production of paper [from megasse]. Eng. Pat. 26,043. *See* V.

Preparing mineral acid esters of carbohydrates and the corresponding hydroxy-acids and polyhydric alcohols. Ger. Pat. 247,809. *See* XX.

XVIII.—FERMENTATION INDUSTRIES.

Malting floor; Practical significance of withering on the ——. A. R. Ling. Brewers' J., 1912, 48, 439.

One of the most important practical points established by the author's researches on malting (this J., 1912, 740) is that the maximum increase in the diastatic power of the germinating grain occurs at the final stages of the flooring process, and this increase is certainly stimulated by withering. It is not contended that withering in itself, however produced, has any useful importance, but when it occurs at the correct period it is an outward symptom accompanying the internal modification which results in mellowness. The fact that this period synchronises with that of the maximum diastatic power affords a means of measuring to some extent the degree of mellowing. H. T. Brown has pointed out that, especially at the later stages, the undisturbed pieces become highly charged with carbon dioxide, whereby respiration and active growth become impeded, but it must be assumed that the internal digestive processes, which produce mellowness of the corn, still continue. When the grain is in the steep or in the early stages on the floor, a free circulation of air is most important, to keep the pieces fresh and to sustain a vigorous growth. But as soon as the acrospire has attained a length of about three-fourths of that of the corn, further respiratory activity is undesirable and uneconomical. At this stage, about the end of the eighth day, the rootlets begin to lose their fresh appearance, and the piece may be thickened up gradually, but should be disturbed as little as possible in the process. It is remarkable that the changes, of which withering is the symptom and mellowness the result, are accompanied by the loss of a comparatively slight amount of water. A good indication that mellowing is proceeding satisfactorily is afforded by the temperature of the piece, which should not rise much above 60° F., and according to the author's recent results, a further measure should now be available by observations of the increase in the diastatic power. On the other hand, if more than 40 per cent. of moisture be present in the grain when the time comes for thickening up, the temperature of the thickened pieces will tend to rise above 60° F. and sweating will set in, resulting in abnormal loss of weight and forced malt, besides preventing the mellowing of the corn.—J. F. B.

Tartaric acid; Action of yeast on ——. L. Karczag. Biochem. Zeits., 1912, 43, 44—46. (See also this J., 1912, 246.)

Solutions of free *d*-tartaric acid, after admixture with yeast (races D and K) were kept for 2—3 months at 38° C. No putrefaction occurred. An odour of volatile fatty acids became perceptible after a few days. Carbon dioxide was evolved and the liquid became yellowish brown. In 2—3 months 30—50 per cent. of the tartaric acid was decomposed. Propionic, butyric, lactic and succinic acids, and possibly acetaldehyde, were present in the product. The action of the yeasts on free tartaric acid appears, therefore, to lead to the formation of reduction-products of the latter.—J. H. L.

Aluminium; Behaviour of —— *towards beer, water and air.* F. Schönfeld and G. Himmelfarb. Woch. für Brau., 1912, 29, 409—411. (Compare Chapman, this J., 1912, 87.)

The use of aluminium fermentation tuns is making steady progress, and already such tuns have been under observation for four years in a fermentation cellar, and show no signs of injury by chemical action. The authors have procured plates of the aluminium used for constructing these tuns from various manufacturers and have submitted them to systematic tests. Plates were suspended in ordinary fermentation tuns in regular use, some being hung vertically, totally immersed, and others allowed to rest horizontally on the bottom to allow the yeast to settle on them. The plates were left in the tun for 4½ months and were then found to have gained slightly in weight, owing to a deposit of beer-scale. This consisted largely of calcium phosphate and on being removed by nitric acid, the aluminium was found absolutely unaffected. Similar results were established with plates suspended so as to be only partially immersed in the fermenting beer, the rest being above the normal surface-level. This resistance of aluminium was confirmed with beers of top and bottom types, as well as with "Weissbier." It relates, however, only to purely chemical actions, since it is well known that aluminium may be attacked when in galvanic contact with other metals such as copper or brass. Towards moisture and air aluminium is less resistant; it undergoes a sort of rusting process with the formation of efflorescent patches of aluminium oxide and underlying pitting. Such oxidation has been studied in the case of domestic utensils by Heyn and Bauer (this J., 1911, 218), who found that hard, cold-rolled or drawn metal was more susceptible than softer aluminium. The authors have confirmed this observation of rusting in the case of plates exposed to moisture and air in the fermentation cellar, although the extent of the damage was in no case so great with these plates as in the instances studied by Heyn and Bauer. The conclusions drawn by the authors are that aluminium may be recommended with full confidence as a perfectly resistant material for the construction of fermentation tuns, but that it is advisable to coat the outside of the tuns with some protective layer, such as lacquer, pitch or waterproofed paper, and that a coating of lacquer be also applied to the upper portions of the inside of the tuns, above the surface of the beer where the metal is constantly exposed to the action of moist air.—J. F. B.

Sucrose; Detection of —— *in grape-juice and wines.* S. Rothenfusser Zeits. Unters. Nahr. u. Genussm., 1912, 24, 93—104

Sugars other than sucrose may be destroyed by treatment with solutions of the alkalis or alkaline earths followed by oxidation with hydrogen peroxide, and the author now carries out his process (this J., 1909, 956; 1910, 584 and 712) for the detection of sucrose in grape-juice and wines in the following manner, using as an indicating reagent a solution prepared by adding 20 c.c. of a 10 per cent. alcoholic solution of diphenylamine to 60 c.c. of glacial acetic acid and 120 c.c. of concentrated hydrochloric acid. *Grape-juice:*—5 c.c. of the juice are added to a solution of 6 grms. of barium hydroxide in 25 c.c. of water to which has been added 25 c.c. of a 3 per cent. solution of hydrogen peroxide. The mixture, contained in a glass or nickel basin, is heated on a water-bath for 20 min. and if, during heating, a yellow colour is developed, hydrogen peroxide solution is added drop by drop until the colour is destroyed. The liquid is filtered and 5 c.c. of the filtrate are heated in a boiling water bath with an equal volume of the diphenylamine reagent. In from 7—8 min. a strong blue colour is developed if only 0·1—0·2 per cent. of sucrose is present in the original juice. After more prolonged heating, some juices, known to be free from sucrose, give a slight colouration, but this cannot be mistaken for the colour developed when sucrose is present. *Dry wines:*—10 c.c. of the wine are added to 50 c.c. of a 5 per cent. barium hydroxide solution which has been mixed with 10 c.c. of a 3 per cent. hydrogen peroxide solution, and the test is proceeded with as described for grape-juice. It is not necessary to remove the colour of red wines, as this is destroyed in carrying out the test, and if the wine is unusually acid it can be neutralised by using a sufficient excess of barium hydroxide solution. *Sweet wines:*—10 c.c. of the wine are shaken with 50 c.c. of acetone and the cloudy solution is filtered, a pinch of purified kieselguhr having been added to assist clarification. Thirty c.c. of the filtrate are mixed with 30 c.c. of water, and the mixture is heated on a water-bath until the acetone has been driven off. Six grms. of barium hydroxide and 25 c.c. of a 3 per cent. hydrogen peroxide solution are added, and the whole stirred until the barium hydroxide is dissolved. If a yellow colour is developed it is removed by small additions of hydrogen peroxide and after heating for 20 min., the liquid is filtered. Five c.c. of the filtrate are shaken with 5 c.c. of dilute sulphuric acid and 5 c.c. of the diphenylamine reagent, and the mixture heated for 8 min.

in a boiling water-bath. On allowing the separated barium sulphate to settle, the clear liquid will be of a strong blue colour if sucrose is present. As almost all sweet wines, from a cause which has not yet been investigated, give a weak colouration, equal to that produced by 0·02—0·1 per cent. of sucrose, such weak indications must be neglected.—J. A.

Pyridine bases as a denaturing agent for alcohol. G. Kraemer. Z. Spiritusind., 1912, **35**, 417.

In 1888 the author was a member of the commission which established the German specification for the denaturing of alcohol, which has remained in force since that time, *viz.*, 2 parts of wood spirit and 0·5 part of pyridine per 100 parts of alcohol. Most countries have recognised that wood spirit alone, in spite of the presence of acetone and bodies which absorb bromine, does not fulfil all the requirements of an effective denaturing agent. In recommending pyridine as a subsidiary component of the mixture, the commission took into account the following properties:—it imparts an extremely disgusting taste to the spirit; it is readily procurable; it is miscible with water in all proportions; at the dilution employed it is absorbed by wood charcoal only to a small extent; in consequence of its feeble basicity it is fixed by mineral acids only when they are used in large excess; it increases the solvent power of the alcohol; it is combustible without residue and is non-injurious to health at the dilutions employed. Since the adoption of pyridine a large number of chemical substances have been advocated for the same purpose, but none of them possesses all the desirable properties which are found in the case of pyridine. The continued use of pyridine, in view of the great increase in the consumption of denatured spirits, is undoubtedly largely due to the decreased cost of production brought about by the process of separating this base as a by-product in the manufacture of ammonia from coal tar oils, whereas formerly it was only obtainable from bone-tar. The author regards the property of complete miscibility with water as one of the most valuable qualifications of a denaturing agent, and views with disapproval the raising of the specification for boiling point to 160° C., whereby constituents are included which are insoluble in water and which are more readily removable by means of wood-charcoal than pyridine itself.—J. F. B.

Methyl alcohol; Determination of ——. F. Wirthle. Z. Unters. Nahr. u. Genussm., 1912, **24**, 14—26.

For the determination of methyl alcohol when mixed with ethyl alcohol, as in spirits adulterated with denatured alcohol, the author has devised a method based on the fact that equal quantities of the two alcohols yield widely different weights of the respective iodides. The sample of spirit (100 c.c.) is first submitted to 4 or 5 distillations and fractionations with additions of ethyl alcohol, so as to obtain finally about 120 c.c. of alcoholic distillate containing the whole of the methyl alcohol in the sample. Ten c.c. of this distillate are treated with the calculated quantity of iodine and phosphorus under prescribed conditions and the mixture of iodides formed is purified and weighed. The average yields obtained from 10 c.c. of the pure alcohols were found to be 23·72 grms. of ethyl iodide and 31·47 grms. of methyl iodide (about 90 per cent. of the theoretical amounts). From the yields, intermediate between these values, obtained from mixtures of the two alcohols, the proportion of methyl alcohol in the mixtures can be calculated. The author found, for example, 12 and 28·35 per cent. of methyl alcohol in test mixtures containing respectively 10 and 30 per cent.; but on changing the flask used for the conversion of the alcohols into iodides, results differing very seriously from the earlier ones were obtained. The cause of these discrepancies is being investigated. The presence of methyl iodide when mixed with ethyl iodide can be confirmed by fractionation, which permits a partial separation, or by determining the saponification-value of the mixture (see this J., 1912, 454). Both iodides (0·5 c.c. weighed into a tared stoppered flask containing 20 c.c. of alcohol) are completely saponified by adding excess of $N/2$ alcoholic potash solution, allowing the mixture to stand all night and afterwards heating it for an hour under a reflux condenser; the excess of alkali can be determined by means of $N/2$ hydrochloric acid in presence of phenolphthalein. —J. H. L.

Patents.

Stout and beer; Manufacture of ——. J. L. Baker, Staines, Middlesex. Eng. Pats. 23,839, Oct 27, 1911, and 5561, March 5, 1912.

To increase the nutritive value of stout and beer, separated (skimmed) milk, which may be in the condensed or dried form, is added at some stage of the brewing process. The addition is best made before the mashing operation, and then the latter is conducted at a temperature (*e.g.*, 60°—63° C.) [140°—145°.4 F.] favourable to the proteolysis of the nitrogenous constituents of the milk. —J. H. L.

Preparing cream of tartar. Ger. Pat. 247,452. *See* VII.

Preparing alkali tartrate solutions from crude tartaric materials. Ger. Pat. 248,163. *See* VII.

Methyl alcohol from waste products of the caustic soda cellulose process; Method of producing ——. U.S. Pat. 1,032,982. *See* V.

XIXa.—FOODS.

Adulterations [of fruit jellies and jams]; Detection of —— by colloid-chemical methods. E. Marriage. Z. Chem. Ind. Kolloide, 1912, **11**, 1—5.

When a reaction is caused to take place in a gel, the appearance of the reaction product varies according to the nature of the gel, and the author describes some experiments made with a view to apply this fact to the detection of adulteration of fruit jellies and jams. The reaction selected was the formation of lead iodide (see Hatschek, this J., 1911, 256), and the appearance of lead iodide when produced in a number of gels of different composition, both with and without addition of sugar, is described and illustrated. The tests were made in test-tubes and also on microscope slides. As an example it may be stated that whilst in a pure currant jelly, the aggregates of lead iodide were all in the form of thin circular scales with concentric bands, two distinct forms could be observed in the lead iodide produced in a sample of commercial currant jelly: the larger aggregates resembled those observed in the pure jelly, but in many cases possessed a visible nucleus, whilst the smaller aggregates were quite different and exhibited well-defined Liesegang-rings. A sample of pure gooseberry jelly gave results almost identical with those obtained with the commercial currant jelly, and it is probable that the latter was adulterated with gooseberry jelly, possibly also with agar.—A. S.

Formic acid in fruit products; Detection of ——. F. L. Shannon. J. Ind. Eng. Chem., 1912, **4**, 526—528.

The usual methods for the detection of formic acid, which is now being used for the preservation of fruit products, are based upon its power of reducing silver nitrate or mercuric chloride. These tests are however not conclusive, for many other substances besides formic acid yield, on distillation with steam, a distillate capable of reducing silver nitrate and mercuric chloride. According to the author, formic acid can be identified with certainty in fruit products by distilling the sample with steam, and (1) reducing the distillate with magnesium and dilute sulphuric acid, and testing for formaldehyde; or (2) treating the distillate with lead hydroxide, and separating by crystallisation any lead formate produced. The lead formate may be identified by the reducing action of its aqueous solution on silver nitrate, mercuric chloride, and platinum chloride, by the evolution of carbon monoxide when it is warmed with sulphuric acid, and by the liberation of formic acid when it is heated with concentrated phosphoric acid.—A. S.

Prussian blue in tea; Detection of ——. F. West. J. Ind. Eng. Chem., 1912, 4, 528.

The finely ground tea, after passing through a 20-mesh sieve, is sprinkled over pieces of thin smooth filter paper, which have been saturated with oxalic acid solution and then pressed on to glass plates. After allowing to dry in the air, the filter papers are removed from the glass plates, and the tea removed with a stiff brush. The presence of Prussian blue is indicated by blue spots on the paper. The natural colouring matter of tea does not stain the paper.—A. S.

Milk and Cream (No. 1). Counties and Boroughs. (Sale of Food and Drugs Acts Authorities.) Regulations under the Public Health (Regulations as to Food) Act, 1907. Local Government Board, Whitehall, S.W., 6th August, 1912. Wyman and Sons, Fetter Lane, London, E.C.

The Local Government Board has had under consideration and inquiry the addition of preservatives and other foreign substances to milk and cream and the importance of controlling such additions, and they have now made regulations under that Act entitled "The Public Health (Milk and Cream) Regulations, 1912." An Order containing these Regulations has been issued. The Regulations are designed to secure that no preservative shall be added to milk, or to cream containing less than 35 per cent. by weight of milk fat, at any stage from the place of production to that of delivery to the purchaser. In the case of cream containing over 35 per cent. of milk fat, the addition of boric acid, borax, or a mixture of these preservative substances, or of hydrogen peroxide, is not prohibited by the Regulations, but is subject to a system of declaration which is required to be followed by all persons dealing with such cream for the purpose of sale for human consumption. By this system (Part II. of the Regulations) it is intended that preserved cream as an article of commerce shall in all stages be differentiated from cream to which no preservative has been added. Article IV. (*a*) prohibits the addition of any thickening substance to cream or preserved cream.

Except as regards Part III. the duty of administering the Regulations has been placed upon those authorities in England and Wales who are local authorities under the Sale of Food and Drugs Acts. Existing arrangements for the collection and examination of milk samples under the Sale of Food and Drugs Acts can be extended to enable the Council to receive reports from the public analyst. Arrangements will be required for the periodical examination of samples of cream for the purpose of ascertaining whether the requirements of the Order are being duly complied with. Article VI. requires that before the local authority institute proceedings against any person for contravention of any of the Regulations in Part II. of the Order, the local authority shall afford him an opportunity of furnishing an explanation. The proceedings here in question are those authorised by the Public Health (Regulations as to Food) Act, 1907, and the enactments referred to in the Notice at the foot of the Order.

The Medical Officer of Health is to exercise general supervision over the action taken in pursuance of these Regulations, and the officer of the Council who directs sampling under the Sale of Food and Drugs Acts is to confer with the Medical Officer of Health and with the Public Analyst as to the details of procedure necessary to secure the observance of the Regulations.

The Regulations will as regards their main provisions take effect on and after October 1st next, and as regards Article V (1) on January 1st, 1913. The Board is anxious to secure uniformity in the administration of the Regulations and will be glad to have their attention drawn to any cases of difficulty which may arise.

Patents.

Desiccation of meats and other substances containing water or other absorbable or condensable liquids; Process and apparatus for ——. C. Tellier, Paris. Eng. Pat. 16,206, July 13, 1911. Under Int. Conv., July 15, 1910.

The material is dried in a vacuum in presence of an absorbent, the vacuum being produced by first exhausting the air as far as possible, then admitting carbon dioxide and again exhausting, and finally absorbing the residual carbon dioxide by means of potash. Claim is also made for an apparatus for carrying out this process and for a device for indicating automatically the loss of weight undergone at any moment by the material being dried. —J. H. L.

Sterilizing and preserving milk; Process and apparatus for ——. T. G. Mollinger, Philadelphia, U.S.A. Eng. Pat. 20,634, Sept. 18, 1911. Under Int. Conv., Sept. 22, 1910.

Milk is driven under high pressure (600 lb. per sq. in.) by means of a steam pump through an apparatus consisting of a heating element and a cooling element into a reservoir. The heating element consists of an outer (4 inch) pipe containing a number of copper tubes about 5/16 in. in diameter and about 10 ft. long, these tubes being connected in series so as to form virtually one long continuous tube. It is designed to heat rapidly the milk flowing through it to a temperature between 130° and 155° C., and to this end is heated by means of steam. The time taken for the milk to flow through the tube is only about 2 seconds. From the heating element the milk flows through a pipe to the cooling element, which is an arrangement similar to the heating element except that the copper tubes are in parallel instead of being in series. This cooler is designed to reduce the temperature of the milk to about the boiling point, but not much below—*e.g.*, 98° C—, and to effect this reduction of temperature in about two seconds. From the cooler the milk passes to the reservoir, which is provided with a steam inlet for cleansing, and with a vent plugged with cotton wool or other suitable material. From the reservoir the milk is run into suitable sterilised bottles, which are filled as nearly full as possible and sealed. Arrangements are made so that the time required for the milk to cool down to 70° C. in the receivers may be about 15 minutes, this precaution being necessary in order to destroy any germ life accidentally introduced in the "bottling" process. —E. W. L.

Pasteurising apparatus. A. A. Pindstofte, Copenhagen. Eng. Pat. 22,827, Oct. 16, 1911. Under Int. Conv., Oct. 19, 1910.

In the apparatus described, perforated frames containing the bottles are arranged to move through a tank of water, heated to the desired temperature, and, in order to prevent unequal heating, the front faces of the trays are provided with plates and slides which can be adjusted (*e.g.*, by means of springs) so as completely to fill up the cross-section of the tank, thus forcing the heated water to pass through between the bottles instead of escaping (in part) between the walls of the tank and the frame, as the latter moves forward.—E. W. L.

Cocoa; Manufacture of a liquid ——. T. Reisenheim, London. From F. Korff und Co., Amsterdam, Holland. Eng. Pat. 6105, Mar. 11, 1912.

Five lb. of milk sugar are dissolved in 26 galls. of boiling distilled water, and the liquid is kept boiling whilst the following ingredients are added, separately and in small quantities :—66 lb. of decorticated, roasted and ground cocoa, 11 lb. of caramel in the form of powder, 240 lb. of cane sugar, 2¾ lb. of pepsin chloride, 17 oz. of potassium carbonate and 7 oz. of vanillin. The hot liquid is passed through a silk sieve of fine mesh, and allowed to cool for 12 hours in copper vessels specially designed to facilitate the subsequent removal of the fat which rises to the surface during cooling. The creamy liquid, after separation from this fat, is milled, to reduce the size of the suspended particles, and afterwards filled into bottles which are then sterilised, unstoppered, at 80° C., and again, after stoppering, at 120° C.—J. H. L.

Oil-cakes containing sinigrin or sinalbin; Process for preventing the formation of mustard oil in ——. O. Brücke. Ger. Pat. 247,427, May 12, 1911.

The oil-cake is exposed to a dry heat at a temperature above 100° C., for 1—2 hours, in order to destroy the myrosin, and are then immediately cooled in a suitable manner.—A. S.

Flour, semolina, and the like; Apparatus for the treatment of ——. F. H. Loring, London. U.S. Pat. 1,032,223, July 9, 1912.

See Eng. Pat. 18,330 of 1911; this J., 1911, 1276.—T. F. B.

Flour, semolina, and the like; Process for the treatment of ——. F. H. Loring, London. U.S. Pat. 1,032,224, July 9, 1912.

See Eng. Pat. 6721 of 1910; this J., 1911, 569.—T. F. B.

Cocoa-powder; Method of producing ——. F. E. F. Neumann, Wandsbek, Germany. U.S. Pat. 1,032,931, July 16, 1912.

See Eng. Pat. 481 of 1910: this J., 1910, 778.—T. F. B.

Food-fats; Process of producing ——. P. A. Schmitt, Hamburg, Germany. U.S. Pat. 1,034,036, July 30, 1912.

See Fr. Pat. 437,665 of 1911; this J., 1912, 554.—T. F. B.

XIXb.—WATER PURIFICATION; SANITATION.

Thermo-mineral waters of Usson; Radio-activity of ——. G. Massol. Comptes rend., 1912, **155**, 373—375.

The Usson springs consist of three groups: (1) Source Condamy, 3 springs, (2) Source des Plaies, 1 spring, and (3) Source Soumain, 2 springs. They all contain about the same quantity of sulphur. The waters from the first two groups evolve on boiling about 16—20 c.c. per litre of gas which contains about 1 per cent. of carbon dioxide and hydrogen sulphide, the remainder being nitrogen and inert gases. The gases are radioactive and the calculated activity of the waters is the same for both groups.—W. H. P.

Carbon monoxide; Construction of a toximeter for ——. A. Guasco. Comptes rend., 1912, **155**, 282—284.

The principle of the apparatus is based on the known property of platinum black or spongy platinum to absorb carbon monoxide and become heated. A differential thermometer is constructed consisting of a U-tube surmounted by two bulbs, one of which is coated with platinum. The U-tube remains uncovered and open to view, but the bulbs are hermetically enclosed in a container, so as to be isolated from all contact with the atmosphere, though the gas itself has access to them by endosmose through a porous septum. The U-tube (outside the envelope) is furnished to about one third of its height with a coloured liquid, so that the least alteration of level can be read off. A very small variation in temperature is thus rendered visible by a difference in level in the arms of the U-tube. A proportion of 1/1000 of carbon monoxide causes a difference of 13 mm. and the apparatus is sensitive to 1/10,000 of carbon monoxide. It can be graduated to indicate the proportion of carbon monoxide present, and if the coloured liquid be replaced by mercury, audible warning of a dangerous proportion of carbon monoxide can be given by means of an electrical device.—E. F. A.

Tobacco growing in Great Britain. Government action. Times, August 6th, 1912.

The Government has accepted Mr. C. Bathurst's amendment on the Finance Bill, the effect of which will be to exempt from payment of Excise duty all tobacco grown in this country by responsible persons under licences from the Treasury, for the extraction therefrom of nicotine to be used in the preparation of insecticides or otherwise for purely agricultural or horticultural purposes. (See this J., 1912, 401.)

Variation in proportion of nicotine in various parts of the tobacco plant in course of growth. Chuard and Mellet. *See* XX.

Hygiene of the lead colour industry in Germany. Rambousek. *See* XIII.

Patents.

Sterilising water or other liquids by means of ultra-violet rays produced in a quartz lamp; Process and apparatus for ——. W. P. Thompson, Liverpool. From Ozonges. m.b. H., Berlin. Eng. Pat. 28,757, Dec. 20, 1911.

For the purpose of sterilising water and other liquids it is preferable to keep the vapour pressure in the mercury lamp employed as low as possible; hence the electrode-containing cells must be efficiently cooled. On the other hand in order to avoid contact between the quartz globe of the lamp and the liquid (which contact is undesirable), a quartz jacket is employed and the interspace is exhausted. In the lamp described, the quartz jacket does not extend to the electrode-containing cells at the ends of the lamp, and these cells are connected with the jacketed illuminating tube by bends. The electrodes are thus kept cool by the liquid being sterilised (or, where this is warm, by some external means) and the vapour pressure of the mercury is kept low.—E. W. L.

Sea-water evaporators. W. Weir, Glasgow. Eng. Pat. 2812, Feb. 3, 1912.

The heating coils of a sea-water evaporator consist of a number of separate flat horizontal coils arranged one above the other, and the inlet and outlet ends of each coil are arranged parallel to each other on the same side of the coil, so that they can be bolted respectively to steam admission and exhaust chambers disposed vertically in the lower part of one side of the evaporator chamber, and can also be inserted or withdrawn through a door on the other side of the evaporator chamber by a single straight line movement.—H. H.

Aqueous solutions and tobacco lyes containing free nicotine; Processes and apparatus for concentrating ——. J. Sartig, Steglitz, Germany. Eng. Pat. 28,085, Dec. 13, 1911.

See Fr. Pat. 438,175 of 1911; this J., 1912, 601.—T. F. B.

Disinfecting agents [Mercury derivatives of substituted benzoic acids]. M. Engelmann, B. Merkel, and G. Wessenberg, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,034,093, July 30, 1912.

See Eng. Pat. 28,049 of 1910; this J., 1911, 572.—T. F. B.

Disinfecting agent. L. Taub, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,034,166, July 30, 1912.

See Eng. Pat. 28,049 of 1910; this J., 1911, 572.—T. F. B.

Ascertaining and indicating the presence of gases other than those ordinarily contained in the atmosphere. Eng. Pats. 19,663 and 22,909. *See* XXIII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Pilocarpine in the presence of quinine; Detection of ——. G. Meillère. J. Pharm. Chim., 1912, 6, 108—109.

The slightly acid solution containing the pilocarpine and quinine is treated with a solution of potassium bichromate as long as a precipitate is formed. The mixture is shaken out with chloroform, which dissolves the quinine chromate but leaves the pilocarpine chromate.

After removing the chloroform, hydrogen peroxide is added to the aqueous portion, when the characteristic colouration due to pilocarpine is readily obtained.—F. Shdn.

Nicotine ; Variations in the proportion of —— in various parts of the tobacco plant in the course of growth. E. Chuard and R. Mellet. Comptes rend., 1912, **155**, 293—295.

On account of the value of nicotine as an insecticide, tobacco is now specially cultivated with the sole object of producing this alkaloid. In estimating the amount of nicotine in different parts of the plant at intervals during growth, it has been found that a considerable loss of nicotine takes place when the fresh plant is dried. The seeds were sown in April 25th ; on May 15 no nicotine could be determined, on June 16 the leaves contained 0·35 per cent., the roots 0·15 per cent. The amount in the leaves increased to 3·12 per cent. on August 9, and 4·79 per cent. on September 18 ; the roots contained on these dates 0·69 and 0·64 per cent. Practically as much nicotine was present in the stalks ; the lateral shoots contained over 1 per cent. and the growing shoot 0·49 per cent. When the leaves were gathered (18 September), the rejected portions contained therefore a considerable proportion of nicotine : it is desirable to devise an inexpensive method of dealing with these, leaving the residues available as manure.—E. F. A.

Apoharmine ; Hydrogenised derivatives of ——. V. Hasenfratz. Comptes rend., 1912, **155**, 284—286.

Apoharmine cannot be reduced with sodium and ethyl or amyl alcohol or with zinc dust. When reduced with hydrogen iodide it yields, as O. Fischer has shown, dihydroapoharmine : in addition tetrahydro-apoharmine, $C_8H_{12}N_2,H_2O$, is obtained. The former crystallises in colourless tablets, m.p. 49° C. ; a very dilute solution made faintly acid with sulphuric acid has a violet fluorescence. Dihydroapoharmine methiodide crystallises in yellow needles which are not attacked by potassium hydroxide even on boiling : this indicates that the methyl iodide in this compound is attached to a tertiary nitrogen atom. Tetrahydroapoharmine crystallises in very long colourless needles often interlaced, m.p. 96° C. ; it forms a picrate. Apoharmine and the alkaloids of *Peganum harmala* (harmaline and harmine) are known to be secondary bases and to contain the group NH— ; it is now obvious that the second nitrogen atom in their molecule acts as a tertiary base.—E. F. A.

Alkaloids ; Microchemical tests for the identification of some of the ——. E. B. Putt. J. Ind. Eng. Chem., 1912, **4**, 508—512.

For the identification of very small quantities of alkaloids, the author recommends dissolving in a drop of acid on a microscope slide, adding a drop of a suitable precipitant, and observing the crystalline form of the precipitate under the microscope, using a low power. Photomicrographs are given of the crystals yielded by morphine, codeine, dionine, and atropine with iodine; by morphine, codeine, and β-eucaine with palladous chloride, and by cocaine, β-eucaine, nicotine, antipyrine, strychnine, and heroine with platinic chloride.—A. S.

Sunlight ; Influence of —— on the synthesis of alkaloid bases by the action of alcoholic ammonia on aldehydes. G. Inghilleri. Z. physiol. Chem., 1912, **80**, 64—72.

A mixture of formaldehyde, concentrated aqueous ammonia and methyl alcohol was exposed to sunlight, in sealed tubes, for seven months. From the mixture crystals were obtained, soluble in ether, and decomposing at 185° C. ; they gave the reactions of the alkaloids and had the composition, $C_6H_8ON_2$. Analysis of the microcrystalline platinichloride, which became black and decomposed at 220° C., confirmed this composition. The compound is perhaps derived in accordance with the equation : $6HCHO—5H_2O+2NH_3=C_6H_8ON_2$. The portion of the original mixture insoluble in ether contained a variety of bases which possibly represent intermediate products of the general type : $nCH_2O—(n—1)H_2O+xNH_3$. Platinichlorides were isolated containing 47·3, 26·06 and 25·5 per cent. of platinum respectively, the two latter containing 13·29 and 14·61 per cent. of nitrogen.—E. F. A.

Styrax liquidus. C. Ahrens. Z. öffentl. Chem., 1912, **18**, 267—272

After the examination of a number of samples of *Styrax liquidus*, both genuine and adulterated, the following characters have been regarded as indicating the unadulterated material. The substance is mixed with sand and ground with light petroleum. The extract is collected, the solvent distilled off, and the residue weighed. The amount soluble in light petroleum lies between 37·6 and 56·0 per cent., or on an average, 45·2 per cent. The acid value of the extract is 33·1 to 62·9, average, 46·7. The cold saponification value of the same extract is 191·3 to 203·3, average 196·1. Where the presence of olive oil or castor oil is suspected, the iodine value of the petroleum ether extract may be determined.—F. Shdn.

Rennin ; Laboratory studies of ——. A. Zimmermann. J. Ind. Eng. Chem., 1912. **4**, 506—508.

For the preparation of rennin, whole rennets are digested with hydrochloric acid at 110° F. (43.3° C.) until completely dissolved, the solution is freed from fat and clarified, and is then precipitated with sodium sulphate or sodium chloride, or "scaled" at a temperature not exceeding 110° F.; the dry scales are converted into a granular product by forcing them through a 16-mesh sieve. The products prepared with sodium sulphate and by scaling have a strength of 1 : 30,000—40,000 in 12 mins., whilst the strength of the product prepared with sodium chloride is 1 : 150,000—200,000 in 12 mins. ; the yield is greater with sodium sulphate than with sodium chloride. Tests with a "glycerol" (aqueous glycerin solution) containing both rennin and pepsin (strength, 1 : 2500 in 12 mins.) showed that whilst the strength of rennin prepared with sodium sulphate and by scaling remained unaltered after 15 months, that of rennin prepared with sodium chloride diminished considerably. This difference appears to be due to phosphoric acid which is present in the first two products, but only to a very small extent, or not at all, in the last. A small quantity of phosphoric acid (0·075 per cent. of the quantity of milk) greatly accelerates the action of rennin, its effect being five times as great as that of hydrochloric lactic acid and ten times as great as that of hydrochloric and oxalic acids; moreover the curd is much firmer and of better quality in presence of phosphoric acid. A glycerin solution of rennin prepared by precipitation with sodium chloride, which required 3—3·5 hours to curdle 18-hour milk curdled it in 1 minute in presence of phosphoric acid. Milk curdles more quickly under the action of rennin the longer it has been kept after milking, this being probably due to the development of acidity. When milk 18—20 hours after milking was heated at 104° F. (40° C.) for 2½ hours, "the acidity was raised from 30 to 40 per cent. in different specimens," but with milk 2 hours after milking, no change in acidity was observed under the same conditions. It is stated that whilst a mixture of rennin and milk kept at 104° F. for several hours does not curdle, yet if the milk alone be kept at that temperature for several hours, the addition of the same rennin causes very quick curdling. If alkali be added to milk, the time required for curdling is increased. In the assay of rennin, the milk used should first be tested with a standard rennin, and allowance made if it requires a longer or shorter period for curdling than normal milk. The rennin should be added to the milk immediately the latter has the temperature of 104° F. An aqueous solution of rennin, of sp. gr. 1·010, containing 0·2 per cent. by vol. of hydrochloric acid, lost 30 per cent. of its activity in 1 day at 70° F. (21.1° C.). A more concentrated solution, of sp. gr. 1·090, containing 1·3 per cent. by vol. of hydrochloric acid, was more permanent. The activity is destroyed more rapidly at higher temperatures. It is suggested that granular scaled rennin be used in the preparation of essence of pepsin, and phosphoric acid in place of lactic acid.—A. S.

Essential oils; Solubility of water in ——. J. C. Umney and S. W. Bunker. Perfumery and Essen. Oil Rec., 1912, 3, 197—198.

The amount of water dissolved in a number of commercial samples of various essential oils was calculated from determinations of the refractive index of the oil before and after drying (see this J., 1912, 602). About half of the oils examined contained from 0·05 to 0·50 per cent. of water. The conclusions drawn from previous experiments (*loc. cit.*) as to the amount of water taken up by oils of different chemical composition, are confirmed. Obviously water cannot be used to adulterate essential oils, but the expense involved in drying the oils may lead to undried oils being quoted at somewhat lower prices. Undried oils distilled and bottled during warm weather frequently become dull at lower temperatures owing to the separation of water. A similar turbidity is sometimes produced when a dry oil is mixed with one containing some water in solution.—F. Shdn.

Lemon oil. E. J. Parry. Perfumery and Essen. Oil Rec., 1912, 3, 204—205.

The characters of a number of authentic specimens of Sicilian lemon oils of the present season have been determined. Definite optical rotations are not characteristic of the oils obtained from particular districts. The following values were obtained :—

Source.	Specific gravity. (15.5° C.)	Optical rotation.	Refractive index.	Citral value.
				per cent.
Reggio	0·8589	+60°30′	1·4760	4·35
Acireale	0·8582	+58°	1·4754	4·35
Aci-Catena ...	0·8583	+57°	1·4757	4·53
Santa Teresa .	0·8575	+60° 30′	1·4752	4·4
Palermo	0·8575	+58°	1·4754	3·7
Giardini	0·8580	+57° 50′	1·4751	4·4
Siracusa	0·8579	+57° 30′	1·4755	3·85

—F. Shdn.

Orange oil; Jamaican ——. E. J. Parry. Perfumery and Essen. Oil Rec., 1912, 3, 198—199.

The characters of Jamaican and Sicilian orange oils show no appreciable difference. The higher the sp. gr. and the lower the optical rotation in a pure orange oil, the higher will be the yield of terpeneless oil therefrom.—F. Shdn.

Essential oil of "Nepal sassafras" or "Nepal camphor" tree. S. S. Pickles. Chem. Soc. Proc., 1912, 28, 192.

The essential oil from the wood of the Indian tree *Cinnamomum glanduliferum*, Meissn. has been examined and found to have the following general characters: sp. gr. at 15°/15° C., 1·1033; a_{D}^{20}=0°4′ (in a 1-dcm. tube); saponification value, 2·8; saponification value after acetylation, 7·0. The oil is pale yellow, and possesses an odour resembling safrole with, however, a suggestion of anise. The yield obtained from the dried ground wood by steam distillation was 4·16 per cent. The oil is soluble in half its volume of 90 per cent. alcohol, and in five volumes or more of 80 per cent. alcohol. An exhaustive examination showed the oil to consist mainly of safrole, myristicin, and elemicin. Other constituents, present in small quantities, are palmitic acid (m. pt. 62·5° C.), esters of the lower fatty acids, and traces of phenols.

Spirits of camphor; Method for assaying ——. A. T. Collins. J. Ind. Eng. Chem., 1912, 4, 514.

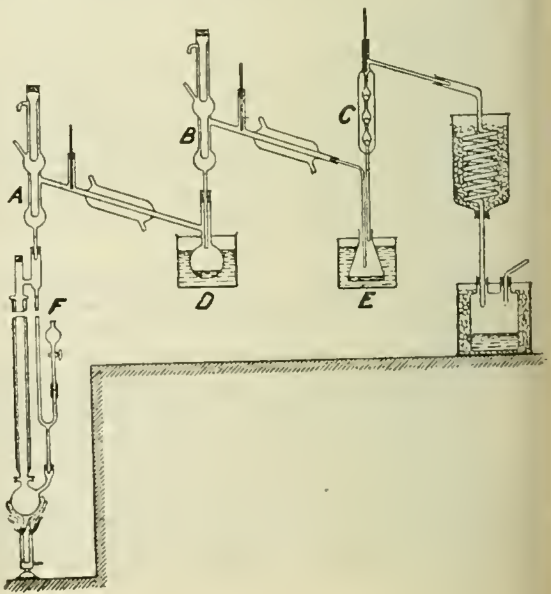
The following rapid polarimetric method is recommended:—The optical rotation of the sample is observed in a 200 mm. tube, the mean of 10 readings being taken, and a temperature correction made by adding 0·5 minute for every degree above 20° C. or deducting the same amount below 20° C. A quantity of the sample is next evaporated on the water-bath, and from the dry residue the camphor is recovered by sublimation. Two and a half grms. of the sublimed camphor are dissolved in alcohol to form a 10 per cent. solution, and the latter is polarised in the same way as the original sample. The percentage of camphor in the sample is obtained by dissolving its rotation by the rotation of the solution of sublimed camphor and multiplying by 10. The non-volatile residue left after subliming the camphor may be examined for the presence of optically active impurities.—A. S.

Bornylene; The preparation of pure ——. G. G. Henderson and W. Caw. Chem. Soc. Proc., 1912, 28, 187—188.

The best method of obtaining bornylene in quantity is to decompose methyl bornyl xanthate, which is easily prepared from borneol, by heating to a temperature not exceeding 200° C., but the product contains a certain proportion of an isomeric terpene (either cyclene or camphene), and hitherto no satisfactory process of removing this impurity has been described. It has now been found that crude bornylene can be completely purified by treatment, under suitable conditions, with a limited quantity of hydrogen peroxide, and that the yield of the pure hydrocarbon is at least 60 per cent. of the original material.

Acrolein; Preparation of ——. A. Wohl and B. Mylo. Ber. 1912, 45, 2046—2054.

It is pointed out that easily polymerised substances like acrolein have gained much in interest since the preparation of Bakelite and especially the synthetic preparation of caoutchouc. The yield of acrolein obtained by the various methods published is very variable, and, although nominally reaching in some cases 60 per cent. of the theoretical figure, is probably, generally speaking, not more than 25—30 per cent. In some cases where very high yields are stated to have been obtained, the product is contaminated with, on an average, 10 per cent. of sulphur dioxide. This is the case when potassium bisulphate is heated with glycerin. All sulphates which yield free sulphuric acid at relatively low temperatures—*e.g.*, aluminium, iron and copper sulphates—act in a similar manner to potassium bisulphate, but the normal alkali sulphates are quite indifferent. Calcium and magnesium sulphates on the other hand act as catalytic agents and form acrolein when heated with glycerin. The magnesium salt is particularly suitable for the purpose, the yields obtained with it, under carefully controlled conditions, being as high as 60 per cent. of the theoretical; the product is free from sulphur dioxide and has a boiling point of 50°—52° C. This result is obtained by passing the vapour of glycerin through a vertical copper tube packed with granulated dehydrated magnesium sulphate, which is kept at a temperature of 330°—340° C. by electrical means. The apparatus employed is shown in the sketch.



At F is shown the heated catalytic-tube fitted to the opper boiling-flask which is also provided with a side-tube or the inflow of additional glycerin and for the return of hat condensed in the first Hahn's column, A. This olumn is filled with saturated potassium chlorate solution b. pt. 104° C.). The flask, D, is kept in a bath at 120° C., and by the aid of the second Hahn's column, B, which ontains acetone, the acrolein is separated from water. The last traces of water are held back by flask, E, and olumn, C, the former being kept in a bath at 75°—80° C. The acrolein is condensed in the ice-cooled worm and Woulff's bottle. From 320 to 350 grms. of magnesium ulphate are used to fill the copper tube, and with the aid f this apparatus a 60 per cent. yield of acrolein can be btained from 1¼ kilos. of glycerin in about 5 hours with very little attention. Tables are given showing the yields obtained by the use of various sulphates both by the above method, and by heating the glycerin itself in contact with the catalytic agent. In the latter case the best yield obtained was 44·2 per cent. when magnesium sulphate was employed.—E. W. L.

Patents.

Urea; Process of manufacturing ——. H. Immendorff and H. Kappen, Jena, Germany. Eng. Pat. 20,611, Sept. 18, 1911. Under Int. Conv., Sept. 19, 1910.

SEE Fr. Pat. 433,457 of 1911; this J., 1912, 257. Manganese peroxide hydrate and ferric hydroxide are claimed as catalysts.—T. F. B.

Halogen derivatives of the paraffin series; Production of ——. Badische Anilin- und Soda-Fabrik, Ludwigshafen on-Rhine, Germany. Eng. Pat. 5125, Feb. 29, 1912. Under Int. Conv., Oct. 30 1911.

A VAPOURISED hydrocarbon which contains more than one atom of carbon in the molecule is mixed in the dark with the halogen and the mixture subjected to the action of a silent electric discharge. By working under reduced pressure the temperature necessary may be reduced. —W. H. C.

C-Mono- and C.C-diallylbarbituric acid; Manufacture of ——. Ges. für Chemische Industrie, Basle, Switzerland. Eng. Pat. 9078, April 17, 1912. Under Int. Conv., June 29, 1911.

BARBITURIC acid (25 parts) is dissolved in water (200) and alcohol (100 parts), the solution is boiled in a reflux apparatus, and a solution of allyl bromide (48·2 parts), and sodium acetate (54·4) dissolved in water (100) and alcohol (250 parts), is added gradually. The alcohol is then distilled off, by passing steam through the liquid, and the diallylbarbituric acid crystallises on cooling in reddish crystals, which, on washing and re-crystallising from water, give colourless leaflets melting at 169°—170° C. The hypnotic action of diallylbarbituric acid is stated to be many times greater than that of diethylbarbituric acid (veronal).—G. W. McD.

Compounds of arylalkylbarbituric acids and cinchona alkaloids; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 247,188, July 4, 1911.

WHEN arylalkylbarbituric acids and cinchona alkaloids are allowed to interact, either in the free state or in the form of their salts, and preferably in presence of a suitable solvent, crystalline compounds are obtained which exhibit the properties of the alkaloids in an intensified form, and also possess soporific properties. Diethylbarbituric acid does not form corresponding compounds with cinchona alkaloids.—T. F. B.

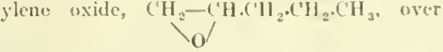
Barbituric acid; Process for preparing derivatives of ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 247,952, March 4, 1911.

ALKYLARYL- or aralkylarylmalonic acids or alkylaryl- or aralkylarylcyanoacetic acids or their derivatives are converted into CC-alkylaryl- or CC-aralkylarylbarbituric acids by the methods usually employed for preparing barbituric acid and its C-mono- and dialkyl derivatives. The same products are obtained by first converting arylmalonic acids or arylcyanoacetic acids into C-arylbarbituric acids, and then treating these with alkylating or aralkylating agents. The products may be used for subcutaneous injection, possessing powerful soporific properties. Their therapeutic activity is considerably greater than that of the corresponding 5-mono- or dialkylbarbituric acids. —T. F. B.

Esters [of ethylarylmalonic and ethylarylcyanoacetic acids]; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 26,503, Nov. 27, 1911.

ESTERS of ethylarylmalonic acids and of ethylarylcyanoacetic acids are obtained by treating with ethylating agents the esters of arylmalonic and arylcyanoacetic acids, respectively. Thus, ethylphenylmalonic ethyl ester is obtained by the action of ethyl bromide, sodium, and alcohol on phenylmalonic ester, as a liquid of b. pt. 166° C. (12 mm.); the ethyl ester of ethylphenylcyanoacetic acid boils at 155° C. under a pressure of 18 mm. The esters may be used for the preparation of substituted barbituric acids (see Ger. Pat. 247,952; preceding).—T. F. B.

Piperylene; Process of producing ——. L. P. Kyriakides and R. B. Earle, Assignors to Hood Rubber Co., Boston. U.S. Pat. 1,033,179, July 23, 1912.

PIPERYLENE may be obtained by passing the vapours of amylene oxide,  $CH_2—CH.CH_2.CH_2.CH_3$ (with O bridging the first two carbons), over heated dehydrating catalysts (*e.g.*, aluminium silicate) at temperatures from 400° to 500° C., and under a pressure of less than 60 mm. of mercury.—T. F. B.

Isoprene; Process of producing ——. L. P. Kyriakides and R. B. Earle, Assignors to Hood Rubber Co., Boston. U.S. Pat. 1,033,180, July 23, 1912.

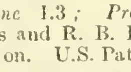
ISOPRENE is formed when the vapours of valeraldehyde are passed over heated dehydrating catalysts (aluminium silicate) at temperatures between 400° and 600° C., and under a pressure of less than 60 mm. of mercury.—T. F. B.

Erythrene; Process of producing ——. L. P. Kyriakides and R. B. Earle, Assignors to Hood Rubber Co., Boston. U.S. Pat. 1,033,327, July 23, 1912.

THE process consists in passing the vapours of normal butyraldehyde over heated dehydrating catalytic agents (*e.g.*, aluminium silicate) at temperatures of from 500° to 600° C., and at pressures less than 60 mm. of mercury. —T. F. B.

γβ-Dimethylbutadiene 1.3; Process of producing ——. L. P. Kyriakides and R. B. Earle, Assignors to Hood Rubber Co., Boston. U.S. Pat. 1,033,328, July 23, 1912.

WHEN the vapours of the hexylene oxide of the formula,



$(CH_3)_2C—C(CH_3)_2,$

are passed over heated dehydrating catalysts (aluminium silicate) at temperatures from 400° to 500° C., and at pressures below 60 mm. of mercury, βγ-dimethylbutadiene-1.3 is obtained.—T. F. B.

Tannoid compounds of digitalis glucosides existing in digitalis leaves; Process for preparing compounds of the —— *soluble in water.* Knoll und Co. Ger. Pat. 246.571, Jan. 4, 1911.

"AMMONIUM digitannoids" are obtained as yellow powders, soluble in water, at first hygroscopic, but stable when dried in a vacuum, (1) by treating with dry ammonia or an alkali alcoholate the alcoholic-ethereal solution obtained according to Eng. Pat. 6019 of 1908 (this J., 1908, 832); or (2) the alcoholic extracts of digitalis leaves which have been treated with ammonia or alkali alcoholates (see Ger. Pat. 245,193; this J., 1912, 511) are submitted to an exhaustive treatment with ether, or (3) alcoholic extracts of finished extracts of digitalis leaves are treated as in methods (1) and (2) above.—T. F. B.

Glycols from dihalogen-butanes and their homologues; Process for preparing ——. Chem. Fabr. auf Actien, vorm. E. Schering. Ger. Pat. 246,572, Sept. 20, 1910.

When dihalogen derivatives of butane or its homologues are treated with dilute aqueous solutions of alkali or alkaline earth hydroxides, they are more completely converted into the corresponding glycols than when potassium carbonate solutions are employed.—T. F. B.

Dichloro-acetic acid; Process for preparing ——. K. Brand. Ger. Pat. 246,661, April 27, 1911.

Dichloro-acetic acid may be obtained by the electrolytic reduction of trichloro-acetic acid. It is advisable to use a two-compartment cell, the anode compartment containing hydrochloric or sulphuric acid or other suitable electrolyte. The anode may consist of graphite, lead peroxide, etc., and the cathode of lead, copper, nickel, or tinned copper. The cathode compartment is supplied with a solution of trichloro-acetic acid in water or other suitable solvent, no other electrolyte being necessary, owing to the relatively high conductivity of trichloro-acetic acid. The reduction temperature is not allowed to exceed 20° or 25° C., and the current density at the cathode is regulated according to the material of which the cathode is made and to the concentration of the trichloroacetic acid.—T. F. B.

Morphine; Process for the alkylation of ——. C. H. Boehringer Sohn. Ger. Pat. 247,180, Sept. 4, 1909.

Morphine is converted into its alkyl derivatives by treatment with a quaternary ammonium base, or with a mixture of substances which will produce the quarternary ammonium bases, with or without addition of a solvent. The formation of quaternary alkaloid salts as by-products, which is a disadvantage in other alkylating processes, is said to be avoided by this method.—T. F. B.

Salts of the compounds of metaphosphoric acid with albuminoids and their derivatives, and of the iron-albumin-phosphorus compounds of Ger. Pats. 237,713 *and* 241,560; *Process for preparing* ——. Dr. W. Wolff und Co. G. m. b. H. Ger. Pat. 247,189, July 17, 1910.

The compounds named in the title (see Eng. Pat. 16,048 of 1910; this J., 1911, 508; also this J., 1912, 151) are neutralised by means of alkalis or alkaline earths, or by both, to produce double salts, and the salts are isolated either by evaporating at low temperatures, preferably in a vacuum, or by precipitation with alcohol, acetone, etc. The calcium-alkali salts may also be obtained by treating the calcium salts with the necessary quantity of alkali fluoride; they contain calcium fluoride in a colloidal, soluble condition. All the products dissolve completely in water, giving clear solutions.—T. F. B.

Ammonium salts of a-hydroxy-acids; Process for preparing pure acid ——. R. Escales. Ger. Pat. 247,240, Aug. 17, 1910.

Ammonium-hydrogen salts of a-hydroxy-acids (*e.g.*, glycollic or lactic acid) may be prepared in a pure condition by distillation, under greatly reduced pressure, of the normal or acid salts or a mixture of the two, or a mixture of the acid with ammonium carbonate or other ammonium salt. It is stated that the elimination of water, which usually occurs when such acids are heated, is avoided. —T. F. B.

Glycollic acid ureide; Process for preparing derivatives of ——. A. Voswinkel. Ger. Pat. 247,270, Oct. 19, 1910.

When bromoacetylurea is treated with a salt of an organic acid in presence of a suitable solvent, a derivative of the ureide of glycollic acid is formed, thus:

$$H_2N{\cdot}CO{\cdot}NH{\cdot}CO{\cdot}CH_2Br+NaO{\cdot}OC{\cdot}R=$$
$$H_2N{\cdot}CO{\cdot}NH{\cdot}CO.CH_2{\cdot}O{\cdot}CO{\cdot}R+NaBr.$$

The examples in the specification describe the use of the sodium salts of acetic, isovaleric, bromoisovaleric, benzoic, and salicylic acids. The products are applicable to medicine.—T. F. B.

Cyanaminoformic esters; Process for preparing ——. E. Merck. Ger. Pat. 247,453, Aug. 10, 1911.

Cyanaminoformic esters, $ROOC{\cdot}NH{\cdot}CN$, may be obtained by the interaction of halogenated aminoformic esters with cyanamide or its salts in aqueous solution and in presence of an alkaline substance, which will combine with the hydrohalogen acid liberated. The products behave as strong acids, their alkali salts dissolving readily in water, forming neutral solutions. They may be employed as synthetic agents and also in medicine. The esters of menthol, guaiacol, and hydroxycamphor, and the ethyl ester are described in the specification.—T. F. B.

Ester-sulphuric acids of hydroxy-acid esters of alkamines; Process for preparing ——. F. Hoffmann-La Roche und Co. Ger. Pat. 247,455, May 7, 1911.

Alkamine esters of hydroxy-acids or their salts are treated with concentrated or fuming sulphuric acid at temperatures below 100° C., with or without the addition of a diluent; the product is then decomposed with water, the temperature not being allowed to rise further, and the ester-sulphuric acid is isolated from the resulting solution, after neutralising the excess of sulphuric acid with alkali or ammonia.—T. F. B.

Ester-sulphuric acids of alkylammonium salts of hydroxy-acid esters of alkamines; Process for preparing ——. F. Hoffman-La Roche und Co. Ger. Pat. 247,456, May 30, 1911. Addition to Ger. Pat. 247,455, May 7, 1911 (see preceding abstract).

Compounds analogous to those prepared according to the principal patent are obtained by treating with sulphuric acid the alkylammonium salts of the hydroxy-acid esters of alkamines and decomposing the products with water. —T. F. B.

Ester-sulphuric acids of hydroxy-acid esters of alkamines and their alkylammonium salts; Process for preparing ——. F. Hoffmann-La Roche und Co. Ger. Pat. 247,457, June 17, 1911. Addition to Ger. Pat. 247,455, May 7, 1911 (preceding).

The hydroxy-acid esters of alkamines or their salts or the alkylammonium salts of hydroxy-acid esters of alkamines are treated with chlorosulphonic acid, with or without addition of a diluent.—T. F. B.

Aposcopolamine; Process for preparing ——. F. Hoffmann-La Roche und Co. Ger. Pat. 247,819, June 17, 1911.

Aposcopolamine may be obtained from the ester-acids of scopolamine (*e.g.*, the ester-sulphuric acid; compare Ger. Pat. 247,455, preceding) either by treatment with alkalis or by evaporating a solution of the ester-acid in an indifferent solvent, such as ether.—T. F. B.

Carbohydrates and the corresponding hydroxy-acids and polyhydric alcohols; Process for preparing mineral acid-esters of ——. Chem. Werke vorm. Dr. H. Byk. Ger. Pat. 247,809, Feb. 3, 1910.

Carbohydrates, or the corresponding hydroxy-acids or polyhydric alcohols, are converted readily into sulphuric and phosphoric esters by treating them with the halogenides of sulphuric or phosphoric acid in presence of a substance which will combine with acid. In the preparation of the sulphuric esters of carbohydrates and the corresponding hydroxy-acids, pyrosulphates may be employed in place of the halogenides of sulphuric acid. This process possesses the advantage over known methods that it is possible here to obtain the partially as well as the completely esterified products.—T. F. B.

Nitrostyrol and arylnitroethanol derivatives; Process for preparing ——. K.W. Rosenmund. Ger. Pat. 247,817, Dec. 29, 1912.

When acidyl derivatives of hydroxybenzaldehydes are treated with nitromethane in presence of an alkaline condensing agent, derivatives of nitrostyrol and of aryl-nitro-ethanols are obtained; in this case the saponification the phenol esters in the alkaline solution takes place atively slowly.—T. F. B.

mopiperonalamine ; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 248,046, Jan. 14, 1911. Addition to Ger. Pat. 245,523, July 5, 1910 (see this J., 1912, 661).

E oxime of homopiperonal may be advantageously luced to homopiperonalamine by the action of an cali metal or calcium in alcoholic solution.—T. F. B.

5-Diaminobenzene-1-arsinic acid ; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 248,047, Feb. 19, 1911.

5-Diaminobenzene-1-arsinic acid, a compound possing valuable biological properties, is obtained by the duction, in absence of free mineral acid, of the 2·5-ainonitrobenzene-1-arsinic acid, which is produced by e action of *p*-nitraniline on arsenic acid (see Eng. Pat.),196 of 1911 ; this J., 1912, 256).—T. F. B.

inacone ; Process for preparing —— from acetone and sodium. Badische Anilin und Soda Fabrik. Ger. Pat. 248,252, April 9, 1911.

hen acetone is treated with sodium alone, pinacone is oduced, but in very small yield (about 12 per cent.) ; , however, a diluent be added which does not react with dium, a much increased yield of pinacone is produced, e only by-product being *iso*-propyl alcohol, which can e quantitatively re-converted into acetone.—T. F. B.

cetylene tetrachloride ; Process of producing ——. G. Ornstein, Berlin. U.S. Pat. 1,030,916, July 2, 1912.

ee Fr. Pat. 420,489 of 1910 ; this J., 1911, 307.—T. F. B.

alogenated paraffin hydrocarbons ; Producing ——. O. Graul and G. Hanschke, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,032,822, July 16, 1912.

ee Eng. Pat. 5125 of 1912 ; preceding.—T. F. B.

henylated 6·6-diquinolyl-4·4-dicarboxylic acids and homologues ; Manufacture of ——. M. Dohrn, Charlottenburg, Assignor to Chem. Fabr. auf Actien, vorm. E. Schering, Berlin. U.S. Pat. 1,032,123, July 9, 1912.

ee Ger. Pat. 246,078 of 1911 ; this J., 1912, 605.—T. F. B.

uinine compound [with diglycollic acid] ; Tasteless —— and process of making same. L. Ach, Assignor to C. F. Boehringer und Soehne, Mannheim-Waldhof, Germany. U.S. Pat. 1,032,642, July 16, 1912.

See Eng. Pat. 15,392 of 1910 ; this J., 1910, 1177.—T. F. B.

Radio-active material. C. Schmidt, Freienwalde on the Oder, Germany. U.S. Pats. 1,032,779 and 1,032,951, July 16, 1912.

See Eng. Pat. 778 of 1911 ; this J., 1911, 1115.—T. F. B.

Arseno compounds and process of making same. R. Kahn, Frankfort, Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,033,904, July 30, 1912.

See Eng. Pat. 11,709 of 1911 ; this J., 1912, 256.—T. F. B.

Cholesterin preparation [with fatty acid esters]. M. Stern, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,034,161, July 30, 1912.

See Eng. Pat. 3594 of 1911 ; this J., 1911, 1409.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Coloured resinates ; Solubility of —— submitted to the action of light. J. Larguier des Bancels. Comptes rend., 1912, 155, 280—282.

To prepare coloured resinates colophony is treated with sodium or potassium hydroxide; the alkali resinate is mixed with a dye and precipitated by a zinc or magnesium salt. The product is washed and dried in the dark. On exposure to light such resinates become, after a certain time, insoluble in such solvents as benzene, toluene and xylene, but on the other hand they become soluble in methyl and ethyl alcohols. The change is essentially caused by radiations of short wave length. The same effect is produced for example if the source of light is screened by a plate of quartz, which is transparent for ultra-violet rays ; whereas, the intervention of a thin sheet of glass, opaque for ultra-violet radiations, suffices to reduce the action. The sensitiveness of the resinates depends upon the degree of desiccation : when this has been carried too far, the resinate is soluble whether it has been exposed to light or not. When a mercury lamp is used as the source of the radiations, an exposure of less than an hour suffices to render a rhodamine resinate soluble : the action of the light can be perceived after 5 or 10 minutes exposure. It is possible by using different solvents as developers to obtain at will either a positive or negative with plates prepared and exposed under identical conditions.—E. F. A.

XXII.—EXPLOSIVES ; MATCHES.

Explosives (Victoria) ; Report of the Chief Inspector (R. J. Lewis) of —— for 1911.

The lighterage of all explosives coming into Port Phillip Bay was taken over by the Ports and Harbours Department at the beginning of the year. The use of nets of approved construction was sanctioned for transferring the packages of explosives between ship and lighter. During the year over-sea ships made 19 voyages, and discharged 1912 tons of explosives (exclusive of service explosives). The condition of the magazines on arrival of the ships was, on the whole, satisfactory. Considerable improvement could, however, be made in the stowing of explosives in the magazines. Attention was drawn in the last report to risk involved in conveyance of explosives in charcoal-insulated ship's holds. This subject was referred by the Victorian Marine Board to the Board of Trade, who considered " there is no evidence at present before the Board which would justify such a serious departure from present practice."

Importation.

Name of explosive.	1911.	1910.
	lb.	lb.
Gelignite	761,000	790,550
Gelatin dynamite	239,100	194,300
Blasting gelatin	89,500	62,750
Abbcite	5,000	—
Bobbinite	—	5,000
Cheddite	2,500	25,000
Excellite	65,200	20,000
Lig. dynamite	6,250	5,000
Monobel	85,000	42,900
Pitsea powder	2,750	—
Rippite	—	5,000
Rendite	700	—
Samsonite	—	7,500
Powder, fuse	92,500	115,000
Powder, blasting	227,000	234,225
Powder, sporting	66,050	28,260
Total	1,642,550	1,535,485
	Total	Number.
Detonators	1,749,000	3,827,000

Samples examined.—A total of 1315 samples of explosives were examined, of which 40 were rejected. Included in the total were 620 samples of gelignite, 204 of gelatin dynamite and 133 of blasting gelatin. The whole of the consignments of blasting gelatin imported during the year were satisfactory. One consignment of 2500 lb. of gelatin dynamite was found to be exuding on arrival, and was condemned. Two shipments of gelignite, representing a total of 15,000 lb., were condemned on account of exudation. The consignments were allowed to be sorted over, with the result that 9850 lb. were obtained free from exudation and passed. The balance (5150 lb.) was handed over for submarine blasting. The total number of factories under licence was 6. Fourteen rack-a-rock licences were issued during the year. The total number of magazines under licence was 276. Twelve Government magazines were available for public use. The number of licences issued during the year for licensed premises was 2245.—G. W. McD.

Products of explosion of hydrocyanic acid. Salomone. *See* VII.

PATENTS.

Explosives. B. J. Flürscheim, Fleet, Hants. Eng. Pat. 18,777, Aug. 21, 1911.

AN explosive consisting of or containing 2·4·6-trinitro-3-aminophenetol or 2·4·6-trinitro-3-amino-anisol.
—G. W. McD.

Explosive. W. Rickmers, London. U.S. Pat. 1,032,242, July 9, 1912.

A BLASTING explosive is claimed, which is composed of ammonium perchlorate and an alkali nitrate, in equal molecular proportions, and also a hydrocarbon of the paraffin series and an aromatic nitro-compound, to which a binding medium may be added; for example, 42 per cent. of ammonium perchlorate, 31 of sodium nitrate, 13 of paraffin wax, and 14 of trinitrotoluene.—F. SODN.

Blasting powder. R. Ponnay, Assignor to J. F. Hubbard, Los Angeles, Cal. U.S. Pat. 1,033,927, July 30, 1912.

A MIXTURE of 45 per cent. of potassium chlorate, 30 of sugar, 10 of manganese oxide, 7·5 of charcoal, and 7·5 per cent. of coal dust.—A. S.

Explosive charges for flexible tubes; Preparation of ——. C. E. Bichel. Ger. Pat. 247,447, Feb. 23, 1911.

IT is sometimes desirable for military purposes to fill flexible tubes with explosives in order that they may subsequently be fired by means of detonators placed at one or at both ends of the tube. In order that the explosive may readily take the form of the tube when the latter is rolled up for transport, it is proposed, according to the present patent, to have the explosive in the form of a number of individual pieces arranged in a series with joints similar to ball- and socket-joints between. The individual pieces are threaded on a string or wire, to which, at intervals, they are fixed, so that the series is not displaced as a whole, but only separate parts of it, and this only to such an extent, that the explosion can be propagated through the whole series.—A. S.

Gases produced on the explosion of explosives in presence of air; Apparatus for collecting the ——. A. Wilhelmi. Ger. Pat. 247,787, Sept. 14, 1911.

THE explosive is fired in a mortar surrounded by a protective hood or bell, the whole being enclosed in a movable bell, filled with air, but closed against the outer air by a liquid seal. When the explosion takes place, this bell rises, in suitable guide-ways, and the gases evolved, together with the air already present in the bell, are collected and measured.—A. S.

Pyrotechnic composition. F. A. Brock, Sutton, Surrey. Eng. Pat. 23,835, Oct. 27, 1911.

THE composition consists of strontium nitrate (25 parts), barium nitrate (2·083), powdered aluminium bronze (6·25) and powdered magnesium (16·666 parts), the whole being mixed with an equal weight of sulphur.—G. W. McD.

Explosive charge. E. Sokolowski, Hamburg, Assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,033,285, July 23, 1912.

SEE Fr. Pat. 432,981 of 1911; this J., 1912, 153.—T. F. B.

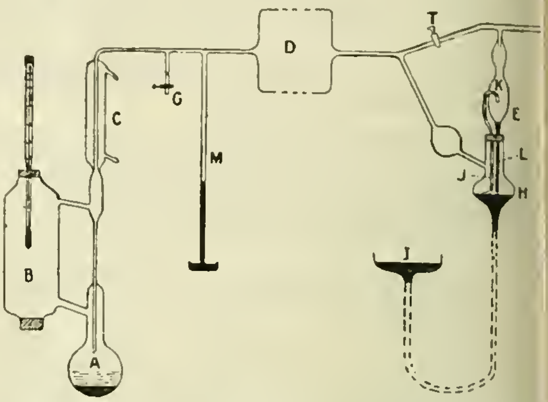
Explosive; Safety ——. N. Ceipek, Vienna. U.S. Pat. 1,033,537, July 23, 1912.

SEE Eng. Pat. 9743 of 1911; this J., 1911, 926.—T. F. B.

XXIII.—ANALYTICAL PROCESSES.

Thermostat; An easily adjustable vapour ——. J. Fletcher and D. Tyrer. Chem. Soc. Proc. 1911, 28, 189—190.

THE authors described a vapour-bath which can be maintained constant with very little trouble to 0·005° and can be fixed at any desired point (say, between 30° and 130° C.) with the greatest ease. In principle it consists of a pure liquid boiling under a constant and adjustable pressure, which is controlled and maintained constant by a very efficient manostat. Practically any liquid of suitable boiling point may be used. The boiling liquid is contained in the flask, *A* (see diagram). The vapour passes into the compartment, *B*, which may be of any particular form suitable: *B* also contains a thermometer, as shown. The vapour is then condensed in *C*, and returns as liquid to the boiling flask, *A*. The end of the condenser, *C*, is connected, as shown, with an air reservoir, *D*, of about 10—20 litres capacity (the larger the size of this reservoir the greater is the efficiency of the apparatus), and then to the manostat, *E*. The manostat being the most important part of the apparatus may be described at some length, and for the sake of clearness has been drawn in the diagram on a rather large scale. The tube, *F*, is attached to an efficient water-pump. The degree of exhaustion is first roughly adjusted by allowing air to enter by the side-tube and pinch-cock, *G*. The mercury rises into the bulb, *H*, out of the reservoir, *I*, until the level reaches the end of the tube, *J*, when it stops and remains constant. If it passes this point it closes off the rest of the apparatus from the pump, and as air is entering through the side-tube, *G*, the pressure increases and the level of the mercury in the manostat falls again. As soon as the end of the tube, *J*, becomes uncovered, the pump again comes into play and rapidly reduces the pressure, causing the mercury level to rise again. When equilibrium is reached, the level of the mercury remains constant, and a continual current of air and mercury passes up the tube, *J*, into the compartment, *K*, from whence the mercury falls back into the bulb, *H*, by the tube, *L*, and the air passes off through the pump. It will be clear that the difference in the levels of the mercury in *H* and *I* represents the pressure in the apparatus, and the adjustment of this pressure is made by merely altering the height of the reservoir. For the proper working of the manostat it is necessary to have a large air supply to draw from; otherwise the mercury level in *H* rises and falls irregularly. This is the purpose of the air reservoir, *D*. Although the level of the mercury in *H* may fluctuate slightly, the pressure recorded by the manometer, *M*, remains perfectly constant. In order to raise the temperature in *B*, the mercury reservoir, *I*, is raised, and to lower the temperature it is merely necessary to lower *I*. For the efficient working of the apparatus attention must be paid to the following details: The reservoir should be shallow, so that if the vessel, *K*, partly fills with mercury, as sometimes happens, the difference in the mercury levels in *H* and *I* is not appreciably altered. The end of the tube, *J*, should be a narrow slit not wider than 0·5 mm., and bent horizontally.



The width of this slit ensures that the greatest possible variation in the pressure is 0·5 mm., although the actual variation need not exceed 0·1 mm. In order to accelerate the initial exhaustion of the apparatus the tap, *T*, is provided as a by-pass, which at all other times must be closed. The connecting tubes should be of wide bore, so that the pressure at all parts of the apparatus is absolutely the same. The boiling liquid used must be pure, and must boil quietly without bumping. It is found that bumping is prevented, however low the pressure, by placing in the flask, *A*, a layer of mercury as indicated. It is better to boil the liquid over a small free flame shielded from draughts. If the efficiency of the water-pump varies considerably, and if it is desired to have a very constant temperature, it is better to use two manostats connected together with an air reservoir and air inlet tube between them. The temperature can, however, be maintained constant to about 0·01° with one manostat. Change of the atmospheric pressure affects the constancy of the temperature, and to a smaller extent change of the room temperature owing to the alteration in the density of the mercury. These influences must be obviated by personal observation and adjustment. If rubber stoppers are used, an alcohol should be employed as the boiling liquid, but with ground-glass connexions lubricated with glycerol-dextrose mixture any liquid can be used. For temperatures ranging from 30° to 65° C. the authors recommend methyl alcohol, from 40° to 70° C. ethyl alcohol or benzene, and for higher temperatures toluene or xylene. In experiments made with a Beckmann thermometer in *B* and with a double manostat, it was found that for short periods of time the temperature remained constant to 0·001°. For longer periods the variation is greater, but so long as the atmospheric pressure remains unchanged the temperature remains constant to about 0·005°. This form of thermostat has many advantages over the usual large water-bath. It is more quickly adjustable, and need not be left going for long periods of time, as it is only a matter of a few minutes to start it again.

Benzoic acid as an acidimetric standard. G. W. Morey. J. Washington. Acad. Sci., 1912, 2, 306—309.

Benzoic acid can be titrated with standard alkali to a high degree of accuracy. The acid is fused to reduce the bulk of the sublimed material, about 1 grm. dissolved in 20 c.c. of alcohol and titrated with barium hydroxide in presence of phenolphthalein. The method is accurate and rapid. Other advantages of benzoic acid are the high molecular weight, which permits the use of large samples and reduces the error of weighing; it is stable, and is not hygroscopic; it can also be easily obtained in a high state of purity.—E. F. A.

The bromine and iodometric methods for the volumetric determination of cresols. Pence. *See* III.

A colour reaction of ammonia. Thomas. *See* VII.

Volumetric determination of thorium in presence of other rare earths. Analysis of monazite sand. Metzger and Zons. *See* VII.

Determination of ozone. Czakó. *See* VII.

Use of phenolphthalein as double indicator [of carbon dioxide] in the determination, by direct combustion, of carbon in iron, steel, etc. Brès. *See* X.

Quartz thermometer; Beckmann ——, and the determination of antimony in lead-antimony alloys. Friedrich. *See* X.

Bacon's test of the purity of Chinese wood [tung] oil. Calef. *See* XII.

Determination of caoutchouc as bromide by Huebener's method. Huebener. *See* XIV.

Report of Committee appointed to revise the Official Method for tannin analysis. *See* XV.

Determination of the crystal content of raw sugar. Meyer. *See* XVII.

Detection of sucrose in grape juice and wines. Rothenfusser. *See* XVIII.

Determination of methyl alcohol. Wirthle. *See* XVIII.

Detection of adulterations [of fruit jellies and jams] by colloid-chemical methods. Marriage. *See* XIXA.

Detection of formic acid in fruit products. Shannon. *See* XIXA.

Detection of Prussian blue in tea. West. *See* XIXA.

Construction of a toximeter for carbon monoxide. Guasco. *See* XIXB.

Detecting pilocarpine in presence of quinine. Meillère. *See* XX.

Microchemical tests for the identification of some of the alkaloids. Putt. *See* XX.

Method for assaying spirits of camphor. Collins. *See* XX.

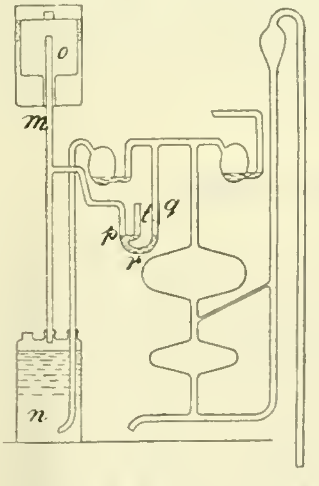
Patents.

Gases; Method of and apparatus for ascertaining and indicating the presence of —— other than those ordinarily contained in the atmosphere for use in mines or other like purposes. A. Barry, Liverpool. Eng. Pats. 19,663, Sept. 4, and 22,909, Oct. 17, 1911.

A battery is contained in a case which is surmounted by a perforated box with an electric incandescent lamp on top of the latter. The current from the battery passes to the lamp through bell-crank levers and a platinum wire which are contained in the perforated box. Should combustible gases be present in the air, which has free access to the perforated box, the platinum wire acts as a catalyst in bringing about oxidation. The rise in temperature causes the platinum wire to expand, displacing the levers, interrupting the contact and extinguishing the lamp, thus giving the required warning.—G. W. McD.

Gas-analysis apparatus; Liquid seal permitting of the escape of the residual gas from the gas-collecting bell of ——. O. Hüfner. Ger. Pat. 244,335, May 8, 1910.

The liquid seal is contained in a U-tube, *p q r t* (see fig.), one limb of which is provided with a side tube, *t*, open to the air. After a constituent of the gas under examination has been removed in the absorption vessel, *n*, the residual gas passes into the measuring bell, *o*. The liquid is then caused to fall in the tubes, *p*, *t*, and rise in the tube, *q*, so that communication between the measuring bell, *o*, and the atmosphere is opened by way of *m*, *p* and *t*, and the residual gas is allowed to escape. The liquid is then caused to rise again in the tubes, *p* and *t*, thus shutting off communication between *n* and *o*, and the atmosphere.—A. S.



Gas; Apparatus for testing ——. H. W. C. Schröder, J. H. Dräger, and A. B. Dräger, Assignors to Drägerwerk H. und B. Dräger, Lübeck, Germany. U.S. Pat. 1,033,626, July 23, 1912.

See Ger. Pat. 236,730 of 1910; this J., 1911, 1141.—T.F.B.

Testing materials; Machine for ——. B. Schiller, Vienna. U.S. Pat. 1,033,623, July 23, 1912.

See Eng. Pat. 6762 of 1911; this J., 1911, 1141.—T. F. B.

XXIV.—MISCELLANEOUS ABSTRACTS.

Enzyme action; Reversibility of ——. Influence of the dilution of ethyl alcohol on the synthetic action of emulsin in this solvent. E. Bourquelot and M. Bridel. Comptes rend., 1912, **155**, 319—322. (See also this J., 1912, 739).

The work of Croft Hill and subsequent observers has shown that though enzymes exercise a synthetic function, the products of their action in this direction differ from the substances which the enzymes normally hydrolyse. In doubtful cases where the natural product has been obtained synthetically, the identification has been incomplete. The probability of the enzymes being mixtures has not been overlooked; to test whether one and the same enzyme effects both hydrolysis and synthesis, experiments have been made under parallel conditions in 85 per cent. and 60 per cent. by weight ethyl alcohol, starting on the one hand from glucose and on the other from the equivalent weight of ethyl glucoside, a like quantity of enzyme being added in each case. In both series, after 16—19 days action, the optical rotation of the solutions was the same irrespective of the original material; that is the same equilibrium had been attained starting from either end. The position of the equilibrium varied according to the strength of the alcohol, most hydrolysis taking place in the dilute solution and most synthesis in the concentrated alcohol. The results are regarded as confirming the true reversibility of enzyme action.—E. F. A

Patent.

Woods [juniper]; Process for removing the volatile constituents of certain —— so as to render them capable of taking a high and durable polish. L. Petersen-Hviid, Copenhagen, Denmark. Eng. Pat. 15,227, June 29, 1911.

Wood, especially juniper intended for the manufacture of lead pencils, is introduced into a hermetically sealed receptacle, and the latter is exhausted; vapours of alcohol, benzol, or similar solvent, heated to 160°—175° C. are then introduced into the receptacle, which is likewise heated, so as to prevent premature condensation; the issuing vapours, charged with the volatile constituents of the wood, are cooled, evaporated (*in vacuo* if necessary), and re-introduced into the cycle of operations.—O. R.

Trade Report.

Scientific instruments, etc.; Free importation of —— into Australia. Board of Trade J., Aug. 8, 1912.

An Australian By-law, No. 229, provides that scientific instruments and apparatus, and materials for scientific purposes for use in university colleges, schools, hospitals, or any public institution, may be delivered free of duty, under Tariff heading No. 440 (a), upon the production of a certificate from a responsible official of the institution for which the goods are intended to the effect that the goods are to be used therein for scientific purposes, provided the Comptroller-General of Customs is satisfied that the instruments, apparatus, or materials in question are properly admissible within the terms of the Tariff heading as to Australian manufacture or production. The Comptroller-General may require security for the due observance of the prescribed conditions.

[*Note.*—The tariff heading No. 440 (a) provides for the free importation of scientific instruments, etc., which cannot reasonably be manufactured or produced within the Commonwealth.]

Books Received.

The Agricultural Ledger. 1911–12. No. 5. Oils and Fats of Vegetable Origin Produced in British India. By David Hooper, Officiating Economic Botanist to the Botanical Survey of India: Superintendent Government Printing, Calcutta, India. 1912. Price 8 annas.

8vo volume paged 107 to 168, and with an alphabetical index.

Bulletin de la Société Industrielle de Mulhouse. Tome LXXXII. No. 4. April, 1912. Imprimerie Veuve Bader & Cie., 30, rue de la Justice. Berger Levrault & Cie., 5, rue des Beaux-Arts, Paris.

A treatise on the Potash mines of Haute-Alsace, running from page 207 to 300, with numerous illustrations and plates. The text consists of a number of monographs as follows:—I. Historical. F. Binder. II. and III. Geological, mineralogical. F. Binder and Edm. Boureart. IV. Borings. E. Remy. V. Pile-driving in sinking wells. Guy de Place. VI. Exploiting. Guy de Place. VII. Mechanical and electrical installations. A. Burgert, Venables and E. Schlumberger. VIII. Mechanical and chemical treatment of the potash salts. E. Wild and G. Wyss. IX. Chemical applications of the potash salts. E. Noelting. X. Agricultural applications. G. Wyss. XI. The economy, administration, transport, sale of products. Ch. Meunier-Dollfus.

Industrial Organic Chemistry. Adapted for the use of Manufacturers, Chemists, and all interested in the utilisation of organic materials in the industrial arts. By Samuel P. Sadtler, Ph.D., LL.D., Professor of Chemistry in the Philadelphia College of Pharmacy, etc. Fourth Edition. J. B. Lippincott Company, Philadelphia, U.S.A., and 5, Henrietta Street, Covent Garden, London. 1912. Price 21s. net.

Large 8vo volume, containing 586 pages of subject matter, including 1½ pages of bibliography and 26 of Appendix—mostly tables; also 122 illustrations. At the end is an alphabetical index of subjects. The text is classified in chapters, each chapter being devoted to a special branch of chemical industry, and treated under five distinct headings, *viz.*: I. Raw Materials. II. Process of Treatment. III. Products. IV. Analytical Tests. V. Bibliography and Statistics. The fourteen chapters thus subdivided and treated, are devoted to the following branches of chemical industry:—I. Petroleum and mineral oil industry. II. Fats and fatty oils. III. Essential oils and resins. IV. Cane sugar industry. V. Starch and its alteration products. VI. Fermentation industries. A. *Nature and varieties of fermentation.* B. *Malt liquors and the industries connected therewith.* C. *Manufacture of wine.* D. *Manufacture of distilled liquors, or ardent spirits.* E. *Bread making.* F. *Manufacture of vinegar.* VII. Milk industries. VIII. Vegetable textile fibres. Industries based upon the utilisation of vegetable fibres. A. *Paper making.* B. *Gun-cotton, Pyroxylin, Collodion, and Celluloid.* C. *Artificial silk* IX. Textile fibres of animal origin. X. Animal tissues and their products. A. *Leather industry.* B. *Glue and gelatin manufacture.* XI. Industries based upon destructive distillation. A. *Destructive distillation of wood.* B. *Destructive distillation of coal.* XII. Artificial colouring matters. XIII. Natural colouring matters. XIV. Bleaching, Dyeing, and Textile printing.

Handbuch der Mineral Chemie. By Hofrat Prof. Dr. C. Doelter (Wien), with 58 contributors and coadjutors. In four volumes. Theodor Steinkopff's Verlag, Dresden and Leipzig. 1912. Price M. 9.10.

8vo volume, commencing on page 801 and ending on page 965, with 21 illustrations and numerous tables and diagrams. This being the concluding volume of the work, there follow indexes of authors and subjects filling 44 pages. (See this J., 1912, 261, 94; 1911, 1415, 928.)

Journal of the Society of Chemical Industry.

No. 17, Vol. XXXI. SEPTEMBER 16, 1912. No. 17, Vol. XXXI.

Journal and Patent Literature.

Patent Specifications may be obtained by post by remitting as follows:—
English.—8*d.* each, to the Comptroller of the Patent Office, W. Temple Franks, Esq., Southampton Buildings, Chancery Lane, London, W.C.
United States.—1*s.* each, to the Secretary of the Society
French.—1 fr. 05 c. each, as follows; Patents dated 1902 to 1907 inclusive, Belin et Cie., 56, Rue des Francs Bourgeois, Paris 3e.); Patents from 1908 to date, L'Imprimerie Nationale, 87, Rue Vieille du Temple, Paris.
German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

Patents.

Absorption of dilute gases by liquids; Apparatus for effecting the ——. I. Moscicki, Freiburg, Switzerland. Eng. Pat. 17,355, July 29, 1911.

The apparatus comprises a closed chamber filled wholly or partly with a suitable fine-grained filling material through which the gases travel in a horizontal direction, whilst the absorbing liquid flows vertically downwards in a number of separate streams through layers of the filling material which are separated by vertical perforated partitions. The bulk of the liquid reaching the bottom of a layer is pumped again to the top of the same layer, while excess liquid flows over a small sill into the next layer, the bottom of which is at a slightly lower level. The arrangement is such that the gas entering the apparatus meets the most highly concentrated liquid.—H. H.

Liquids and gases; Apparatus for effecting intimate contact between ——. Kirkham Hulett and Chandler, Ltd., and S. Hersey, London, and E. W. Blake, Thornton Heath, Surrey. Eng. Pat. 23,813, Oct. 27, 1911. Addition to Eng. Pat. 18,129, Aug. 28, 1908 (this J., 1909, 873).

The rotary spraying members described in the earlier patent are replaced by revolving trays of flat form having upturned lips, the outer edges of which are formed with serrations or undulations. A number of such trays may be superposed and each may have a separate scoop depending into the liquid, which is picked up from the bottom of the gas-absorbing or gas-washing chamber and sprayed outwards from the periphery of the revolving tray in a manner similar to that described in the prior patent. —H. H.

Regenerative furnaces. O. Imray, London. From The Knox Pressed and Welded Steel Co., Niles, Ohio, U.S.A. Eng. Pat. 8883, Apr. 15, 1912.

The portion of the gas inlet of a regenerative furnace nearest the hearth is contained in and surrounded by a hollow metal casing, which can be withdrawn transversely through the side of the furnace, and through which cooling water is circulated. Flat removable cooling tanks are also arranged at the sides and above the top of the outer portion of the gas inlet, so that all the walls of the gas inlet near the hearth are efficiently cooled.—H. H.

Regulating and reversing apparatus for regenerating gas-furnaces. H. Konper, Mülheim-on-the-Rhine, Germany. U.S. Pat. 1,029,696, June 18, 1912.

The valve-chamber is divided into a number of water-sealed compartments, communication between which can be controlled by altering the level of the water seal. This is effected by a pair of tilting overflows connected with the water-supply pipes to the valve chamber and supported by a sprocket chain which passes over a sprocket wheel. By raising or lowering the tilted overflows by turning the wheel, the level of the water in the compartments of the valve-chamber can be adjusted as desired.—W. H. C.

Kiln. T. J. Dugan, Cleveland, Ohio. U.S. Pat. 1,033,162, July 23, 1912.

Two series of open racks are provided within the casing or kiln to support the materials to be dried. One series of racks is fixed and the other is capable of an upward or downward movement as a whole. Means are provided for moving the materials being dried from one series of racks to the other and *vice-versa.* The working is as follows: the movable series of racks being in the highest position, the materials are moved from the fixed to the movable series of racks and the latter lowered a distance equal to that between two racks. The materials are then moved back to the fixed racks, and the movable series raised again and the operations repeated at suitable intervals.—W. H. C.

Combination-digester. A. F. Richter, Watertown, N.Y. U.S. Pat. 1,031,088, July 2, 1912.

The digester has a jacketed cylindrical body and conical lower portion and a domed upper portion. The jacket does not project beyond the lower portion of the dome which is provided with a lining. A series of heating pipes are provided within the cylindrical portion of the digester and are in communication with the jacket. —W. H. C.

Pressure-filter. E. J. Sweetland, Montclair, N.J. U.S. Pat. 1,032,091, July 9, 1912.

The apparatus consists of a horizontal cylindrical casing, the bottom half of which is hinged to the upper half and forms a door. A number of removable filter plates are arranged within the casing, their outlet pipes passing through the upper portion of the casing. The mixture to be filtered is delivered into the casing and the liquid passes through the filter plates. A tube passes centrally through the casing and the plates, from which jets of water are directed on to the surface of the plates to cleanse them. —W. H. C.

Clarifier and filter; Centrifugal ——. B. R. Wright, Poughkeepsie, N.Y., Assignor to The De Laval Separator Co. U.S. Pat. 1,032,641, July 16 1912.

The claim is for the combination in a centrifugal machine of a clarifying compartment with a separate and removable filter compartment.—W. H. C.

Removing suspended matter (liquids and solids) from gases and vapours; Apparatus for ——. H. L. Doherty, New York. U.S. Pats. 1,034,215 and 1,034,216, July 30, 1912.

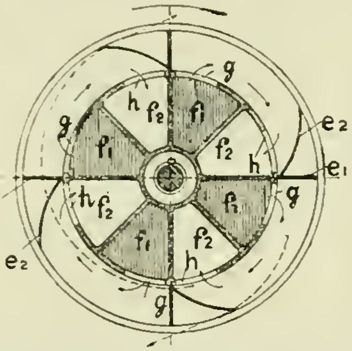
The apparatus consists of an open tank in which a cylinder or gas-holder is supported. The cylinder has a spiral partition attached to the top, the bottom dipping into a liquid contained in the tank and acting as a seal. The whole arrangement forms a spiral passage for the gas which enters either at the axis of the spiral through a perforated pipe and leaves by a pipe near the periphery, or *vice versa.* The cross-sectional area of the spiral passage is varied to suit varying quantities of gas by raising or lowering the liquid seal, this being effected by the pressure of the gas before entering and after leaving the apparatus through the intermediary of two gas-holders, the motion of which operates the valves controlling the supply and discharge of liquid to the tank.—W. H. C.

Filter for the purification of air or gases charged with dust, with cleansing of the filter by a counter current. W. F. L. Beth Maschinenfabrik. Fr. Pat. 441,468. March 18, 1912. Under Int. Conv., Mar. 20 and May 5, 1911.

THE claim is for the employment of a multiple valve or two valves coupled together in such a manner that the opening of the discharge main for purified air from the filter is closed before the opening from the counter current main is opened, and *vice versa*.—W. H. C.

Centrifugal apparatus for the separation of solids or liquids from gases. Maschinenfabr. Buckau A.-G. zu Magdeburg. Ger. Pat. 247,624, April 12, 1910. Addition to Ger. Pat. 234,509, Dec. 1, 1909 (this J., 1911, 792).

THE apparatus described in the chief patent is modified, in that the annular conduits on the rotating drum are subdivided, the number of the baffles, c_1 and e_2, of the compartments, f_1 and f_2, inside the drum, and of the openings, g, h, being correspondingly increased, so that the gas instead of flowing round the whole periphery of the drum, flows round only a portion of the latter.—A. S.



Separating and collecting particles of one substance suspended in another substance; Apparatus for ——. A. C. Wright, Berkeley, Cal. U.S. Pat. 1,034,668, Aug. 6, 1912.

THE mixture to be separated is introduced into the lower part of a vertical cylinder which is rotated about its axis. The inner surface of the shell has a spiral rib or projection to conduct the heavier bodies to the outlet near the periphery at the bottom of the shell. Within the shell, but spaced apart from it, is a body of similar shape, which, as well as the shell itself, is connected with a source of electricity by means of which the mixture is subjected to an electric field. The lighter bodies are discharged through a central conduit at the upper part of the shell.—W. H. C.

Evaporator. J. E. Dunn, Philadelphia, Pa. U.S. Pats. 1,033,558 and 1,033,559, July 23, 1912.

THE evaporator consists of a shell divided into an upper evaporating space and a lower heating space by a horizontal tube-plate. Vertical tubes project upwards from the tube plate and extend above the level at which the liquid is maintained in the evaporating compartment. The evaporation is effected by a heating agent supplied to the lower compartment and which passes up the tubes. The latter have lateral openings at the top to allow any gas or vapour to pass into the vapour space of the evaporating chamber. The evaporators may be connected in series so that the evaporating space of the first is connected with the heating space of the second.—W. H. C.

Evaporator. W. G. Hall, Honolulu, and W. Scarby, Puunene, Hawaii. U.S. Pat. 1,033,580, July 23, 1912.

THE evaporator is provided with an annular, tubular heating chamber having a large central circulating tube surrounded by a number of small circulating tubes. The central circulating tube is provided with inverted angle-shaped devices which act as gas traps and from which the gases and vapours are conducted into the vapour space by vertical tubes extending above the surface of the liquid. The bottom of the casing is indented upwards towards a point about the centre of the bottom of the large circulating tube and the steam is admitted to the heaters from a steam chest through slots the size of which is increased from chamber to chamber.—W. H. C.

Evaporator. P. Müller, Vilbel, Germany. U.S. Pat. 1,033,609, July 23, 1912.

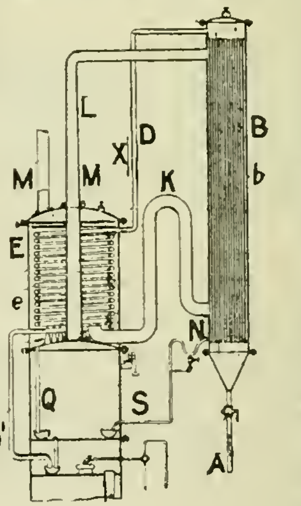
A DRUM is rotated adjacent to a "trickle-wall" with horizontal corrugations. At the crest of one of the corrugations is a horizontal series of perforations through which a gaseous fluid is discharged against the surface of the drum. Between the perforations are projections which serve as guide-plates.—W. H. C.

Evaporating and melting chemical products; Annular vessel for —— with walls heated by electric induction currents. Siemens und Halske A.-G. Ger. Pat. 249,239, Nov. 20, 1910.

THE walls of the vessel are so formed that the quantity of electrical energy transformed into heat at the inner and outer walls respectively is different, whereby the walls are heated to different temperatures, and hence a uniform circulation of the contents of the vessel is produced. By the use of electrical heating and the efficient circulation, the vessel acquires practically unlimited durability and hence may be made of precious metals for such purposes as the concentration of acids and the preparation of very pure caustic alkali.—A. S.

Distillation; Apparatus for ——. P. J. Mattingly, T. J. Hines and J. J. Brennan, Louisville, Ky. U.S. Pat. 1,034,267, July 30, 1912.

THE liquor to be distilled enters through the pipe, A, and passes upwards through the tubes, B, of the preheater, *b*, and thence through the pipe, D, the coil, *e*, in the differential chamber, E, placed on the top of the column, and the pipe, D^1, into the column, S. The vapours from the still pass through the pipe, L, which passes through the centre of the differential chamber, E, into the space surrounding the tubes in the preheater, B. Any liquid which condenses returns to the column by the trapped pipe, N, and the uncondensed vapour passes through the pipe, K, to the bottom of the differential chamber, E, and thence through the pipe, M, to the condenser. A baffle, X, is fixed near the top of the differential chamber, E, leaving an annular passage for the vapour. The return pipe, Q, from the differential chamber to the column is kept quite free, so that no accumulation of condensed liquid may form in the chamber, E, and undergo redistillation there.—W. H. C.



Coating objects with subdivided material; Process of ——. F. F. Bradley, Assignor to Bradley and Vrooman Co., Chicago, Ill. U.S. Pat. 1,034,761, Aug. 6, 1912.

THE objects to be coated are first covered with a suitable adhesive material and then treated in a receptacle with an eddying current of gas in which the finely-divided material is suspended, so that the gas and material impinge upon all the surfaces of the objects to be coated.—W. H. C.

Column for the desiccation of various materials. G. P. Guignard and H. L. A. M. Watrigant. First Addition, dated May 19, 1911, to Fr. Pat. 427,458, May 28, 1910 (this J., 1911, 1102).

The addition claims the use of levers and counter-weights to press the scrapers against the plates of the column. When used for drying potatoes or similar materials, the scrapers are replaced by drums set radially from the central shaft and provided with agitators which are also driven from the shaft.—W. H. C.

Hydro-extractor; Continuous ——. C. Lampp et Cie. Fr. Pat. 440,779, May 10, 1911.

The action of the centrifugal hydro-extractor is rendered continuous by feeding the material to be treated into the bottom of the basket from a screw conveyor and by providing a vertical screw elevator which works at a slow speed just within the perforated wall of the basket. This gradually lifts the deposited solids to the upper edge of the basket, which has no inner flange, and they are discharged over the edge by the centrifugal force. As only a very thin layer of material is allowed to form, it is very rapidly dried.—W. H. C.

Dehydration of pasty or fine material; Apparatus for the ——. R. Petri. Ger. Pat. 247,450, April 28, 1911.

In an air-tight chamber connected with a suction device, a vessel with sides and bottom of permeable filtering material is mounted so that it can be rapidly rotated. Inside this vessel is a hollow agitating or mixing device, provided over its whole surface with fine nozzles, through which warm compressed air is delivered to effect the dehydration of the material within the rotating vessel. —A. S.

Desiccation of air; Process and apparatus for the ——. General Dehydrator Co. Fr. Pat. 440,521, Feb. 23, 1912.

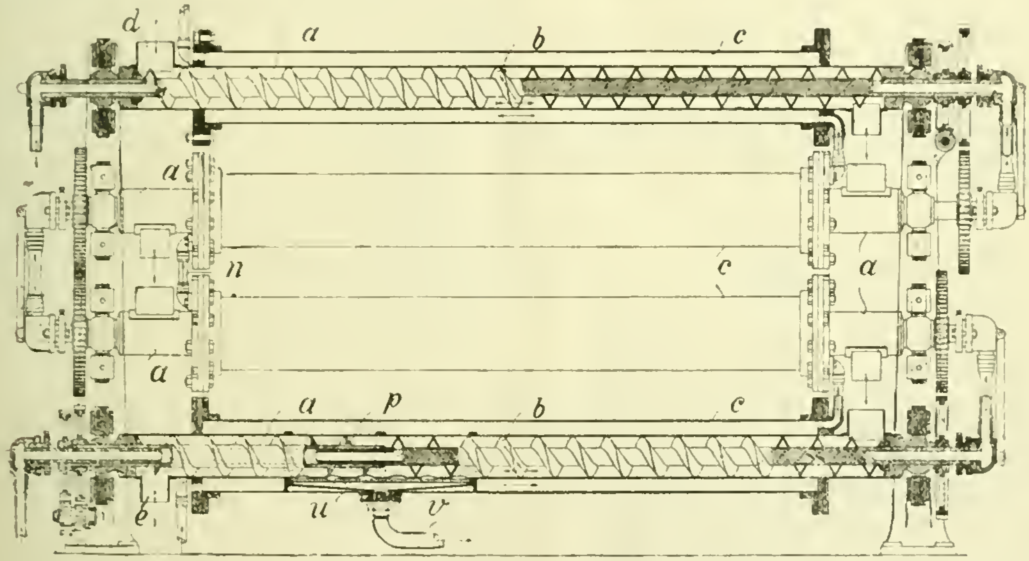
Water is cooled by passing it through a vessel the exterior of which is kept wet and over which a rapid current of air is passed, causing rapid evaporation of the moisture on the outer surface of the vessel and consequent cooling of the water passing through the interior. The cold water so obtained and the air it is required to desiccate are passed in opposite directions through a heat interchanging apparatus, whereby the moisture present in the air is condensed; the air is afterwards heated if desired. —W. H. C.

Separator; Electrostatic —— *for the classification of heterogeneous material, especially metallic ores, sulphur, phosphates of lime, etc.* A. M. F. Blanchard. Fr. Pat. 441,053, March 7, 1912.

The material is crushed and sifted in order to bring the particles to the same size, and is then fed on to a moving endless belt of thin metal which is inclined longitudinally and transversely. The belt being electrified, the particles become more or less electrified by contact and are repelled by the belt. According to the amount of electrification the friction between the particles and the belt is greater or less. Advantage is taken of this difference in friction of the different materials to bring about a classification by the combined action of a jigging motion imparted to the table and of jets of air directed laterally across the belt. Variants of the apparatus are (1) to have two belts, one vertically above the other, and oppositely charged, and (2) to have a circular revolving table, slightly conical in shape, the material being fed on to the centre. —T. St.

Continuous separation by crystallisation or solidification of solid matters contained in liquids; Process and apparatus for ——. N. Ceipek. Fr. Pat. 441,184, March 11, 1912. Under Int. Conv., July 3, 1911.

The liquid to be treated is fed into the apparatus at the point, *d*, and passes through the series of tubes, *a*, *a*, which are cooled or heated by a heating medium in the jacket, *c*, and the hollow screw conveyor, *b*. The mixture of solids which separate out, and the liquid, are moved forward by the screw conveyor. When the mixture reaches the bottom tube, it passes over the drainer, *u*, being at the same time compressed by the action of the lowest conveyor which is divided at *p*, the conveyor on each side being worked at different speeds with the result that the mixture is heaped together and compressed. The liquid escapes through the pipe, *v*, and the solids, which contain very little liquid, are discharged through *e*. —W. H. C.



Filling material for reaction towers composed wholly or mainly of wood charcoal. H. Vollberg. Ger. Pat. 247,950, June 13, 1911.

The charcoal is obtained by the carbonisation of pieces of wood of definite shape or of briquettes prepared by compressing wood waste and a binding agent in moulds.—A. S.

Evaporating and concentrating apparatus: Tubular ——. U. Rossi, Milan, Italy. Eng. Pat. 18,163, Aug. 10, 1911.

See Fr. Pat. 432,231 of 1911; this J., 1912, 16.—T. F. B.

Evaporating apparatus. T. F. Sanborn, New York. Eng. Pat. 18,216, Aug. 11, 1911.

See Fr. Pat. 433,573 of 1911; this J., 1912, 218.—T. F. B.

Concentrating liquids; Continuously working apparatus for ——. W. Wiegand. First Addition, dated March 4, 1912, to Fr. Pat. 400,860, March 15, 1909. Under Int. Conv., March 28, 1911.

See Eng. Pat. 5944 of 1912; this J., 1912, 707.—T. F. B.

Furnaces; Regenerative reverberatory ——. J. Maerz, Breslau, Germany. Eng. Pat. 19,536, Sept. 1, 1911.

See Fr. Pat. 434,807 of 1911; this J., 1912, 343.—T. F. B.

Furnace. R. Okrassa, Antigua, Guatemala. U.S. Pat. 1,034,495, Aug. 6, 1912.

See Eng. Pat. 29,355 of 1911; this J., 1912, 576.—T. F. B.

Drying apparatus; The conveyors of ——. W. Greding, München, Germany. Eng. Pat. 7, Jan. 1, 1912.

See Fr. Pat. 438,745 of 1912; this J. 1912, 628.—T. F. B.

Drum furnace; Rotary —— with air tuyères for producing heat from granular or small fuel. Möller und Pfeifer. Fr. Pat. 441,103, March 8, 1912.

See Eng. Pat. 5867 of 1912; this J., 1912, 761.—T. F. B.

Evaporating apparatus, particularly for milk. Fr. Pat. 441,426. *See* XIXa.

Erratum.

This J., 1912, page 707, col. 2, in title of second abstract, line 20 from top, *for* "July 3, 1912." *read* "July 3, 1911."

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Wood refuse for power production; Utilisation of ——. H. Winkelmann. Papierfabrikant, 1912, 10, 920.

In present conditions the best way of utilising wood-refuse is by burning for steam-raising in a furnace, specially designed for the purpose. The calorific value of fresh wood amounts to 3000—4000 cals. and that of thoroughly dried wood is 4200—4500 cals., as compared with coal at about 7000 cals. Damp wood refuse should be allowed to dry in covered sheds, otherwise, with 50 per cent. of moisture for instance, its calorific value will amount only to about 1800 cals. Sawdust and similar small refuse should be worked up into briquettes, whereby most of the moisture is pressed out and the volume of the fuel is reduced. For waste timber, cut up into lengths of about ½ m., a step-grate is the best. This grate can be readily fired and allows no unconsumed fuel to fall between the bars. The inclination of the step-grate should be about 30°, and when wood-refuse is burnt, the ratio of the uncovered to the total surface should be about 1 : 7, because only a small amount of air is necessary with a draught equal to 12—13 mm. of water-column. For burning briquettes of small-grade refuse, a specially long horizontal grate is recommended, with bars 8 mm. thick and spaced 3 mm. apart. When the material is not too damp, the ratio of the grate-area to the heating surface should be: for flue-boilers 1 : 25, for fire-tube boilers 1 : 30, and for water-tube boilers 1 : 35, it being assumed that 100 kilos. of fuel are fired per sq. m. per hour. The making of briquettes is always to be recommended for utilising small refuse to the best advantage; the presses are simple and economical, but should have automatic charging arrangements so that the material may be fed into them from a silo.—J. F. B.

Naphthalene; Use of oil-gas tar for the removal of ——. K. Volquardts. J. Gasbeleucht., 1912, 55, 815—817.

Some gas-oils used in carburetting water-gas do not yield an oil-gas tar which is suitable for use in a coal-gas naphthalene-washer. Thus an American oil, working with temperatures of 700°, 750° and 820° C. in the carburetting chamber, gave tars of sp. gr. 0·98, 1·01, and 1·03 respectively, the lighter tars containing too much water and, in the first case, some unchanged oil, whilst the heavier tar contained too much naphthalene. Where it is desired to use the oil-gas tar in naphthalene-washers, the oil for carburetting should not be selected solely with a view to making gas of the required heat value, with the minimum cost for oil, as another oil, more of which would have to be used might yield tar which could be used in the naphthalene-washers, and gas containing less naphthalene. The examination of the oil should therefore include a fractionation of the oil-gas tar as well as of the oil itself.—A. T. L.

[*Mineral*] *lubricating oils; Old and modern methods of obtaining ——.* F. Seidenschnur. Petroleum, 1912, 7, 1165—1176.

In the author's method of distillation the material is first heated to about 80° C. and then introduced in a thin stream at several places into the still, which has previously been heated to 380° to 400° C. and exhausted of air. Meanwhile a current of superheated steam (450° to 500° C.) is also passed through the vessel, with the result that there is an immediate and simultaneous volatilisation of volatile substances, the vapours being at once separated and fractionally cooled in the receivers. In this process advantage is taken of the fact that a mixture of two substances boils at a lower temperature than that at which the one of higher boiling point boils; the b. pt. of the higher volatile petroleum fractions is so lowered that they now distil without decomposition. The application of the vacuum and the use of superheated steam are intended to accelerate the process, and since the volatile products remain only a few seconds in the superheated still, decomposition is out of the question. Hence, even in the case of petroleum rich in sulphur and compounds that readily decompose (*e.g.* Wietzer crude petroleum), hardly a trace of hydrogen sulphide or similar gas can be extracted with the air-pump. Distillates of high boiling point thus obtained from this petroleum had a purely aromatic odour. In the experimental plant erected at Stendal to work this process on a manufacturing scale, the maximum yield of distillate was first aimed at, and from 90 to 94 per cent. thereof was obtained from a heavy Wietzer crud oil. The residue consisted of coke, which although smal in quantity injured the plant and had to be frequentl removed. Hence a modification of the method wa adopted, the distillation being carried only as far as th production of petroleum asphaltum, and the process bein rendered continuous. This was effected by lowering th temperature in the still to, *e.g.*, in the case of heavy Wietze oil, 380° to 400° C. Care was also taken that the whol of the constituents to be separated were actuall vapourised. For this purpose the distillation vessel wa provided with four separate pairs of steam and oil conduit so that the same process was taking place in four differen parts of the apparatus. From 15 to 17 per cent. of har asphaltum were thus obtained from Wietzer oil, the othe products directly separated consisting of cylinder oil machine oil, spindle oil and lamp oil. Oils of other origin such as Texas fuel oil, Borneo oil, Roumanian residues etc., yielded an equally good asphaltum. The distillat are of uniform quality, and for many purposes need n refining, whilst even the poorest crude oils yield goo products. Other advantages claimed for the process ar the cheapness of the apparatus (preferably of cast iron economy of fuel and labour, and less risk of fire.—C. A. M

Naphthenic acids and their reaction with ferrous oxid E. Pyhälä. Chem.-Zeit., 1912, 36, 869—870.

The author prepared pure naphthenic acids from number of petroleum distillates and lyes from the refinin of petroleum. The neutralised waste lyes were precipitat fractionally with aluminium sulphate, and the precipitates washed with water and decomposed with hydrochloric acid. The liberated acids were washed with water, dissolved in ether, the ethereal solution washed with water until free from acid, filtered, and the ether distilled off. From the petroleum distillates the naphthenic acids were recovered by extraction with alcoholic potassium hydroxide, then liberated by hydrochloric acid, dissolved in ether, and washed successively with concentrated hydrochloric acid and water. Tests with these acids showed that the colour reactions with copper sulphate and ferrous sulphate described by Charitschkoff (this J., 1910, 650; 1911, 651) are given only by alkali salts of the naphthenic acids; the acids themselves do not give the reactions, but do so after the addition of a drop of alkali hydroxide solution. Moreover the chocolate brown colour given by ferrous sulphate with sodium naphthenate is due not to ferrous but to ferric naphthenate; the ferrous salt is of a dirty green colour, and is oxidised very rapidly to the ferric salt. The lower-boiling naphthenic acids are mobile liquids; with increase of molecular weight the viscosity increases, but the specific gravity and acidity diminish and the odour becomes less pronounced. The naphthenic acids readily retain alkali naphthenates in colloidal solution. (See also this J., 1908, 439, 799, 1054; 1910, 78; 1911, 498, 1041).—A. S.

Production of petroleum in 1911. D. T. Day. U.S. Geolog. Survey, 1912. [T.R.]

The following table shows the production of petroleum in the various countries of the world during 1911, with the percentage contribution of each:—

	Metric tons.	Percentage of whole.
United States	29,393,252	63·80
Russia	9,066,259	19·16
Mexico	1,873,552	4·07
Dutch East Indies	1,670,668	3·52
Roumania	1,544,072	3·21
Galicia	1,458,275	3·04
British India	897,184	1·87
Japan	221,187	0·48
Peru	186,405	0·40
Germany	140,000	0·29
Canada	38,813	0·08
Italy	10,000*	0·02
Other fields	26,667*	0·06
Total	46,526,334	100.00

* Estimated.

Patents.

Fuel briquets [briquettes]. H. Faraday, Manchester. Eng. Pat. 26,692, Nov. 29, 1911.

The briquettes are composed of 22 parts of coal, 1¼ parts of sodium sulphite, and 4¾ parts of tar.—A. T. L.

Fuel; Manufacture of artificial ——. A. E. Hodder and S. A. R. Conover. Fr. Pat. 440,753, Feb. 29, 1912.

Briquettes are made from coal dust with a binder made from waste leather, the binder being rendered insoluble by treatment with potassium bichromate. For example 22·5 kilos. of waste leather, cut in small pieces, together with 110 grms. of resin, are digested with water at 110° C. for 24 hours, and potassium bichromate is then added. An equal quantity of coal tar is then mixed in, and the binder mixed with coal dust which has been heated to 93° C., and the mixture briquetted whilst hot.—A. T. L.

Gas retorts; Method of and means for heating vertical ——. R. Dempster and Sons, Ltd., and H. J. Toogood, Elland, Yorks. Eng. Pat. 16,825, July 22, 1911.

The setting of vertical gas retorts of the "continuous" or "semi-continuous" type is arranged in such a manner that the gases are ignited and the maximum temperature applied at a cross-section of the retorts intermediate of their length, the products of combustion being utilised to heat the lower and upper portions to an intermediate temperature, and all the products commingling round the extreme top of the retort in a common chamber, from which they pass into a regenerator. In order to prevent the coal in the feeding hopper from becoming sticky, the parts of the setting adjacent to the top of the retort may be filled in with fireclay and a fireclay extension added to the retort mouthpiece; or the hopper may be lined with non-conducting material. The taper of the retorts is preferably made sharper in the upper portion than in the lower portion, in order to provide for the expansion of the coal when first heated and facilitate the uniform downward progress thereof. In smaller retorts the two streams of hot gases may be arranged to flow in zig-zag paths, but in larger retorts vertical flues are preferably employed.—H. H.

Gas retorts; Means for utilising the residual heat of coke produced in vertical ——. R. Dempster and Sons, Ltd., and H. J. Toogood, Elland, Yorks. Eng. Pat. 11,209 of 1912, date of Appl., July 22, 1911.

In vertical gas retorts of the "continuous" or "semi-continuous" type, the coke is cooled and the residual heat therein utilised by providing air-heating flues enclosing an extension of the retort through which the discharged coke passes. Two such flues may be provided, the one in contact with the hottest coke serving to heat the secondary air supply, used for the combustion of the gaseous fuel, to a temperature of say 1000° C., and the other being employed for producing steam-saturated primary air for delivery to the gas producer at a temperature of say 250° C. If further cooling of the coke is necessary, a water drip may be introduced into the centre of the coke, the steam produced passing up through the charge and forming water-gas.—H. H.

Coking coal and production of gas; Process of ——. H. L. Doherty, New York. U.S. Pat. 1,034,214, July 30, 1912.

The coal is carbonised by direct contact with the flame of burning gas derived from a previously carbonised portion of coal, and the products of combustion are caused to pass through the resulting hot coke with the twofold object of cooling the coke and converting the water vapour and carbon dioxide into hydrogen and carbon monoxide. The gases are withdrawn for use and the coke, after being quenched by sprinkling with water, is discharged.—W. H. C.

Gas [for heating purposes]; Process of manufacturing a mixed ——. R. P. Pictet, Wilmersdorf, Germany. Eng. Pat. 16,373, July 15, 1911. Under Int. Conv., July 16, 1910. Addition to Eng. Pat. 13,397 of 1911 (this J., 1912, 641).

A mixture of pure hydrogen and pure carbon monoxide is produced by passing a vapourised hydrocarbon such as commercial or crude petroleum, tar oils, etc., together with water vapour and a certain quantity of oxygen through an iron tube heated to about 1200° C. As described in Eng. Pat. 14,703 of 1911 (this J., 1912, 686) a mixture of hydrocarbon and water vapour without oxygen can be decomposed to give a similar gas if the tube through which it passes is maintained at 1350° C., but there is danger of melting the tube and the addition of oxygen enables the external temperature of the tube to be reduced to say 1200° C. as soon as the reaction has once been started. A tube 3 metres long and 20 cm. in diameter is capable of decomposing 10 litres of petroleum per hour, 3 litres of water and 150 litres of oxygen being required and 1200 litres of gas produced.—H. H.

Peat or the like; Utilisation of —— *in gas producers.* Soc. per l'Utilizzazione dei Combustibili Italiani and D. Civita, Milan. Eng. Pat. 17,436, July 31, 1911.

Freshly dug peat is broken in a suitable machine, and stacked for two days or longer, whereby the moisture is reduced to 75 per cent. The peat is then taken to a machine which delivers it in lumps, the size of a fist, on to wire gauze trays which are stacked on trucks. The loaded trucks are run into a drying chamber, through which are passed waste gases from the producer plant, diluted with air so as to reduce their temperature to 105° C. In this way the peat is dried to an extent sufficient to enable it to be gasified in the producer. The gases leaving the drying chamber are used for raising steam.—A. T. L.

Gas producers; Generation of steam for —— by direct contact of heated escaping gases with water. Bender und Frambs G.m.b.H. First Addition, dated March 13, 1912, to Fr. Pat. 432,950, Aug. 3, 1911 (this J., 1912, 117).

The mixture of steam and combustion products for addition to the blast for the producer may be obtained by burning any other gas, instead of the producer gas, in contact with water. Thus blast-furnace gas, coke-oven gas, water-gas or oil-gas may be used where convenient. Further, the combustion-products alone may be mixed with the blast in order to superheat it, in cases where steam from boilers, non-condensing engines, etc. is used.—A. T. L.

Gas producers. Standard Gas Power Co. Fr. Pat. 441,049, Mar. 7, 1912.

The producer is worked with a down-draught, the gas being drawn from the generator and through the scrubbers by a fan. The generator is mounted over a water-trough which seals the lower part of the casing, and the gas leaves by a central vertical hooded pipe in the lower part of the producer chamber. Air and steam are admitted above the fuel, and a secondary supply is admitted about midway of the height of the fuel column through a ring of tuyères, the arrangement of the blast supply and of the gas outlet ensuring uniform combustion in the fuel column. The steam for the primary supply is generated in a vapouriser formed in the lower conical part of the producer wall. The secondary vapouriser forms the top plate of the producer, and there is a valved connection between the two vapourisers, so that both may supply steam for the primary blast, if required. The gas from the generator passes upwards through a cooling column, meeting jets of water, then through a hydraulic seal in a chamber at the top of the cooling column, and then downwards through a second column. This seal can be flooded when the producer is not working. The gas next passes upwards through a wet scrubber packed with any suitable material, and then through a valved down-pipe to the suction fan. This down-pipe can be opened to the atmosphere when the gas valve is closed and the generator not working. The gas is forced by the fan through a purifier and thence to the supply main. A relief valve on the purifier opens when the gas production is greater than the consumption, and admits part of the gas to a by-pass which delivers to the base of the scrubber. A valved branch from this by-pass leads to the base of the generator and is used, when the generator is shut down, for reversing the draught.—A. T. L.

Fuel; Manufacture of smokeless and odourless ——, by the dissociation of water into its elements. A. Choury. Fr. Pat. 440,946, Feb. 20, 1912.

Steam is passed through horizontal retorts containing coke heated to incandescence by means of horizontal gas burners arranged beneath the retorts. The heat of the combustion products, and also that of the gases leaving the retorts, is used for raising steam in separate multitubular boilers, both boilers being connected with a common steam-dome. The gas outlet of any retort can be closed separately for recharging the retort with coke.
—A. T. L.

[Coal] gas purifying material; Process for making used —— fit for re-use by roasting. K. Burkheiser, Hamburg, Germany. Eng. Pat. 8217, April 4, 1912. Under Int. Conv., Aug. 28, 1911. (Compare this J., 1912, 717.)

In order to prevent the formation of iron sulphate in the revivification of spent gas-purifying material, a complete conversion of the iron sulphur compounds into hydrated oxide of iron and sulphur is effected by any known process before the material is roasted, so that during the roasting process only a burning-off of the sulphur takes place. The changes are represented by the following equations:—

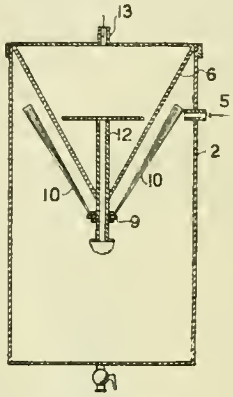
$$Fe_2S_3(+H_2O)+3O=Fe_2O_3(+H_2O)+3S.$$
$$Fe_2O_3(+H_2O)+3S+6O=Fe_2O_3(+H_2O)+3SO_2.$$

The purifying material is preferably employed in a finely divided condition, unmixed with organic compounds or other solid admixture, as described in Eng. Pat. 22,335 of 1910 (this J., 1910, 735). When the gas-purifying material contains iron sulphate, this should be removed by a preliminary roasting carried to the point at which vapours of sulphuric anhydride cease to be evolved. It is stated that the recovery process described in Eng. Pat. 20,920 of 1908 (this J., 1909, 1117) is open to the objection that sulphates of iron are formed in the mass which detrimentally affect its absorbing capacity for hydrogen sulphide.—H. H.

Carbon bisulphide; Process for separating —— from gases. Athion Ges. m. b. H. Fr. Pat. 440,802, March 1, 1912. Under Int. Conv., March 4, 1911.

The gas is first freed from carbon dioxide and hydrogen sulphide, and is then passed through a porous mass of alkali-cellulose.—A. T. L.

Acetylene gas; Purifier for ——. A. B. Cobb, Waterbury, Conn. U.S. Pat. 1,034,204, July 30, 1912.



The apparatus consists of a vessel, 2, into which the gas enters through the pipe, 5, and from which it is discharged through the pipe, 13. A funnel, 6, through the apex of which a pipe, 12, passes, is fixed within the vessel. Blades, 10, are attached by the disc, 9, to the pipe, 12, in such a way that they can be rotated round the pipe.
—W. H. C.

Gas-washer. M. W. Johnson, junr., Birmingham, Ala. U.S. Pat. 1,034,463, Aug. 6, 1912.

The gas is introduced tangentially into a chamber of circular cross-section within which a whirling mass of water is maintained. The fresh water is fed into the chamber in the same direction as the gas, which is compelled to pass through the whirling water, and is withdrawn from the centre of the chamber. The outer film of the whirling mass of water, which is saturated with the impurities of the gas, is continuously skimmed off and removed.
—W. H. C.

Blast-furnace gas, coke-oven gas, producer-gas, and the like; Apparatus for purifying ——. A. von Kerpely. Ger. Pat. 249,133, March 26, 1911.

The apparatus is of the type in which the gas is passed through a layer of fine-grained filtering material, which is continuously renewed. The cylindrical receptacle containing the filtering material dips into a water-seal and is closed below by a plate to which a rotary motion is imparted, in order to keep the filtering material in continuous motion and thus prevent stoppage. In order to facilitate the transmission to the filtering material of the motion of the bottom-plate, the latter is provided with a projecting portion, disposed eccentrically, in the form of a short tower or column, surmounted by a hood. The gas is led in through this tower, which is provided with lateral openings directed downwards and covered by the hood, so as to prevent stoppage by the filtering material.—A. S.

Hydrocarbon spirit; Method of producing ——. W. Higgins and H. Marcussen, London. Eng. Pat. 16,987, July 25, 1911.

Coal tar is mixed with a heavy hydrocarbon oil such as kerosene, so that the mixture contains from 50 to 75 per cent. of the oil, and the mixture is distilled, with occasional stirring.—A. T. L.

Condensation of gases or vapours [natural gas] into their liquid forms ; Art of ——. F. P. Peterson, Grove City, Pa., Assignor to The American Gasol Co., Pittsburg, Pa. U.S. Pat. 1,031,664, July 2, 1912.

The process of separating the different constituents of natural gas consists in compressing the latter to a certain point and then cooling it and collecting the separated liquid. The gaseous residue is then again subjected to a similar treatment but at higher pressures and lower temperatures. The cold produced by the expansion of the separated liquid is utilised to cool a portion of the compressed gas.—W. H. C.

Peat ; Processes for extracting water from wet carbonised ——. The Peat Coal Investment Co., Ltd. Fr. Pat. 440,575, Feb. 24, 1912. Under Int. Conv., Feb. 21, 1911.

See Eng. Pat. 4684 of 1911 ; this J., 1912, 323.—T. F. B.

Coke oven ; Horizontal —— of the regenerative type. E. Hohmann, Assignor to Stettiner Chamotte-Fabrik A. G. vorm. Didier, Stettin, Germany. U.S. Pat. 1,034,709, Aug. 6, 1912.

See Fr. Pat. 425,133 of 1911 ; this J., 1911, 882.—T. F. B.

Combustible gas ; Process for the production of a ——. C. Harting. Fr. Pat. 440,573, Feb. 24, 1912. Under Int. Conv., March 11, 1911.

See Ger. Pat. 245,059 of 1911 ; this J., 1912, 481.—T. F. B.

Simultaneous extraction of sulphur and cyanides contained in spent materials [oxide] used for the purification of illuminating gas. Addition to Fr. Pat. 434,673. *See* VII.

Apparatus for and actuated by gases of varying density. Eng. Pat. 27,484. *See* XXIII.

IIb.—DESTRUCTIVE DISTILLATION ; HEATING ; LIGHTING.

Patents.

Peat ; Apparatus for charring ——. A. Kesson, Prestwick, Scotland. Eng. Pat. 18,176, Aug. 11, 1911.

The peat is charged into metal tanks or chambers which are carried to the doors of the charring ovens by means of a conveyer, run into the ovens on rollers fitted to the floors thereof, and connected with mains for the gaseous and liquid products of distillation by means of pipes projecting horizontally from the top and bottom portions of the tanks and passing through the walls of the ovens opposite to the doors. The gas given off is passed through a cooling coil to a gas-holder, from which it is led back to the ovens for heating them. The flue gases are utilised for effecting a preliminary drying of the peat.—H. H.

Heat ; Process for the production of reactionary substances for the generation of ——. A. Lang, Karlsruhe, Germany. U.S. Pat. 1,035,202, Aug. 13, 1912.

See Fr. Pat. 395,536 of 1908 ; this J., 1909, 591.—T. F. B.

Metal filaments ; Producing ——. W. C. Arsem, Schenectady, Assignor to General Electric Co., New York. U.S. Pat. 1,034,949, Aug. 6, 1912.

See Eng. Pat. 23,335 of 1906 ; this J., 1908, 15.—T. F. B.

Flaming-arc electrode. E. J. Guay, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,035,119, Aug. 6, 1912.

See Eng. Pat. 6500 of 1912 ; this J., 1912, 578.—T. F. B.

Incandescent mantles ; Process for the manufacture of ——. W. Bruno, Berlin. U.S. Pat. 1,035,527, Aug. 13, 1912.

See Fr. Pat. 438,260 of 1911 ; this J., 1912, 633.—T. F. B.

Production of ammonium sulphate. Eng. Pat. 26,429. *See* VII.

III.—TAR AND TAR PRODUCTS.

Pyrogenic decompositions. Part I. Benzene. C. Smith and W. Lewcock. Chem. Soc. Trans., 1912, **101**, 1453—1459.

The results of experiments are described showing how greatly the yield of diphenyl by the pyrogenic decomposition of benzene in an iron tube is affected by the experimental conditions, especially the duration of heating (length of tube and rate of flow of benzene) and temperature. For the continuous conversion of benzene into diphenyl, the following conditions have proved most satisfactory. An iron tube (3·2 cm. diam. ; length of heated portion, 36 cm.) is placed, sloping downwards, in a combustion furnace, and is attached at its upper end to the side tube of a copper distilling flask. Benzene is allowed to fall, drop by drop (100 c.c. in 20 mins.), from a separating funnel into the flask, which is heated to about 150° C. The iron tube is heated to 720° C., and the lower end is connected, by a bent iron pipe, with the lower end of a vertical iron condenser, 55 cm. in length, enclosed in a steam jacket. The upper end of the iron condenser is attached to an ordinary Liebig water-condenser, which slopes downwards, so that its lower end is above a filtering funnel placed in the neck of the separating funnel attached to the copper distilling flask. The diphenyl is condensed in the iron condenser, whilst the unchanged benzene is condensed in the Liebig condenser and flows back to the distilling flask. With this apparatus the yield of diphenyl is, on the average, about 65 per cent., but at times is as high as 70 per cent. In practice it is necessary to cease working after about 300 c.c. of benzene have passed through the tube, in order to remove the deposit of carbon in the latter.—A. S.

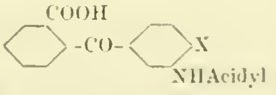
Patents.

Ketodihydrobenzo-para-thiazine or its derivatives ; Manufacture of bodies containing sulphur derived from ——. A. G. Bloxam, London. From Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 22,614, Oct. 31, 1911.

See Ger. Pat. 243,196 of 1910 ; this J., 1912, 325. Sulphur may also be added to the reaction-mixture.—T. F. B.

2-Nitro-5-acidylaminobenzoylbenzoic acids ; Manufacture of ——. Act.-Ges. f. Anilinfabr., Treptow, Germany. Eng. Pat. 12,920, June 1, 1912. Under Int. Conv., Nov. 4, 1911.

When 3-acidylaminobenzoylbenzoic acids of the constitution,



(where X represents hydrogen, halogen, methyl, etc.), are nitrated by the usual methods, 2-nitro-5-acidylaminobenzoylbenzoic acids are produced, the nitro group entering the position *para* to the acidylamino group. The products may be used in the synthesis of anthraquinone derivatives.—T. F. B.

Diacetyl-paramidophenol ; Process of manufacturing ——. F. E. Stockelbach, Assignor to F. Stearns and Co., Detroit, Mich. U.S. Pat. 1,034,528, Aug. 6, 1912.

A mixture of *p*-aminophenol and acetyl chloride is heated, in presence of zinc dust or other condensing agent until the hydrochloric acid is removed ; the heating

is continued until the material is melted, and the product is poured into hot water, with agitation, to produce a granular product, which is purified by crystallisation.
—T. F. B.

Compositions containing pitch and analogous substances; Manufacture of ——. J. Radcliffe. Fr. Pat. 440,461. Feb. 21, 1912.

See Eng. Pats. 4859 and 20,635 of 1911; this J., 1912, 325.—T. F. B.

IV.—COLOURING MATTERS AND DYES.

Indigo Blue; N-methyl-derivatives of ——. L. Ettinger and P. Friedländer. Ber., 1912, **45**, 2074—2080.

N,N-Dimethylindigo, m. pt. 182° C., was prepared from N-methyl-acetylindoxyl by dissolving in warm dilute alcohol (1 : 1), adding ammonia, and treating with a current of air, and from N-methylisatin-α-anilide by dissolving in hot alcohol, saturating with hydrogen sulphide, treating with water and a small quantity of ammonia, again treating with hydrogen sulphide and then with carbon dioxide, filtering, and passing air through the filtrate. It differs from indigo in its ready solubility in nearly all solvents except water, and in its colour, which in benzene solution, is similar to that of Malachite Green. With alkaline hydrosulphite it gives a yellowish vat, from which the leuco-compound separates in yellowish needles on addition of bicarbonate. The leuco-compound is oxidised much less readily than Indigo White and is adsorbed by the fibre to a much smaller extent than the latter in alkaline solution. N,N-Dimethylindigo has much stronger basic properties than indigo and is much less resistant to alkalis than the latter. N-Monomethylindigo, obtained by oxidation of indoxyl and N-methylindoxyl in ammoniacal alcoholic solution, or by warming with acetic anhydride a solution of indoxyl and N-methylisatin-α-anilide in glacial acetic acid, is about intermediate between indigo and the dimethyl-derivative with respect to its resistance to acids and alkalis, but stands nearer to the latter in regard to solubility in organic solvents and the colour of its solutions. The N,N-dimethyl-derivative of 6.6′-dibromoindigo was also prepared, and here likewise the introduction of methyl into the imino groups was found to have a considerable influence on the colour, displacing it towards the blue end of the spectrum. The introduction of methyl into the benzene nucleus has little influence on the colour, for the shades of 5.5′-dichloro- and 5.5′-dimethyl-1.1′-dimethylindigo were found to be practically identical.—A. S.

Dehydroindigo. IV. Its addition-products. L. Kalb. Ber., 1912, **45**, 2136—2149.

A discussion of the constitution of the addition products of dehydroindigo with acids (see this J., 1909, 1189).—A. S.

6.6′-*Dibromoindirubin.* L. Ettinger and P. Friedländer. Ber., 1912, **45**, 2081—2083.

6.6′-Dibromoindirubin was prepared by warming with a small quantity of fuming hydrochloric acid a solution of 6-bromoisatin and 6-bromoacetylindoxyl in glacial acetic acid. It is slightly soluble in boiling glacial acetic acid and xylene, easily soluble in quinoline. With alkaline hydrosulphite it gives a yellowish vat, from which cotton is dyed cherry-red. The xylene solution of the dyestuff gives an absorption spectrum consisting of two bands with the maximum $\lambda = 567\mu\mu, \lambda = 520\mu\mu$. The 6-bromoisatin used in the synthesis was prepared from *m*-bromoaniline, which was converted into the thiourea-derivative and the latter in the known manner into the bromoisatin-bromoanilide: the bromoisatin obtained in this way was found to consist of a mixture of 6- and 4-bromoisatin, the former preponderating.—A. S.

Hydroxy-ketonic dyes; Some ——. J. M. Dutta and E. R. Watson. Chem. Soc. Trans., 1912, **101**, 1238—1244.

2.3.4-Trihydroxyphenyl styryl ketone and 2.3.4-trihydroxybenzylacetophenone were produced by the condensation of cinnamic acid and β-phenylpropionic acid respectively with pyrogallol, and 2·4-dihydroxyphenyl 2-hydroxystyryl ketone by the condensation of resacetophenone and salicylaldehyde in concentrated alcoholic potassium hydroxide solution. These compounds have dyeing properties similar to those of the polyhydroxybenzophenones previously examined (this J., 1911, 196). 2.3.4-Trihydroxyphenyl 2-hydroxy(3)-naphthyl ketone and 2·4-dihydroxyphenyl 2-hydroxy(3)-naphthyl ketone were also prepared, but the replacement of a benzene by a naphthalene nucleus did not result in any appreciable deepening of the shades produced. The compounds produced by the condensation of o-hydroxycinnamic acid with pyrogallol and resorcinol respectively, probably pyrogallol-hydroxycinnamein:—

$$\left.\begin{array}{l} C_6H_2(OH)_3.C(OH)(CH : CH.C_6H_4.OH).C_6H_2(OH)_2 \\ C_6H_2(OH)_3.C(OH)(CH : CH.C_6H_4.OH).C_6H_2(OH)_2 \end{array}\right> O$$

and resorcinol-hydroxycinnamein:—

$$\left.\begin{array}{l} C_6H_3(OH)_2.C(OH)(CH : CH.C_6H_4.OH).C_6H_3(OH) \\ C_6H_3(OH)_2.C(OH)(CH : CH.C_6H_4.OH).C_6H_3(OH) \end{array}\right> O,$$

dye much deeper shades on wool, the former giving maroon on alum, dark brown on chrome, dark grey on iron, and cerise on tin mordant, and the latter, purplish-red on alum, crimson on chrome, deep purple on iron, and red on tin mordant.—A. S.

Dyes; Application of adsorption to the detection and separation of certain ——. A. C. Chapman and A. Siebold. Analyst, 1912, **37**, 339—343.

When 0·1 per cent. solutions of dyestuffs (10 c.c.) are stirred in a mortar with kaolin (5 grms.), the dyestuff may be (1) completely adsorbed, (2) partially adsorbed, but the adsorbed colour extractable wholly or partly by washing with water, or (3) not adsorbed. Into the first category fall Congo Red, Safranine, Magenta, Neutral Red, Malachite Green, Brilliant Green, Methylene Blue, Bismarck Brown, Crystal Violet, Methyl Violet B extra, Auramine; into the second Acid Green, Patent Blue, Soluble Blue; and into the third Acid Magenta, Eosin, Erythrosin, Fluorescein, Methyl Orange, Tropaeolin, Orange IV, Ponceau 4R, Bordeaux R, Sudan Red, Tartrazin, Naphthol Yellow, picric acid, Naphthol Green, Indigo Carmine, Cochineal (1 per cent. solution). In this way separations of these dyestuffs from one another can be effected; the usual tests for the identification of the dyestuffs can be applied to the kaolin containing the adsorbed substance. Further separations can in some instances be effected by taking advantage of the fact that some alcohol-soluble dyes, once adsorbed by kaolin, cannot be extracted again by alcohol, whilst others can; in this way the ternary mixtures Ponceau 4R, Crystal Violet, Safranine; or Naphthol Yellow, Magenta, Methylene Blue; or Fluorescein, Brilliant Green, Congo Red, were separated into the three individual dyestuffs. In most of the cases tried, saccharine solutions of the dyestuffs gave the same results as aqueous solutions, and in some cases—but not in all—alcoholic solutions could be successfully treated.—J. T. D.

Patents.

Indigo-rot; Manufacture of preparations particularly suitable for making an ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 17,045, July 25, 1911. Addition to Eng. Pats. 18,761, Aug. 9, 1910, and 20,324, Aug. 31, 1910.

Preparations of indigo white, suitable for use in the cold vat, especially the cold fermentation vat, are obtained by adding to the indigo white or a salt thereof an aromatic sulphonic or carboxylic acid of the type described in Eng. Pats. 18,761 and 20,324 of 1910 (see this J., 1911, 1047, 1110); for example, if 5 to 15 per cent. or more of a salt of benzylanilinesulphonic acid be added to indigo white, the vats made from such a preparation deposit only small quantities of indigo in a very finely divided and easily reducible condition. A syrupy mono-, di-, or trisaccharide, especially molasses, may also be added to the preparation (see Eng. Pat. 4617 of 1905; this J., 1906, 174).—T. F. B.

Tetrachloro-indigo; Process for making a violet ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 440,462, Feb. 21, 1912. Under Int. Conv., March 15, 1911.

A violet tetrachloro-derivative of indigo is obtained when 4·5-dichloro-2-nitrobenzaldehyde is converted into the corresponding indigo by the usual means. 4·5-Dichloro-2-nitrobenzaldehyde is obtained by nitration of 4·5-dichlorobenzaldehyde in the form of yellow prismatic crystals, of m. pt. 73° C.; it condenses with acetone in presence of alkali, forming dichlorophenyl lactomethyl ketone, of m. pt. 116°, which may be converted into tetrachloro-indigo by the action of alkali.—T. F. B.

Dyestuffs of the triphenylmethane series; Manufacture of ——. Farbwerke vorm. Meister, Lucius, und Brüning. Höchst on Maine, Germany. Eng. Pat. 12,378, May 24, 1912. Under Int. Conv., July 25, 1911.

According to Eng. Pat. 12,130 of 1910 (this J., 1910, 1297), and the Addition of July 7, 1910, to Fr. Pat. 417,490 of 1910 (this J., 1911, 17), chrome triphenylmethane dyestuffs are obtained by oxidising the products obtained by condensing *p*-halogen-benzaldehydes or their substitution products with two mols. of an *o*-hydroxyarylcarboxylic acid having a free *p*-position. If, in place of one mol. of these last, one mol. of a corresponding o-hydroxyarylcarboxylic acid is used in which the *p*-position is occupied, *e.g.*, *p*-cresotinic acid, *p*-chlorosalicylic acid, *p*-chloro-*m*-cresotinic acid, or 2.3-hydroxynaphthoic acid, unsymmetrical condensation products are obtained, in which the reaction of the aldehyde with the hydroxycarboxylic acid has occurred on the one hand in the *p*-position and on the other hand in the *o*-position to the hydroxyl group of the acid. The dyestuff obtained by oxidising the condensation product from *p*-chlorobenzaldehyde, *m*-cresotinic acid, and *p*-cresotinic acid, in molecular proportions, is much greener in shade than that obtained from one mol. of *p*-chlorobenzaldehyde and two mols. of *m*-cresotinic acid.—T. F. B.

Arylated naphthylaminesulphonic acids; Manufacture of —— and of sulphide dyestuffs therefrom. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 440,879, March 2, 1912.

A new series of arylated naphthylaminesulphonic acids is obtained by condensing *p*-diamines, such as *p*-phenylenediamine, naphthylenediamines, benzidine and their substitution products, either with naphthylamine-mono- or polysulphonic acids, or with the sulphonic acids of naphthylated *p*-diamines. The reaction is preferably effected by heat, in presence of a solvent or suspending agent or condensing agent. When these new arylnaphthylaminesulphonic acids are condensed with nitrosophenol or its derivatives, or oxidised in presence of *p*-aminophenol or its derivatives, indophenolsulphonic acids are produced, from which blue or greenish-blue dyestuffs may be obtained by treatment with alkali polysulphides, preferably in presence of a copper or other metallic salt: the shades produced by these dyestuffs are stated to be very fast to washing.—T. F. B.

Monoazo dyestuffs; Process for making ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 441,044, March 6, 1912. Under Int. Conv., March 30, 1911.

Aromatic aminoketones or aminosulphones are obtained by the action of the chlorides of aromatic carboxylic or sulphonic acids on aromatic hydrocarbons in presence of aluminium chloride or ferric chloride, and subsequently nitrating and reducing the products. Dyestuffs which dye wool brown shades fast to washing, may be obtained by combining the diazo compounds of these amino-ketones or aminosulphones with aryl-2-amino-8-naphthol-6-sulphonic acids. The products from phenyl-2-amino-8-naphthol-6-sulphonic acid and *m*-amino-*p*-methylbenzophenone and *m*-amino-*p*-methyldiphenylsulphone are described in detail in the specification.—T. F. B.

Anthraquinone derivatives containing sulphur; Process for the manufacture of ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 7699, March 29, 1912. Under Int. Conv., April 1, 1911.

Dianthraquinonyl thio-ethers and their derivatives are obtained by the action of derivatives of thiocarbonic acid (such as xanthogenates, trithiocarbonates, etc.) on halogenated anthraquinones or their derivatives, preferably in presence of a solvent of high boiling-point, such as nitrobenzene. The products are similar to those formed by treating halogen-anthraquinones or their derivatives with alkali sulphides. They are reduced by alkali hydrosulphites forming vats from which cotton is dyed yellow, orange, or red shades.—T. F. B.

Vat dyes of the anthracene series; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 15,753 of 1912, date of appl., Oct. 11, 1911. Addition to Eng. Pat. 29,352, Dec. 17, 1910.

Dyestuffs identical with those obtained according to the chief patent (see U.S. Pat. 996,109 of 1911; this J., 1911, 1109), are produced by treating dianthraquinonylamines or their homologues or amino or benzoylamino derivatives with chlorine derivatives of sulphuric acid, *e.g.*, chlorosulphonic acid.—T. F. B.

Dyestuffs of the anthraquinone series which dye wool and process for making them. F. Ullmann. Fr. Pat. 440,303, Jan. 31, 1912. Under Int. Conv., July 7, 1911.

The halogen derivatives of the anthraquinone-pyridazones (pyridazone-anthrones) or of their sulphonic acids (obtained by the action of hydrazines on anthraquinone-*o*-carboxylic acids according to Fr. Pat. 423,720 of 1910; see this J., 1911, 613) react readily with aromatic amines, forming arylamino-pyridazone-anthrones; the reaction is preferably carried out in presence of a catalytic agent and of a substance which will absorb the liberated hydro-halogen acid, with or without addition of a solvent or diluent. The products when sulphonated furnish dyestuffs for wool. Thus, the product from aniline and pyridazone-4-chloranthrone (from 4-chloro-anthraquinone-1-carboxylic acid and hydrazine hydrate) when sulphonated dyes wool yellow shades, and that from phenylpyridazone-4-chloranthrone (using phenylhydrazine) and *p*-toluidine gives orange shades.—T. F. B.

Vat dyestuffs of the anthraquinone series and process for making them. F. Ullmann. Fr. Pat. 441,245, March 12, 1912. Under Int. Conv., July 11, 1911.

The benzylidine derivatives obtained by the action of aldehydes on 1-halogen-2-aminoanthraquinones or their derivatives, may be condensed in presence of copper, forming the corresponding dianthraquinonyl derivatives: when the aldehydic group is eliminated from these, *e.g.*, by means of acids, vat dyestuffs are obtained. Thus, the benzylidine derivative of 1.3-dibromo-2-aminoanthraquinone is converted by copper into the benzylidine derivative of 2.2′-diamino-3.3′-dibromo-1.1′-dianthraquinonyl, which is a yellow vat dyestuff, apparently identical with dibromoflavanthrene.—T. F. B.

Condensation products and colouring matters of the anthracene series. Badische Anilin und Soda Fabrik. Fr. Pat. 440,698, Feb. 27, 1912. Under Int. Conv., May 30, 1911.

By condensing arylmercaptans with anthraquinone derivatives containing one or more negative substituents and also one or more auxochrome groups (*e.g.*, OR or NRR′, when R and R′ represent hydrogen, alkyl, or aryl), a series of coloured thioaryl ethers is produced, in a variety of shades, which may be utilised as dyestuffs or as pigments; when sulphonated, the ethers are converted into dyestuffs which dye wool fast shades from acid baths; to produce such dyes, moreover, it is not essential to use thioaryl ethers containing auxochrome groups, various other thioaryl ethers of anthraquinone with any substituents being equally suitable. Analogous wool dyestuffs are also obtained by condensing arylmercaptans with anthraquinone-sulphonic acids containing one or more easily replaceable substituents, as well as other indifferent or auxochrome groups, in such a way that at least one of the sulphonic groups remains intact. Twenty examples of the process are given.—T. F. B.

Azo dyes for lakes. A. Winther, A. L. Laska, and A. Zitscher, Offenbach, Assignors to Chem. Fabr. Griesheim-Elektron, Frankfort-on-Maine, Germany. U.S. Pat. 1,034,853, Aug. 6, 1912.

See Eng. Pat. 6379 of 1912; this J., 1912, 635.—T. F. B.

Monoazo dyestuffs especially suitable for the manufacture of lakes; Process for preparing ——. Chem. Fabr. Griesheim-Elektron. Fr. Pat. 441,333, March 13, 1912.

See Eng. Pat. 6379 of 1912; this J., 1912, 635.—T. F. B.

Vat [anthracene] dyes. H. Friedmann, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,034,895 and 1,034,896, Aug. 6, 1912.

See Eng. Pat. 9111 of 1911; this J., 1912, 426.—T. F. B.

[Azo] dyestuffs; Process for producing direct cotton ——. Farbenfabr. vorm. F. Bayer und Co. First Addition, dated Feb. 26, 1912, to Fr. Pat. 429,823, April 29, 1911. Under Int. Conv., March 7, 1911.

See Ger. Pat. 246,668 of 1911; this J., 1912, 635.—T. F. B.

Azo dyes and process of making the same. E. Fussenegger, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,034,898, Aug. 6, 1912.

See Eng. Pat. 25,903 of 1911; this J., 1912, 765.—T. F. B.

Vat [anthracene] dyes and making the same. A. Lüttringhaus, Mannheim, and W. Braren, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,035,023, Aug. 6, 1912.

See Addition of Jan. 31, 1912, to Fr. Pat. 425,859 of 1911; this J., 1912, 712.—T. F. B.

Anthracene series; Production of sulphurised dyestuffs of the ——. Soc. pour l'Industrie Chimique à Bâle. First Addition, dated May 3, 1911, to Fr. Pat. 403,025, Sept. 14, 1908.

See Eng. Pats. 11,422 and 15,979 of 1911; this J., 1911, 1204 and 1912, 66.—T. F. B.

Azo dyestuff and lakes derived therefrom. Act.-Ges. f. Anilinfabr. Fr. Pat. 440,864, March 2, 1912. Under Int. Conv., Jan. 17, 1912.

See Eng. Pat. 6993 of 1912; this J., 1912, 635.—T. F. B.

Desiccating wood and extracting its colouring and tanning matters. Fr. Pat. 441,241. *See* IX.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Sizing cotton yarn, Action of metallic chlorides and other substances used in ——. T. W. Fox, J. Hübner and E. Knecht. Text. Inst. Jour., 1912, 3, 27—42.

Solutions of magnesium chloride of known strength were evaporated to dryness, and the residues heated to temperatures varying from 212° F. to 374° F. (100° to 190° C.) for 20 minutes, in order to observe the action of heat on the salt. No decomposition occurred at 212° F. (100° C.), but decomposition was slight at 230° F. (110° C.) and rapid at 300° F. (149° C.). To observe the action of magnesium chloride and other substances used in sizing during singeing of the cloth, three pieces were woven, the warp being untreated and the weft treated with different materials. Each piece thus contained equal lengths of yarn treated with the different materials and an equal length of untreated yarn. The three pieces were passed through the gas-singeing machine, one piece being cut off and the remaining two pieces being singed a second time, the third piece being finally singed a third time. The following salts were employed with a thickening of steeped flour only:—ammonium, barium, calcium, magnesium, sodium and zinc chlorides, and in addition sizes were prepared containing 3 per cent. of glucose, 0·92 per cent. of salicylic acid, 0·909 per cent. of carbolic acid, and 0·18 per cent. of aluminium chloride. No appreciable tendering of the yarn was obtained with one or two singeings, and breaking tests were therefore confined to yarn thrice singed, and subsequently boiled in caustic soda lye in a high-pressure kier. With the exception of aluminium chloride, each treatment strengthened the yarn, the maximum increase being 20 per cent. on the unsized yarn. None of the materials appreciably changed the strength prior to singeing, but after singeing and boiling, the following results were obtained:—

Salt used.	Percentage loss after thrice singeing.	Percentage loss after boiling.	Total loss.
	per cent.	per cent.	per cent.
Ammonium chloride ...	5·5	26·0	31·5
Calcium chloride	11·0	10·0	21·0
Magnesium chloride ...	6·0	17·0	23·0
Sodium chloride	12·5	10·0	22·5
Zinc chloride	increase 3·0	29·0	26·0
Glucose	no change	13·0	13·0
Salicylic acid	8·0	17·0	25·0
Carbolic acid	1·0	19·0	20·0
Aluminium chloride ...	22·0	23·0	45·0
Sour size	8·0	18·0	26·0

The untreated sized cloth showed a reduction of 17 per cent. after boiling, and this must be deducted from the above figures to give absolute results. With lower quality cloth than that used in the above tests, greater tendering has been observed in actual practice, and experiments were therefore conducted with such a cloth, containing magnesium chloride, before singeing and after singeing, one, two and three times; the magnesium chloride was then extracted and the experiments repeated. The first singeing had little effect, but the magnesium chloride produced very distinct tendering after repeated singeing. The general results, however, show that other substances used in sizing besides magnesium chloride produce tendering sometimes in quite as marked a degree.—B. N.

"Black liquor"; Quantitative determination of sodium hydroxide in ——. E. Sutermeister and H. R. Rafsky. J. Ind. Eng. Chem., 1912, 4, 568—571.

In the preparation of cellulose by the soda process, wood is digested, under pressure, with a solution of sodium hydroxide. The by-product liquid is termed "black liquor," and contains the unconsumed sodium hydroxide together with the sodium salts of acids formed in the decomposition of the wood. The present method of sodium hydroxide determination is by titration with acid using phenolphthalein as indicator, and though several variations were devised and tested, none of them equalled that just mentioned, although it only gives approximate results. The ideas worked upon were as follows:—(1), Centrifugalising the precipitate formed by barium chloride, with subsequent titration of the clear liquor. (2), The use of various indicators. (3), Determining a ratio between the centrifugalised liquor, and the sample of "black liquor" taken. (4), An electrometric method.

Papers; Measurement of the translucency of ——. C. F. Sammet. U.S. Dept. Agric., Bureau of Chem., Circular No. 96, Apr. 8, 1912.

When a paper is placed over a white surface, the luminosity observed is composed of the light reflected from its surface and that which is reflected from the surface underneath. When the paper is placed on a perfectly black surface, the luminosity is that of the light reflected from the surface of the paper only. The difference in the observations is a measure of the translucency of the paper. Two blocks of magnesium carbonate are used as a standard white background, and a piece of black velvet as the black. The rays of the sun diffused through tracing cloth evenly illuminate the white surfaces of the blocks. These are viewed in a mirror on reflection through two apertures which are focussed by a lens into semicircular fields. One aperture is controlled by a shutter operated by a lever which reads 100 when wide open and zero when closed, whereby any degree of luminosity may be obtained. In order to produce uniform fields the light is passed through a series of revolving lenses, and to facilitate matching the luminosity of fields of different tints, the fields are viewed through a coloured glass of the primary colour representative of the predominating hue of the paper. After the fields are matched, the black velvet is placed over one block. The paper to be tested is then placed over both blocks. By operating the lever, its luminosity is reduced until it matches that from the field with the black background. The lowering of the luminosity is then a measure of the transmitted light reflected back through the paper, *i.e.*, of the translucency of the paper. The paper should be in immediate contact with the background. The proposed method gives more satisfactory results than those previously suggested, particularly with coloured papers; moreover it gives a measure of the translucency generally sought, *viz.*, the transmission of light through the paper and reflection back from the underlying surface, while other photometric methods measure only the direct transmission.—J. F. B.

Parchment papers of commerce. A. Burr, A. Wolff, and F. M. Berberich. Z. Unters. Nahr.-u. Genussm., 1912, 24, 197—227.

The authors have examined 58 samples of parchment papers from various sources, used for wrapping butter, etc. Such papers are usually treated with a hygroscopic agent to keep them in a pliable condition, and in the majority of cases starch-glucose syrup or invert sugar is the material employed. Glycerin is also suitable, but more costly, whilst calcium or magnesium chloride is used in rare cases, but the latter imparts a bitter taste. The analysis of such papers comprises determinations of moisture, aqueous extract, cupric-reducing substances expressed as invert sugar, and mineral matter soluble and insoluble. In these samples the moisture ranged from 5·5 to 13·1 per cent., the ash from 0·23 to 17·1 per cent.; the presence of more than traces of iron and lead is objectionable. The aqueous extract ranged from 0·005 to 31·1 per cent., the sugar (direct reduction) from 0 to 25·78 per cent., and the highest soluble mineral matter was 2·1 per cent., this value, however being generally below 1 per cent. Nearly half the samples contained over 10 per cent. of sugar, but 16 of the 58 were free from sugar. Biological experiments showed that the presence of sugar in the paper undoubtedly favoured the growth of mould on the butter wrapped in it, as also did glycerin but in a minor degree. Butter salted with 2 per cent. of salt was sufficiently preserved against mould, provided it was sound and the percentage of buttermilk not excessive. Roughness of the surface of the paper tends to collect mould spores. Moist butter, butter from which the moisture exudes in drops, butter not properly freed from buttermilk all tend to become mouldy; the moisture exuded at the surface dissolves the sugar in the paper, forming a nutrient medium. If the paper be firmly pressed in contact with the butter, air is excluded and mould is less likely to develop. Washing the paper with hot water, then steeping in cold brine, is the best preventive against mould. If it be admitted that sugar should be used at all, the authors consider that a maximum limit of 10 per cent. of aqueous extract or 8 per cent. of reducing sugar should be fixed; but the best Swedish butter papers are free from sugar.—J. F. B.

Patents.

Bark of willow-switches or osiers; Utilisation of the ——. O. Duda, Vizovice, Austria. Eng. Pat. 17,803, Aug. 4, 1911.

The process consists in submitting willow bark or the twigs of osiers to a steaming or boiling process at a pressure of 1—3 atmospheres for several hours and afterwards breaking the product between corrugated rollers in order to separate the fibres from each other and from the remaining cellular part of the bark. The resulting product is sorted into long fibres, which are used for spinning purposes, and short fibres with which is mixed the cellular part of the bark. This mixture is useful for insulating purposes. —P. F. C.

Wool and woollen material; Treatment of —— *for destroying cotton or other vegetable fibres and silk fibres therein.* W. Crowther, Upper Birstall, Yorks. Eng. Pat. 3715, Feb. 14, 1912. Addition to Eng. Pat. 22,101, Sept. 23, 1910 (this J., 1911, 1155).

After treating the material with silicon tetrafluoride gas to carbonise vegetable matter, it is neutralised with a solution of soda ash, then washed, drained, steamed, hydro-extracted, and dried without removing it from the apparatus. Other operations such as bleaching, mordanting, and dyeing may be carried out in the machine.—P. F. C.

Flax fibres; Bleaching and treating ——. F. E. Burgess, Columbiaville, Mich. U.S. Pat. 1,034,195, July 30, 1912.

The fibres are boiled in water, the surplus liquid removed, and the material subjected to the action of caustic potash or soda, approximately 50° to 60° Tw. in strength, at an approximate temperature of 100° F. The treated material is washed, and then subjected to a bath containing sodium sulphite.—B. N.

Retting vegetable fibres; Process of ——. L. Peufaillit, Tunis. U.S. Pat. 1,034,502, Aug. 6, 1912.

See Eng. Pat. 22,869 of 1910; this J., 1911, 1307. Urine may be added to the mixture of water and petroleum. —T. F. B.

Fabrics; Crinkling of —— *uniformly or in patterns.* M. Ratignier and H. Pervilhac et Cie. First Addition, dated May 2, 1911, to Fr. Pat. 432,185, Sept. 28, 1910 (this J., 1911, 1310).

The process described for crinkling fabrics by causing them to adhere to a stretched elastic support and then allowing the latter to contract, may be extended to include the crinkling of fabrics in patterns. The adhesive is applied by means of a hollow engraved roll fitted with a doctor, so that only the hollow portions retain the adhesive. The roll is pressed in contact with the fabric which takes the adhesive in patterns, and when pressed against a stretched rubber band, adheres only in these places, producing a crinkled pattern leaving the non-adherent portions in their normal state.—J. F. B.

Artificial threads; Process of manufacturing ——. J. Hermans, Herrenhausen, Assignor to E. de Haen, Chem. Fabr. "List," Seelze, Germany. U.S. Pat. 1,034,235, July 30, 1912.

A filament of a cuprammonium cellulose solution is passed through a slightly alkaline solution of a salt such as a nitrate, containing a nitrous salt dissolved in it.—B. N.

Artificial threads and films from mixed solutions of waste silk and cellulose; Manufacture of ——. E. M. S. Galibert. Fr. Pat. 440,846, May 11, 1911.

Solutions containing mixtures of silk and cellulose are prepared by the use of ammoniacal copper chloride in such proportions that a stable solution is obtained. The waste silk, which may be partially degummed by any suitable process, is dried and mixed with cellulose in such quantity that the resulting mixture contains 14 to 17 per cent. of nitrogen. The mixture is impregnated with copper chloride, alone or in conjunction with other salts of copper, in the correct proportion to avoid subsequent precipitation of the solution; carbohydrates or polyhydric alcohols are then added, amounting to 10—15 per cent. of the weight of the cellulose, and finally ammonia. A viscous solution results which is stable for a considerable time and is used for the manufacture of threads or films. —J. F. B.

Artificial threads; Manufacture of stable solutions for spinning ——. E. de Haen, Chem. Fabr. "List." Fr. Pat. 441,063, March 7, 1912. Under Int. Conv., June 23, 1911.

ORDINARY solutions of cellulose in cuprammonium are unstable, particularly at moderately high temperatures, so that it is necessary to preserve them at low temperatures or else to add certain organic matters which counteract the instability. According to this specification, the fixed alkali (caustic soda) which is employed in preparing the cuprammonium solution from a copper salt and ammonia, is previously digested with vegetable matter, preferably straw, so as to extract about 1 per cent. of organic matter calculated on the weight of the solution. For instance, 45 kilos. of soda lye at 21° Bé. are digested with 0·5—1·0 kilo. of straw at a temperature of 15°—20° C. for about half an hour. This extract is then used for preparing the solvent produced from 25 kilos. of copper sulphate and 90—95 kilos. of ammonia.—J. F. B.

Cellulose esters. W. H. Walker, Newton, Mass. U.S. Pat. 1,035,108, Aug. 6, 1912.

SOLUTIONS of organic acid esters of cellulose, suitable for use as varnishes, lacquers, etc., are obtained by dissolving the ester (*e.g.* acetate) in a halogen substitution product of ethane, such as acetylene tetrachloride.—T. F. B.

Plastic material; Non-inflammable ——. Comp. Franç. du Celluloid. Fr. Pat. 440,955, May 15, 1911.

A PLASTIC material is claimed, made up of the following substances, preferably in the proportions stated: cellulose acetate, 100 parts; glycerol acetate (mono-, di-, or tri-), 45 parts; triphenyl or tricresyl phosphate, 20 parts; acetone, 80 parts; alcohol, 30 parts; tetrachlorethane, 30 parts; magnesium chloride, 7 parts. The mixture is rolled and pressed into blocks or tubes and subsequently worked up similarly to celluloid.—J. F. B.

Soda- or sulphate-cellulose; Recovery of soda and the extraction of useful by-products from the lyes obtained in the manufacture of ——. E. L. Rinman. Fr. Pat. 441,186, Mar. 11, 1912. Under Int. Conv., Mar. 23, 1911.

THE "black lye" obtained during the manufacture of cellulose by the soda or sulphate process contains salts of humic acids which decompose on heating with a strong base and liberate aldehydes, alcohols, etc., leaving the mineral components behind. Different methods of effecting the decomposition are described and claim is made for the process of passing the gases obtained by dry distillation of the humic acid residues over carbon or copper at a high temperature in order to decompose the isopropyl alcohol which they contain into acetone and hydrogen.—P. F. C.

Paper pulp from the broom plant; Manufacture of ——. F. S. Finiels. Fr. Pat. 440,329, May 1, 1911.

THE broom plants are first steeped in water saturated with carbonic acid; they are then crushed and digested under steam pressure with a lye containing soda and petroleum. The mass from the digesters is passed into filter-presses, in which the cellulose is separated from the lye. The cakes of pulp are washed by the passage through them of a very dilute solution of an alkali hydrosulphide and finally of pure water charged with carbon dioxide. The cellulose is dried on hurdles in a stove and the waste liquors are treated for the recovery of by-products. —J. F. B.

Paper, cardboard, etc.; Manufacture of ——. O. E. Tingberg, Stockholm. Eng. Pat. 6491, March 15, 1912.

IN the manufacture of paper, cardboard, etc., lime is mixed with the pulp in the engine, preferably in the form of "lime-white" prepared from new-slaked lime, such lime not being neutralised by separately added substances. It is claimed that the lime acts both as a weighting and sizing material.—J. F. B.

Paper for colour-printing purposes and the preparation of ceramic and like transfers. H. Taylor, Congleton, Cheshire. Eng. Pat. 7634. Mar. 29, 1912.

PAPER employed for printing in different colours contracts or expands in the intervals between successive printing operations on account of temperature variations and thus tends to throw the work out of register. This is prevented by coating the back of the sheet to be printed on with a shellac varnish which is not affected by atmospheric changes.—P. F. C.

Mechanical wood pulp; Process for the production of ——. G. C. Howard, Seattle, Wash., U.S.A. Eng. Pat. 20,220, Sept. 12, 1911. Under Int. Conv., Sept. 12, 1910.

SEE U.S. Pat. 997,064 of 1911; this J., 1911, 951.—T. F. B.

Alcohol from the waste sulphite-cellulose lyes; Method of producing ——. P. G. Ekström, Skutskär, Assignor to Stora Kopparbergs Bergslags Aktiebolag, Falun, Sweden. U.S. Pat. 1,035,086, Aug. 6, 1912.

SEE Fr. Pat. 402,331 of 1909; this J., 1909, 1221.—T. F. B.

Cellulosic products from solutions of cellulose in ammoniacal cupric oxide; Process for making shaped or moulded ——. Comp. Française des Applications de la Cellulose. Fr. Pat. 440,776, May 10, 1911.

SEE Eng. Pat. 11,714 of 1911; this J., 1912, 428.—T. F. B.

Artificial threads from cupro-ammoniacal solutions of cellulose; Process for making ——. E. de Haën Chem. Fabr. "List." Fr. Pat. 440,907, March 4, 1912. Under Int. Conv., Aug. 12, 1911.

SEE U.S. Pat. 1,034,235 of 1912; preceding.—T. F. B.

Paper, cardboard, and the like; Treatment of material for making ——. A. Lietzenmayer, Aix-la-Chapelle, Germany. Eng. Pat. 17,714, Aug. 3, 1911. Under Int. Conv., Aug. 3, 1910.

SEE Fr. Pat. 433,467 of 1911; this J., 1912, 226.—T. F. B.

Cellulose ester varnishes. Fr. Pat. 440,733. *See* XIII.

Machines for straining waste liquids or trade effluents, and recovering fibrous substances contained therein. Eng. Pat. 19,718. *See* XIXB.

Apparatus for recovering fibres from liquids. Eng. Pat. 7060. *See* XIXB.

Cellulose films for use in photography and cinematography, etc. Fr. Pat. 441,146. *See* XXI.

Ammonium nitrate explosive. [*Utilising waste sulphite-cellulose lyes.*] Fr. Pat. 441,419. *See* XXII.

VI.—BLEACHING ; DYEING ; PRINTING ; FINISHING.

Faults in dyed cotton piece goods arising from manganese compounds. W. Zänker and P. Weyrich. Färber-Zeit., 1912, **23**, 316—319.

Dull grey stains and streaks were found to be generally distributed over cotton piece goods dyed with direct or sulphide dyestuffs in a German dye-house. It was proved that neither lime nor iron was the cause of the trouble. The ash obtained by incinerating a stained part of the fabric was darker, however, and slightly heavier than the ash from an equal weight of unstained cloth. Fusion of the ash with alkali nitrate and carbonate definitely proved that the production of a stain was always accompanied by the presence of a manganese compound. Further investigation demonstrated that the source of the manganese compounds was the product which was being added to the dyebath in place of Glauber's salts or common salt. This substance is a by-product which crystallises out of the lyes obtained during the recovery of glycerin from soap liquors and in it are accumulated the manganese compounds which are frequently added to oils and fats to promote "drying." During the boiling of the dye-bath the manganese is precipitated as hydrated manganese dioxide and settles on to the fabric, giving rise to stains and streaks.—P. F. C.

Surface tension and flocculation of colloid systems. (*Contribution to the theory of poisons, medicines, and dyestuffs.*) Traube. *See* XX.

Patents.

Flax fibres ; Bleaching and treating ——. U.S. Pat. 1,034,195. *See* V.

Mercerising apparatus in which the distance between the yarn carriers can be automatically regulated by hydraulic means during the impregnation of the material with the mercerising lye. H. le Wita. Fr. Pat. 440,394, Feb. 19, 1912.

This is a machine for varying the tension on yarn during the mercerising process.—P. F. C.

Hank mercerising machine. P. Hahn. Fr. Pat. 441,730, Mar. 9, 1912.

A mercerising machine of the type in which the hanks are placed over rotating cylinders which can be relatively adjusted at will.—P. F. C.

Phosphate baths for weighting silk ; Purification or regeneration of ——. A. Feubel. Fr. Pat. 440,827, Mar. 2, 1912. Under Int. Conv., June 19, 1911.

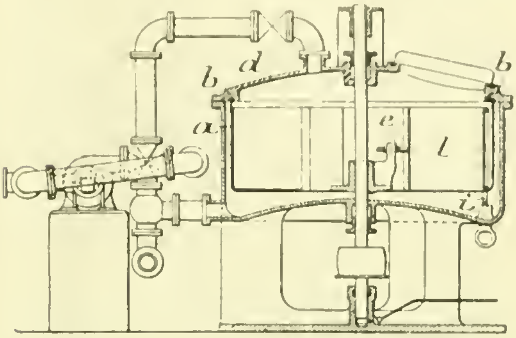
The process is illustrated by the following example :—2 litres of a solution of water glass of 38°—40° B. are added to a cubic metre of phosphate solution which by repeated usage for weighting purposes has accumulated 0·1 per cent. of tin. After thoroughly mixing, the temperature is raised to the boil for a few minutes. Free silicic acid is precipitated and carries down with it all the tin and other foreign metals contained in the solution. After filtration the solution can be used again for the weighting of silk. —P. F. C.

Drying, shrinking, or "ageing" textile fabrics ; Machine for ——. J. B. Whiteley and H. Calam, Huddersfield. Eng. Pat. 18,105, Aug. 10, 1911.

In this improvement of the machine described in Eng. Pat. 5845 of 1906 (this J., 1907, 315), the lags or rods are mounted on arms pivoted to the chain, and each lag is brought closer to the preceding lag after the loop of fabric is formed, thus increasing the carrying capacity of a given length of chain.—P. F. C.

Treating with fluids and centrifuging textile and other materials ; Apparatus for ——. Gebr. Sulzer, Winterthur, Germany. Eng. Pat. 8585 Apr. 11, 1912. Under Int. Conv., April 11, 1911.

Boxes, *l*, in which the material to be treated is closely packed, are inserted through an opening into a drum, *a*, having a cover, *d*, and are then firmly pressed outwards against the wall of the drum by means of screws, *e*. The centrifugal drum, *a*, is then raised and its upper edge is pressed by means of screws, *i*, against the packing, *b*, on the cover, *d*, of the casing, so as to produce within the casing two closed chambers. The lateral walls of the drum, *a*, and the circumferential walls of the boxes, *l*, are perforated. Dyeing, bleaching or washing liquor, or air, gases, or the like, can therefore only pass from one chamber to the other through the material packed in the boxes, *l*. After the dyeing or other wet process is completed, the screws, *i*, are loosened, the drum, *a*, is lowered and the material in the boxes is hydro-extracted by centrifugal force.—P. F. C.



Finishing textile fabrics : Apparatus for ——. J. B. Whiteley, Huddersfield. Eng. Pat. 22,480, Oct. 12, 1911.

A combined stretching and blowing machine.—P. F. C.

Bleaching ; Method of ——. E. Steiger, St. Gallen, Switzerland. U.S. Pat. 1,034,658, Aug. 6, 1912.

See Fr. Pat. 424,451 of 1910 ; this J., 1911, 742.—T. F. B.

Mercerising cotton yarn in skeins ; Method and machine for ——. P. Hahn, Neiderlahnstein on Rhine, Germany. Eng. Pat. 6171 of 1912, date of appl., Oct. 12, 1911.

See Fr. Pat. 434,516 of 1911 ; this J., 1912, 330.—T. F. B.

Dyeing of cotton or linen cloth with vat colours. R. B. Ransford, London. From L. Cassella und Co., G.m.b.H., Frankfort on Maine, Germany. Eng. Pat. 18,877, Aug. 22, 1911.

See U.S. Pat. 1,029,066 of 1912 ; this J., 1912, 638. The process is applicable to vat dyestuffs generally.—T. F. B.

Dyeing of fabrics with Aniline Black which will not turn green. F. Heilmann und Co., and M. Battegay, Mülhausen, Germany. Eng. Pat. 2056, Jan 25, 1912.

See Fr. Pat. 439,337 of 1912 ; this J., 1912, 715.—T. F. B.

Finishing, filling, loading or dressing textile fabrics and spun goods. L. Lilienfeld, Vienna. Eng. Pat. 25,245, Nov. 13, 1911. Under Int. Conv., Nov. 12, 1910.

See Fr. Pat. 436,087 of 1911 ; this J., 1912, 383.—T. F. B.

Washing and drying machine [for textiles]. Turbine ——. K. J. Breh, Zürich, Switzerland. Eng. Pat. 4758 of 1912, date of appl., Aug. 8, 1911. Under Int. Conv., May 4, 1911.

See Fr. Pat. 433,004 of 1911 ; this J., 1912, 122.—T. F. B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Nitrous acid; New method for the detection and determination of small quantities of ——. E. H. Miller. Analyst, 1912, **37**, 345.

Fifty c.c. of the solution to be examined are placed in a Nessler cylinder, acidulated with 1 drop of hydrochloric acid, then 3 drops of a dimethylaniline reagent (8 grms. of dimethylaniline and 4 grms. of hydrochloric acid dissolved in water and made up to 100 c.c.) are added and the solution allowed to stand till the maximum development of colour is reached (15 minutes or more). The colour is then matched by means of a standard sodium nitrite solution (1 part of nitrous acid per 100,000), which is similarly treated with 1 drop of hydrochloric acid and 3 drops of the dimethylaniline solution. Nitrates do not interfere with the reaction.—J. T. D.

Ultraphosphates. II. Thermal investigation of vitreous lead phosphate. A. V. Kroll. Z. anorg. Chem., 1912, **77**, 1—40. (See this J., 1912, 719).

An investigation of the vitreous lead phosphates by a thermal method, which is described, has furnished evidence of the existence, in the glasses obtained by fusing together lead oxide and phosphoric oxide, of lead salts of the ultraphosphoric acids previously studied (*loc. cit.*). This thermal method, in which points of constant softening were determined, in place of melting points, allows of the construction of an equilibrium diagram (corresponding to the melting point diagram for crystalloids), and it is suggested that the method might be applied to the study of glasses generally. Glasses are regarded as "cryosols," and not as supercooled liquids, their amorphous state being explained by their colloidal nature. During the solidification of fused glass, it is supposed that, as colloid molecules form, they remain in colloidal solution, causing a freezing point depression which increases, as more colloid forms, until the whole solidifies as a sol, the molten material "colloidising" instead of crystallising on cooling. —F. Sodn.

Borohydrates. M. W. Travers and R. C. Ray. Proc. Roy. Soc., 1912, **87**, A. 163—179.

A study of the products obtained by heating boric acid with magnesium powder, in an atmosphere of hydrogen, has led the authors to the conclusion, that the reactions taking place between these substances are by no means simple, and that there must exist compounds of boron and magnesium other than the compound, B_2Mg_3. When water is allowed to act upon the magnesium boride prepared in this way, hydrogen is evolved and a yellow solution obtained which exhibits marked similarity in its properties to a solution of hydroxylamine, being a powerful reducing agent; the solution, which owes its yellow colour to the presence of colloidal boron, decomposes on standing or evaporating, with the evolution of hydrogen, and the same gas is given off when dilute acid is added or when the evaporation residue is heated, although different reactions occur in each case. These reactions have been studied by measuring the hydrogen evolved and the iodine absorbed by the solution under various conditions, and by determinations of boron and magnesium. The authors conclude that hydrated derivatives of the oxides, B_4O_2 and B_4O_3, are first formed in the original solution, and that these undergo spontaneous decomposition, with the formation of a volatile, non-acid polymer of boric anhydride and compounds of boron, hydrogen, and oxygen, which in their turn decompose, giving hydrogen and oxy-compounds of boron, the exact nature of which depends on the conditions. The hydrogen evolved burns with a green flame but contains only a trace of boron, and the supposed solid "hydroborons" of previous workers are considered to be more properly classed as "borohydrates."—F. Sodn.

Aluminium peroxide. A. Terni. Atti R. Accad. dei Lincei, Roma, 1912, **21**, II., 104—108.

A concentrated solution of potassium aluminate prepared by dissolving freshly precipitated aluminium hydroxide in the smallest possible quantity of 50 per cent. potassium hydroxide solution, was treated with excess of a 30 per cent. solution of hydrogen peroxide, and the precipitate produced was filtered off with the aid of the pump, washed well with water, then with alcohol and ether, and dried in the air. The light, amorphous, white powder thus obtained had the composition, $Al_2O_3.Al_2O_4.10H_2O$, and exhibited the properties of a true peroxide. It dissolves readily in alkalis, without evolution of oxygen, probably owing to the formation of peraluminates. If the precipitate produced on adding hydrogen peroxide to potassium aluminate solution, be rapidly filtered off and pressed between absorbent paper without washing, a product is obtained in which the ratio of active oxygen to alumina is approximately 1 : 1. This substance, Al_2O_4, is decomposed by water and slowly, even on keeping, with formation of the compound, Al_2O_3,Al_2O_4.—A. S.

Cuprous sulphantimonites. N. Parravano and P. de Cesaris. Atti R. Accad. dei Lincei, Roma, 1912, **21**, I., 798—802.

The results of a thermal and micrographic study of mixtures of cuprous sulphide and antimony trisulphide show that two compounds are formed, viz., cuprous metasulphantimonite, $Cu_2S.Sb_2S_3.(=2CuSbS_2)$, and cuprous orthosulphantimonite, $3Cu_2S.Sb_2S_3(=2Cu_3SbS_3)$. The former is found in nature as chalcostibite and the latter forms the principal constituent of styiotypite.—A. S.

Thoria from monazite sand; Preparation of pure —— by means of hypophosphoric acid. F. Wirth. Z. angew. Chem., 1912, **25**, 1678—1679. (Compare Rosenheim, this J., 1912, 719.)

A cold saturated solution of disodium hypophosphate, $NaHPO_3,3H_2O$, is added, drop by drop, with stirring, to a boiling solution of thorium and trivalent earth metals (*e.g.*, that obtained by the decomposition of monazite sand), which should contain 15—20 per cent. of free sulphuric acid, and, after some hours, the flocculent precipitate of thorium hypophosphate, which at once separates, is brought on to a hardened filter, washed with water containing sulphuric acid, rinsed into a dish, dried on the water-bath, and oxidised by treating with 20 c.c. each of fuming nitric acid and concentrated sulphuric acid (for 0·2—0·25 grm. of precipitate); the nitric acid is then completely removed by evaporation, the mixture of sulphate and phosphate dissolved in 800 c.c. of water, and the thorium separated by adding excess of oxalic acid to the cold solution. The hypophosphate precipitate may also be decomposed by prolonged boiling with potassium hydroxide solution, the hydroxide precipitate being dissolved in dilute hydro-chloric acid and the solution precipitated by oxalic acid.—F. Sodn.

Cerium with nitrogen and hydrogen; Compounds of ——. F. W. Dafert and R. Miklauz. Monats. Chem., 1912, **33**, 911—918.

Cerium will not form an imide or any other nitrogen-hydrogen compound. The nitride can be formed without difficulty from cerium hydride. Ammonia cannot be synthesised from its elements when using cerium hydride or nitride.—F. Shdn.

Selenium and tellurium hydrides; Preparation of ——. W. Hempel and M. G. Weber. Z. anorg. Chem., 1912, **77**, 48—50.

None of the methods which have been proposed for the preparation of the hydrides of selenium and tellurium are found to furnish pure products. A mixture of hydrogen and selenium hydride, containing 56 per cent. of the latter, is, however, readily prepared by passing selenium vapour and hydrogen over pumice at 350° C., and the hydride is easily purified by condensation with liquid air. Attempts to prepare tellurium hydride by direct synthesis were not successful, but it was obtained without difficulty by the electrolysis, with a tellurium cathode, of 50 per cent. sulphuric acid, the electrolyte being cooled with a mixture of solid carbon dioxide and ether and the operation conducted in the dark (compare Ernyei, Z. anorg. Chem., 1900, **25**, 313), and an apparatus giving a 44 per cent. product, with a current of 4·5 amp. and 75—120 volts, is described.—F. Sodn.

Adsorption of gases by charcoal and other porous bodies. W. Hempel and G. Vater. Z. Elektrochem., 1912, **18**, 724—727.

Experiments were made upon the adsorptive power of charcoal which had been produced at different temperatures. The adsorption was carried out at the three temperatures of 20°, —78°, and —185° C. Cocoanut shell charcoal produced at the ordinary bunsen burner temperature, adsorbed small quantities of hydrogen but much larger quantities of other gases, nitrogen, methane, carbonic acid, etc., and the quantities increased considerably in each case as the temperature at which the experiment was conducted diminished. Samples of charcoal which had been produced at temperatures varying from 360° to 1360° C., were used to adsorb hydrogen and nitrogen, and with each gas it was found that the best results were obtained with the charcoal which had been produced at 600° C., the figures for hydrogen being 6·3 c.c. at 20°, 11·5 c.c. at —78° and 197·3 c.c. at —185° C. per c.c. of charcoal. Animal charcoal from different sources gave varying results, but in this case also the sample which had been produced at 600° C. and made into a paste with blood adsorbed the most gas, the figures for hydrogen being 7·3, 19·5, and 284·7 c.c. This sample of charcoal was used also in the presence of many other gases, and it was found that the quantities adsorbed were very much higher than in the corresponding experiments with cocoanut charcoal. The other porous bodies experimented with, kieselguhr, pumice, platinum black, etc., all gave results very much lower than charcoal. It was thought that this property of charcoal of adsorbing gases might be used to analyse a gaseous mixture. Many experiments were made with mixtures of hydrogen with methane, ethane, etc., and with mixtures of nitrogen and ethylene, but it was found that no constant results could be obtained, either as to the amount of gas adsorbed, or as to the percentage of hydrocarbon present adsorbed.
—J. H. J.

Sulphur; Volatility of —— and its action on water. F. Jones. Mem. and Proc. Manchester Lit. and Phil. Soc., 1911—1912, **56**, Mem. 14.

When 5 grms. of sulphur were boiled with 100 c.c. of water in a flask attached to a reflux condenser, the deposit of crystalline sulphur in the condenser after 22 hours amounted to 0·478 grm. Sulphur volatilised appreciably when heated to 100° C. in a current of dry air, and in the sublimed sulphur besides aggregations of octahedral crystals, there were fine transparent crystals of β-sulphur; some of these crystals have maintained their transparency for 35 years. Experiments with carefully purified sulphur in vessels of platinum and fused silica showed that when boiled with water, sulphur invariably yields hydrogen sulphide and thiosulphuric acid:

$$3H_2O+4S=H_2S_2O_3+2H_2S.$$

In presence of oxygen the reaction is:

$$3H_2O+3S+O=H_2SO_4+2H_2S.$$

Water interacts most readily with the sulphur obtained by precipitating a solution of sodium thiosulphate with an acid.—A. S.

Patents.

Sulphurous acid gas; Process of purifying ——. J. Blanc, Paris. U.S. Pat. 1,034,574, Aug. 6, 1912.

The gas is cooled and dried, any solid particles being simultaneously removed, and is subsequently passed through a mixture of glycerin and an alkaline solution, after which it may be again cooled.—F. Sodn.

Alkali hydroxides; Process of manufacturing ——. A. W. Ekstrom, Los Angeles, Cal. U.S. Pat. 1,034,599, Aug. 6, 1912.

An alkali thiosilicate is treated with barium hydroxide, in order to obtain alkali hydroxide and barium thiosilicate.
—F. Sodn.

Soda ash; Evaporating apparatus for recovering ——. C. H. Marshall, New York. U.S. Pat. 1,035,097, Aug. 6, 1912.

The apparatus consists essentially of an evaporating tank (of which a flue forms the upper side), with means for supplying liquor thereto and for maintaining circulation therein, and an overflow outlet at the feeding arrangement, the form described being provided with a "feed weir" and a partition wall, besides an arrangement for liquor supply to the tank through the weir, at a point on the inner side of the partition, and one, leading from an overflow compartment formed on the outer side of the partition, for carrying off overflow liquor from over the partition, a supply tank being in communication both with the evaporating tank and the overflow compartment. There is also a series of baffles mounted for rotation on a longitudinal shaft in the tank, and extending up into the flue, each baffle comprising a plate having wings, inclined to the plane of the baffle, and openings (in the plane of the baffle) which are covered by the wings.—F. Sodn.

Bleaching powder; Apparatus for the manufacture of ——. C. W. Marsh, Greenwich, Conn., U.S.A. Eng. Pat. 19,288, Aug. 29, 1911.

The bleach chamber is constructed of reinforced concrete, preferably with an internal gas-tight sheathing (*e.g.*, of paint or varnish containing asphaltum), and is so designed that, by reason of the conductivity and relatively extended radiating surface of the floor and walls, the excess of heat developed by the reaction between lime and chlorine may be conducted away, so that the temperature, under normal conditions, may be maintained within the necessary limits. A number of superposed, spaced supports for the lime are provided in the chamber, and means for transferring the lime between these, and, as an additional means of regulating the temperature when required, the gas may also be made to circulate through the chamber and through a temperature-regulating device. In the apparatus described, which comprises two superposed chambers, through which the chlorine passes in succession, flight conveyors are employed, and these preferably operate only until the lime is distributed over their surfaces, remaining then at rest until absorption of chlorine is complete: the chambers receive gas of progressively increasing concentration, as in the usual practice.—F. Sodn.

Calcium cyanamide and bisulphide of carbon; Utilisation of waste gases [from metallurgical works] for production of ——. A. A. Govan, Glasgow. Eng. Pat. 21,589, Sept. 30, 1911.

Claim is made for the utilisation of waste gases and products of partial combustion, produced at metallurgical works (*e.g.*, from smelting furnaces), for the generation of electricity to be employed in the production of calcium cyanamide and carbon bisulphide.—F. Sodn.

Formaldehyde sulphoxylates; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 22,453, Oct. 11, 1911.

An alkali formaldehyde bisulphite or hydrosulphite is reduced with zinc, in presence of zinc oxide, hydroxide, or carbonate, free acid being absent. For example, 152 parts of sodium formaldehyde bisulphite ($NaHSO_3.CH_2O.H_2O$) are dissolved in 150 parts of water, and the solution is heated to 70° C.; then, while stirring, an aqueous paste containing 120 parts of zinc dust (90 per cent. of metallic zinc) and 50 parts of zinc oxide is added, and the mass is heated for 2 hours at 100°—105° C., after which it is filtered and the filtrate evaporated *in vacuo*. If any dizincformaldehyde sulphoxylate be formed, sodium carbonate or hydroxide is added until the solution is alkaline, and the mixture is then filtered and the solution evaporated. —F. Sodn.

Sulphate of ammonia; Production of ——. G. W. England, Scarborough. Eng. Pat. 26,429, Nov. 25, 1911.

Ammonia gas, obtained by treating ammoniacal liquors produced in the destructive distillation of coal, peat, oil, and like ammonia-yielding substances, is passed into a solution of iron sulphate, contained in the usual saturator, and the resulting iron oxide (which may, if desired, be prepared for use in gas purification) is separated from the ammonium sulphate solution formed.—F. Sodn.

Aluminium nitride; Process [and electric furnace] for the manufacture of ——. Soc. Générale des Nitrures, Paris. Eng. Pat. 8347, April 6, 1912. Under Int. Conv., Jan. 12, 1912.

A mixture of alumina and carbon is heated by an electric resistance in a stationary furnace, and nitrogen is supplied to the neighbourhood of the resistance, in such a way that a cavity is formed between the resistance and the nitride. The mixture is introduced into this cavity so as to make the process continuous.—B. N.

Nitrogenous compounds; Preparing ——. L. L. Summers, Chicago, Ill. U.S. Pat. 1,033,842, July 30, 1912.

A metallic nitride, such as that of magnesium, or an alkaline-earth metal, is treated with ammonia (or with ammonia and hydrogen), in the presence of heated carbonaceous material or of such material and a metal.—F. Sodn.

Nitrogen; Process of fixation of —— *in the form of ammonia.* Comp. Bordelaise des Produits Chimiques. First Addition, dated May 12, 1911, to Fr. Pat. 440,217, April 27, 1911 (this J., 1912, 722).

Finely divided copper may be employed as catalyst, instead of the metals previously specified.—F. Sodn.

Salt-cake furnace. J. H. Neild, Hackensack, N.J., Assignor to General Chemical Co., New York. U.S. Pat. 1,033,825, July 30, 1912.

The furnace contains a support for the material, and a slide arrangement moves to and fro alongside this support. Feed-members are carried by the slide, and by means of mechanism, governed by the reciprocation of the slide, are moved alternately toward (into operative position) and away from the support.—F. Sodn.

Potash from felspar; Process of obtaining ——. J. M. Neil, Assignor to A. M. Hay, Toronto, Canada. U.S. Pat. 1,034,281, July 30, 1912.

The mineral is fused with an alkali sulphate (such as potassium sulphate), and the molten mass is subjected to the action of a gaseous sulphur compound containing oxygen, in the presence of steam or air, whereby the potash of the felspar is converted into potassium sulphate. The soluble and insoluble compounds are subsequently separated by treatment with water.—F. Sodn.

Magnesium carbonate; Process of manufacturing ——. F. S. Young, Newark, N.J. U.S. Pat. 1,034,330, July 30, 1912.

Dolomitic limestone is crushed and heated to a temperature at which the major portion of the magnesium carbonate is dissociated, and the material substantially dehydrated, whilst practically all the calcium carbonate remains undissociated, and it is then ground, and the magnesium compounds are dissolved out by treating the product with carbon dioxide (which may be at about atmospheric pressure), in the presence of water, until most of the magnesium has been converted into bicarbonate, after which the solution may be separated from undissolved residue, and boiled so as to precipitate the magnesium as basic carbonate.—F. Sodn.

Peroxidation of the alkali metals by oxygenated air; Process for the ——. Soc. Anon. des Usines de Rioupéroux. First Addition, dated May 6, 1911, to Fr. Pat. 429,269, July 11, 1910 (this J., 1911, 1212).

The process described in the principal patent may be carried out in apparatus of modified or novel design, as well as in that of known type.—F. Sodn.

(1) *Oxidation of the alkali metals; Process of* ——. (2) *Apparatus for the production of oxides of the alkali metals, or the peroxidation of their oxides.* Soc. Anon. des Usines de Rioupéroux. Fr. Pats. 440,588, May 6, and 441,034, May 17, 1911.

(1) Ozone ("pure" or diluted) is employed in place of the gases hitherto used for the oxidation of the alkali metals, and varying degrees of oxidation, up to the highest stages, are secured. (2) The metal (*e.g.*, sodium) or oxide to be treated is passed from a preliminary purifying vessel, in a molten or finely divided state, into a reservoir, from which it is forced by gas pressure through a pulverising device, into the upper part of an oxidation cylinder, which receives also the oxidising gas (air, oxygen, ozone, etc.) by a spiral pipe opening below, the product collecting in the lower part of the cylinder passing directly into storage tins. The reservoirs and cylinder are heated by a system of electrical resistances or in other manner, and there are means for cooling the cylinder when necessary, so that oxidation may be effected at any desired temperature and pressure.—F. Sodn.

Hydrogen peroxide; Process of obtaining pure solutions of ——. Darrasse Frères and L. Dupont. First Addition, dated Feb. 16, 1912, to Fr. Pat. 439,566, Jan. 31, 1912 (this J., 1912, 721).

Claim is made for the application of the process described in the principal patent to the purification of hydrogen peroxide prepared by using sodium peroxide.—F. Sodn.

Sulphur and cyanides contained in spent materials [oxide] used for the purification of illuminating gas; Process of simultaneous extraction of ——. H. Gouthière et Cie, and P. Ducancel. First Addition, dated May 2, 1911, to Fr. Pat. 434,673, Dec. 2, 1910 (this J., 1912, 324).

The material is treated with ammonium sulphide, filtered, and a current of steam passed through the filtrate, as described in the principal patent. The sulphur thus precipitated is filtered off, and the filtrate, which contains ammonium salts and soluble thiocyanates and ferrocyanides, is boiled with barium or calcium sulphide, whereby ammonium sulphide is recovered:—

$$(NH_4)_2SO_4 + BaS = BaSO_4 + (NH_4)_2S.$$

The barium or calcium sulphate is separated, and reduced by heating with carbon, so as to recover the sulphide. The filtrate from the barium sulphate is added to the residue from the original treatment with ammonium sulphide and is boiled with milk of lime; the ammonia set free is converted to sulphate, the liquid is filtered, the filtrate evaporated to dryness, and the residue obtained is distilled with lime so as to convert all the nitrogen present to ammonia, and this further quantity of ammonia is also converted to sulphate. The insoluble residue from the treatment with milk of lime is oxidised so as to obtain a revivified purifying material, as described in the principal patent. Another method of using the residue from the original treatment with ammonium sulphide consists in distilling it with lime in a current of steam, so as to convert all the nitrogen into ammonia, which is converted into ammonium sulphate. A third method is to dry the residue and oxidise it in a closed vessel, whereby some of the nitrogen is liberated in the form of ammonia, and is converted to ammonium sulphate, and the residue, containing all the nitrogen of the Prussian blue is useful as a manure.—A. T. L.

Hydrogen ; Process of purifying ——. G. H. Rabenalt, Dover, N.J. U.S. Pat. 1,034,646, Aug. 6, 1912.

The gas is passed into a solution of iodine in a suitable solvent, through which an electric current is simultaneously conducted.—F. Sodn.

Nitrous products hitherto lost and unemployed resulting from the manufacture of sulphuric acid by the lead chamber process ; Process for the recovery of the ——. A. Taraud and P. Truchot, Paris. Eng. Pat. 16,866, July 22, 1911. Under Int. Conv., Aug. 20, 1910. Addition to Eng. Pat. 9461 of 1911, dated April 18, 1910.

See Addition of Aug. 20, 1910, to Fr. Pat. 425,913 of 1910 ; this J., 1911, 1381.—T. F. B.

Oxalic acid ; Processes for the production of ——. E. C. R. Marks, London. From F. A. Lidbury, Niagara Falls, U.S.A. Eng. Pat. 6466, March 15, 1912.

See U.S. Pat. 1,031,074 of 1912 ; this J., 1912, 773.—T.F.B.

Acetic acid ; Process for making ——. Chem. Fabr. Griesheim-Elektron. Fr. Pat. 440,658, Feb. 26, 1912. Under Int. Conv., March 24 and Dec. 23, 1911.

See Eng. Pat. 17,424 of 1911 ; this J., 1912, 772.—T. F. B.

Ammonia ; Manufacture of ——. Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 24,657, Nov. 6, 1911. Under Int. Conv., Nov. 29, 1910.

See Fr. Pat. 436,472 of 1911 ; this J., 1912, 432.—T. F. B.

Ammonia and formic acid from alkali cyanides or earth alkali cyanides ; Process for the production of ——. H. Sulzer, Aadorf, Switzerland. Eng. Pat. 784, Jan. 10, 1912.

See Ger. Pat. 243,797 of 1911 ; this J., 1912, 385.—T. F. B.

Ammonium sulphite ; Method of converting —— into ammonium sulphate. K. Burkheiser, Hamburg, Germany. U.S. Pat. 1,034,974, Aug. 6, 1912.

See Eng. Pat. 12,227 of 1911 ; this J., 1911, 1160.—T. F. B.

Ammonium chloride ; Process of making pure ——. F. A. Freeth, Great Crosby, and H. E. Cocksedge, Herne Hill. U.S. Pat. 1,035,696, Aug. 13, 1912.

See Eng. Pat. 86 of 1910 ; this J., 1910, 1378.—T. F. B.

Nitrogen compounds ; Manufacture of ——. A. Schweitzer and F. Hauff, Stuttgart, Germany. Eng. Pat. 3410, Feb. 10, 1912. Under Int. Conv., Feb. 10, 1911.

See Fr. Pat. 439,872 of 1912 ; this J., 1912, 721.—T. F. B.

Compounds of oxygen and nitrogen ; Method of producing ——. P. Bunet, Paris, and A. Badin, Assignors to Comp. des Produits Chimiques d'Alais et de la Camargue, Salindres, France. U.S. Pat. 1,035,684, Aug. 13, 1912.

See Fr. Pat. 402,012 of 1908 ; this J., 1909, 1198.—T. F. B.

Oxides of nitrogen ; Method of obtaining ——. W. A. Phillips, Assignor to Nitrogen, Ltd., London. U.S. Pat. 1,035,732, Aug. 13, 1912.

See Eng. Pat. 27,558 of 1910 ; this J., 1911, 1211.—T. F. B.

Dehydrated [graphite] mixtures ; Process for preparing ——. Acheson Oildag Co. Fr. Pat. 440,507, Feb. 23, 1912.

See U.S. Pat. 1,030,372 of 1912 ; this J., 1912, 722.—T.F.B.

Sulphites and bisulphites ; Process for making anhydrous ——. General Chemical Co. Fr. Pat. 440,685, Feb. 27, 1912.

See U.S. Pat. 1,023,179 of 1912 ; this J., 1912, 489.—T.F.B.

Electrostatic separator for the classification of ores, sulphur, etc. Fr. Pat. 441,053. *See* I.

VIII.—GLASS ; CERAMICS.

Fire bricks ; The melting points of ——. C. W. Kanolt. J. Franklin Inst., 1912, 174, 225—227.

The melting point was taken as the temperature at which a small piece of the brick could be distinctly seen to flow. The experiments were made in an Arsem graphite resistance vacuum furnace, and the temperatures measured by a Morse optical pyrometer of the Holborn-Kurlbaum type, calibrated by sighting the carbon filament pyrometer lamp into a platinum resistance furnace, and also by comparison with the freezing points of copper, silver, and the copper-silver eutectic. Samples of the materials, about 1 to 2 cm. in diameter, were enclosed in a tube composed of a mixture of kaolin and alumina in the ratio required for the formation of sillimanite, to protect them from the small amount of reducing gas in the furnace, and were heated at a rate of about 10° per minute when near the melting point. The following table is a summary of the results :—

Material.	No. of samples.	Melting point, Centigrade.
Fire clay brick	41	1555° to 1725°
Bauxite ,,	8	1565° ,, 1785°
Silica ,,	3	1700° ,, 1705°
Chromite ,,	1	2050°
Magnesia ,,	1	2165°
Kaolin	3	1735° to 1740°
Bauxite	1	1820°
Bauxite clay	1	1795°
Chromite	1	2180°
Pure alumina	—	2010°
Pure silica	—	1750°

The value 1750° for silica is not the true melting point, but is approximately the temperature at which silica flows distinctly. Silicon carbide does not melt below 2700° C., but is unstable at much lower temperatures.—W. C. H.

Ultraphosphates. II. Thermal investigation of vitreous lead phosphate. Kroll. *See* VII.

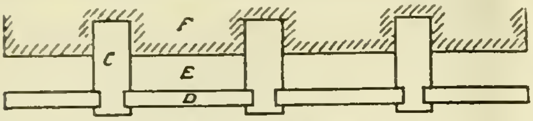
Patents.

Glass furnaces. V. H. Gregory. Fr. Pat. 441,183, March 11, 1912.

Reversible crucibles are so disposed that the molten glass flows from them on to the bottom of the hearth, which is fitted with an outlet. In order to keep the glass sufficiently fluid to escape, this outlet is provided with a long narrow bridge, shaped so that it does not impede the passage of the glass, whilst at the same time projecting into the flame used to heat the bottom of the crucible. The bridge thereby attains such a temperature that it keeps the glass fluid.—H. H. S.

Kilns and ovens [for pottery, etc.] ; Brick for building ——. G. A. C. Thynne and T. Pulling, Hereford. Eng. Pat. 16,893, July 24, 1911.

The slabs, D, forming the walls of kilns or ovens for the manufacture of tiles or pottery, are let into vertical grooves formed in special fireclay bricks, C, which are imbedded in the ordinary brickwork, F, of the kiln in the manner shown so as to form a flue, E. The grooves in the bricks, C, are made the full width of the slabs, D, so that the latter do not require to be rabbetted.—H. H.



Shaft-kilns [for ceramic ware]; Method for operating ——. H. L. Doherty, New York. U.S. Pat. 1,034,347, July 30, 1912.

A COURSE of hollow, refractory tiles is interposed between the separate charges of material to be burned. The tiles are of rectangular shape, and have a round longitudinal opening; they are laid in practically parallel rows, so that between each charge there are a number of parallel passages extending across the kiln and corresponding, when the contents of the kiln sink down consequent upon the burning, with a row of oppositely placed apertures in the walls of the furnace near the bottom, but above the discharging door. When the passages are abreast of the openings, bars are inserted through the latter and serve to support the materials in the upper part of the kiln, while the finished articles are withdrawn. When this has been done, the weight is taken off the bars by a ram and they are withdrawn until the next row of passages comes down into position.—W. H. C.

Glass furnaces. W. W. Pilkington. Fr. Pat. 440,611. Feb. 26, 1912. Under Int. Conv., March 28, 1911.

SEE Eng. Pat. 9244 of 1911; this J., 1912, 490.—T. F. B.

Formation of metallic coatings on objects composed of carbon, clay, porcelain, etc. Fr. Pat. 440,597. *See* X.

IX.—BUILDING MATERIALS.

Lime; The slaking of hydraulic ——. W. Vaubel. Tonind.-Zeit., 1912, **36**, 1299—1300.

UNLESS hydraulic lime is to be used at once, the water, which is used for slaking, must not be in such amount as to hydrate the calcium oxide which is in combination with the hydraulic constituents, silica, ferric oxide, and aluminium oxide, as this would cause premature setting; after the preliminary slaking process, the hydraulic lime must be allowed to "weather" in damp air for a prolonged period, in order to complete the hydration of the uncombined calcium oxide; access to carbon dioxide should be prevented as far as possible. When preparing mortar, an adequate quantity of water should be added so as to enable the hydraulic constituents to perform their functions as soon as possible.—O. R.

Lime; Effect of the addition of highly silicious material on the hardening of ——. H. Burchartz. Mitt. Kgl. Materialprüfungsamt, 1912, **30**, 133—138.

THE author investigated the effect on the hardening of lime of a material rich in soluble silica, designated as "Si," which was of the nature of trass, puzzuolana, and the like. Tests were made with five brands of hydraulic lime in conjunction with "Si," standard sand, and in certain cases, Portland cement. It was found that the addition of "Si" to the lime-sand mortars was accompanied by an enormous increase in the hardening properties of the mixtures, the increase in the tensile and crushing strengths of the mortars being proportional to the quantities of "Si" added within the limits of the experiments (up to 80 parts of lime: 20 parts of "Si"), and being reduced by the substitution of Portland cement for a portion of the "Si" used. The increase was most marked in the case of the crushing strengths of feebly hydraulic limes.—O. R.

Cements; The cause of the cracking of ——. H. Kühl. Tonind.-Zeit., 1912, **36**, 1331—1334.

THE author contends that the cracking of cement is not due to the increase in volume of the hydrating cement particles, owing to the formation of calcium hydroxide from free or combined lime in the cement, but is simply the result of the pressure produced by growing crystals ("crystallisation pressure"). It was found that when a paste of cement and water was introduced into a volumenometer, and the instrument filled with water up to a definite mark, in all cases the level of the water fell, whereas it should remain fixed if the cement were constant in volume, or rise if the volume increased. In order to protect the brass vessel of a Michaëlis volumenometer used in the experiments from pressure from any cracking of the cement, the vessel was lined with a beaker, between the wall of which and the vessel a space of 1 to 2 mm. was left. The cement was poured down the graduated tube into a known volume of water in the apparatus, and the sum of the volume of this water and of the cement, calculated from its weight and specific gravity, almost exactly equalled the volume registered by the instrument, and observations were taken at definite intervals of time up to 28 days. A normal cement, constant in volume, gave a contraction of 13·6 c.c. in 28 days, without any apparent alteration of the hardened pat. A cement, rather richer in lime, that failed to pass the volume-constancy tests, contracted 14·2 c.c. in the same time; in spite of undoubted cracking in this case the contractions are slightly higher than in the former. Another cement with a higher content of lime cracked so much that the cover of the apparatus was lifted after 3 days so that the water escaped. With a rich "dead burnt" lime, treated in the same way, the contraction after 8 days was constant at 9·2 c.c., showing that the reaction ends sooner than in the case of the hydration of Portland cement, and the contraction is also less. These results are even more marked in the case of pure burnt lime, and consequently the formation of hydrated calcium silicates and aluminates, which are produced during the hydration of Portland cement, is accompanied by a greater contraction than occurs in the hydration of lime. A cement with a high content of gypsum, which cracked badly, showed relatively a smaller contraction than a normal cement, so that from all these experiments the real cause of cracking appears to be due to the effect of the "crystallisation force" like the direct forces exerted in the crystallisation of supersaturated solutions.—W. C. H.

Iron-Portland cement and Portland cement; Comparison of ——. M. Gary and H. Burchartz. Mitt. Kgl. Materialprüfungsamt, 1912, **30**, 122—129.

THIS paper forms the sequel to the first report (this J., 1909, 1250), additional data being furnished for the behaviour of Portland and iron-Portland cement mortars after 5 years, both in the case of fresh cements and of cements that had been stored for 6 months before use. The tables comprise the tensile and crushing strengths, the relationships of added water and volume-weight, and the effects of slag-sand and fine sand, in respect of mortars containing the two classes of cement, raw sand, and Freienwald sand. Beyond the general conclusion that iron-Portland cement compares favourably with some brands of Portland cement, especially as regards crushing strength, the most noticeable feature of the observations lies in the increase in crushing strength evinced by both Portland cement and iron-Portland cement mortars made from stored cement and kept under water for five years. (See also this J., 1912, 388, 491.)—O. R.

Cement-mortar and concrete; Determination of the relative proportions of the constituents of hardened ——. H. Burchartz. Mitt. Kgl. Materialprüfungsamt, 1912, **30**, 117—121.

As it may often be important to ascertain what proportions of cement and filling material were used in making mortars and concretes, after these have set and hardened, the author made a number of investigations to determine whether chemical analysis would lead to sufficiently accurate results. The amount of lime found by analysis was taken to indicate the quantity of Portland cement of average composition, which was used in the preparation of the mortar, and 1 part by weight of cement so determined was taken to represent 1·4 parts by volume, this figure having been found to be a reliable standard. The insoluble residue, after decomposition with dilute hydrochloric acid, was taken to be the weight of the filling material used, and its volume-weight was determined as follows: The dried material was moistened with 4 per cent. of water, and the volume-weight was taken to be the mean of the values obtained (*a*), by running the material freely into the measure, and (*b*), by shaking it in as closely as possible. Except in the case of highly calcareous filling material, the figures obtained by analysis agreed very closely with the volume-proportions of cement and sand, which were used in making test mortars. As the lime content was no index to the amount of cement mixed with calcareous filling materials, the soluble silica was determined instead, 22 parts of soluble silica being taken to represent 100 parts of cement; in these cases, of course, it was not possible to determine the volume-weight of the filling material, and only the proportions by weight could be estimated.—O. R.

Lava bricks; Occurrence of efflorescence on ——. W. McGeorge. J. Ind. Eng. Chem., 1912, 4, 559—561.

In using building bricks made from dark grey basaltic lava rock by grinding it finely, mixing with a small quantity of lime, cement, or both, moistening, pressing into bricks, and treating these with steam under pressure in a drying kiln, it was found that some of the bricks soon became covered with an efflorescence of needle-shaped crystals composed essentially of sodium and potassium carbonates. Leaching the ground rock with water, addition of barium carbonate or chloride, and painting the surface of the bricks with oil were found not to prevent the efflorescence. The lava rock when used in its natural state rarely shows any efflorescence, and the production of the latter is probably due to the interaction of complex alkali silicates with the lime used as binding agent, under the action of the steam and pressure, with the formation of alkali hydroxides which are subsequently converted into carbonates. The substitution of cement for lime as binding agent, together with an alteration of the method of drying, has led to a more compact brick being obtained, and to a decided improvement in regard to the occurrence of efflorescence.—A. S.

Disintegration of concrete as a consequence of production of excess of hydrogen sulphide in sewage disposal plants. Barr and Buchanan. *See* XIX B.

Patents.

Cement; Manufacture of ——. J. G. A. Rhodin, London. Eng. Pat. 21,697, Oct. 2, 1911.

A finely-divided mixture of orthoclase felspar (100 parts), slaked lime (56 parts), and sodium chloride (40 parts), is roasted, and the mass incompletely lixiviated with hot water, so as to leave a wet residue containing soluble chlorine corresponding to about 0·25 per cent. of sodium chloride, or the residue may be impregnated with a suitable salt solution. To 100 parts of this residue, calculated on the dry substance, 40 to 70 parts of quicklime, previously slaked, are added, and the slurry fired at a temperature of about 1000° C., thus leaving a finely-divided hydraulic cement.—B. N.

Hydraulic cement; Manufacture of ——. F. W. Brown, Florence, Colo., Assignor to L. M. Schmidt, Hartford, Conn. U.S. Pat. 1,033,984, July 30, 1912.

Calcium sulphate in any of its forms, hydrated or anhydrous, is subjected to an "oxidising temperature" of not less than 2000° F. (1093° C.) till a portion of the calcium sulphate is decomposed. The product is cooled and combined with silicious material.—B. N.

Cement; Production of —— *from blast-furnace slag.* C. Walter. Fr. Pat. 440,737, Feb. 28, 1912. Under Int. Conv., June 26, 1911.

The process of rendering pulverised slag friable by its projection against cold drying surfaces may suffer from the formation of a non-conducting layer on the surface. To remedy this defect, the surfaces (walls or rotating drums) are made perforated and the projected slag is met by jets of water or steam playing over them.—H. H. S.

Preserving timber by means of phenolate solutions. F. Seidenschnur, Charlottenburg, Germany. U.S. Pat. 1,034,652, Aug. 6, 1912.

The timber is uniformly impregnated with a quantity of solution insufficient for completely filling the pores, and carbon dioxide, or a mixture of gases containing carbon dioxide, is then introduced into the pores of the timber. —B. N.

Wood; Process and apparatus for desiccating —— *and for extracting its colouring and tanning matters.* P. Ziegler. Fr. Pat. 441,241, March 12, 1912.

Wood stacked on trolleys is run into the desiccating chamber which is fitted with apparatus for heating and for producing a vacuum. The chamber is heated and exhausted, and the liquid extracted from the wood, which may contain tanning or colouring matters, is run into a well. Fresh air delivered through perforated plates is then caused to play over the wood, whilst continuing the heating, in order to promote evaporation of moisture as it arrives at the surface, the wood being thereby desiccated. The process is applicable to freshly-cut wood.—H. H. S.

Cement; Process for producing an improved ——. A. A. V. Poulsen, Lemvig, Denmark. Eng. Pat. 24,775, Nov. 7, 1911. Under Int. Conv., Nov. 21, 1910.

See Fr. Pat. 427,776 of 1911; this J., 1911, 1061.—T. F. B.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Zinc; Hardening and annealing of ——. G. Timoféef. Comptes rend., 1912, 155, 430—432.

Small rods of 15 mm. diameter were cast, and the hardening was effected by compression in a vice whilst the piece was cooled by ice. They were etched by very weak nitric acid containing a little chromic acid. The centre of the original ingot shows very large crystalline grains furrowed by macles, but after hardening, the structure is very much more finely granular. A similar change occurs by gradual annealing at the ordinary temperature (20°—25° C.) after a fortnight or so, or at 100° C. in a few minutes. If the reheating be carried out at higher temperatures (about 300° C.) very much larger crystals are formed. Photomicrographs are given in the paper.—J. T. D.

[*Gold and silver*]. *Cyanidation; Lime in* ——. C. E. Rhodes. Eng. and Min. J., 1912, 94, 251—252.

An account of a series of experiments on the use of lime in cyaniding is given, where 1, 1·5, 2, and 2·5 lb. respectively of unslaked lime per ton was added before the ore reached the stamp bin, this being an advantage as it is in contact with the ore before the "cyanicides" have any deleterious effect. Experience has shown that it is advantageous to determine the amount of lime to be added, and to use mechanical rather than air agitation.

The results are given in the following table, thirty-six hours' agitation having been given and no lime added to the tests.

Test No.	Agitation, hrs.	Lime per ton, lb.	Potassium cyanide, per cent.	Per cent. extraction.			Potassium cyanide consumed, lb. per ton.	Remarks.
				Gold.	Silver.	Total.		
1	0	1·04	0·060	—	—	—	—	No lime added
	12	0·24	0·054	77·96	66·67	75·94	—	
	24	0·01	0·045	89·83	73·33	86·87	—	
	36	0·00	0·036	88·62	73·33	85·88	3·74	
2	0	1·50	0·060	—	—	—	—	No lime added
	12	0·59	0·054	89·17	73·33	86·45	—	
	24	0·18	0·052	92·16	73·33	88·93	—	
	36	0·00	0·040	91·47	73·33	88·36	2·20	
3	0	1·98	0·060	—	—	—	—	No lime added
	12	0·89	0·052	90·11	73·33	87·44	—	
	24	0·35	0·052	92·21	73·33	89·20	—	
	36	0.00	0·042	91·79	73·33	88·85	1·98	
4	0	2·50	0·058	—	—	—	—	No lime added
	12	1·25	0·052	89·47	66·67	85,43	—	
	24	0·45	0·052	89·95	73·33	87·01	—	
	36	0·00	0·042	91·15	73·33	87·99	1·76	
5	0	0.98	0·058	—	—	—	—	Lime added
	12	0·93	0·049	91·46	68·18	88·68	—	
	24	0·71	0·048	94·65	77·27	92·57	—	
	36	0·99	0·048	91·46	75·00	89·49	1·10	
6	0	1·58	0·061	—	—	—	—	Lime added
	12	1·34	0·050	91·22	70·45	88·80	—	
	24	1·33	0·050	94·81	77·27	92·77	—	
	36	1·50	0·049	92·02	75·00	90·04	1·32	
7	0	2·26	0·058	—	—	—	—	Lime added
	12	2·20	0·050	89·54	68·18	86·78	—	
	24	2·20	0.049	91·90	72·73	89·42	—	
	36	2·17	0·048	92·80	77·27	90·79	1·10	
8	0	2·26	0·058	—	—	—	—	Lime added
	12	2·26	0·050	89·54	68·18	86·78	—	
	24	2·24	0·048	87·29	68·18	84·82	—	
	36	2·10	0·048	93·59	75·00	91·19	1·10	

—A. H. C.

Patents.

Armour plates and other steel articles; Manufacture of ——. Vickers, Ltd., Sheffield, and J. L. Benthall, Chesterfield. Eng. Pat. 19,458, Aug. 31, 1911.

For making an armour plate, an ingot containing from 0·15 to 0·35 per cent. of carbon, 0·30 to 0·40 of manganese, 5·0 to 6·0 of nickel, 0·25 to 0·75 of chromium, and 0·75 to 1·75 of molybdenum, having been rolled to the required thickness, is heated to a temperature of from 1050° F. (565° C.) to 1250° F. (676° C.) to remove internal strains and then allowed to cool in air. The face of the plate is then cemented in the usual way at a temperature of from 1700° F. (926° C.) to 1850° F. (1010° C.) for 8 to 14 days. The temperature is then allowed to fall to from 1400° F. (760° C.) to 1550° F. (843° C.), the plate is bent, reheated to from 1400° F. (760° C.) to 1600° F. (871° C.) and oil- or water-hardened. It is then reheated to from 1150° F. (621° C.) to 1350° F. (732° C.), again bent if necessary and allowed to cool to from 400° F. (216° C) to 500° F. (260°C.). It is again heated to from 1050° F. (565° C.) to 1250° F. (676° C.), sprinkled with water, machined, and finally hardened. The final hardening may be carried out in one of three following ways:—1. By the Krupp process, the plate being embedded with its face exposed. 2. (Known as a "two furnace method.") The plate is placed in a furnace and heated uniformly to from 1150° F. (621° C.) to 1480° F. (804° C.), placed on supports on a base plate, the side being bricked round, and the two plates quickly transferred to a second furnace heated to from 1700° F. (926° C.) to 2050° F. (1121° C.), and when the face of the armour plate has reached the desired temperature, the plate is removed and quenched on the face and back in the usual way. 3. The plate is heated to from 1150° F. (621° C.) to 1480° F. (804° C.), quickly heated on its face to from 1750° F. (954° C.) to 1850° F. (1010° C.), and then quenched.—A. H. C.

Armour plates; Manufacture of ——. A. J. Boult, London. From L. Blum, Neustadt a. d. Haardt, Germany. Eng. Pat. 9749, April 24, 1912. (See also Fr. Pat. 362,371 and Eng. Pat. 1356 of 1906; this J., 1906, 700, 764.)

The armour plate having been kept in a closed space at a temperature of 900° C. in contact with the powder described in the previous specification for about five hours per cm. of depth of treatment, it is dipped into water at 30° C.—A. H. C.

Armour plates and method of treatment. S. S. Wales. Fr. Pats. 441,382 and 441,383, March 15, 1912.

Martin steel of the following composition is used:—carbon 0·15 to 0·25, manganese 0·15 to 0·25, nickel 5 to 12, chromium 0·15 to 0·25, and tungsten 0·50 to 0·70 per cent. Silicon should be below 0·15, and sulphur and phosphorus below 0·04 per cent. Vanadium and molybdenum may be added to the extent of 0·20 to 0·50 per cent., and these elements may wholly or partially replace the tungsten. It is claimed that homogeneous plates of this composition, without cementation of the surface, are more resistant to projectiles than plates of equal thickness made by the Harvey or Krupp processes. The heat treatment is as follows:—After the plate is forged, it is heated to about 700° C. and cooled in air. It can then be reforged, after which it is heated to about 875° C. and quenched in water. The period of quenching is 4 minutes for each 10 cm. thickness, and is less the higher the carbon. The plate is then heated to above 710° C., preferably about 775° C., and allowed to cool in air, when it is ready for machining. If the plate has to be bent to a shape, it is reheated to about 750° C., but in any case this temperature must be lower than that of the previous heating. The plate is then annealed at about 500° C. by one, or several successive treatments, followed by air cooling. The final tempering is preferably accomplished by heating the plate uniformly to about 725° to 775° C., and then spraying both faces simultaneously with water. Following this, one side is reheated to 500° or 550° C., the other side being protected from the heat by coating it with clay. On removing the plate from the furnace, the tempered side is sprayed with water in order to prevent the whole plate from being re-annealed.—T. St.

Iron or steel articles; Method of treating ——. G. F. Westcott, Buffalo, N.Y., Assignor to Internat. Acheson Graphite Co., Niagara Falls, N.Y. U.S. Pat. 1,034,174, July 30, 1912.

Iron and steel surfaces are coated with a composition containing a non-coalescing electric-furnace graphite and a suitable vehicle (*e.g.*, one comprising a vegetable oil, a resinous material and a drier), and the article is afterwards baked.—J. H. L.

Steel; Process of case-hardening ——. K. Blake, Laporte, Ind. U.S. Pat. 1,034,962. Aug. 6, 1912.

A case-hardening mixture consists of a quantity of bone meal sufficient to embed 90 lb. of steel, ½ lb. of potassium cyanide, 1 quart of ammonia, and 5 lb. of brown cane sugar.—A. S.

Steel; Process of manufacturing ——. H. D. Hibbard, Plainfield, N.J. U.S. Pat. 1,035,120, Aug. 6, 1912.

Crude iron is treated in a closed vessel, at about its fusing temperature, with a quantity of heated oxide of iron sufficient substantially to eliminate those metalloids (*e.g.*, silicon) which give an exothermic reaction with the oxide. Successive portions of the molten iron are then transferred to an externally heated steel furnace, together with a predetermined portion of the slag, and a quantity of oxide of iron is introduced with each such charge, in order to eliminate the excess of carbon therefrom before the introduction of the next charge.—A. S.

Steel; Manufacture of ——. P. P. Reese and S. S. Wales. Fr. Pat. 441,352, March 14, 1912.

The charge having been melted in the Martin furnace, ore is added until the carbon is reduced to about 0·35 to 0·45 per cent. Successive small quantities of manganese are then added until the temperature of tapping is reached. By this means the charge is kept under control so that the desired carbon content and the desired temperature for tapping may be attained simultaneously. The successive additions of manganese also cause a more complete elimination of sulphur.—T. St.

Tin; Recovery of —— from tin-bearing ores and the like by conversion into volatile tin compounds. A. Richards, London. Eng. Pat. 56, Jan. 1, 1912. Addition to Eng. Pat. 26,644, Nov. 28, 1911 (this J., 1912, 440).

The tin-bearing materials are heated with coal or other reducing agent and any suitable chlorine- or bromine-bearing substance such as the chlorides of calcium, barium, magnesium, or potassium, or a mixture of 90 per cent. of sodium chloride and 5 of potassium bromide, the resulting volatile chlorides and bromide of tin being collected and reconverted into tin. In the case of ores containing sulphur or arsenic, a preliminary calcination is given prior to the above chlorination process.—A. H. C.

De-tinning tin-plate scrap; Process for ——. Dubois und Kaufmann. Ger. Pat. 247,967, Nov. 5, 1910.

In the de-tinning of tin-plate scrap by treatment with chlorine diluted with another liquid, claim is made for the use of sulphuryl chloride as the diluting liquid. Sulphuryl chloride possesses advantages over carbon tetrachloride for this purpose, in that the reaction proceeds more rapidly and any moisture adhering to the scrap does not impede the reaction.—A. S.

Alloy; A new ——. C. E. P. Gabriel, Birmingham. Eng. Pat. 2035, Jan. 25, 1912. Addition to Eng. Pat. 19,518, Aug. 20, 1910 (this J., 1911, 1068).

The alloy is prepared by adding 1 part of zinc to about 9 parts of the alloy described in the original patent (98·38 per cent. of aluminium and 1·62 per cent. of copper). It is claimed that the new alloy is particularly suitable for castings, increasing their tensile strength and rendering them more durable.—T. St.

Alloys; Manufacture of —— such as brass, bronze, etc. C. E. Grégoire de Bollemont and A. Willemin. Fr. Pat. 440,703, May 9, 1911.

The alloys are formed by subjecting one of the metals to the action of another in the form of vapour. Taking brass as an example, zinc vapour is brought into contact with heated copper. The zinc may be made to penetrate throughout the copper, or a surface alloy merely may be formed. The object, by this means, may be fashioned completely in copper before being converted into brass, and selected portions may be preserved unalloyed as desired.—T. St.

Electroplating apparatus. J. W. Dow, Mansfield, Ohio. U.S. Pat. 1,034,219, July 30, 1912.

The apparatus consists of a tank to contain a suitable electrolyte, within which an endless band formed of flexible material, stiffened by cross pieces or slats, is mounted on suitable rollers so that it hangs down into the electrolyte and forms a pocket to contain the articles to be plated. The band also serves to shake up the articles during the process and to discharge them when finished on to a "runway" which is placed adjacent to the tan.
—W. H. C.

Cyanide plant. A. F. Tanner, Greenfield, Wis. U. S. Pat. 1,034,532, Aug. 6, 1912.

The plant comprises a frame with "a heating pipe extending back and forth across the frame alternately at the opposite ends thereof with its portions extending across the frame horizontal and its intermediate portions inclined." Removable inclined pans rest on the horizontal portions of the heating pipe, the lower end of one pan being beneath the upper end of the next pan in the series. The lower ends of the pans are concave in shape and ribbed drums rotate in these concave portions for the purpose of lifting the material from one pan to the next.—A. S.

Electric furnace. C. A. Weeks, Philadelphia, Pa. U.S. Pat. 1,034,747, Aug. 6, 1912.

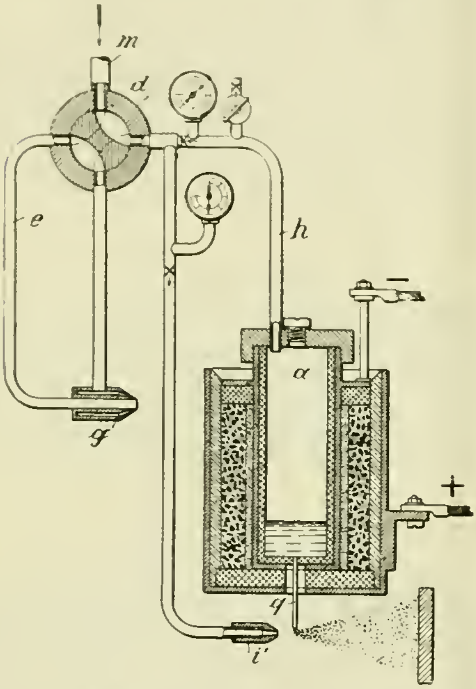
An electric metal-refining furnace, with a refractory hearth and electrodes above the hearth, is provided with a "neck portion" which forms an adjustable connection with the lower end of a long inclined rotating cylindrical flue. Means are provided for rocking the electric furnace without disturbing the connection with the rotary flue. The latter is connected with a chimney stack at its upper end and serves as a smelting furnace. The charge of ore and flux is fed in at the upper end, and, in descending through the smelting furnace, meets the hot gases coming from the electric furnace. Finely-divided fuel is injected by means of a blast into the lower end of the smelting furnace so as to produce a smelting temperature therein, and the reduced molten metal produced flows through the connecting passage into the hearth of the electric refining furnace.
—A. S.

Furnace; Electric [steel] ——. J. A. Bernardini and C. Didierjean. Fr. Pat. 441,213, May 20, 1911.

The furnace comprises a transportable casting-pot, furnished with cooled and protected electrodes for heating by resistance, for the production of refined steels from metal previously deoxidised. It may be mounted on a carriage, or placed on fixed supports, and is provided with arrangements in the latter case for tilting it, *e.g.*, by means of a pinion and endless screw. The casting spout of the pot is made of such a shape, that it may serve either for pouring the metal or for the introduction of suitable ingredients, without entraining the slag floating on the surface.—B. N.

Furnace; Process and arrangement for putting in and out of action an electric —— serving for the production of metallic powders. M. U. Schoop. Fr. Pat. 441,100, March 8, 1912.

THE metal is heated in a closed melting chamber, *a*, in which may be produced, at convenient times, alternately increased or diminished pressure. The chamber, *a*, is connected with a four-way valve, *d*, so that in the position of the valve shown, the compressed air entering through *m*, and the tube, *h*, drives out the liquid metal through *q*, and by means of the nozzle, i^1, the metal is also scattered in the form of a powder. When the valve is turned into the position shown by the dotted lines, the compressed air passes through *e*, and by means of the injector, *g*, a diminished pressure is produced in the chamber, *a*, thus preventing escape of the metal through the tube, *q*.—B. N.



Metals and alloys; Method of producing refined ——. A. E. Greene, Pueblo, Colo., Assignor to American Electric Smelting and Engineering Co., St. Louis, Mo. U.S. Pat. 1,034,784, Aug. 6, 1912.

A BATH of molten metal covered by a layer of slag is heated electrically to a temperature suitable for selective oxidation, and is then treated with a gas containing carbon dioxide (or oxygen) in quantities suitable for effecting such selective oxidation, but not capable, at the temperature in question, of oxidising elements which it is desired to retain unaffected. The process may be made continuous, the gases containing carbon dioxide from an ore-smelting furnace being used to effect selective oxidation in the refining furnace, and the hot furnace-gases from the latter used to produce a further quantity of molten metal from a mixture of ore, reducing agent, and flux in the ore-smelting furnace.—A. S.

Alloy steel; Process of producing ——. A. E. Greene, Chicago, Ill., Assignor to American Electric Smelting and Engineering Co., St. Louis, Mo. U.S. Pat. 1,034,786, Aug. 6, 1912.

FOR the production of a low-carbon alloy steel, a high-carbon ferro-alloy is heated in an electric furnace to a temperature below the point of excessive volatilisation of the alloying metal, and then subjected to the action of a gaseous agent (which may be a mixture of two gases in suitable proportions), the oxygen pressure of which is such that, at the working temperature, it acts as a reducing agent towards the oxides of iron and of the alloying metal, but as an oxidising agent towards the element or elements (*e.g.*, carbon) it is desired to eliminate.—A. S.

Metals and alloys; Process of refining ——. A. E. Greene, Chicago, Ill., Assignor to American Electric Smelting and Engineering Co., St. Louis, Mo. U.S. Pat. 1,034,787, Aug. 6, 1912.

THE metal or alloy is heated to a suitable temperature by means other than combustion (*e.g.*, electrically), and then blown with a mixture of carbon monoxide and dioxide in such proportions that the impurity is oxidised but the metal is not.—A. S.

Metals and ores; Process of extracting and refining ——. A. E. Greene, Chicago, Ill., Assignor to American Electric Smelting and Engineering Co., St. Louis, Mo. U.S. Pat., 1,034,788, Aug. 6, 1912.

A CHARGE of sulphide ore or matte is fed into a furnace, in which high-potential arcs, terminating on the charge, are produced. A gaseous agent, which has a reducing action towards the metal it is desired to obtain, and an oxidising action towards the elements (sulphur, etc.) it is desired to eliminate, is forced into the furnace so as to blow the flame of the arcs into contact with the charge. —A. S.

Sherardising-furnace. J. Riddell, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,034,930, Aug. 6, 1912.

A WHEELED carriage, resting on tracks extending through the furnace, is caused to move backwards and forwards by a succession of intermittent impulses. Circular (cylindrical) charge containers having peripheral guide-bands are disposed transversely on the wheels of the carriage, so that they revolve as the carriage moves to and fro.—A. S.

Gold, silver, and other metals; Extraction of —— from sea water. E. Lapisse. Fr. Pat. 440,519, May 5, 1911.

THE sea water is pumped through mercury, intimate contact being effected by forcing the water through a grid at the bottom of the mercury and by having above the mercury a mass composed of small steel balls. The height of the cylindrical vessels containing the mercury is several times that of the mercury columns, and above the mercury the walls are furnished with annular collars inclined downwards to prevent currents along the walls. In series with the cylindrical vessels are several tanks in which particles of amalgam carried forward with the water may settle. —T. ST.

Metals [copper]; Purification of ——. Helsingborgs Kopparverks Aktiebolag. Fr. Pat. 440,537, Feb. 23, 1912. Under Int. Conv., Feb. 27, and Aug. 15, 1911.

MOLTEN crude metal, such as copper, is subjected to the action of suitable material, by blowing the latter in a fine state of division into the mass of metal by means of a current of air. In this way all the metal comes into contact with the reagent and a minimum amount of the latter is required. The reagent combines with the impurities and rises to the surface of the metal, forming there a scum, or escaping in the gaseous state. Powdered charcoal or other combustible may with advantage be mixed with the reagent, as the cooling effect of the air current may thus be even more than compensated for. —T. ST.

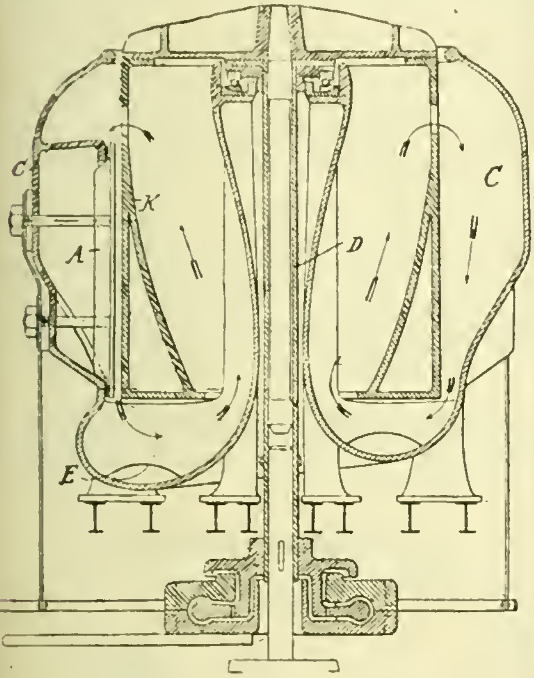
Copper; Extraction of —— from sulphide ores. N. V. Hybinette. Fr. Pat. 440,712, Feb. 28, 1912. Under Int. Conv., March 23, 1911.

THE ores are roasted with from 2 to 20 per cent. of sodium sulphate, and then lixiviated with dilute sulphuric acid.

The solution, which contains the sulphates of sodium, copper, iron, and possibly of nickel and zinc, is then subjected to electrolysis with insoluble anodes. A preliminary extraction of the roasted mass may be made with water, in order to avoid the solution of iron. The acid electrolyte is used for successive lixiviations until too strongly charged with sulphates. It is then used instead of fresh quantities of sodium sulphate to add to the charges of ore before roasting. The loss of sodium sulphate is thus very small, and is made up by the addition of common salt. When the concentration of zinc and nickel becomes sufficiently great, these metals are separated either by electrolysis or by precipitating with soda or lime.—T. St.

Copper; Process for the solution, purification, and deposition of ——. W. Engel. Ger. Pat. 248,099, March 26, 1911.

Finely-ground copper matte or ore, after removal of the greater part of the iron by magnetic separation, is roasted, and treated with dilute sulphuric acid, whereby the whole of the copper and part of the impurities are dissolved. The clear filtered solution is warmed and treated with air (or oxygen) and copper oxide, whereby iron, arsenic, antimony, etc., are precipitated, after which the pure copper sulphate solution is electrolysed with insoluble anodes (lead, carbon, or platinum), at which oxygen is evolved. According to the present patent, the extraction of the copper, the purification of the solution, and the electrolysis are combined in a single process. The apparatus (see fig.) consists of a cast-iron casing, C, lined with lead, in which the copper cathode, K, is rapidly rotated around the hollow copper tube, D, which also serves to convey the current. The anodes, A, of copper lined with platinum are clamped between projections on the inner side of the casing, C. Inside, the cathode is shaped as a centrifugal stirrer in which the roasted ore or matte is continuously agitated with the acid solution. The copper sulphate solution overflows through the openings shown and flows down between the anode and cathode, exercising a rubbing action on the copper deposited on the cathode, and having its impurities precipitated by the action of oxygen evolved at the anode. Precipitated impurities are discharged through tangential outlets, E. —A. S.



Metallic coatings; Formation of —— on objects composed of carbon, clay, porcelain, etc. Gebr. Siemens und Co. Fr. Pat. 440,597, Feb. 26, 1912. Under Int. Conv., April 6, and May 31, 1911.

A carbon object is heated in a powder consisting essentially of an oxygen compound of the metal in question. In the case of copper, the protoxide is preferably used. A coating of copper, extremely regular, adherent, and more or less thick, is thus obtained. In order to coat objects of other material, these are given a preliminary coating of carbonaceous matter, or are manufactured containing such carbonaceous matter admixed. The object may also be painted, wholly, or wherever it is desired the metallic coating shall be formed, with a solution of sugar, tannic acid or gelatin.—T. St.

Zinc; Extraction of —— from ores, and improvements in the manufacture of zinc compounds. F. Russak. Fr. Pat. 440,975, March 5, 1912. Under Int. Conv., April 8, and May 12, 1911.

The ore is treated with a solution of sulphurous acid, and the solution, after being separated from the insoluble material, is subjected to reduced pressure. The excess of sulphur dioxide thus comes away and may be recovered, whilst at the same time, basic zinc sulphite is precipitated. The precipitate is washed, dried, and calcined. Sulphur dioxide is driven off and may be recovered and zinc oxide of great purity remains. This method also serves for the purification of zinc oxide containing lead. Owing to its fine state of division, the zinc oxide is readily soluble in solutions of caustic alkalis or alkaline earths. If zinc sulphide is desired, the washed basic zinc sulphite may be redissolved in sulphurous acid (avoiding excess) and the sulphide precipitated by the addition of an equivalent amount of sodium sulphide solution. The precipitated zinc sulphide is filtered, washed, dried and calcined. Ores containing zinc sulphide are first roasted till the sulphide is converted into sulphate. The sulphate is extracted with water and any foreign metals are removed from the solution. This latter is concentrated until it contains at least 500 grms. per litre, and then a solution of sodium sulphite is added in slight excess at a moderate temperature. After a little while, normal zinc sulphite separates as a very dense, white powder.—T. St.

Zinc; Treatment of ores of ——. J. J. Boguski and Soc. Minière et Industrielle Saturn. Fr. Pat. 441,098, March 8, 1912.

Poor zinc ores containing carbonate or silicate of zinc are crushed and placed in hermetically sealed extractors and treated with a concentrated aqueous solution of ammonia (or other ammoniacal solution) under pressure. The zinc salts are so soluble that the specific gravity of the solution may rise to 1·4, when a litre contains more than 300 grms. of zinc. The solution is run off, heated under reduced pressure, and the ammonia recovered. Basic zinc carbonate is at the same time precipitated, containing, when dried and gently roasted, up to 70 per cent. of zinc. Any ammonium carbonate formed is decomposed by treating the solution with lime. The extracted ore is washed with water or heated with hot air or other gas in order to recover the ammonia left behind. —T. St.

Zinc from zinciferous residues and low-grade ores; Process and apparatus for the direct recovery of ——. P. Schmidt und Desgraz Ges. m. b. H. Ger. Pat. 248,179, Feb. 26, 1911.

The material is melted on a special hearth and then transferred to a second hearth, where is is subjected to the action of reducing agents or other additions, such as charcoal or coke, and lime or limestone. The furnace comprises a reverberatory hearth for melting the material and a second hearth (or reduction chamber) closed by a cover consisting of a series of rectangular or semicylindrical muffles open below. The two portions of the furnace are covered by a common roof, from which a series of ribs projects downwards above the reduction chamber. The gases from the melting hearth pass over the cover of the reduction chamber and serve to heat the latter and are further used in regulated quantities, for maintaining the desired temperature in the condensing chamber for the zinc vapour. A suitable atmosphere is maintained in the reduction chamber during the process by the introduction of carbon monoxide.—A. S.

Nickel; Extraction of pure —— from garnierite (hydrosilicate of nickel and magnesium). P. A. M. de Meherenq de St. Pierre. Fr. Pat. 441,074, March 7, 1912.

The finely crushed ore is roasted in a reverberatory furnace, and then boiled for two hours with dilute sulphuric acid (1 to 5 per cent.). Metals other than nickel and magnesium are precipitated from the solution by means of powdered chalk, and then the nickel is precipitated by the addition of an equivalent amount of sodium carbonate. The precipitated carbonate may be roasted and converted into oxide, which may then be treated in an electric furnace, or by the thermite reaction, for the production of the metal. Or, the nickel sulphate solution may be subjected to electrolysis with nickel cathodes and carbon anodes. The solution may be kept neutral by means of chalk, or the sulphuric acid may be recovered by placing the anodes in porous pots. If the pots are filled with a solution of sulphurous acid, this will be oxidised by the oxygen liberated, thus giving a greater amount of sulphuric acid. —T. St.

Aluminium; Production of a coating on —— resisting the action of sea-water and concentrated acids or alkalis. Z. D'Amico. Ger. Pat. 248,857, Dec. 31, 1910.

The aluminium is thoroughly cleaned, treated with a solution of ferric chloride, stannous chloride, zinc chloride, and ammonium chloride, and then provided with an oxide-film by immersion in an ammoniacal solution of cuprous chloride containing potassium-iron tartrate and calcium tartrate. The adherence of the oxide film is increased by treatment with an aqueous alcoholic solution of zinc acetate, with subsequent neutralisation by an aqueous solution of an alkali carbonate, and washing with faintly acidulated water. The aluminium is then exposed to the action of hot air at over 200° C. (preferably 350° C.), treated with a warm oxidised solution of a mineral oil, drying oil, soft resin, or balsam mixed with gum resins, and finally again exposed to hot air at about 350° C. The aluminium thus treated is said to resist completely the action of sea-water and weak acids or alkalis, and for short periods the action of concentrated acids or alkalis. —A. S.

Ingot iron and ingot steel; Process and apparatus for removing the slags from ——. K. Stobrawa, Gleiwitz, Germany. Eng. Pat. 17,434, July 31, 1911. Under Int. Conv., Aug. 1, 1910.

See Ger. Pat. 232,989 of 1910; this J., 1911, 629.—T. F. B.

Copper; Process for melting and purifying ——. W. S. Rockey and H. Eldridge. Fr. Pat. 440,455, Feb. 21, 1912.

See U.S. Pat. 1,018,681 of 1912; this J., 1912, 342.—T. F. B.

Copper alloys; Manufacture and refining of ——. W. S. Rockey and H. Eldridge. Fr. Pat. 440,457, Feb. 21, 1912.

See U.S. Pat. 1,017,629 of 1912; this J., 1912, 287.—T. F. B.

Copper alloys; Process for remelting and refining old or waste ——. W. S. Rockey and H. Eldridge. Fr. Pat. 440,914, March 4, 1912.

See U.S. Pat. 1,019,524 of 1912; this J., 1912, 342.—T. F. B.

Alloy of copper and zinc. A. Schmid, Zürich, Switzerland. Eng. Pat. 27,829, Dec. 11, 1911. Under Int. Conv., April 8, 1911.

See Fr. Pat. 432,260 of 1911; this J., 1912, 32.—T. F. B.

Metals and alloys; Method of producing refined ——. A. E. Greene, Chicago, Assignor to American Electric Smelting and Engineering Co., St. Louis. U.S. Pat. 1,034,785, Aug. 6, 1912.

See Fr. Pat. 402,353 of 1909; this J., 1909, 1205.—T. F. B.

Ore-roasting furnace; Mechanical ——. J. Harris, Sheffield. U.S. Pat. 1,035,186, Aug. 13, 1912.

See Eng. Pat. 23,331 of 1910; this J., 1911, 963.—T. F. B.

Vanadium; Processes for the extraction of ——. B. D. Saklatwalla. Fr. Pats. 441,270 and 441,271, March 12, 1912.

See U.S. Pats. 1,020,224 and 1,020,312 of 1912; this J., 1912, 394.—T. F. B.

Furnace; Electric —— for melting and reduction. H. B. Lorentzen, and Tinfos Papirfabrik. Fr. Pat. 441,385, May 23, 1911.

See U.S. Pat. 996,492 of 1911; this J., 1911, 903.—T. F. B.

Aluminium alloy. G. J. Coles. Fr. Pat. 441,400, March 16, 1912.

See Eng. Pat. 6583 of 1912; this J., 1912, 780.—T. F. B.

Electrolyte for electroplating and refining zinc and for secondary batteries. U. C. Tainton and J. N. Pring. Fr. Pat. 441,476, March 18, 1912. Under Int. Conv., March 23, 1911.

See Eng. Pat. 7235 of 1911; this J., 1912, 780.—T. F. B.

Electrostatic separator for the classification of ores, sulphur, etc. Fr. Pat. 441,053. *See* I.

Utilisation of waste gases [from metallurgical works] for production of calcium cyanamide and bisulphide of carbon. Eng. Pat. 21,589. *See* VII.

Obtaining aluminium oxide in a thick layer, and application of aluminium wire coated with this oxide, as an insulated electrical conductor. Fr. Pat. 440,516. *See* XI.

XI.—ELECTRO-CHEMISTRY.

Preparation of selenium and tellurium hydrides. Hempel and Weber. *See* VII.

Patents.

Cells; Electrolytic ——. R. Threlfall, Birmingham. Eng. Pat. 10,142, April 26, 1911.

The apparatus comprises a receptacle for the electrolyte, and a non-conducting tube or vessel in which the two main electrodes and several intermediate electrodes are placed. The intermediate electrodes are inclined or so set that the gases and liquid products may easily escape, and so that a circulation of the electrolyte is secured with a minimum of electric leakage, ducts or passages being for this purpose arranged between the electrodes and the walls of the non-conducting tube or vessel. The latter is also provided with pipes of non-conducting material, for facilitating the escape of the gas and the circulation of the electrolyte. Spacing devices are employed between the intermediate electrodes, so that the electrolytic gaps are automatically maintained, practically constant in length, parallel to the lines of current flow, irrespective of wear or chemical action on the surfaces of the electrodes. —B. N.

Battery; Storage ——. T. A. Edison, Llewellyn Park, Orange, N.J., Assignor to Edison Storage Battery Co., West Orange, N.J. U.S. Pat. 1,034,002, July 30, 1912.

The active depolarising material for alkaline storage batteries is prepared by mixing freshly-precipitated nickel and bismuth hydroxides, then drying, washing and finally re-drying the mixture.—B. N.

Cell; Electrolytic ——. A. Tommasini, New York. U.S. Pat. 1,035,060, Aug. 6, 1912.

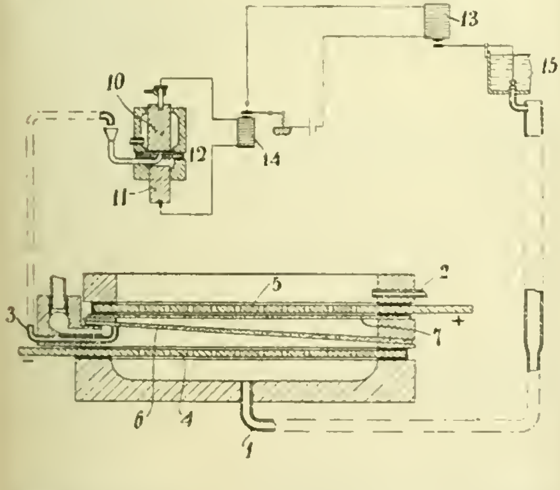
The electrolytic cell comprises a receptacle supplied with an aqueous fluid forming the electrolyte, and with an inverted housing or bell-shaped vessel partly submerged in the electrolyte, and serving to collect oxygen during the electrolysis, the gas being led off through a suitable tube. Within the bell-shaped reservoir are inverted U-shaped receptacles partly submerged in the electrolyte, and forming one set of electrodes from which the hydrogen is liberated on the inner surfaces. Each electrode is covered with rubber which projects below the receptacle. The second set of electrodes, or anodes, are arranged adjacent to the first set, their lower edges being in the same plane as the lower edges of the inverted receptacles, or cathodes. The hydrogen collecting within each cathode is led off through a tube into a safety device, for regulating the pressure of the hydrogen. This consists of a receptacle adapted to contain a quantity of liquid, and an inverted chamber into which the hydrogen is led, the inverted chamber being provided with slots at its lowermost point. A discharge tube extends from the upper inner portion of the inverted chamber through the bottom of the outer receptacle. When the pressure of the hydrogen reaches a certain point, the liquid will be driven downward until the gas escapes through the slots into the outer receptacle, and thus into the atmosphere.—B. N.

Cadmium; Preparation of an active mass of —— for negative electrodes of alkaline accumulators. Svenska Ackumulator Aktiebolaget Jungner. Fr. Pat. 440,621, Feb. 26, 1912. Under Int. Conv., March 7, 1911.

Cadmium and nickel or cobalt are simultaneously precipitated from their solutions by electrolytic means, after which the spongy mass is washed, dried, and reduced to powder of convenient coarseness.—B. N.

Electrolytes in movement; Electrolysis of ——. J. G. Paulin. Fr. Pat. 441,316, March 13, 1912.

The anode, 5, consists of a thick perforated plate of lead, and the cathode, 4, of a thick perforated plate of zinc, if zinc sulphate is to be electrolysed. The electrolyte enters through the tube, 1, and traverses the porous diaphragms, 6 and 7, the sulphuric acid formed leaving by the tube, 2. In order to regulate the speed of the electrolyte, and keep it as nearly as possible uniform, a small sample of the liquid, near the upper end of the plate, 6, is led off through the tube, 3, to an electrolytic cell, 12, containing suitable electrodes, 10 and 11. If the amount of the sulphuric acid in the escaping electrolyte rises above a certain percentage, the relay, 14, interrupts the current in the coil, 13, and the valve, 15, is opened, thus admitting more electrolyte through the tube, 1. The speed of the electrolyte is thus increased until the electromotive force of the cell, 12, falls to the normal amount, when the throttle-valve, 15, is again partially closed by the passing of the current in 13. This method of regulation may be employed for the electrolysis of sodium chloride, sulphate, etc.—B. N.



Aluminium oxide; Method of obtaining —— in a thick layer, and application of aluminium wire coated with this oxide, as an insulated electrical conductor. P. A. F. de Saint-Martin. Fr. Pat. 440,516, May 5, 1911.

Aluminium wire is coated thickly with a layer of oxide by making it the anode of a bath containing a solution of ferrous sulphate acidified with sulphuric acid, using iron as the cathode. The coating of oxide thus formed is firm and tenacious and is not injured when the wire is bent or wound on bobbins. It forms a good insulator and can be made to withstand a pressure of 1000 volts. Wire thus coated can therefore be used without further insulating for the windings of dynamos, etc. In order to connect the sections with the copper collectors, the ends of the wires are flattened, pierced with holes, coated first lightly with copper and then with tin. The ends having then been placed in position, the connections are heated till the tin melts, filling the holes and thus forming so many small pegs.—T. St.

Galvanic batteries; Reversible ——. W. Morrison, Des Moines, Iowa, U.S.A. Eng. Pat. 18,360, Aug. 14, 1911. Under Int. Conv., Oct. 10, 1910.

See U.S. Pats. 975,885, 975,980, 975,981, and 976,092 of 1910; this J., 1910, 1461.—T. F. B.

Voltaic arcs, Stabilising ——. C. E. Guye, Geneva, Switzerland. Eng. Pat. 804, Jan. 10, 1912. Under Int. Conv., Jan. 10, 1911.

See Fr Pat. 438,783 of 1912; this J., 1912, 649.—T. F. B.

Endothermic reactions in gases; Apparatus [electric furnace] for producing ——. P. A. and C. E. Guye, Geneva, Switzerland. U.S. Pat. 1,035,581, Aug. 13, 1912.

See Fr. Pat. 420,524 of 1910; this J., 1911, 372.—T. F. B.

Chemical reactions in a mass of gas; Method and apparatus for [electrically] producing ——. A. A. Naville, P. A. and C. E. Guye, Geneva, Switzerland, Assignors to Southern Power Co., New York. U.S. Pat. 1,035,723, Aug. 13, 1912.

See Fr. Pat. 361,827 of 1905; this J., 1907, 23.—T. F. B.

Process [and electric furnace] for the manufacture of aluminium nitride. Eng. Pat. 8347. *See* VII.

Phenolic condensation product [insulator]. Fr. Pat. 441,017. *See* XIII.

XII.—FATS; OILS; WAXES.

Fats of the American buffalo (bison); Analyses of some ——. A. H. Schmidt. J. Ind. Eng. Chem., 1912, 4, 592.

In the following table are given the results of analyses of fats from different parts of a pure bred buffalo bull. The fats were rendered in the laboratory when comparatively fresh. The buffalo was probably 7 or 8 years old.

	Caul fat.	Kidney fat.	Ruffle fat.	Paunch fat.	Chip fat.
Sp. gr. at 15° C. .	0·9263	0·9346	0·9364	0·0244	0·9344
Free fatty acids, per cent.	0·90	1·65	1·90	1·50	1·25
Titer test, ° C. .	50·1	52·2	51·0	47·4	49·6
Iodine value (Wijs)	33·23	29·45	32·50	34·92	35·16
Saponif. value ..	200·6	199·3	199·4	204·2	199·5

The analyses of fats from native (American) steers are also given for purposes of comparison.—A. S.

Cholesterol; Modification of Ritter's method of determining ——. H. J. Corper. J. Biolog. Chem., 1912. **12**, 197—204.

In Ritter's method of determining cholesterol (this J., 1901, 1147; 1902, 643), the fat is saponified with sodium ethoxide, the alcohol evaporated, sodium chloride added to prevent extraction of the soap by ether, the mass dried, and the cholesterol extracted with ether, separated from the glycerin, and dried. The objection to this method is that the excess of sodium ethoxide required for complete saponification of the fat prevents quantitative extraction of the cholesterol from the salt mixture; but this is obviated by passing carbon dioxide into the saponified solution for not less than three hours so as to convert the sodium ethoxide into sodium bicarbonate. For instance, in determining cholesterol in animal tissue, 30 grms. of the sample are extracted with hot absolute alcohol and then with ether and the residue from the combined extracts dissolved in 200 c.c. of hot absolute alcohol. Half of this solution is concentrated to 10 or 20 c.c. and saponified with 20 to 30 c.c. of 5 per cent. sodium ethoxide solution, and allowed to stand over night. The liquid is then diluted with 100 c.c. of water and subjected to the action of a current of carbon dioxide for 3 to 5 hours, after which the mixture is heated, mixed with 20 to 30 grms. of common salt, and evaporated to dryness on the water-bath, with occasional stirring. The residue is dried for an hour or two at 100° C., cooled, and extracted for 7 to 9 hours with anhydrous ether. The extract is washed with three changes of water (200 to 500 c.c.) to remove glycerin, the washings being shaken out with ether (about 100 c.c.) to recover any cholesterol, and this ethereal extract washed with two changes of water and added to the main solution. Finally the total ethereal extracts are evaporated to dryness under an electric bulb (16-candle power), and the residue of cholesterol and similar compounds dried for one to two hours at 100° C., and weighed. (See also this J., 1912, 239.) —C. A. M.

Glycerin; Purity of ——. L. F. Kebler and H. C. Fuller. Techn. Drug Studies. U.S. Dept. Agric., Bureau of Chem., Bull. **150**, April 22, 1912, 24—35.

In order to ascertain to what extent commercial glycerin complied with the requirements of the U.S. Pharmacopœia, samples were obtained from 11 American manufacturers, whilst two of foreign origin were bought in the open market. The sp. gr. at 25° C. ranged from 1·248 to 1·258, all exceeding the Pharmacopœia standard of 1·246. In every instance reduction occurred in the pharmacopœal test with ammoniacal silver nitrate. This test was therefore regarded as inconclusive and abandoned in favour of Hager's test (Handbuch der Pharm. Praxis, 1905. **1**, 1221), according to which 5 c.c. of the glycerin are mixed with 5 c.c. of 26 per cent. ammonia solution and 5 drops of silver nitrate solution, and left in the dark for 15 minutes at the ordinary temperature. Two of the samples gave a pronounced reduction, five a slight colouration, whilst with six there was no reduction. The amount of arsenic ranged from nil to 0·75 part per million, with the exception of a foreign sample which contained 3·75 parts. On the basis of this examination it was concluded that glycerin of the best quality should answer to the following requirements:—It should be neutral to litmus, leave no ash on ignition, and have a sp. gr. of about 1·250 at 25° C. It should emit only a slight odour when heated on the water-bath, and not give off an unpleasant ethereal or a fruity odour when warmed with alcohol and sulphuric acid. When mixed with an equal volume of sulphuric acid there should be no disagreeable odour nor any colouration deeper than yellow. In Hager's test no colouration, or at most a yellow colouration, should be produced. It should not contain sulphates, chlorides, oxalates, metals or sugars, and when mixed with an equal volume of water should not reduce Fehling's solution. Arsenic in excess of the limit fixed by the U.S. Pharmacopœia must not be present.—C. A. M.

Chinese vegetable oils in 1911. Oil, Paint, and Drug. Rep., Aug. 19, 1912. [T.R.]

Shipments of various vegetable oils from China in 1911, on the whole, materially exceeded those of the previous year. Shipments of wood oil out of the Yangtze Valley and the West River country during the closing months of the year were interfered with greatly, which continued into the present year, the trade in South China being entirely stopped for several weeks in the height of the season. There was a falling off in the value of the shipments of peanut oil from all China as a result of disturbances in various districts, although actual volume of shipments of this oil increased and the value of such oil from Hong Kong to the United States increased from $228,296 in 1910 to $300,866 in 1911. Shipments of bean oil during the past year accounted for the increase on the whole, as may be seen from the following table of exports of such oils, in tons of 2,000 lb. and with values in gold as calculated, from the returns of the Chinese customs:—

Exports.	1910. Tons.	1910. Value.	1911. Tons.	1911. Value.
Oil, bean	38,043	$3,438,032	47,569	$3,792,340
Oil, ground or peanut	16,443	1,695,182	17,386	1,644,034
Other kinds	41,342	2,587,224	37,089	3,516,712
Totals	95,828	$8,720,438	102,044	$8,953,086

Exports of essential oils, including particularly star aniseed and cassia oils, from all China showed a notable increase in 1911 over 1910, the year's record in these products being substantially complete before the critical times of the closing months of the year came in. The price of these oils enhanced greatly between 1910 and 1911 as a result of failing supplies and a successful speculative movement in Hong Kong. The exports of such oils from China to all countries amounted to 921,600 lb., valued at $557,033 in 1911, as compared with exports of 1,993,860 lb., valued at $509,442 in 1910. From two-thirds to three-fourths of this trade in all China is handled through Hong Kong. The shipments of cassia and aniseed oils from Hong Kong to the United States in 1911 amounted to a value of $136,030, as compared with a value of $120,695 in 1910. No direct shipment of these oils from China to the United States is reported.

Patents.

Organic compounds, especially fatty acids and their compounds; Process for the reduction or hydrogenation of ——. K. H. Wimmer and E. B. Higgins. Fr. Pat. 441,097, March 8, 1912. Under Int. Conv., March 11, 1911.

Organic compounds of metals, such as metallic salts of organic acids, are employed as catalytic agents in the reduction or hydrogenation of various organic compounds; thus the copper, iron, nickel, or cobalt salts of formic, acetic, or lactic acid may be employed. The advantage of these compounds is that they can readily be mixed with the compound to be reduced, either in the form of a solution or as an emulsion: thus the compound may be emulsified with the catalyst and at the same time treated with hydrogen. It is stated that hydrogenation may be accelerated either by using the hydrogen under pressure, or by impregnating the compound to be reduced with hydrogen, and then bringing it into intimate contact with the catalyst. One detailed example is given in the specification, describing the treatment of 100 grms. of cottonseed oil with hydrogen in presence of 1—5 grms. of nickel formate at a temperature of 170°—200° C.—T. F. B.

Soap-powder; Machine for making ——. W. M. Schwartz and E. B. Ayres, Assignors to The Philadelphia Textile Machinery Co., Philadelphia, Pa. U.S. Pat. 1,033,737, July 23, 1912.

The soap passes from a hopper on to the surface of a drum rotating beneath it. By means of a scraper it is transferred from the surface of this drum to the trough between two cooled drums, through which a flow of water is caused to pass from end to end by means of spirally arranged internal plates. One of this pair of drums is mounted in fixed bearings; the other, in movable bearings, is kept close up to the first by means of springs, and each drum is provided with a scraper. Below the first pair of drums is a second pair similar in all respects but of greater diameter, and finally the soap powder falls upon an agitated screen from which the particles which are too large to pass through can be removed by means provided.—E. W. L.

Soap for calcareous waters. A. E. Bouillot. Fr. Pat. 440,402, May 2, 1911.

An addition of about 10 per cent. of a soluble oxalate is made to the soap.—C. A. M.

Soap; Process of manufacturing new ——. C. Lallemand. Fr. Pat. 441,440, March 18, 1912.

An antiseptic soap containing any desired proportion of hydrocarbons and yet completely soluble in water is made by sulphonating hydrocarbons, from petroleum, etc., in the presence of an oil or fat, and treating the product with an alkaline base. Or a mixture of the hydrocarbons with a previously sulphonated fat is treated with the alkali, whilst a small proportion of a hydrocarbon may also be added in the form of an emulsion to the soaps thus prepared.—C. A. M.

Emulsions of aqueous liquids and fats of every kind; Process for the rapid separation of ——. A. Rost. Fr. Pat. 440,474, Feb. 22, 1912. Under Int. Conv., Sept. 11, 1911.

A rapid separation of the emulsion is effected by the addition of, say, 0·3 per cent. of formaldehyde or its polymerised derivatives.—C. A. M.

Detersive agent suitable also for other purposes [insecticides]; Manufacture of ——. W. H. Murray. Fr. Pat. 440,978, March 5, 1912.

A cereal flour (*e.g.* of rice) is treated with an alkali in such a way as to produce combination and obtain a homogeneous mass. The product may be mixed with soap; or it may be incorporated with tobacco, quassia, carbolic acid or other insecticidal substance, then dried, preferably with the aid of heat, and formed into blocks or tablets. —C. A. M.

Fats and unsaturated fatty acids; Process for the reduction of ——. Verein. Chemische Werke A.-G., Charlottenburg, Germany. Eng. Pat. 18,642, Aug. 18, 1911. Under Int. Conv., Jan. 26, 1911.

See Fr. Pat. 425,729 of 1911; this J., 1911, 1022.—T. F. B.

Fat and impurities from vegetable and animal materials; Process of removing ——. J. Stockhausen, Crefeld, Germany. U.S. Pat. 1,035,815, Aug. 13, 1912.

See Fr. Pat. 396,493 of 1908; this J., 1909, 612.—T. F. B.

Resin emulsions and resin-soap; Manufacture of ——. J. Aktschourin, Aktschourin-Tupik, Russia. Eng. Pat. 17,822, Aug. 4, 1911.

See Fr. Pat. 432,998 of 1911; this J., 1912, 140.—T. F. B.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Turpentine standards. E. J. Parry. Chem. and Drugg., 1912, 81, 52—53.

For the detection of "wood" or "stump" turpentine in pure American gum-turpentine, the author has found that the behaviour of the oil towards halogens gives the best indications. The hydrocarbons present in wood-turpentine are more saturated than those in gum-turpentine and therefore absorb less of the halogen. The iodine value may be determined by either the Wijs or the Hübl method and the bromine value in the following ways: (1) One c.c. of the oil is dissolved in 5 c.c. of chloroform, and a three per cent. aqueous solution of bromine added, with shaking until a permanent colouration remains; the strength of the bromine solution is determined in the usual way and the amount combining with the oil calculated. (2) One c.c. of the oil is dissolved in 50 c.c. of absolute alcohol and 5 c.c. of hydrochloric acid are added; a solution containing 28 grms. of potassium bromate and 100 grms. of potassium bromide per litre is then added until a brown colour remains for one minute after shaking; the bromine absorbed is calculated for 1 c.c. and reduced to the proper number by dividing by the specific gravity, say 0·86. The author has found that the following figures form satisfactory standards for American gum-turpentine: Sp. gr. at 15·5° C., 0·862—0·870; refractive index at 20° C., 1·4680—1·4730; initial boiling point, not below 154°—155° C.; distillate below 160° C., 72—73 per cent.; below 170° C., 95—97 per cent.; bromine value, not below 1·9; iodine value (Hubl, 16 hrs.), 360—375; iodine value (Wijs, 1 hr.), 335—350; iodine value of last 10 per cent. (Hübl, 16 hrs.), not less than 350; iodine value of last 10 per cent. (Wijs, 1 hr.), not less than 350. The usefulness of the iodine value is shown by the fact that wood-turpentine will often show an absorption of 230 to 300. The colour reactions which have been proposed for the detection of this oil are of no value. The adoption of the above standards renders it impossible to pass a sample containing petroleum products. If it is desired to determine the amount of such adulteration, Eibner and Hue's modification of Armstrong's polymerisation process (this J., 1910, 890) may be used. The unpolymerised residue from a pure oil will have a refractive index of not less than 1·500 and not more than 1·520. The author has prepared the following table showing the characters of adulterants and of mixtures of these with pure turpentine:—

	(1)	(2)	(3)	(4)	(5)
	Pure American turpentine.	Wood turpentine.	50 per cent. each of (1) and (2).	"Petroleum" turpentine.	50 per cent. each of (1) and (4).
Specific gravity .	0·866	0·873	0·869	0·808	0·838
Refractive index	1·4720	1·4745	1·4737	1·4490	1·4610
Initial boiling pt.	155° C.	159° C.	157° C.	98° C.	99° C.
Distillate below 160° C.	74%	61%	68%	48%	62%
Distillate below 170° C.	94%	78%	84%	75%	82%
Bromine value .	2·2	1·46	1·82	0·05	1·1
Iodine value (Hübl)	372	264	321	9·0	190·5
Iodine value (Wijs)	350	240	298	8·4	179
Iodine value of last 10% (Hübl)	360	251	304	9·0	184
Iodine value of last 10% (Wijs)	355	242	298	8·5	177
Refr. index of first 10%	1·4719	1·4731	1·4728	1·448	1·4660
Refr. in. of second 10%	1·4700	1·4730	1·4720	1·449	1·4675
Refr. in. of third 10%	1·4712	1·4734	1·4722	1·4481	1·4721
Refr. in. of fourth 10%	1·4712	1·4732	1·4721	1·4470	1·4721
Refr. in. of fifth 10%	1·4781	1·4812	1·4821	1·4495	1·4735

With regard to Russian turpentine, the author finds that the amount of the fraction boiling at 155°—160° C. is practically nil. This is due to the fact that the Russian turpentine imported into this country is the higher-boiling portion of the native product, from which the lower-boiling portion has been removed by a refining process for use in Russia.—J. H. J.

Mineral paints; Production of —— *in the United States in* 1911. W. C. Phalen. U.S. Geol. Survey, Aug., 1912. [T.R.]

The production of the natural mineral pigments in the United States in 1911 as reported to the Survey amounted to 62,739 short tons, valued at $498,821. Compared with

1910 this was a falling off in quantity of 5.884 short tons. and in value of $28.974. Advances are shown for metallic paint and ground slate and shale, and declines are shown for ochre, umber, sienna, and mortar colours. The production of ochre in 1911 was 11.703 short tons, valued at $109.465, compared with 11.711 short tons, valued at $112.445, in 1910. The total quantity of umber and sienna produced in the United States in 1911 was 1.005 short tons, valued at $26.225, a decrease of ten tons in quantity and of $475 in value, as compared with the production of 1910. The production of metallic paint reported to the Survey in 1911 was 25.599 short tons, valued at $181.163, as compared with 29.422 tons, valued at $184,869, in 1910. The production of mortar colours reported to the Survey in 1911 was 7.922 short tons, valued at $76.517, a decrease of 2.038 tons in quantity and of $31.263 in value as compared with 1910.

The production of zinc oxide, leaded zinc, sublimed white lead, and sublimed blue lead in 1911 amounted to 80,611 short tons, valued at $7.343.762. As compared with the production of 1910 this was an increase of 5,449 tons in quantity, and of $490.958 in value.

The chemically manufactured pigments treated in this report include basic carbonate white lead, both dry and in oil, red lead, litharge, and orange mineral among the lead pigments, and lithopone and venetian red. Though the quality and value of these pigments produced in 1911 was very great, amounting to 200.747 short tons, valued at $23.980,244, there was a decrease compared with 1910, which amounted to 6,249 tons in quantity and to $703,479 in value. The production of basic carbonate (corroded) white lead in 1911 was 132.612 short tons, valued at $17,393.241. Of this total 106.778 short tons, valued at $14,699.339, were reported sold in oil, and 25,834 short tons, valued at $2.693.902, were reported sold dry. The sales for 1911 represented a net decrease from those for 1910 of 11.198 short tons in quantity and of $1.013.374 in value. The production of red lead fell from 19,801 short tons, valued at $2.448.684 in 1910, to 19.540 short tons, valued at $2.345,320, in 1911. The production of litharge was 25.190 short tons, valued at $2.773.196, as compared with 23,742 short tons, valued at $2,686.159, in 1910. The production of orange mineral was 766 short tons, valued at $119.370, in 1911, as compared with 676 short tons, valued at $111.773, in 1910. The production of Venetian red was 5.773 short tons, valued at $106.009, compared with 6,312 short tons, valued at $113,980, in 1910.

Patents.

Paint; Method of producing ready-mixed ——. F. F. Bradley, Assignor to Bradley and Vrooman Co., Chicago, Ill. U.S. Pat. 1,032.652, July 16, 1912.

The method consists in producing separate masses of definite volume of different paint bases each of a definite character and capable of constituting a base of any one of several different coloured paints, normally storing the paint base in a portable can; producing separate masses of different tinting substances for making a substantially complete line of mixed paints, storing and preserving in receptacles the amounts of these masses necessary to give the requisite tints when mixed with the paint bases; and subsequently introducing the tinting substance into the can containing the base.—E. W. L.

Aluminium pigment. A. H. Lecomte. Fr. Pat. 440.987, March 5, 1912.

Powdered calcium carbonate is incorporated with powdered bauxite from which the emery has been eliminated.—H. E. P.

Resinised phenols; Method of forming articles of non-plastic ——. J. W. Aylsworth, East Orange, N.J., Assignor to F. L. Dyer, Montclair, N.J. U.S. Pat. 1,033,044, July 16, 1912.

The phenolic component of a phenolic condensation product—*e.g.*, ordinary phenol—is introduced into a suitable mould placed in a closed receptacle into which compressed formaldehyde gas—or other substance which reacts with the phenolic component on application of sufficient heat to form the desired product—is then forced. Sufficient heat is applied to cause a complete reaction between the two components, the pressure of the gas being maintained sufficiently high to counteract the liberation of gaseous products. Water vapour given off during the reaction is passed into a connected chamber containing suitable water-absorbing means.—E. W. L.

Phenolic condensation product [*insulator*]. J. W. Aylsworth. Fr. Pat. 441.017, Mar. 6, 1912. Under Int. Conv., Mar. 11, 1911.

An infusible phenolic condensation product, specially adapted for coating or impregnating electrical conductors, is made by passing into a phenolic resin a gas containing a methylene group, such as formaldehyde, causing it to be absorbed, and warming the mass sufficiently for a reaction to occur giving an infusible product. The treatment of the resin by the gas may be effected in a non-oxidising atmosphere. A "solid solvent" may be incorporated in the resin with an organic oil solvent such as eugenol. The product may be anhydrous.—H. E. P.

Cellulose ester varnishes. Badische Anilin und Soda Fabrik. Fr. Pat. 440.733, Feb. 28, 1912. Under Int. Conv., Sept. 5, 1911, and Feb. 23, 1912.

Esters of cyclohexanol, of cyclopentanol, or of their homologues or derivatives, are employed as solvents for celluloid or cellulose esters for the preparation of varnishes. —H. E. P.

Lakes [*from azo dyestuffs*]; *Process for the production of yellow* ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 441.421, March 16, 1912. Under Int. Conv., March 21, 1911.

See Eng. Pat. 8590 of 1911; this J., 1912, 193.—T. F. B.

Wood; Apparatus for extracting turpentine and other substances from ——. M. McKenzie, Plainfield, N.J. Reissue No. 13,456, Aug. 6, 1912, of U.S. Pat. 852.236, April 30, 1907.

See Fr. Pat. 367.926 of 1906; this J., 1906, 1226.—T. F. B.

Cellulose esters. U.S. Pat. 1,035,108. *See* V.

Production of fermentable sugars (*and turpentine*) *from lignocellulose.* U.S. Pats. 1,032,440 to 1,302,450. *See* XVII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Vulcanisation; Theory of ——. H. Loewen. Z. angew. Chem., 1912, 25, 1610—1612.

The author criticises the conclusions of Spence and Scott (this J., 1911, 816) that their extraction experiments with acetone show a distinction between "free" and "adsorbed" sulphur in vulcanised rubber. He considers that this is not the case and that the experiments do not support the view that adsorption occurs. It is pointed out that the initial flat portion of the curve, when the extracted sulphur did not diminish regularly, is due to the small solubility of sulphur in acetone. Moreover the curve cannot be considered an adsorption curve, since it does not express the relation between initial and final concentrations at equilibrium, but only the course of sulphur removal with number of extractions. When a curve is plotted showing the relation between concentrations before and after each extraction, it is found not to be an adsorption curve.—H. E. P.

Rubber exports from the Amazon Basin. Board of Trade J., Aug. 29, 1912. [T.R.]

The quantity of rubber exported from Pará, Manaos, Iquitos, and Itacoatiara, *viâ* Pará, during the crop year ended June, 1912, was as follows:—

——	Fine.	Medium.	Coarse.	Caucho.	Total.
Crop Year 1911-12.	kilos.	kilos.	kilos.	kilos.	kilos.
To the United States from—					
Pará	4,418,849	833,694	4,703,139	1,574,785	11,530,467
Manaos	4,996,871	1,196,568	1,636,815	979,167	8,809,421
Iquitos	39,746	32,626	11,381	47,888	131,641
Itacoatiara	—	—	—	—	—
Total	9,455,486	2,062,888	6,351,335	2,601,840	20,471,529
To Europe from—					
Pará	6,159,487	514,687	1,517,267	1,868,407	10,059,848
Manaos	4,403,572	794,769	757,354	1,783,461	7,739,156
Iquitos	729,267	171,035	303,918	1,162,239	2,366,450
Itacoatiara	85,336	12,489	55,579	12,475	165,879
Total	11,377,662	1,492,980	2,631,118	4,826,573	20,331,333
Grand total, 1911-12	20,833,128	3,555,868	8,985,153	7,428,413	40,802,862
Grand total, 1910-11	17,178,710	2,866,590	6,846,468	6,610,938	33,532,706

Patents.

Caoutchouc-like products; Process of manufacturing ——. A. Caroselli, Assignor to Chem. Fabrik Flörsheim, Dr. H. Noerdlinger, Flörsheim-on-Maine, Germany. U.S. Pat. 1,031,837, July 9, 1912.

The process consists in treating oxidised oils, or mixtures of oxidised oils and albumins or loading materials with an aldehyde, *e.g.*, formaldehyde, or a substance producing formaldehyde, in presence of a condensing agent.—E. W. L.

Rubber; Apparatus for and method of separating particles of —— *from materials with which they are commingled.* W. S. Blaine, Torreon, Mexico, Assignor to Intercontinental Rubber Co., New York. U.S. Pats. 1,032,732 and 1,032,733, July 16, 1912.

The mass, consisting of particles of rubber and heavier particles of other materials—designated "sinkers"—is fed forward from a hopper, under a series of impulses, beneath a shallow mass of water on a concentrating table, which is provided with longitudinal partitions, and on which a partial separation or stratification takes place. The table communicates at the other end with a deep flotation tank, filled with water, into which the partially stratified mass passes, the "sinkers" falling to the bottom, and the rubber particles being removed progressively from the surface. The "sinkers" are transferred by a screw-conveyor from the bottom of the flotation tank through a communicating channel to an auxiliary tank, in which there is a compensating head of water, and from which they are removed, without substantial suction action, by means of a series of sifting elevator buckets.—E. W. L.

Vulcanised rubber; Production of substances similar to ——. Badische Anilin und Soda Fabrik. Fr. Pat. 441,204, Mar. 11, 1912. Under Int. Conv., Jan. 9, 1912.

Substances similar to vulcanised rubber are obtained by vulcanising substances similar to rubber derived from the polymerisation of α.γ-butadiene or its homologues in presence of bodies capable of yielding or carrying oxygen. —H. E. P.

Caoutchouc; Preventing tackiness and resinification in substances resembling ——. Farbenfabrik vorm. F. Bayer und Co. Fr. Pat. 441,477, Mar. 18, 1912. Under Int. Conv., Mar. 23, 1911.

Substances resembling caoutchouc, obtained by polymerising erythrene, its homologues and analogues, are prevented from becoming tacky or resinous by treatment with reagents having an alkaline reaction such as ammonia or dimethylamine in solution.—H. E. P.

Caoutchouc substances; Process of preventing —— *from getting sticky or resinous.* Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 29,213, Dec. 28, 1911. Under Int. Conv., March 23, 1911.

See Fr. Pat. 441,477 of 1912; preceding. T. F. B.

Caoutchouc; Synthetic ——. A. Heinemann, London. U.S. Pat. 1,035,788, Aug. 13, 1912.

See Eng. Pat. 1445 of 1911; this J., 1912, 349.—T. F. B.

Rubber or vulcanite or analogous substances; Process for treating —— *and making various articles therefrom.* The Bourne Rubber Co., Ltd. Fr. Pat. 440,717, Feb. 28, 1912.

See Eng. Pat. 28,489 of 1910; this J., 1912, 399.—T. F. B.

Seaweed; Process for treating —— *to produce artificial rubber, artificial leather, and analogous substances.* J. S. Campbell. Fr. Pat. 440,865, March 2, 1912. Under Int. Conv., March 3, 1911.

See Eng. Pat. 5395 of 1911; this J., 1912, 400.—T. F. B.

Fabric [; Rubbered ——]. The Henderson Rubber Co. Fr. Pat. 441,483, March 19, 1912.

See U.S. Pat. 1,020,499 of 1912; this J., 1912, 446.—T. F. B.

Production of isoprene. Eng. Pat. 24,549. *See* XX.

Preparing trimethylethylene and also isoamyl alcohols from isopentane. Fr. Pat. 441,278. *See* XX.

XV.—LEATHER; BONE; HORN; GLUE.

Salt stains [on hides]. H. Becker. Collegium, 1912, 408—418.

Salt stains are of several varieties:—(1), yellow stains of small surface area appearing on the flesh side of the hide and extending through the hide until appearing on the grain, resulting in a loss of hide substance in the finished leather and a damaged grain; (2), yellow stains of larger surface extent, which do not however penetrate far into the hide and are not apparent on the finished leather; (3), red colourations which appear on parts of the hide to which air has had access; (4), blue or violet stains which could not be artificially reproduced and the origin of which is different from that of the three previous kinds. In the yellow stains under class 1, microscopic examination revealed the presence of *cocci* of an average size of 1·49 μ. The organisms are aërobic and grow quickly in broth-peptone-gelatin, which they liquefy, forming a yellow colouring matter. Yellow salt stains could be produced on hide kept at 22° C., partly with and partly without salt, and inoculated with the bacteria. The liquefied region gradually deepened until the stain appeared on the grain side. In the orange-coloured stains *cocci* were also found which spread to a large surface when cultivated on hide but do not liquefy gelatin and have no harmful effect on the hide. The growth of the organism is very slow, the shape is circular, and the cells reach a size of 1·25—1·49 μ. Another organism was isolated from the red stains, the cells being circular and 1·12—1·49 μ in size. It does not liquefy gelatin and is, like the others, strongly aërobic. It appears to have no harmful effect on the finished leather. From both the yellow and red stains a species of *Torula* was obtained which grew quickly in artificial cultures. The colonies are circular and have an appearance of having been sprinkled with flour. The cells are partly round, 5·96—7·45 μ in size, and partly elliptical with a width of 2·98 μ and a length of 8·94 μ. When growing the artificial cultures great differences in the rate of growth were occasioned by variation in the temperature, composition and reaction of the medium and its content of salt. The orange and red bacteria need an easily assimilable albumin which they find on the flesh side of the hide in the remains of flesh, blood and lymph. Since these substances are absent in the interior of the hide, the growth of the organisms is restricted to the surface. The blue and violet stains are possibly due to the action of an organism, as the author isolated from a human head some years ago a *sarcina* which developed a blue-violet colouring matter. It was also observed that by drying red stained portions of hide, the increased temperature caused the stains to change to a blue or blue-violet colour. The effect of mixing soda-ash with the salt on the growth of the bacteria was observed and it was found that an addition of 2—3 per cent. of sodium carbonate to the salt had no inhibiting effect on the growth of the organisms; 4 per cent., however, had a satisfactory effect. An addition of 1 per cent. of perborate to the salt had no effect on the bacteria, but 1·5 per cent. prevented their growth. The perborate, however, had a considerable swelling effect on the hide. By immersion of the hide in a 0·25 per cent. zinc chloride solution for an hour, an insufficient disinfection was produced; in 2 hours however all harmful organisms were destroyed. Half an hour's immersion in a 0·5 per cent. solution had the same effect. By immersing for an hour in a 0·25 to 0·50 per cent. solution of artificial mustard oil, complete sterilisation of the hide was effected.—D. J. L.

Cerium salts ; Tanning with ——. F. Garelli. Collegium, 1912. 418—420.

EITNER (this J., 1911, 1128) has stated that solutions of normal cerium chloride prepared from monazite residues change hide into a product more resembling gutta-percha than leather. The author has observed the same effect but only when the chloride solutions are too acid and too concentrated. If the solutions are neutralised to incipient precipitation and diluted sufficiently, results are obtained similar to those given by aluminium salts. Results obtained in the tannage of lamb-skin with cerium nitrate shows that the trivalent salts of cerium tan skin very similarly to those of aluminium. The suitably prepared skin was treated with a 2—3 per cent. salt solution containing 1 per cent. of cerium nitrate, and the concentration of the latter was increased gradually to 5 per cent. A good soft leather was produced in a few hours, having 10·6 per cent. of ash and 9 per cent. of cerium sesquioxide, Ce_2O_3, and with water-resisting properties at least equal to those of alum-tanned leather. Eitner found that ceric sulphate had a strong tanning effect, but as he used only solutions of ceric sulphate, which have a strongly acid reaction, the leather which he obtained was tender. The author had already stated (compare this J., 1907, 978) that ceric salts tan more strongly than cerous salts and attributed the difference in their action to the strongly oxidising effect of the former. The best results were obtained with ceric-ammonium nitrate, a salt which can be obtained in neutral and dilute solutions.—D. J. L.

Rising or pickling of skins. J. T. Wood. Tanners' Year Book, 1912. 116. J. Amer. Leather Chem. Assoc., 1912, 7, 409—413.

THE old method of rising consists in stirring the skins in a 1 : 300 solution of sulphuric acid. The skins become swollen and gelatinous. After 20 minutes they are transferred to a salt solution of sp. gr. 1·065 until the swelling is reduced. After 20 minutes they are placed in saturated brine in which they "fall" completely. In the modern method the skins are put in a solution containing 50—60 grms. of common salt and 4—5 grms. of sulphuric acid per litre. After paddling for 40—50 minutes they are transferred to saturated brine. The mean absorption of acid in a series of goods put through the same paddle, strengthened up each time, was as follows: The weight of dry pelt per litre of solution was about 100 grms.

	c.c. *N*/1 alkali per 100 c.c.
Before passage of goods	11·10
After passage of goods	4·14
Acid absorbed	6·94

Procter has shown that the acid in the rising bath can be much reduced with advantage. A drop of water sprinkled on a pickled skin will eventually produce putrefaction, which frequently spreads to other parts of the skin. The author has found that some species of moulds and bacteria are capable of growing in a medium acid to the extent of *N*/10 sulphuric acid. As soon as growth is established, the acid is quickly neutralised by ammonia compounds produced by the bacteria, after which putrefaction pursues its normal course. Many acids have been tried for pickling but none have been found so good and simple in practice as sulphuric acid. Acetic acid in 0·1 to 0·2 per cent. solution is efficient; when formic acid is used the solution should contain at least 0·5 per cent. There is a loss of skin-substance in all rising processes. In a case investigated by the author, the skin-substance found on the rising liquor was 2·9 grms. per litre or 3·5 per cent. on the dry weight of skin put through.—D. J. L.

PATENTS.

Chrome-tanning for sole-leather ; Method of ——. P. Castiau. Fr. Pat. 440,736, Feb. 28, 1912. Under Int. Conv., Jan. 31, 1912.

THE leather, after chroming, is treated in a bath of vegetable tanning materials, washed to remove all tannin not fixed by the fibre, and then immersed in a mixture of paraffin and resin or other substances, or mixtures, in order to fill up any interfibrillar spaces, left by the vegetable tannin removed by washing. The process is applicable to leathers chemically tanned by other substances than chromium compounds, such as formaldehyde, quinone, etc.—D. J. L.

Sole-leather hard and impervious ; Process for rendering ——. A. Wigand. Fr. Pat. 441,269, March 12, 1912

THE chrome- or vegetable-tanned leather, either split or not, is treated in a vacuum or under pressure with "solutions of resinous derivatives in aromatic carbonides (aromatic carbonides treated with chlorine or sulphurous acid)" and afterwards in solutions of aluminium salts in order to precipitate the resinates in an insoluble form in the fibres of the leather.—D. J. L.

Tanning extract obtained from heath-wood. X. F. Debédat. Fr. Pat. 441,217, March 7, 1912.

A TANNING extract is made from heath-wood in the usual way. If the extraction is carried out at a low temperature (60° C.) and concentration effected in a vacuum, a relatively light-coloured extract is produced which yields a leather of excellent quality.—D. J. L.

Leather ; Treatment of —— *for waterproofing it and imparting to it increased adhesive properties.* G. G. Johnston, Woollahra, Sydney, N.S.W. Eng. Pat. 18,286, Aug. 12, 1911.

SEE Fr. Pat. 440,105 of 1912 ; this J., 1912, 738.—T. F. B.

Hides ; Process for treating raw —— *and the product resulting therefrom.* The Henderson Rubber Co. Fr. Pat. 441,482, March 19, 1912.

SEE U.S. Pats. 1,020,497 and 1,020,498 of 1912 ; this J., 1912, 447.—T. F. B.

Desiccating wood and extracting its colouring and tanning matters. Fr. Pat. 441,241. *See* IX.

XVI.—SOILS ; FERTILISERS.

Basic slag ; Reliable method for the determination of the citric acid soluble phosphate in ——. M. Popp. Chem.-Zeit., 1912, **36**, 937.

After a reply to criticisms as to the co-precipitation of silica, etc., and the advisability of introducing certain modifications, the author is of the opinion that Wagner's process, as described by König (" Unters. landwirtschaftl. u. gewerbl. wichtiger Stoffe," p. 191, 4th ed.) as the iron-citrate method, is perfectly satisfactory. A black precipitate noticed by some workers is ferrous sulphide which the author removes by the employment of a weak oxidising agent. The following modification is said to give concordant results. To 50 c.c. of the citric acid extract of the basic slag are added in succession 25 c.c. of the iron-citrate solution, 10 c.c. of 0·3 per cent. hydrogen peroxide, and 25 c.c. of magnesia mixture, the whole is stirred vigorously for fifteen minutes, allowed to stand, and then treated in the usual way. It is recommended to make the solutions as follows:—(1) *Iron citrate:* 1 kilo. of citric acid is stirred with a solution of 30 grms. of ferric chloride in 50 c.c. of water. To this 4 litres of 20 per cent. ammonia solution are carefully added and stirred until all is dissolved. It is then diluted to 5 litres and filtered. (2) *Peroxide of hydrogen:* 100 c.c. of the 30 per cent. solution are diluted to 1000 c.c. and 100 c.c. of this solution again diluted to 1000 c.c. (3) *Magnesia mixture:* 550 grms. of magnesium chloride and 700 grms. of ammonium chloride are dissolved together in 2 litres of water, then 1750 c.c. of 20 per cent. ammonia solution added and the whole diluted to 10 litres. It should stand a few days before filtering.—A. H. C.

Chlorosis ; Vegetable ——, *induced by calcium carbonate.* P. Mazé, Ruot, and Lemoigne. Comptes rend., 1912, **155**, 435—437.

Calcium carbonate, when it induces chlorosis in plants, does so not by introducing calcium, for neutral calcium salts such as nitrate or chloride do not produce the same effect ; but by depriving the plant of iron, which it renders insoluble and thus not absorbable, for droplets of ferrous sulphate on the blanched leaves restore the chlorophyll locally. Lupin and Narbonne vetch were affected in this manner by calcium carbonate, whilst maize was not. The difference is due to the fact that the maize rootlets excrete malic acid which dissolves the calcium carbonate, and allows the iron compounds to remain in a soluble form. French vines behave like maize ; American vines like lupin or Narbonne vetch.—J. T. D.

Patents.

Phosphates ; Treatment of ——. N. P. Pratt, Decatur, Ga., U.S.A. Eng. Pat. 663, Jan. 9, 1912.

See U.S. Pat. 1,014,254 of 1912 ; this J., 1912, 196. Commercial acid phosphates (*e.g.*, superphosphates) may be converted into dicalcium phosphate, by treatment with calcium carbonate, before the removal of the calcium sulphate.—T. F. B.

Phosphorites ; Treatment of —— *to render them of value as fertilisers.* A. S. Clift and A. B. Hunt. Fr. Pat. 441,448, March 18, 1912. Under Int. Conv., Aug. 24, 1911.

See Eng. Pat. 19,043 of 1911 ; this J., 1911, 1325.—T. F. B.

Detersive agent suitable also for other purposes [*insecticides*]. Fr. Pat. 440,978. *See* XII.

XVII.—SUGARS ; STARCHES ; GUMS.

Sucrose ; Direct determination of —— *in the presence of reducing sugars.* W. E. Cross and W. G. Taggart. Intern. Sugar J., 1912, **14**, 444—448. (Compare also this J., 1912, 351.)

As a more rapid means of determining the sucrose content of sugar factory products containing reducing sugars than the Clerget inversion process, Jolles (this J., 1910, 1467) and Lemeland (1910, 1220) have recommended destruction of the rotatory power of the dextrose and lævulose by sodium hydroxide, and this method has recently been improved by Pellet and Lemeland (this J., 1911, 1400). Using samples of cane syrups and molasses, the authors obtained much lower results with the Pellet-Lemeland process than with the Clerget-Herzfeld inversion method, the differences varying from 2 to 14 per cent. ; and determinations made with pure solutions of sucrose, dextrose and lævulose in the proportions obtaining in cane molasses confirmed these figures. Experiments were afterwards made for the purpose of modifying the process to obtain more trustworthy results. As finally elaborated, the procedure now recommended is as follows : A normal sugar weight of the sample is prepared, and 50 c.c. are transferred to a 100 c.c. flask, 6·3 c.c. of sodium hydroxide solution (36° Bé.) and 7·5 c.c. of hydrogen peroxide (100 vol.) added, and the mixture cooled to prevent effervescence. The flask is then immersed in a water-bath at 55° C. for 20 minutes, after which the liquid is cooled, acidified with acetic acid, made up to the mark, clarified with dry basic lead acetate, filtered, and polarised, using preferably the 400 mm. tube. It is stated that the solution thus obtained is almost colourless and quite bright. On applying (a) this modification, and comparing the results with (b) the Clerget-Herzfeld process, satisfactory results were obtained, some of these being as follows : Syrup, (a) 32·40, (b) 31·87 ; open kettle molasses, (a) 41·12, (b) 40·98 ; molasses, (a) 28·40, (b) 27·93 per cent. As this method has been found so reliable in the authors' hands, they recommend it as a substitute for the Clerget-Herzfeld inversion method in the analysis of syrups and molasses, and especially as a routine method for the determination of the sucrose content of low-grade products like hot-room goods.—J. P. O.

Iron ; Rapid and accurate determination of traces of —— *in cane and beet sugar factory and refinery products.* J. J. Eastick, J. P. Ogilvie, and J. H. Lindfield. Intern. Sugar J., 1912, **14**, 428—435.

It is of the greatest importance to control the iron content during the several stages of cane or beet sugar manufacture or refining, otherwise an objectionable greyish product will invariably result. For this purpose, the authors recommend the sulphide colourimetric process, which has the great advantage of being usually applicable to a solution of the sugar product, without the inconvenience of incineration. It is most easily carried out as follows : A standard solution of iron is prepared by dissolving crystallised ferrous sulphate in distilled water, adding a few drops of sulphuric acid, and diluting, so that 1 c.c. = 0·00002 grm. of iron. In the case of light-coloured products, 3—10 grms. of the sample are dissolved in water in a Nessler cylinder, and made up to the 100 c.c. mark. Into a series of Nessler cylinders are placed increasing amounts of the standard solution of iron, and the volumes in each are likewise completed to 100 c.c. To each cylinder, 2 c.c. of ammonium sulphide (freshly prepared) are added, the contents stirred, and allowed to stand for 10 minutes. Comparison of the test with the standard tubes then gives the iron content. If the sugar, massecuite, syrup, etc., be too dark, 3—10 grms. of the product must first be incinerated, using sulphuric acid, the ash being dissolved in the smallest possible quantity of hydrochloric acid, and made up to 100, 200, or 500 c.c., according to the amount of iron present, and the rest of the determination carried out as already described. It has also been observed as regards the preservation of the stock solution of iron that if instead of making the solution of the salt up to bulk with water, a 50—60 per cent. solution of sucrose (refined sugar) be used, the titre will keep constant almost indefinitely. On making a series of comparative experiments with the sulphide, the thiocyanate, and the ferrocyanide methods, the authors find that the limit of accuracy, expressed in parts of iron per 100,000, is as follows: sulphide, 0·05; thiocyanate, 0·10; and ferrocyanide, 0·25, and it was also noticeable that the maximum intensity of colour is more rapidly reached in the sulphide method than in either of the other two. A number of determinations of the iron content by the sulphide method, using syrups (thick-juices), refinery heavy liquors, cane and beet sugars, and molasses, are recorded, and it is shown that, except in the case of molasses and low-grade sugars, the result obtained by working with a solution of the product is identical with that found by operating upon the solution of the ash.—J. P. O.

Starch of glutinous rice and its hydrolysis by diastase. Y. Tanaka. J. Ind. Eng. Chem., 1912, 4, 578—581.

The granules of glutinous rice starch (*Oryza glutinosa*; Jap. *mochi-gome*) and the products of its hydrolysis do not differ from those of ordinary rice starch in regard to their appearance under the microscope. The starch of glutinous rice does not contain Nägeli's amylodextrin, erythrodextrin, or "albuminoids" (Atkinson, Chem. Saké Brew., 1882, 2), and its red colouration by iodine is considered by the author to be due to the fact that it is capable of holding only a minute quantity of iodine in solid solution. The blue colour of ordinary starch iodide, which is regarded as a solid solution of iodine in starch, is changed to red on washing with a potassium iodide solution or with alcohol. The starch of glutinous rice probably contains a greater quantity than ordinary starch of amylopectin or some analogous constituent which yields a dextrin hydrolysed slowly by diastase, for on hydrolysis with diastase (malt extract), the glutinous rice starch yields relatively less maltose and more dextrin than potato or ordinary rice starches. Starch of similar character to that from glutinous rice has also been found in glutinous millet (*mochi-awa*), glutinous *Panicum miliaceum*, L. (*mochi-kibi*), *Andropogon sorghum*, Brot., var. *vulgaris* Hack. (*morokoshi*), and a glutinous variety of "kaoliang" (*nien kaoliang*).—A. S.

Photolysis of ketoses by solar and ultraviolet rays. Berthelot and Gaudechon. *See* XXIV.

Patents.

Sugar-manufacturing apparatus. M. G. Wild, Assignor to F. G. Akin, Loveland, Colo. U.S. Pat. 1,034,176, July 30, 1912.

Claim is made for the combination of a carbonatation tank, a gas tube mounted within it provided with perforations for distributing the gas, and a worm mounted for rotation within the tube for the purpose of continuously cleansing the latter.—J. H. L.

Syrup-pan. G. W. Baker, Colmesneil, Tex. U.S. Pat. 1,034,407, Aug. 6, 1912.

The claim relates to an evaporating pan of elongated form, having one end rounded. It is traversed longitudinally by a division plate which, however, does not extend quite to the rounded end. Several vertical plates, not reaching to the bottom of the pan, extend radially from the free end of the division plate to the rounded end of the pan. A transverse barrier with a valve-controlled passage extends from the division plate to one side wall of the pan. The inlet and outlet are on opposite sides of the division plate and remote from the rounded end of the pan. The liquid passes along one side of the division plate, then under the radially disposed plates at the rounded end, then through the passage in the transverse barrier and finally past a number of baffle-plates to the outlet. The maximum heat is applied at the rounded end of the pan, so that ebullition only occurs there, and any floating matter is driven back away from the free end of the division plate.—J. H. L.

Filter for saccharine juices. G. Boesel, New Orleans, La. U.S. Pat. 1,035,680, Aug. 13, 1912.

Two cylindrical frames with open ends are fitted vertically one upon the other by means of a flange on the lower one, which holds the upper one in position. A filtering bag is suspended within the framework, its upper, overturned edges being clamped against the top of the frame by means of a detachable hoop.—J. H. L.

Massecuites; Process and apparatus for the separation of syrup from sugar crystals in ——, and for the washing of sugar crystals. W. de Proskowetz. Fr. Pat. 441,427, Mar. 16, 1912. Under Int. Conv., April 24, 1911.

The massecuite, in a fixed vessel provided with perforated walls, is subjected to jets of compressed air radiating from a rotating tube at the centre of the vessel; the charge is thus kept in motion, whilst the syrup is expelled through the perforations. In the apparatus claimed, the perforated walls are made in separate vertical sections, each hinged to the floor of the vessel and all held together in an upright position by the annular cover of an outer vessel surrounding and extending below the one containing the massecuite, and serving to receive the expelled syrup. This outer receiver is movable vertically, and is held in position by balancing weights. When the massecuite has been sufficiently treated, the weight of expelled syrup lowers the receiver until the sectional walls of the inner vessel, being left without external support, fall outwards and allow the sugar crystals to be blown by the compressed air into another outer annular receptacle. When the receiver containing the expelled syrup reaches its lowest position, the syrup is automatically discharged, and the receiver again rises, lifts into position the sectional walls of the inner vessel, and automatically opens valves which allow a fresh charge of massecuite to flow into the inner vessel from a feeding vat.—J. H. L.

Fermentable sugar from lignocellulose; Process for producing ——. M. F. Ewen and G. H. Tomlinson, Chicago, Ill., Assignors to Standard Alcohol Co., New York. U.S. Pat. 1,032,392, July 16, 1912.

The finely-divided lignocellulose is mixed with acid and afterwards introduced quickly into a digester in which it is submitted to the requisite temperature and pressure. Claim is also made for the pre-heating of the mixture of cellulose and acid before it enters the digester.—J. H. L.

Fermentable sugars (and turpentine) from lignocellulose; Various processes and apparatus relating to the production of ——. G. H. Tomlinson, Chicago, Ill., Assignor to Standard Alcohol Co., New York. U.S. Pats. 1,032,440 to 1,032,450, July 16, 1912.

(1). Pat. 1,032,440. Lignocellulose is rapidly heated to 212° F. (100° C.) in a closed vessel by admission of steam, and a suitable quantity of an acid liquid is then introduced into the current of steam, whereby it is disseminated through the lignocellulose. The temperature is subsequently maintained for 15—60 minutes at 260°—330° F. (126°—166° C.). (2). Pat. 1,032,441. Finely-divided cellulose is discharged, in a loose free stream, into a digester, and simultaneously the necessary quantity of an acid-carrying fluid, which may be in the form of spray, is mixed with this stream. (3) and (6). Pats. 1,032,442 and 1,032,445. Process and apparatus for passing finely divided cellulose in a loose layer, over a supporting surface and simultaneously admixing the necessary amount of acid. (4) and (5). Pats. 1,032,443 and 1,032,444. Process and apparatus for obtaining turpentine and sugar from cellulose of resinous woods. The material, in an unsaturated and permeable condition, and in motion if necessary (by rotation of the digester), is treated with steam and a hydrolysing agent. The hydrocarbon vapours evolved during the earlier stages of the digestion are withdrawn, and the heating is further continued for the production of sugar. (7) and (8). Pats. 1,032,446 and 1,032,447. Apparatus and process for impregnating finely divided cellulose with hydrolysing vapour (sulphuric anhydride). The apparatus comprises a closed chamber

with sealed devices for introducing and withdrawing the material, and means for moving the latter in a thin layer exposed to the acid fumes. (9). Pat. 1,032,448. Process for producing sugars from cellulosic materials. The moist material is submitted, in motion, to the action of a hydrolysing agent and steam under pressure, in a closed vessel, having a lining resistant towards acids and non-conducting towards heat, and after the reaction has proceeded far enough, the temperature is reduced to about 100° C. by blowing-off steam. The mass in the digester, which is freely permeable, is transferred to a diffusion battery to extract the constituents soluble in water. Claim is also made to the heating of cellulose with the hydrolysing agent by means of steam in a closed vessel having an acid-proof and insulating lining, so that the contents remain in an unsaturated and absorptive condition throughout the whole operation. (10). Pat. 1,032,449. Apparatus consisting of a digester mounted for rotation, and means for introducing steam, withdrawing vapours, and distributing hydrolysing agent upon the surface of the charge whilst the digester is rotating. (11). Pat. 1,032,450. Process consisting in the heating of moist lignocellulose to a temperature sufficient to vapourise a substantial proportion of the contained moisture, and the consequent addition of hydrolysing agent, if necessary, at a lower temperature.
—J. H. L.

Fermentable sugars: Process for producing ——. F. E. Gallagher, Newton, and H. S. Mork, Boston, Mass., Assignors to A. D. Little, Incorporated, Boston, Mass. U.S. Pat. 1,033,064, July 16, 1912.

Lignocellulose or similar material is digested under pressure of steam and in presence of a suitable hydrolysing agent until fermentable sugars are formed, and volatile products are allowed to escape during the digestive period.—J. H. L.

Dextrine; Manufacture of ——. C. Hervey, Salford. Eng. Pat. 16,284, July 14, 1911.

In order to avoid the use of a stirring appliance during conversion, closed vessels, that are sufficiently narrow to allow the heat applied to penetrate evenly throughout the mass, are used. These may be 3 ft. 10 in. in depth, 4 ft. 6 in. in length, and 6½ in. in width, and are heated by immersion in boiling water.—J. P. O.

Plants of the Amorphophallus family, Process of forming an insoluble substance from the roots of ——. H. Lyncke, Charlottenburg, Germany. U.S. Pat. 1,035,615, Aug. 13, 1912.

See Fr. Pat. 393,426 of 1908; this J., 1909 103.—T. F. B.

XVIII.—FERMENTATION INDUSTRIES.

Zymases and phosphatese; Influence of toluene on the ——. H. Euler and D. Johansson. Z. physiol. Chem., 1912, 80, 175—181.

The enzymes of yeast in their behaviour towards antiseptics fall into two groups: those which are unaffected in their action and those which are restricted so long as they are still in union with the living cells. The enzymes of the first group, *e.g.*, invertase, are readily separated by simple extraction from the cells, whilst those of the second group, *e.g.*, zymase, can only be separated by the destruction of the living cells, and when separated are by no means so readily influenced by protoplasmic poisons as when they are bound up with the cells. The authors have studied the influence of toluene on the activity of the zymase and phosphatese of living yeast. Phosphatese is an enzyme which promotes the temporary combination of inorganic phosphates with a carbohydrate derived from the sugar, apparently as an intermediate stage of fermentation. In solutions containing 20 c.c. of a 20 per cent. dextrose solution and 20 c.c. of 10 per cent. disodium phosphate, with 6 grms. of living yeast and 0·2 c.c. of toluene, the amounts of carbon dioxide evolved and the residual free inorganic phosphate were determined at intervals, comparatively with similar solutions without toluene. The results showed that the presence of the toluene caused a restriction of the activity of the zymase, but caused an abnormal accumulation of the organic phosphoric ester produced by the activity of the phosphatese. In the first three hours the amount of inorganic phosphate fixed in organic combination was very small, but in 6½ hours the whole of the phosphate had combined with the carbohydrate when toluene was present. On the other hand, in absence of toluene, the amount of free inorganic phosphate remained sensibly constant the whole time. Other experiments with dried yeast showed that in presence of toluene the inorganic phosphate steadily diminished owing to the uncontrolled activity of the phosphatese, whilst in absence of toluene a similar diminution was marked at first, followed by a gradual increase as the zymase came into action and the initially formed phosphoric ester was split up and fermented. Hence it is concluded that phosphatese belongs to the first group of enzymes; it is readily extracted from dried living yeast cells and is unaffected by poisons, such as toluene, which inhibit the fermentative activity of the cells. Comparative experiments on the fermentation of glycocoll and of sucrose showed that the presence of toluene materially restricts the fermentation both of the amino-acid and the carbohydrate.—J. F. B.

Yeast; Reducing action of ——. *Reduction of sulphur during alcoholic fermentation.* M. A. Chowrenko. Z. physiol. Chem., 1912, 80, 253—273.

Beer wort containing added sulphur (1 grm. of flowers of sulphur per litre) was fermented by, (1) a beer yeast, (2) pressed yeast, and (3) a wine yeast, and the hydrogen sulphide formed was carried over in a current of carbon dioxide or air and determined. The wine yeast produced the largest quantity of hydrogen sulphide and the pressed yeast the smallest. In all cases the maximum rate of production was attained after the fermentation had practically ceased, and this maximum was followed by a rapid decrease, especially in presence of air. Addition of glucose to the wort increased the quantity of hydrogen sulphide formed. Aeration gave rise to an increase during the primary fermentation, but diminished considerably the total quantity produced. The addition of toluene, thymol or large quantities of alcohol to the wort, after the primary fermentation, diminished greatly the subsequent production of hydrogen sulphide. Further experiments showed that "zymin" contains an enzyme (destroyed by heating) capable of reducing sulphur. This enzyme is soluble in water and in 50 per cent. alcohol; its activity increases with rise in temperature but the optimum was not determined. The author concludes that since, for the production of hydrogen sulphide from sulphur by yeast, a special enzyme is not likely to be elaborated *ad hoc*, yeast must contain normally a reducing enzyme which probably has a rôle to play in the mechanism of alcoholic fermentation.
—J. H. L.

Fermentation organisms; Effect of sulphurous acid on ——. W. V. Cruess. J. Ind. Eng. Chem., 1912, 4, 581—585.

Experiments are described showing that sulphurous acid (potassium metabisulphite) may be advantageously used to inhibit the growth of wild yeasts, moulds, and vinegar bacteria, such as occur on Californian grapes, whilst permitting the vigorous development of the true wine yeast (*Saccharomyces ellipsoideus*) naturally present or added as a "starter." Wine yeast cultivated in presence of metabisulphite does not become accustomed to sulphurous acid, but becomes more susceptible, and the most rational mode of procedure is to sulphite the must in order to eliminate wild yeasts, moulds, etc., and then add pure wine yeast (or pure cider yeast in the case of apple must) which has been grown in musts free from sulphite.—A. S.

Aspergillus oryzae; Enzymes of ——. G. Kita. Woch. Brau., 1912, 29, 460—463.

Aspergillus oryzae forms a diastatic enzyme in all nutrient media hitherto investigated. The fact, previously observed by Saito, that the mould shows only very slight saccharifying power when grown in media containing ammonium sulphate or chloride as source of nitrogen, is explained by the formation of mineral acid; for in presence of a substance (barium carbonate) capable of neutralising the latter, the mould exhibits a saccharifying power equal to that observed in presence of asparagin or potassium nitrate. Whilst the presence of acid is injurious to weak solutions of the enzyme, it is without influence or even has a favourable action if the enzyme is present in sufficient quantity. The quantity of diastase secreted by *Aspergillus oryzae* depends on the character of the nutrient medium and also on the age of the culture.—J. H. L.

Vines treated with lead arsenate; Detection of arsenic and lead in the products from ——. Carles and L. Barthe. Ann. Chim. Analyt., 1912, 17, 287—291.

Wines from vines treated even with an excessive quantity of lead arsenate contain only negligible traces of lead or of arsenic, whilst those from vines treated with a normal amount contain none. The lees from the grapes so treated, however, contain both arsenic and lead in quantities not to be neglected.—J. T. D.

Determination of benzaldehyde in Maraschino cherries and liqueur. Woodman and Davis. *See* XIXa.

Patents.

Yeast; Method of producing dry ——. E. Koelitz, Berlin, Assignor to S. Oppenheimer, Düsseldorf, Germany. U.S. Pat. 1,033,807, July 30, 1912.

Pressed grain yeast of commerce is well agitated, in presence of fresh air, with a dilute solution of sugar (*e.g.*, 2 parts of yeast to 1 part of sugar, which may be dextrose, lævulose, sucrose and maltose). Thus invigorated, the yeast is separated, washed, pressed as rapidly and strongly as possible, and afterwards kneaded with a solution of asparagin, and dried, in the form of filaments, by a current of cold air.—J. H. L.

Yeast; Manufacture of ——. T. Ruf. Fr. Pat. 440,841, March 2, 1912.

Beer yeast (used about 24 hours after pressing) or commercial pressed yeast, is mixed with a solution of raw sugar and some potato- and rye-starch and allowed to ferment at 30° C. For the production of 100 kilos. daily, 70 kilos. of pressed yeast, together with 100 kilos. from the previous day's fermentation, are mixed with a solution of 20 kilos. of raw sugar and 5 kilos. each of rye- and potato-starch. After fermentation, 100 kilos. of the product are set apart for consumption, and the remainder used for the next day's fermentation.—J. H. L.

Pulque [a Mexican beverage]; Preparation of ——. A. J. Carbajal, Mexico. U.S. Pat. 1,033,873, July 30, 1912.

The juice of *Agave Americana* is filtered under pressure and then evaporated, *e.g.* to a syrup of 25°—40° Bé., which may, if necessary, be subsequently diluted with water. The product is treated with a suitable ferment.—J. H. L.

Fermented malt beverages; Manufacture of ——. A. J. Boult, London. From Wahl-Henius Institute of Fermentology, Chicago, U.S.A. Eng. Pat. 22,663, Oct. 14, 1911.

See U.S. Pat. 1,006,154 of 1911: this J., 1911, 1329. —T. F. B.

Producing fermentable sugars from lignocellulose. U.S. Pat. 1,032,392. *See* XVII.

Production of fermentable sugars (and turpentine) from lignocellulose. U.S. Pats. 1,032,440 to 1,032,450. *See* XVII.

Producing fermentable sugars. U.S. Pat. 1,033,064. *See* XVII.

Sulphited glycerophosphate, its manufacture, and its application in wine making. Fr. Pat. 440,778. *See* XX.

XIXa.—FOODS.

Benzoic acid; Detection of —— *in milk.* C. Revis. Analyst., 1912, 37, 346.

At least 100 c.c. of the milk are diluted with an equal volume of water, 5 c.c. of 10 per cent. solution of sodium carbonate are added, and the whole is heated in boiling water for two or three minutes; then 10 c.c. of 20 per cent. solution of calcium chloride are added, the heating is continued till the casein is completely coagulated, the liquid is cooled and filtered, and the filtrate made neutral to litmus paper by hydrochloric acid. Then 10 c.c. of cupric sulphate solution (as made for Fehling's solution), and 10 c.c. of a solution of potassium hydroxide containing 31·18 grms. per litre, are successively added, and the liquid again filtered. The filtrate, in a separating funnel, is acidified with hydrochloric acid and shaken with 50 c.c. of ether. The aqueous solution is run off, the ether washed three times with a little water, 10 c.c. of water and a drop of phenolphthalein are added, and saturated barium hydroxide solution is gradually added, with shaking, till a permanent pink colour is produced. The aqueous layer is now filtered off into a porcelain basin, evaporated to about 5 c.c., filtered into a test-tube, and 1 per cent. acetic acid added till the liquid is decolourised. Two extra drops of acetic acid are added, and 1 drop of 10 per cent. neutral freshly prepared solution of ferric chloride. Even with 0·02 per cent. of benzoic acid, the characteristic precipitate of ferric benzoate is obtained.

In examining cream, 50 c.c. are diluted with water to 200 c.c. and treated as above.—J. T. D.

Crude fibre; Modification of the Sweeney method for ——. C. Kennedy. J. Ind. Eng. Chem., 1912, **11**, 600—601.

The sample of feeding stuff, after extraction with ether, is boiled with 200 c.c. of a 1·25 per cent. solution of sulphuric acid for 30 minutes, then treated with 200 c.c. of a boiling 3·52 per cent. solution of sodium hydroxide, and the whole boiled for a further 30 minutes, and filtered through a linen filter. The insoluble matter is washed free from alkali, next washed thoroughly with boiling 1·25 per cent. sulphuric acid, and afterwards with water until free from acid, then transferred to a crucible, dried, weighed, incinerated, and again weighed. The washing with acid removes the substances precipitated by the addition of alkali, which are the cause of the high results obtained by Sweeney's method (U.S. Dept. Agric., Bureau of Chem., Bull. No. 137, 157).—A. S.

Benzaldehyde in Maraschino cherries and Maraschino liqueur; Determination of ——. A. G. Woodman and L. Davis. J. Ind. Eng. Chem., 1912, 4, 588—589.

The method of Denis and Dunbar (this J., 1909, 488) is not suitable for such small quantities of benzaldehyde as are present in Maraschino cherries. To obtain accurate results with small quantities of benzaldehyde, the volume of the solution should not exceed 110 c.c., and the alcohol content should be between 8 and 12 per cent. by volume. As modified by the authors, the method is as follows:—100 c.c. of the liquor from Maraschino cherries, or 50 c.c. of Maraschino liqueur, are diluted to 140 c.c., and 110 c.c. are distilled off. In a small portion of the distillate the alcohol content is determined approximately. 100 c.c. of the distillate are mixed with alcohol or water to bring the alcohol content to about 10 per cent. by vol., and then shaken vigorously for 10 mins. in a rubber-stoppered vessel with "100 c.c." of freshly prepared phenylhydrazine reagent (3 c.c. of glacial acetic acid mixed well with 40 c.c. of water, and 2 c.c. of phenylhydrazine, and filtered through several thicknesses of filter paper). The precipitate is collected in a tared Gooch crucible, washed with cold water and then with 10 c.c. of 10 per cent. alcohol, dried in a vacuum desiccator for 20—24 hours at about

20 cm. pressure, or in a vacuum oven at 70°—80° C. for 3 hours and weighed. The weight of the precipitate obtained in a blank determination is deducted, and the corrected weight multiplied by 0·5411 gives the weight of benzaldehyde. The method can be applied to almond extracts, using 10 c.c. of the extract diluted to 100 c.c. with water, and 15 c.c. of the reagent. Genuine Maraschino contains very little benzaldehyde, and in cherries flavoured with this, the benzaldehyde expressed in mgrms. per 100 c.c. of the liqueur, should not be more than two or three times the alcohol content, expressed in per cent. by volume. Samples containing practically no alcohol and more than 20 mgrms. of benzaldehyde are manifestly artificially flavoured.—A. S.

Lithium [in mineral waters]; Determination of ——. L. R. Milford. J. Ind. Eng. Chem., 1912, 4, 595—597.

The author describes in detail a method whereby a relatively large volume (200—500 c.c.) of the water can be used without inconvenience, and a lithium salt obtained containing only spectroscopic traces of sodium and potassium. The principal features of the process consist in removing the greater portion of the sodium and potassium chlorides from the residue obtained by evaporating the water with hydrochloric acid, by washing this residue with alcohol; using calcium hydroxide instead of barium hydroxide for precipitating the magnesia; and after separating the calcium and magnesium, using amyl alcohol for effecting the final separation of sodium and potassium chlorides from lithium chloride. (See also this J., 1890. 1066).
—A. S.

Parchment papers of commerce. Burr and others. *See* V.

Patents.

Butter; Process for the manufacture of ——. A. Witte, Hamburg, Germany. Eng. Pat. 10,972, May 8, 1912. Addition to Eng. Pat. 1744. Jan. 24, 1910 (this J., 1910. 836).

Cream is cooled to a temperature of from 0° to 2° C. for 24 hours, but is not allowed to freeze; it is then quickly heated to 18°—20° C. and treated with 10 per cent. of its weight of an acidifying agent (pure culture). After remaining at this temperature for about 6 hours, the mixture is treated with a further quantity of 10 per cent. of the acidifier, cooled to 10°—13° C., and allowed to ripen for a period of about 20 hours. The mixture is then churned.—W. P. S.

Butter-milk; Process for separating the fatty matters contained in ——. O. N. Lüning. Fr. Pat. 441,345, Mar. 14, 1912.

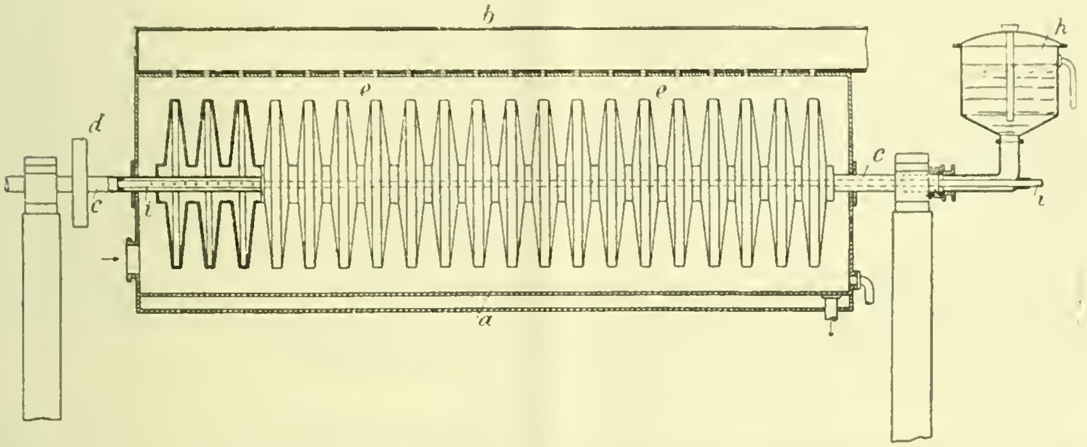
The butter-milk is passed through an emulsifier or a pump, or it may be diluted with milk, skimmed milk, or water, the object being to obtain the casein in a fine state of division. After this treatment it is passed through a separator of special design in order to separate the fatty matters present. If the butter-milk be introduced slowly into the separator it need not be diluted previously.
—W. P. S.

Condensed milk; Process for the manufacture of —— *also applicable to the concentration of solutions or infusions of cocoa, coffee, tea and other aromatic or nutritive substances.* V. de Brugada Vila and L. E. Dotesio. Fr. Pat. 441,170, Mar. 9, 1912.

Milk is passed through a Pasteur filter under an atmosphere of compressed carbon dioxide and is then frozen a number of times until most of the water has been separated as ice; these freezing operations are also carried out in an atmosphere of carbon dioxide. The concentrated milk is then evaporated to the desired consistence under reduced pressure at a temperature of about 45 C.—W. P. S.

Evaporating apparatus for various liquids, and particularly for milk. A. Wurm. Fr. Pat. 441,426, March 16, 1912. Under Int. Conv., March 18, 1911.

The liquid to be evaporated is introduced into the jacketed cylinder, *a*, provided with a vapour escape pipe, *b*. Steam is introduced through the inner perforated pipe, *i*, the outer pipe, *c*, being in communication with the constant-level cold water reservoir, *h*, and the extremities of the discs, *e*, which are rotated by the pulley, *d*. The object of the arrangement is to ensure a constant and equable temperature in the evaporator and discs. This is attained by maintaining the discs completely full of hot water, the temperature of which is controlled by adjusting the relative amounts of steam and cold water. The reservoir, *h*, being at a higher level than the uppermost part of the discs, the latter are always kept full of water.—W. H. C.



Condensed milk or mixtures of the same with cocoa, coffee, or other substances; Process and apparatus for the preparation of ——. M. Vouga and C. Debu. Fr. Pat. 441,489, Mar. 19, 1912.

The liquid, such as milk, is introduced into the top of a vertical chamber containing a number of inclined trays which slope alternately towards and away from a shaft passing down the centre of the chamber. Distributing arms, attached to this rotating shaft, distribute the milk over the trays successively. The air is exhausted from the chamber during the operation, quantities of sterilised and filtered air being also admitted to aid in the removal of the moisture. The trays are separately heated to different temperatures by means of steam jackets, the uppermost tray being the hottest. The concentrated milk is drawn off at the bottom of the chamber.—W. P. S.

Condensed milk or mixtures of the same with cocoa, coffee, or other like substances ; Process and apparatus for drying ——. M. Vouga and G. Debu. Fr. Pat. 441,490, Mar. 19, 1912.

The condensed milk is forced, by means of sterilised air under pressure, from a reservoir into the upper part of a cylindrical chamber where it falls on to a hollow perforated partition. The milk passes through the holes in this partition, and the thin threads of milk which are formed hang vertically in the lower part of the chamber, where they are dried by means of a current of air introduced through the hollow partition above-mentioned. The lower ends of the dry threads are broken off at the bottom of the chamber by means of a rotating paddle-wheel and the granular powder obtained is conducted to a receptacle containing a heated roller where the drying is completed. The moist air is drawn off from the bottom of the chamber.—W. P. S.

Baking-powder. D. Beatty, Berkeley, Cal. U.S. Pat. 1,034,677, Aug. 6, 1912.

A mixture of a tartaric acid, *e.g.*, racemic acid, with gluten and sodium bicarbonate.—J. H. L.

Coffee berries ; Process for removing caffeine from ——. Kaffee-Patent Akt. Ges. First Addition, dated May 6, 1911, to Fr. Pat. 438,437, Mar. 16, 1911 (this J., 1912, 657).

The aqueous extract containing the caffeine, as obtained in the process described in the original patent (*loc. cit.*) is mixed with peat, sawdust, or the like, and the mixture is extracted with petroleum spirit in order to remove ethereal oils, fats, etc. The caffeine is then extracted with chloroform or carbon tetrachloride, and the residual mass is extracted with alcohol to obtain the caffeetannic acid.—W. P. S

Nutritive and flavouring substance and process of making same. K. Ikeda and S. Suzuki, Tokyo. U.S. Pat. 1,035,591, Aug. 13, 1912.

See Fr. Pat. 402,630 of 1909 ; this J., 1909, 1219.—T. F. B.

XIXb.—WATER PURIFICATION ; SANITATION.

Copper sulphate for purifying water supplies. G. Embrey. J. Gas Lighting, 1912, **119**, 507.

An account of work performed at the Gloucester reservoirs on water from the Upper Lias and Inferior Oolite formations. It was found that watercress beds could be treated with copper sulphate for the destruction of algae without injuring the cress. For reservoir treatment it was found that 1 part of copper sulphate in 1,000,000 parts of water, could be used to destroy the lower forms of plant life without injuring fish or rendering the water toxic to human beings, but that the lesser amount of one in three millions was sufficiently effective. Through the growth of *Chara vulgaris* the water of three reservoirs had been rendered coloured and fishy in odour. To remove these defects the water was treated with copper sulphate in the proportion of one in three millions. The salt was used as a fine crystalline powder and was sprinkled over the surface of the water, the crystals sinking to the bottom before dissolving. In this way the greatest effect of the copper sulphate was obtained at the bottom where it was desired. The reservoir was allowed to stand from three to seven days when the odour and colour disappeared, and not a trace of copper was found in the water. It was noticed that if the water was treated in February, the diatoms, which were then present alone, were destroyed and the development in later months of confervæ and the *Chara* was prevented. The trout in the reservoirs were unaffected, but the roach were starved by the removal of their vegetable food. It was noticed that the stones with which the reservoirs were lined became coated with red bands of cuprous oxide, which on exposure to air became black by oxidation. The author states also that he has found ferrous sulphate to be effective in the same way as copper sulphate.—J. H. J.

Electrolytic disinfecting fluid ; Production and use of —— *at Poplar.* F. W. Alexander. Annual Report for 1911 to the Metropolitan Borough of Poplar by the Medical Officer of Health, pp. 90—100.

The output of electrolytic hypochlorite solution during 1911 was 53,063 gallons ; the total cost of materials was £107 14s. 4½d. (including 9093 units of electricity at 1½d. = £56 16s. 7½d.), power for electric motor for stirring, 14s. 7½d., and bottles, corks, and labels, £19 6s. 1d. The disinfectant fluid continues to be added to the water in the swimming baths in the same quantity as hitherto—viz., one part of chlorine to 2,000,000 parts of water. During the year, 3,237 gallons of the fluid were supplied to the Poplar Baths, 3,217 gallons to the Bow Baths, and 1,106 gallons to the Island Baths, making a total of 7,560 gallons. The addition of this fluid prevents the formation of slime in the water, and also prevents the occurrence of offensive smells when the baths are being cleansed. The medical officer is fully convinced, after the six years' practical success of the electrolytic process of production adopted in Poplar, that there is no more suitable means of producing a cheap, clean, and effective chlorine solution. Since the installation of the plant 200,000 gallons of fluid (at an average strength of 5 grammes of available chlorine per litre) have been made for the sum of £380, out of which amount £212 was for electricity, leaving a sum of £168 for raw material, including water. Respecting the £212 for electricity, an advantage accrues to the borough from this expenditure, because £35, or 16 per cent., of this sum is clear profit. It is quite possible that a saving could be made upon the raw material, but as the plant is worked absolutely by unskilled men, a rule of thumb must be adopted. The labour has been considerably lessened by a small motor stirring the fluid while making it stable, and quite recently the same motor has been arranged to keep the fluid in the large supply tank constantly stirred—which was formerly done by hand—so as to keep the electrolyte at a constant specific gravity.

Concrete ; Disintegration of —— *as consequence of production of excess of hydrogen sulphide in sewage disposal plants.* W. M. Barr and R. E. Buchanan. J. of Ind. and Eng. Chem., 1912, 4, 564—567.

In the case of three sewage plants under observation, viz., Grinnell, State Inebriate Hospital, and State Hospital at Mount Pleasant, large quantities of hydrogen sulphide are evolved. The sulphide is formed in two ways :—(*a*) By the bacterial decomposition of proteins, etc., containing sulphur, and (*b*) by the reduction of sulphates, contained in unusual amounts in the water supplies used. Of the two, the second seemed to be the more important. The organism chiefly responsible for the reduction of the sulphates and evolution of hydrogen sulphide, is a spiral bacterium closely related to, if not identical with *Spirillum desulfuricans.* The hydrogen sulphide escaping as gas from the sewage, especially in the "dosing chamber," is partially dissolved by the moisture on the under side of the roof and concrete walls. Here it becomes oxidised to sulphuric acid, partly through atmospheric oxidation and partly through bacterial action. The sulphuric acid acts upon the calcium compounds of the concrete forming calcium sulphate, and thus causes gradual corrosion of the concrete. Not infrequently an excess of free sulphur is deposited, which has escaped oxidation. The exact species of the organisms responsible for the conversion of the hydrogen sulphide produced, into sulphuric acid, has not been determined. But the fact has been demonstrated, that bacteria in mixed cultures may bring about this change. *Beggiatoa* and a bacillus, have been isolated, and they are probably the most important of the organisms bringing about this change.

Patents.

Water; Apparatus for softening and purifying ——. F. A. Anderson, Newcastle-upon-Tyne. Eng. Pat. 18,219, Aug. 11, 1911.

The water is delivered into a cylindrical chamber through a T-piece, one branch of which communicates with the lower portion of the chamber and the other with the upper. The main volume of the water passes through the latter branch, whilst a smaller quantity enters the lower part of the chamber which is filled with lime; the quantities of water passing through the two branches are regulated by perforated discs situated in the branch pipes. The lime-water rises and mixes with the hard water in the upper part of the chamber, and the softened water is drawn off through a filter at the top of the apparatus. —W. P. S.

Water; Mechanical filtration of ——. Ozonair, Ltd., and E. L. Joseph, London. Eng. Pat. 4406, Feb. 21, 1912.

To prevent the holes in the perforated false-bottom of a filter from being obstructed by fragments of filtering material, hollow perforated cones are placed over the holes. The cones have approximately hemispherical tops, the bases being provided with flanges which rest on the upper surface of the false-bottom. A tubular stem in each case fits into the hole in the false-bottom and may be secured to the latter.—W. P. S.

Liquids; Apparatus for treating —— with ultra-violet rays. V. Henri, A. Helbronner, and M. von Recklinghausen. First Addition, dated Feb. 19, 1912, to Fr. Pat. 428,170, April 6, 1911 (see Eng. Pat. 12,948 of 1910; this J., 1911, 828).

The liquid to be treated is passed through flat chambers or channels formed of quartz plates, these chambers forming the sides and bottom of a vessel in which the lamp is situated. Flat cooling chambers are also provided between the first chambers and the lamp, the quartz plates between the two being common to both sets of chambers. Various forms of the apparatus are described.—W. P. S.

Water; Automatic apparatus for the sterilisation of —— by means of ultra-violet rays. P. G. Triquet. Fr. Pat. 441,457, May 24, 1911.

Floats are placed in the reservoir in which the sterilised water is collected and by their movement stop, or start, the working of the lamp, as the tank is filled or emptied, respectively. The necessary electrical connections for this purpose are provided, as is also a means for preventing the lamp from being put in operation should the supply of water to the apparatus be interrupted.—W. P. S.

Liquids, particularly water; Apparatus for distilling or sterilising ——. W. Boehm. Fr. Pat. 440,600, Feb. 26, 1912.

The apparatus consists of a flat-bottomed retort and a corrugated glass receiver, the latter being partially immersed in a small tank of cold water. The retort is heated by means of a burner or by an internal electrical heating device, a small burner being also provided under the neck of the retort. The whole apparatus is enclosed in a wire cage.—W. P. S.

Incrustations in boilers; Process and product for preventing the ——. T. Brázda, E. Richter and A. Schückher. Fr. Pat. 440,763. Feb. 29. 1912. Under Int. Conv., March 2, 1911.

In the process for preventing incrustation in boilers described in Fr. Pat. 391,701 of 1908, the water to be heated is passed through a vessel divided into a number of communicating compartments and is treated with intermittent jets of steam in order that the finely divided ("microcrystalline") precipitate may form in a suitable manner. The pulsations in the steam supply are caused by a spring-controlled valve in the steam main. When sufficient pressure of steam has accumulated in a chamber, above the water, it closes the valve against the spring and the supply of steam is cut off until the inflowing cold water has condensed the steam, when the pressure of the spring reopens the valve and steam is re-admitted. The finely divided precipitate is then used in the boiler either alone or with the water from which it was formed and serves to prevent the formation of scale by causing the solids which are precipitated as the water is evaporated to separate as a fine mud which can be easily removed.—W. H. C.

Waste liquids or trade effluents; Machines for straining —— and recovering the fibres or fibrous substances contained therein. J. Turner, Sowerby Bridge, Yorks. Eng. Pat. 19,718, Sept. 5, 1911.

An inclined chamber is fitted in a suitable tank, the upper end of the chamber being open, whilst the lower end is curved or rounded and is perforated, as is also the under side of the chamber. The liquid to be strained is introduced into the chamber and the fluid portion escapes through the perforations into the tank; any fibrous material present collects in the chamber and is carried upwards by means of a series of travelling brushes and discharged from the top of the chamber into a perforated receptacle.—W. P. S.

Fibres and the like; Apparatus for separating and recovering —— from liquids. E. V. Chambers and T. C. Hammond, Huddersfield. Eng. Pat. 7060, Mar. 22, 1912.

Two perforated circular screens are placed across the inlet and outlet ends, respectively, of a tank through which the liquid is caused to flow. The screens are mounted on a rotating shaft and the screen at the inlet end is of coarser mesh than the other. A fixed board is fitted in close proximity to that portion of the inlet surface of each screen which is moving upwards, and fibrous material collecting on the screens is thus rolled up and squeezed until it reaches the upper edge of the board when it falls on to a platform. Dirt and heavy foreign substances are removed, by means of a system of travelling buckets, from a sump situated in the tank between the screens.—W. P. S.

Sewage and the like; Apparatus for reducing ——. A. Maclachlan, Brooklyn, N.Y., Assignor to Hammond Iron Works, Warren, Pa. U.S. Pat. 1,035,797, Aug. 13, 1912.

The apparatus comprises settling tanks, a dryer communicating with the bottom of the tanks, and means for heating the dryer, removing vapours from it, and partially exhausting it so as to draw in material which has settled at the bottom of the tanks. The pump used for exhausting the dryer can also be put in communication with the upper part of the tanks to draw off liquid and transfer it from one tank to another.—J. H. L.

Sewage sludge; Process of treating —— in horizontal tanks or basins. Städtehygiene- und Wasserbauges. m. b. H. Fr. Pat. 441,302, Mar. 13, 1912.

The sludge is introduced through pipes into conical wells or sumps situated in a tank; short partition walls at the upper edges serve to separate the wells from one another, and a current of water or clarified sewage is passed continuously through the upper part of the tank. When the sludge has been liquefied and dissolved, a fresh charge is admitted into the wells.—W. P. S.

Effluents; Purification of —— by means of a mixture of clay and chemicals. C. Gunkel. Ger. Pat. 248,980, June 11, 1911.

Small quantities of highly plastic raw clay mixed with excess of fine, weathered, mineral waste from silicate-containing rocks, is added to the effluent in the dry or moist condition. It is stated that the clayey constituents rapidly disintegrate, without separating from the mineral waste, and settle to the bottom, carrying down any impurities in the effluent.—A. S.

Respiratory apparatus for use in diving and in working in poisonous atmospheres. G. Kermode, London, and G. F. Davis, Birmingham. Eng. Pat. 16,550. July 18, 1911.

THE container of the apparatus is composed of a number of compartments through which the exhaled air is caused to pass successively; the compartments are provided with stirring devices, operated by hand, in order that the chemicals contained in the said compartments may be agitated from time to time. The apparatus is also provided with a valved mouth-piece of special construction in order to prevent vitiated air left in the pipes and mouth-piece from entering the mouth at the next intake of breath. —W. P. S.

Disinfecting and antiseptic purposes; Compositions for ——. Act.-Ges. fur Anilin-Fabrikation. Fr. Pat. 440,686. Feb. 27. 1912. Under Int. Conv., July 25, 1911.

FINELY powdered "*bolus alba*" is sterilised and mixed with its own weight of pure 95 per cent. alcohol; a plastic mass is obtained to which may be added, if desired, glycerin, colouring matters, soap, perfumes, etc.—W. P. S.

Sewage and waste waters; Apparatus for separating floating and light suspended matter from ——. Ges. f. Abwässerklärung m. b. H. Fr. Pat. 440,421, Feb. 20, 1912.

SEE Eng. Pat. 2741 of 1912; this J., 1912, 699.—T. F. B.

Animal carcases, slaughter-house refuse, and similar matter; Process and apparatus for converting —— into powder and fat. A. Sommermeyer. Fr. Pat. 440,468, Feb. 21, 1912.

SEE Eng. Pat. 8898 of 1911; this J., 1912, 200.—T. F. B.

Sterilisation of liquids by means of ultra-violet rays. M. von Recklinghausen. Fr. Pat. 441,165, March 9, 1912. Under Int. Conv., March 17, 1911.

SEE Eng. Pat. 6759 of 1911; this J., 1912, 457.—T. F. B.

Detersive agent suitable also for other purposes [*insecticides*]. Fr. Pat. 440,978. *See* XII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Cocaine; Separation and identification of ——. H. C. Fuller. Techn. Drug Studies. Division of Drugs. U.S. Dept. Agric., Bureau of Chem., Bull. **150**. April 22, 1912. 41—43.

SOLID substances are dissolved in water or in $N/1$ sulphuric acid, or if necessary they are extracted with alcohol containing ammonia, water added, and the bulk of the alcohol evaporated. Syrups should be diluted to the consistence of a 50 per cent. sugar solution and freed from gum and fat when present. The solution containing a slight excess of ammonia is shaken in a separating funnel with three successive portions of 50 c.c. of Prolius mixture (ether, 4 parts; chloroform, 1 part; and alcohol, 1 part), and the combined extracts filtered and evaporated nearly to dryness on a hot water bath. The moist residue is taken up with 25 c.c. of $N/1$ sulphuric acid, added in portions of not more than 10 c.c., the mixture being warmed and filtered after each addition, and is finally washed with a little water. The acid solution is shaken with five successive portions (15 c.c. each) of chloroform, and the united chloroform extracts washed with 10 c.c. of water, which is added to the acid solution, whilst the chloroform is discarded. The acid solution is next shaken with 10 c.c. of petroleum spirit (b. pt. 40° to 60° C.), the extract discarded, a slight excess of ammonia added to the acid solution, and the extraction thrice repeated with 15 c.c. of petroleum spirit each time. The united petroleum spirit extracts are washed once with water, filtered, and evaporated rapidly on the water-bath in a current of air. The residue will then contain any cocaine that was originally present. A test is made for alkaloids in a portion of the residue with mercuric iodide solution, and if a precipitate is obtained the remainder of the residue is heated with 2 c.c. of strong nitric acid on the water-bath until there is no further odour of nitric acid, and then cooled and treated with 5 to 10 drops of $N/5$ alcoholic potassium hydroxide solution. On gently warming the dish, cocaine, when present even in minute traces, gives off the odour of ethyl benzoate. A purple colouration indicates the presence of atropine, strychnine or yohimbine, though in some instances a similar colouration is given by the residue from the coca leaf. An odour of ethyl benzoate is also produced by tropacocaine, benzoylecgonine and aconitine, but the two first may be differentiated by means of the microscope, whilst benzoylecgonine and aconitine are not removed to any great extent from the aqueous solution by petroleum spirit. Cocaine may also be identified by the crystalline compound which it gives with gold chloride. Moreover, when heated for 1½ hours in a strong closed flask on the water-bath with 15 c.c. of dilute hydrochloric acid and a few crystals of salicylic acid, cocaine will cause an odour of oil of winter green to be produced, whereas tropacocaine does not give this reaction. This test might also indicate cinnamylcocaine and the truxillines, but, on the other hand, none of these gives the ethyl benzoate reaction.—C. A. M.

Brucine in strychnine; Test for ——. D. B. Dott. Brit. Pharm. Conf., 1912. Pharm. J., 1912, Special Issue, 22.

WHEN nitric acid of sp. gr. 1·42 is added to strychnine for the purpose of detecting brucine, the former alkaloid is rapidly attacked by the acid, and the characteristic colour change is difficult to follow. This difficulty is obviated by using the following test: When 0·05 grm. of the strychnine in powder is dissolved in 4 c.c. of acid (prepared by mixing equal volumes of nitric acid and water) at the ordinary temperature, the colour should, after five minutes, be purely yellow, showing no red or orange tinge. —F. SHDN.

Pareira root; Alkaloids of ——. F. Faltis. Monats. Chem., 1912, **33**, 873—897. (See this J., 1911, 1136.)

AFTER discussing the constitutional formulæ, a description is given of the alkaloids of Pareira root (*Chondodendron tomentosum*). Commercial amorphous bebirine sulphate was dissolved in water and the bases precipitated by means of sodium carbonate solution. β-Bebirine was isolated from the precipitate by means of its solubility in benzene, and purified by the addition of light petroleum to the benzene solution. It has been styled β-bebirine from its small optical activity, in comparison with the high optical activity of the α-bebirine of Scholtz (*loc. cit.*). The substance can be represented by the formula, $C_{19}H_{16}O_2(NCH_3)(OH)(OCH_3)$. The melting point, which is not sharp, lies between 142° and 150° C. In absolute alcohol $[\alpha]_D$ is $=+28·6°$ at 21° C., and in pyridine $[\alpha]_D$ is $=-24·7°$ at 21° C. The hydriodide melts at 245° C. The mother liquors obtained after the removal of the bases precipitated from the crude bebirine sulphate deposited a small amount of flocculent matter on standing, which contained β-bebirine, isobebirine, and another alkaloid insoluble in benzene, but soluble in alcohol. The latter alkaloid is microcrystalline and has the composition, $C_{20}H_{15}O_2(NCH_3)(OH)_2(OCH_3)$. It has $[\alpha]_D=+56·7$ at 20° C. in pyridine. Protocatechuic acid was formed by fusing the substance with potassium hydroxide. Isobebirine was isolated owing to its small solubility in alcohol. It crystallises from a mixture of methyl alcohol and pyridine in rhombic needles, m. pt. 290° C. The composition is $C_{19}H_{15}O(NCH_3)(OH)_2(OCH_3)$, and $[\alpha]_D=-47·7°$ at 22° C. in pyridine. When β-bebirine was warmed to 60° C. with acetic anhydride, a monacetyl derivative was formed, which melted indefinitely between 120° and 142° C. The triacetyl derivative melts between 140° and 165° C. The tribenzoyl derivative, formed in a similar way, melts at 144°—147° C. β-Methylbebirine was obtained by treating the base with nitrosomethylurea, and crystallised from benzene in needles, m. pt. 81°—83° C. Methylation with dimethyl sulphate gave a derivative, the hydriodide of which melted at 244° C. When β-bebirine is boiled for a considerable time with benzene, it becomes partially converted into an insoluble optically inactive isomeride.—F. Shdn.

Alkaloid salts ; Action of bases and basic salts on ——. I. Traube. Biochem. Zeits., 1912, **42**, 470—495.

The author has extended the observations of Gros (this J., 1910, 1176 ; 1912, 407), Pribram (Arch. ges. Physiol., 1911, **137**, 350), and von Prowazek (Arch. f. Protistenk., 1910, **18**, 221), and shows that the pharmacological and toxic action of numerous alkaloids is strengthened by alkaline salts and alkalis, and that this effect proceeds parallel with an alteration of the surface tension of the alkaloid solution, as measured by aid of the stalagmometer (compare this J., 1911, 448 and following abstract) or the viscostagonometer (see page 845). The magnitude of the intensifying action depends upon the strength and quantity of the alkali and on the nature of the alkaloid, and a simple method for determining the relative strengths of bases can be founded on their behaviour in this respect. The results of experiments with cocaine, quinine, cinchonidine, atropine, physostigmine, pilocarpine, morphine, scopolamine, and dionine are described, and it is shown that where the addition of sodium carbonate causes little or no alteration of the surface tension of a solution of the alkaloid salt, there is also little or no effect on the toxic action of the alkaloid, but in other cases there is parallelism or even proportionality between the change of surface tension and of toxic action.—A. S.

Colloidal systems ; Surface tension and flocculation of ——. (*Contribution to the theory of poisons, medicines, and dyestuffs.*) I. Traube. Kolloidchem. Beihefte, 1912, **3**, 237—336.

The author gives the results of a large number of experiments, carried out mainly with the stalagmometer (compare this J., 1911, 448), on the surface tension of colloidal systems and the effect thereon of the addition of various substances ; and on the basis of the results obtained, together with those obtained by other workers, discusses the action of poisons (and antidotes) and medicines, and the nature of the dyeing process. The work comprises sections on : (1) Surface tension of some dyestuff solutions. (2) Influence of salts on the surface tension of dyestuff solutions. (3) The system, Night Blue : effect of various additions thereon. (4) The system, Night Blue, and the action of blood- and protoplasm-poisons. (5) The system, colloidal platinum and gold, also blood, and the catalysis of hydrogen peroxide. (6) The system, Wool Violet S : effect of various additions. (7) Poisoning and healing ("*Entgiftung*") of colloidal systems. (8) Capillary analysis. (9) The system, lecithin. (10) The system, soap. (11) The systems, bile, milk, pancreas, gastric juice. (12) The system, kaolin. (13) The systems, blood serum, red blood corpuscles, and bacteria cultures. (14) The systems, albumin, peptone, and gelatin. (15) The systems, Benzopurpurin and picric acid. (16) The systems, sodium carbonate and alkaloid salts. (17) Theory of the action of poisons. (18) Theory of the action of toxins and ferments. (19) A. P. Mathews' theory of the action of poisons. (20) Theory of the action of medicines. (21) Theory of dyeing. With regard to the conclusions to be drawn from the results of the experiments, it may be stated that the changes (flocculation, alteration of surface tension, etc.) observed on addition of different substances to colloidal systems are produced in the manner that, in the first place, anionic systems are affected by cations and cationic systems by anions ; and that the intensity of the effects produced by the different additions is, broadly speaking, the same for different colloidal systems. The more an added substance alters the physical properties of a colloidal system (aggregation, disaggregation, hydration, etc.), the greater is its toxicity with respect to the system, especially if the changes are irreversible ; and since, as stated above, the effects on different systems are comparable, it follows that in general a blood- or bacteria-poison will also be a "dyestuff poison" and that with due precautions, it will be frequently possible to make use of a test with a dyestuff solution instead of a physiological test on an animal. Again the modern tendency has been to introduce as far as possible pure compounds into medicine, but the author's results show that :—(1) It is frequently advisable to administer a mixture of an anionic and a cationic remedy. (2) Many medicinal substances are rendered much more active by the presence of even a small quantity of another substance (compare this J., 1910, 1176 ; 1912, 407, 700, 745 ; also preceding abstract). (3) The toxic properties of a substance may be considerably reduced by a small quantity of another substance : *e.g.*, an alkaloidal extract containing a small quantity of tannin is relatively less toxic than a similar extract without tannin.

In the section on the theory of dyeing it is suggested that the fact, observed by Knecht (this J., 1905, 841) that human saliva increases the affinity of cotton for dyestuffs, is due to a mordanting action of the thiocyanates contained therein. It is also stated that without doubt the very cheap alkali perchlorates would prove efficient mordants for certain basic dyestuffs. With regard to the insolubility of the dyestuff on the dyed material, it is stated that with the aid of the author's attraction-pressure ("*Haftdruck*") theory, this is explicable without the assumption of a chemical or physical alteration of the dyestuff itself. According to this theory, the distribution of a dissolved substance between two solvents depends upon the relative magnitudes of the attraction pressure of the dissolved substance in the two phases (compare Pflüger's Arch., 1910, **132**, 511 ; 1911, **140**, 109 ; also Verh. deutsch. physik. Ges., 1908, **10**, 901).—A. S.

Opium alkaloids ; Synergy of the ——. Béla v. Issekutz. Pflüger's Arch. Physiol., 1912, **145**, 415—439. Chem. Zentr., 1912, 2, 274.

Opium alkaloids of dissimilar chemical constitution (*e.g.*, morphine, narcotine, papaverine) when administered together show not merely an additive action, but the effect of one is intensified by the presence of another to a varying degree (up to 20—50 per cent.). Such intensification is, however, not exhibited in the case of the opium alkaloids of similar constitution (*e.g.*, morphine, codeine, dionine, heroine, thebaine). (See also this J., 1912, 700, 745.) —A. S.

Local anaesthetics ; Synergy of ——. Béla v. Issekutz. Pflüger's Arch. Physiol., 1912, **145**, 448—454. Chem. Zentr., 1912, 2, 274.

The anæsthetic action of cocaine is increased by 46 per cent., that of β-eucaine by 39 per cent., and that of novocaine by 19 per cent. by antipyrine. β-Eucaine increases the anæsthetic action of novocaine by 32·5 per cent. On the other hand, in the case of mixtures of cocaine and β-eucaine and of cocaine and novocaine, only an additive effect is observed.—A. S.

Coumarin, particularly in factitious vanilla extracts ; Detection of small quantities of ——. H. J. Wichmann. U.S. Dept. of Agric., Bureau of Chem., Circular No. 95, April 6, 1912.

In order to detect coumarin in vanilla extracts, 25 c.c. of the extract are made slightly acid with sulphuric acid, 25 c.c. of water added and the whole distilled to dryness. 15 to 25 drops of potassium hydroxide solution (1 : 1) are added to the distillate, which is then rapidly evaporated to 5 c.c. and transferred to a test-tube. The water is now boiled off and the residue fused to a colourless mass. When cold, the residue is dissolved in a few c.c. of water and made slightly acid with 25 per cent. sulphuric acid. The solution is distilled, when the salicylic acid, formed from the coumarin during the potash fusion, passes over and may be detected by the addition of neutral ferric chloride solution to the distillate.—F. Shdn.

Erythrophlœum Guineense; Chemical examination of the bark of ——. F. B. Power and A. H. Salway. Amer. J. Pharm., 1912, 84, 337—351.

The bark of *Erythrophlœum Guineense*, G. Don (Sassy bark), was extracted with hot alcohol, and the resulting concentrated extract distilled in steam without any essential oil being obtained. The following substances were isolated from the portion of the extract soluble in water: small amounts of luteolin, $C_{15}H_{10}O_6$, and an alkaloid identical with that previously described by Harnack (Arch. Pharm., 1896, 234, 561) as erythrophleine. Tannin and a sugar yielding *d*-phenylglucosazone, m. pt. 210° C., were also found in the aqueous liquid. The portion of the alcoholic extract insoluble in water consisted of a dark brown brittle resin. The following substances were isolated from this portion of the extract: a phytosterol, $C_{27}H_{46}O$, m. pt. 130°—133° C., cerotic, stearic, palmitic, oleic, and linolic acids; and small amounts of ipuranol and luteolin.—F. Shdn.

East Indian bark; Essential oil from an ——. E. W. Mann. Brit. Pharm. Conf., 1912. Pharm. J., 1912, Special Issue, 23—24.

The bark yielding the oil was obtained from the Dutch East Indies, where it is known as "Lawang." It appears to be a massoi bark, derived from some species of *Cinnamomum*, *Litsea*, or allied genus. About 0·5 per cent. of essential oil was obtained from the bark. The oil had the following characters: sp. gr. 1·0104 at 15·5° C.: optical rotation (100 mm.), —6·97° at 20° C.: refractive index 1·5111 at 15·5° C., 1·5095 at 20° C.; acid value 1·15; saponification value 43·02; ester value 41·87; saponification value after acetylation 121·91. After treating the oil with metallic sodium, a white crystalline acid was obtained, m. pt. 51°—52° C.—F. Shdn.

Cypress oil. Roure-Bertrand fils. Wiss. u. ind. Ber. von Roure-Bertrand fils, 1912, [3], 5, 25—27. Chem. Zentr., 1912, 2, 351—352.

In the following table are given the characters of oils obtained from: (1) the twigs of *Cupressus sempervirens fastigiata* (1 kilo. of oil from 491 kilos. of twigs): (2) the twigs of *C. lusitanica* (1 kilo. of oil from 400 kilos. of twigs); and (3) the cones of *C. sempervirens fastigiata*, freed from seeds (yield 0·415 per cent.).

	1	2	3
Sp. gr. at 15° C.	0·8744	0·8723	0·8739
Opt. rotation	+12° 6′	+9° 10′	+29° 52′
Opt. rotation of acetylated oil	+14° 16′	+8° 38′	+29° 48′
Acid value	0·7	1·05	1·0
Saponif. value	4·9	9·8	9·8
Saponif. value of acetylated oil	14·7	26·6	21·0
Solubility in 90% alcohol	1 in 3·5 vls.	1 in 3 vls.	1 in 4 vols.
Colour	brownish	pale yellow	amber

—A. S.

Eucalyptol (cineol); Determination of —— in essential oils. F. D. Dodge. J. Ind. Eng. Chem., 1912, 4, 592—593.

The proposed method is based on the fact that eucalyptol, being a saturated cyclic compound, is practically unaffected by cold permanganate, whereas terpenes and unsaturated compounds are oxidised more or less readily to soluble products. Ten c.c. of the oil (eucalyptus or cajeput oil) are treated with a 5—6 per cent. solution of potassium permanganate, added in small portions, with shaking, so long as the permanganate is reduced; the flask is kept in ice water. When an excess of permanganate has been added, the flask is shaken occasionally during 12—18 hours, whilst still kept in the ice water, then the precipitated manganic oxide is dissolved by addition of sulphurous acid (or sodium bisulphite and hydrochloric acid), and the flask filled with water. The unoxidised oil (eucalyptol) is pipetted off into a graduated tube, washed with a little alkali, and its volume read off. The eucalyptol thus obtained should have a sp. gr. between 0·929 and 0·930 at 15° C., should be optically inactive, and soluble in 3½ vols. of 60 per cent. alcohol at 25° C. Check assays on mixtures of eucalyptol, terpenes, and terpineol have proved satisfactory, and the method has now been in use for several years, with good results.—A. S.

Esters used in perfumery and for flavouring purposes; Commercial ——. J. C. Umney and C. T. Bennett. Brit. Pharm. Conf., 1912. Pharm. J., 1912, Special Issue, 11—13.

The following are the characters of a number of commercial esters used for flavouring and for perfumery:—

Ester.	Specific gravity, 15° C.	Refractive index, 20° C.	Ester percentage.	Range of boiling point.
Ethyl formate, pure	0·908	1·3621	74·9	54°— 65° C.
Ethyl formate, commercial	0·869—0·927	1·360—1·367	59·6— 68·9	55°— 80°
Ethyl acetate, pure	0·904	1·3740	100·8	75°— 79°
Ethyl acetate, commercial	0·901—0·904	1·373—1·374	82·8— 94·7	71°— 84°
Ethyl butyrate, pure	0·883	1·3922	100·1	110°—120°
Ethyl butyrate, commercial	0·883—0·886	1·388—1·492	95·4—100·5	105°—140°
Ethyl succinate	1·042—1·054	1·419—1·421	98·0— 99·5	210°—214°
Ethyl sebacate	0·959—0·966	1·436—1·439	94·9— 96·4	above 300°
Ethyl benzoate	1·048—1·053	1·504—1·545	73·8—100·5	210°—215°
Ethyl cinnamate	1·052—1·056	1·557—1·559	99·1—100·6	260°—267°
Ethyl salicylate	1·132—1·134	1·521—1·523	96·0— 99·8	225°—230°
Amyl acetate, pure	0·860—0·863	1·397—1·402	89·6— 99·6	130°—140°
Amyl acetate, commercial	0·863—0·870	1·399—1·402	82·2— 88·9	110°—142°
Amyl butyrate, pure	0·867	1·4128	99·4	170°—180°
Amyl butyrate, commercial	0·857—0·867	1·407—1·412	76·9— 83·4	135°—180°
Amyl valerianate, pure	0·858	1·4131	98·7	180°—190°
Amyl valerianate, commercial	0·850—0·866	1·408—1·413	75·6— 81·8	140°—190°
Amyl salicylate	1·048—1·053	1·505—1·508	97·2— 98·7	260°—275°

—F. Shdn.

Chloroform. Chemistry of anaesthetics. IV. C. Baskerville and W. A. Hamor. J. Ind. Eng. Chem., 1912, 4, 212—220, 278—288, 362—372, 422—429, 499—506, 571—578.

The paper is divided into the following sections:—I. History. II. Uses. III. Manufacture. IV. Purification. V. Physical constants. VI. Decomposition. VII. Impurities. VIII. Examination of anæsthetic chloroform. Ethyl alcohol, which was formerly largely used for the manufacture of chloroform, is now almost entirely replaced by acetone (this J., 1889, 1008; 1896, 612; 1904, 621; compare Frerichs, this J., 1912, 660), and more recently carbon tetrachloride (obtained from carbon bisulphide manufactured in the electric furnace) has become an important raw material (see this J., 1896, 612, 919; 1904, 383). It is stated that when properly purified, chloroform made from carbon tetrachloride, methylated spirit, acetone, etc., is just as satisfactory for anæsthetic purposes as is that made from alcohol. Acetone which is to be used in the manufacture of chloroform should be purified in such a way, *e.g.*, avoiding the use of mineral acids, that condensation products are not formed (see Dott, this J., 1908, 271). In the section on purification (compare Thorpe, J. Chem. Soc., 37, 196), it is stated that the French practice of distilling in presence of poppy oil (this J., 1899, 782) is useless if the chloroform has been properly purified before fractionation. Special methods of purification such as Pictet's cooling process (this J., 1892, 59; 1899, 231) and the formation of double compounds (this J., 1893, 782) are not necessary for the production of anæsthetic chloroform. Tests with specially purified chloroform gave the values 1·49887 for sp. gr. at 15°/4° C. and 61·20° C. for boiling point; the boiling point is of no value as a criterion of purity (compare Wade and Finnemore, this J., 1904, 759). Special experiments were made on the decomposition of pure chloroform and of anæsthetic chloroform containing the usual pharmacopœial amounts of alcohol and water, and from the results obtained the following conclusions are drawn:—The products of the oxidation of pure chloroform are carbonyl chloride and hydrochloric acid:—

$$CHCl_3 + H_2O + O_2 = COCl_2 + HCl + H_2O_2;$$
$$CHCl_3 + H_2O_2 = COCl_2 + HCl + H_2O.$$

The oxidation is favoured by "a degree of moisture" and accelerated by light; the formation of carbonyl chloride is accelerated by acids. The extent of the oxidation depends upon the nature of the container, the amount of air present, the purity of the sample, and the intensity of the light. With exclusion of air, exposure to light causes no appreciable decomposition for ordinary periods of exposure; in the dark, oxidation in presence of air proceeds slowly. When chlorine is found among the decomposition products, this is due to the photochemical decomposition of carbonyl chloride. In the case of anæsthetic chloroform, *i.e.*, in the presence of alcohol, the primary products of oxidation are those of the alcohol and no decomposition of the chloroform occurs at first. When the oxidation of alcohol reaches a maximum, decomposition of the chloroform begins, the products being the same as in the case of pure chloroform, except that chlorinated derivatives of the oxidation products of alcohol may be formed. When anæsthetic chloroform is subjected to agitation accompanied by mechanical shock, the alcohol present undergoes oxidation to a greater or less extent, depending upon the amount of air present, the violence and duration of the agitation, and the intensity of the light. Hence when anæsthetic chloroform is shipped for considerable distances, or is kept at sea, the containing vessels should contain a minimum amount of air, and precautions should be taken to avoid mechanical shock as far as possible; if cork stoppers are used, they should be capped. The known preservative action of alcohol is confirmed, and it is stated that any readily oxidisable substance, soluble in chloroform, will in a similar manner exert an inhibitory effect on the oxidation of chloroform itself (see this J., 1907, 67). The preservative action lasts only so long as the added substance remains unoxidised; as soon as it is completely oxidised, decomposition of the chloroform begins. Chloroform for anæsthetic purposes should always be furnished in vessels of anactinic glass containing, at the most, not more than can be used in several days. For storage it should be contained in completely filled stoppered bottles of anactinic glass and kept in a cool dark place; the glass should show no alkaline reaction to phenolphthalein when filled with water and heated at 100° C. for six hours. Glass bottles are preferable to tin containers, and if the latter be employed, special care must be taken that traces of the flux used in soldering are not introduced into the chloroform. If cork-stoppered glass containers are used, the corks should be capped, preferably with thin sheet tin.

The following scheme for the examination of chloroform for anæsthetic and analytical purposes, with particular reference to the detection of avoidable impurities, is given. "Anæsthetic chloroform" is the term given to chloroform complying with pharmacopœial requirements: it contains ethyl alcohol (up to 1 per cent.) and small quantities of water. "Commercial chloroform" contains at least 99 per cent., by weight, of chloroform, but may contain small amounts of "organic impurities." (1). *Specific gravity* is determined by means of a pycnometer at 15° C. (2). *Odour.* One hundred c.c. are slowly evaporated to about 10 c.c. on the water-bath. The residue from anæsthetic chloroform should be colourless and possess no foreign odour, and when allowed to evaporate on filter-paper, no odour of other substances than alcohol and chloroform should be perceptible as the last portions disappear. (In the case of pure chloroform, no odour except that of chloroform should be observed). (3). *Residue.* No weighable residue should be left when 100 c.c. of pure or anæsthetic chloroform are evaporated in a platinum dish at 100° C. (4). *Organic impurities.* Twenty c.c. of the sample are mixed with 15 c.c. of concentrated sulphuric acid in a glass-stoppered tube of 50 c.c. capacity, and after the addition of 0·4 c.c. of pure 40 per cent. formaldehyde solution, the whole is shaken for 5 minutes. No colouration should be produced with anæsthetic chloroform, and with pure chloroform no colouration should be produced even on allowing to stand for 1 hour in the dark. (5). *Water.* When 20 c.c. of the sample are boiled with 1 grm. of clean crystals of calcium carbide, and the vapours evolved passed into ammoniacal silver nitrate solution, no acetylene reaction should result in the case of pure chloroform or anhydrous anæsthetic chloroform (see this J., 1898, 864). In the case of anæsthetic chloroform, 10 c.c. should dissolve to a clear solution when shaken with an equal volume of paraffin oil of sp. gr. 0·880. (6). *Alcohol.* For pure chloroform, 10 c.c. are extracted with successive portions of 4 c.c., 4 c.c., and 2 c.c. of concentrated sulphuric acid, the acid solution is diluted with 40 c.c. of water, and gently distilled until 20 c.c. have passed over. Ten c.c. of the distillate are treated with 6 drops of a 10 per cent. solution of potassium hydroxide, warmed to 50° C., and treated with a saturated solution of iodine in potassium iodide until it becomes permanently brown, when it is carefully decolourised with potassium hydroxide; no iodoform should be deposited. A negative response to this test indicates the absence of alcohol, acetaldehyde, propyl alcohol, acetone, etc. Tests with chromic acid (this J., 1896, 748), alkaline permanganate (this J., 1882, 117), and potassium hydroxide (agitation of the sample first with ignited potassium carbonate to remove water, and then with a small piece of fused potassium hydroxide and red litmus paper: the latter becomes blue in presence of alcohol) may be used for confirmatory purposes. In the case of anæsthetic chloroform and commercial chloroform, the amount of alcohol present should be determined by the method of Nicloux (this J., 1897, 473; 1906, 611) as modified by the authors (shaking the chloroform for at least ten times in succession with twice its volume of water and using a portion of the combined aqueous extracts for the determination) or by Behal and François (this J., 1897, 566). (7). *Acetone.* For pure chloroform see (6). For anæsthetic chloroform, 10 c.c. are agitated with 5 drops of a 0·5 per cent. solution of sodium nitroprusside and 2 c.c. of ammonia of sp. gr. 0·925, and the mixture allowed to stand for several minutes. When acetone is present, the supernatant liquid acquires an amethyst colour. The test should also be applied to the first 10 per cent. distillate and the 10 per cent. residue obtained on slowly distilling 100 c.c. of the sample. If the proportion of acetone is as low as 1 : 1000, the amethyst colour is not distinct until the mixture of chloroform with ammonia and sodium nitroprusside is saturated with ammonium sulphate, shaken, and then allowed to stand for 5 minutes. In all cases a blank test should be made with pure chloroform for comparison. (8). *Acetaldehyde.* With chloroform of all grades, no colouration should be produced even after 15 minutes when 5 c.c. are agitated with 5 c.c. of François' reagent (22 c.c. of sulphurous acid, 30 c.c. of 1 : 1000 rosaniline acetate solution, and 3 c.c. of sulphuric acid). For pure chloroform, in addition to test (6), no colouration should be produced when 5 c.c. are shaken with 5 c.c. of Nessler's reagent (U.S.P.) and the mixture allowed to stand for 5 mins. For anæsthetic chloroform, 10 c.c. are shaken with 10 c.c. of water and 5 drops of Nessler's reagent, and the mixture allowed to stand for 5 mins.: no precipitate should be produced, and the reagent should not become coloured, although it may become opalescent or slightly turbid. (9) *Acidity.* Twenty c.c. of the sample are thoroughly agitated with 10 c.c. of water and 2 drops of phenolphthalein solution and then titrated with $N/100$ potassium hydroxide solution; in the case of either pure or anæsthetic chloroform, not more than 0·2 c.c. of the alkali solution should be required to produce a faint but decided alkaline reaction permanent for 15 minutes. when the mixture is shaken for 30 seconds after the addition of each drop of alkali. (10). *Decomposition products of pure chloroform.* A dry stoppered tube of 25 c.c. capacity, containing 15 c.c. of the sample. is filled with a clear solution of barium hydroxide (1 : 19) and allowed to stand for 3 hours in the dark, without agitation: the formation of a film of barium carbonate indicates the presence of carbonyl chloride. In addition to test (9), both pure and anæsthetic chloroform should comply with the following test: When 10 c.c. are agitated with 5 c.c. of water for 5 minutes, the aqueous extract should not become turbid or give any precipitate on addition of silver nitrate solution (absence of hydrochloric acid, chlorides, etc.), and no reduction should occur on warming (absence of acetaldehyde, formic acid and formates, etc.). With chloroform of all grades, no liberation of iodine, as determined by addition of starch solution, should result when 10 c.c. are shaken during 15 mins. with 10 c.c. of a 10 per cent. solution of cadmium potassium iodide (absence of chlorine and hydrogen peroxide). (11). *Decomposition products of anaesthetic chloroform.* For the detection of acetaldehyde see (8). If the sample fails to comply with test (9) and contains none of the impurities referred to under (10), the presence of acetic acid is indicated, and the sample should be rejected. For the detection of chlorinated derivatives of the oxidation products of alcohol, 20 c.c. of the sample are shaken during 20 mins. with 15 c.c. of concentrated sulphuric acid, and 2 c.c. of the mixture are diluted with 5 c.c. of water: the liquid should remain colourless and clear, and should possess no odour foreign to anæsthetic chloroform (chloroform and alcohol): it should remain colourless when further diluted with 10 c.c. of water and its transparency should not be diminished on addition of 5 drops of silver nitrate solution.

The results of the examination of a number of samples of American anæsthetic chloroform are given. The chief impurities, besides water, are substances decomposable by sulphuric acid and traces of the oxidation products of alcohol. Anæsthetic chloroform should contain but mere traces of water, and it is desirable that it be anhydrous.
—A. S.

Ether in normal saline solution; Solubility of ——. R. R. Bennett. Brit. Pharm. Conf., 1912. Pharm. J., 1912. Special Issue, 24.

The solubilities of pure ether and commercial purified ether prepared from methylated spirit in normal saline solution (0·91 per cent. sodium chloride solution in water) were determined at temperatures between 0° C. and 30° C. The following weights of pure ether are dissolved by 100 grms. of the salt solution. 13·08 grms. at 0° C. and 5·30 grms. at 30° C. The average weights of purified ether dissolved by 100 grms. of the salt solution are, 13·46 grms. at 0° C., and 5·83 grms. at 30° C. The solubilities were determined by observations of the freezing points of the solutions.—F. Shdn.

Formates and other compounds; Notes on commercial ——. T. Tyrer and F. C. Gosling. Brit. Pharm. Conf., 1912. Pharm. J., 1912, Special Issue, 35.

Some of the formulæ given in the British Pharmaceutical Codex for certain formates are not correct, as shown by the following table:—

Salt.	Codex formula.	Established formula.
Sodium formate	$NaCHO_2,H_2O$	$NaCHO_2,2H_2O$
Potassium formate ...	$KCHO_2$	$KCHO_2$
Lithium formate	$LiCHO_2,H_2O$	$LiCHO_2,H_2O$
Calcium formate	$Ca(CHO_2)_2$	$Ca(CHO_2)_2$
Ferric formate	$Fe_2(CHO_2)_6,H_2O$	$Fe_2(CHO_2)_6$
Ferrous formate	$Fe(CHO_2)_2$	$Fe(CHO_2)_2,2H_2O$

Ether of sp. gr. 0·735 loses 15 per cent. when shaken with water owing to its solubility, and not 11 per cent. as stated in the Codex.

Petroleum spirit. The Codex gives sp. gr. 0·640 to 0·700 and boiling point 40° to 60° C. But a spirit with a sp. gr. of 0·640 always has a large fraction boiling below 40° C., and a spirit of sp. gr. 0·700 contains a large amount boiling above 60° C.

Potassium binoxalate [$KHC_2O_4(H_2O)_2$]. In the trade, salts of sorrel are understood to consist of potassium quadroxalate. $KH_3(C_2O_4)_2(H_2O)_2$.—F. Shdn.

Calcium lactate. C. A. Hill and T. T. Cocking. Brit. Pharm. Conf., 1912. Pharm. J., 1912. Special Issue, 33—35.

Pure calcium lactate having the composition, $CaC_6H_{10}O_6,5H_2O$, can be readily obtained by adding acetone to the saturated aqueous solution and washing the precipitate with ether. 100 parts of water dissolve 3·1 parts of the hydrated salt at 0° C., 5·4 parts at 15° C., and 7·9 parts at 30° C. There is no evidence that calcium lactate becomes insoluble with age, and the above salt appears to be stable on exposure to air. It is suggested that the salt to be made official should be the hydrate, $CaC_6H_{10}O_6.5H_2O$, that it should be neutral, or a limit of slight acidity stated, and that when treated with sulphuric acid and ignited, again treated with acid and ignited, 41 to 45 per cent. of the original weight should be left as calcium sulphate. Limits of lead and arsenic should be introduced.—F. Shdn.

Nitrates in Bismuthi Carbonas. B.P.; Determination of ——. W. R. Pratt. Brit. Pharm. Conf., 1912. Pharm. J., 1912, Special Issue, 30—32.

A modification of Sprengel's process is used to determine the small amounts of nitrates frequently present in Bismuthi Carbonas, B.P. Phenoldisulphonic acid is prepared by heating 3 grms. of phenol with 20 c.c. of concentrated sulphuric acid for 6 hours on the water-bath. Two or three drops of this reagent are added to 0·02 grm. of the bismuth carbonate, followed by the addition of 10 c.c. of ammonia solution. The precipitate is filtered off and washed, the filtrate being made up to 100 c.c. and put in a Nessler cylinder. The yellow colour can then be matched with one of those obtained by similarly treating the residues left after the evaporation of standard solutions containing 0·01 to 0·02 mgrm. of potassium nitrate. It appears that a limit of 2 per cent. of nitrate as bismuth subnitrate might be allowed in commercial samples of the carbonate. Nitrates can be detected by the deep blue colouration produced when concentrated sulphuric acid is added to the substance mixed with resorcinol and brucine.—F. Shdn.

Sicilian citrus industry in 1910–11. Board of Trade J., Aug. 29. 1912. [T.R.]

The following particulars relative to the Sicilian citrus industry have been extracted from the report for the year ended 30th November, 1911, of the Royal Commissioner administering the "Camera Agrumaria" (Citrus Chamber):—

——	1909.	1910.	1911.
Estimated production of citrate of lime and lemon juice * metric tons	7,500	6,300	4,800
Estimated consumption ,,	5,400	5,800	7,100
Deliveries by Chamber ,,	2,248	6,073	7,548
Proceeds of sales in 1911 lire	—	—	11,396,971
Profit and Loss Account—			
Receipts .... ,,	—	—	519,933
Expenses .... ,,	—	—	365,652
Net profit .... ,,	—	—	154,281

* 162 litres of concentrated lemon juice (*Agrocotto*), of which the production is relatively small as compared with citrate of lime, are calculated as equivalent to 100 kilos. of citrate.

The exports of citrate to the undermentioned countries during the years 1909—1910 and 1910—1911 were as follows:—

To—	1909-1910.	1910-1911.
	kilos.	kilos.
United States	2,131,925	2,206,131
France	1,612,981	1,779,592
United Kingdom	1,173,460	1,700,847
Germany	952,102	1,183,990
Austria	213,626	171,559

It is calculated that the world's production of citrate of lime and concentrated juice amount to an average of about 7,200 metric tons per annum, of which about five-sixths are produced in Sicily. The remaining 1,000 tons are produced in the British Antilles (principally in the Islands of Dominica and Montserrat), in Mexico, and in Central and South America. The citrate produced in these regions is exported to the United States, while the concentrated lemon and lime juice finds its principal outlet in the London market.

Purity of glycerin. Kebler and Fuller. *See* XII.

Patents.

Preparations containing formic aldehyde. H. Sefton-Jones, London. From J. A. von Wülfing, Berlin. Eng. Pat. 15,671, July 5, 1911. (See also this J., 1911, 982.)

Solid chemical compounds of crystalline bioses and formaldehyde can be made of different molecular proportions from those given in previous patents (*loc. cit.*). The aqueous solutions of the biose and the formaldehyde are mixed in the molecular proportions of 1 : 1, 1 : 2, 1 : 3, or 1 : 4, and the mixture evaporated in a vacuum or in the air at about 70° C. In place of one mol. of a biose, 2 mols. of a monose may be used. The crystalline compounds obtained in this way are soluble in water and alcohol.—F. Shdn.

Isoprene; Production of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 24,549, Nov. 4, 1911.

The continuous process described in Fr. Pat. 433,322 of 1911 (this J., 1912, 151) for producing isoprene from turpentine or other similar substances, by decomposition under a reflux condenser, is, according to the present patent, carried out in a vacuum. *Example.* 15 litres of the terpene are introduced into a vessel of about 30 litres capacity, provided with a reflux condenser and connected with a vacuum pump. A platinum wire is immersed in the liquid, and heated by an electric current; the low-boiling products are distilled over in a vacuum or under a reduced pressure (*e.g.*, 20 to 30 mm.), and condensed. The vessel containing the terpene is cooled externally. The yields of isoprene are stated to be from 20 to 60 per cent., according to the nature of the terpene used.—T. F. B.

Cyclic hydrocarbons; Process for producing partially hydrogenated ——. Badische Anilin und Soda Fabrik. Fr. Pat. 441,203, March 11, 1912. Under Int. Conv., Nov. 20, 1911, and Jan. 22, 1912.

Halogen derivatives of hexahydrobenzene or other cycloparaffins are readily converted into partially saturated cyclic hydrocarbons, giving good yields, when they are passed in the form of vapour over heated substances capable of removing hydro-halogen acids, or suitable catalytic agents. The reaction may be carried out under the ordinary or reduced pressure, and it is advisable to employ temperatures lower than those at which the desired hydrocarbons decompose. As catalytic agents may be employed barium chloride, alumina, nickel chloride, etc. Thus, monochlorocyclohexane furnishes tetrahydrobenzene, dichlorocyclohexane is converted into dihydrobenzene, and chloropentamethylene yields cyclopentene.—T. F. B.

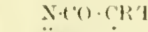
Trimethylethylene and also isoamyl alcohols from isopentane; Process for preparing ——. Chem. Fabr. auf Actien, vorm. E. Schering. Fr. Pat. 441,278, March 12, 1912. Under Int. Conv., March 17, 1911.

Trimethylethylene, of b. pt. 36°—37° C., may be obtained by removing the elements of hydrochloric acid from the mixture of monochloro-isopentanes of b. pt. 85°—105° C. produced by treating isopentane with the calculated quantity of chlorine. Potassium acetate or other salts of fatty acids, alkali hydroxides, or organic bases such as pyridine, quinoline, or aniline, may be used for this purpose. When alkali hydroxides or fatty acid salts are used for the conversion, the product consists of a mixture of the trimethylethylene with the two isoamyl alcohols or their fatty acid esters. In the example given, 100 kilos. of isopentane furnished 48 kilos. of the monochloro derivatives of b. pt. about 85° C., which, when heated with alcoholic potassium acetate solution, gave 14·6 kilos. of pure trimethylethylene and 17—20 kilos. of a mixture of the isoamyl alcohols, of b. pt. 125°—145° C. (after saponification of the acetates).—T. F. B.

Pinacone; Process for the production of [homologues of] ——. Farbenfabr. vorm. F. Bayer und Co. First Addition, dated Feb. 16, 1912, to Fr. Pat. 434,553, Sept. 25, 1911. Under Int. Conv., March 1, 1911. (See Eng. Pat. 22,795 of 1911; this J., 1912, 151.)

The homologues of pinacone may be obtained by treating the homologues of acetone with aluminium amalgams, or with amalgamated aluminium, or with magnesium in presence of a mercury salt, such as mercuric chloride. Thus, diethylketone furnishes a tetraethylglycol, $(C_2H_5)_2:C(OH).C(OH):(C_2H_5)_2$, of b. pt. 116°—119° at 17 mm., which when crystallised from ether melts at 27°—28° C. Similarly a dimethyldiethylglycol (b. pt. 78°—79° C. at 3 mm.) and a dimethyldipropylglycol (m. pt. 95° C.) are produced from methylethylketone and methylpropylketone, respectively.—T. F. B.

Therapeutical compounds [barbituric acids]; Manufacture of —— *and of intermediate products for use therein.* P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 27,112, Dec. 4, 1911.

2-Alkyloxybarbituric acids of the general formula,  $\begin{array}{l}\quad N\cdot CO\cdot CR'R''\\ RO\cdot\ddot{C}\cdot NH:\dot{C}O\end{array}$ (where R means alkyl or aralkyl, R′ hydrogen or alkyl, and R″ alkyl, aryl, or aralkyl), are obtained by treating with malonyl halides the ethers of isourea of the formula, $HN:C(OR)NH_2$ (where R means alkyl or aralkyl), or their salts. When treated with acids the products yield 5-mono- or dialkyl, monoaralkyl, monoaryl, alkylaryl, or alkylaralkyl-barbituric acids, which may be used as soporific agents. The following products are described:—2-ethoxy-5-ethylbarbituric acid, m. pt. 211° C.; 2-ethoxy-5-benzylbarbituric acid, m. pt. 202° C.; 2-ethoxy-5-phenylbarbituric acid, m. pt. 218° C.; 2-methoxy-5-phenylethylbarbituric acid, m. pt. 152° C.; 2-methoxy-5-diethylbarbituric acid, m. pt. 131° C.; 5-phenylethylbarbituric acid, m. pt. 170° C.—T. F. B.

Hydrocinchona alkaloids; Production of esters of ——. G. W. Johnson, London. From Verein. Chininfabr. Zimmer und Co., G. m. b. H., Frankfort-on-the-Maine, Germany. Eng. Pat. 27,952, Dec. 12, 1911.

The chlorides, anhydrides, or the phenol esters of organic acids are made to react upon the hydrocinchona alkaloids, their salts, or oxy-magnesium haloid compounds, in order to form esters with the organic acids in question. Or the corresponding esters of the cinchona alkaloids can be reduced by means of hydrogen in the presence of metals of the platinum group.—F. Shdn.

Di[hydr]oxydiaminoarsenobenzene ; Manufacture of derivatives of ——. Farbwerke vorm. Meister, Lucius, und Bruning, Höchst a/Main, Germany. Eng. Pat. 3615, Feb. 13, 1912. Under Int. Conv., Feb. 13, 1911.

An acid, giving readily soluble neutral salts, is obtained by treating 3·3′-diamino-4·4′-dihydroxyarsenobenzene with solutions of formaldehyde and a bisulphite.—F. Shdn.

Dihydroxydiamino-arsenobenzene ; Process for making derivatives of ——. Farbwerke vorm. Meister, Lucius, und Bruning. Fr. Pat. 441,392, March 15, 1912. Under Int. Conv., March 17, 1911.

Dihydroxy-amino-arsenobenzene-amino-acetic acid and its derivatives are produced by treating dihydroxy-diamino-arsenobenzene with monohalogen derivatives of acetic acid or its homologues : the reaction takes place more readily in presence of potassium iodide. The halogen-acetic acid may be applied in the free state or in the form of a salt. Dihydroxyamino-arseno-benzene-amino-acetic acid is a yellow powder, readily soluble in alkalis and in excess of acid, and also in the usual organic solvents. When neutralised with alkalis it forms salts ; thus the sodium salt is yellowish brown, and readily soluble in water, giving a neutral solution.—T. F. B.

Dichloro-arsinobenzoic acid chloride ; Production of ——. Les Etabl. Poulenc frères, and K. J. Œchslin. Fr. Pat. 441,215, May 20, 1911.

Dichloroarsinobenzoyl chloride, $Cl_2As.C_6H_4.COCl$, may be obtained by treating with phosphorus pentachloride either dichloroarsinobenzoic acid, or benzarsenious acid, $(HO)_2As.C_6H_4.COOH$, or benzarsine oxide, $OAs.C_6H_4.COOH$; it may also be produced by the action of phosphorus trichloride on benzarsenious acid or its anhydride, and treating the product with phosphorus pentachloride. It consists of a mobile liquid, of b. pt. 189°—190° C. at 19 mm., and is soluble in chloroform, ether, and benzene. It behaves like benzoyl chloride in presence of alcohols, phenols, aminoalcohols, ammonia, etc.—T. F. B.

Acetylsalicylic acid ; Formation of the calcium salt of ——. Gedeon Richter, Budapest, Hungary. Eng. Pat. 4986, Feb. 28, 1912. Under Int. Conv., Sept. 16, 1911.

The calcium salt of acetylsalicylic acid can be made by grinding the acid with water and calcium carbonate, filtering, and precipitating by the addition of alcohol to the filtrate.—F. Shdn.

Cocaine isovalerianate ; Manufacture of ——. T. Teichgraeber, Berlin. Eng. Pat. 10,750, May 6, 1912. Under Int. Conv., March 21, 1912.

The free cocaine base can be allowed to act upon isovaleric acid so as to form cocaine isovalerate. Or the salt may be formed by double decomposition.—F. Shdn.

Ketone of high boiling point from acetone and its homologues ; Process for making a ——. J. Hertkorn. Fr. Pat. 440,445, Feb. 21, 1912.

See U.S. Pat. 1,030 177 of 1912 ; this J., 1912, 702. The alkaline-earth oxide may be replaced by magnesium oxide.—T. F. B.

Sulphited glycerophosphate, its manufacture, and its application in wine making. G. E. Jacquemin. Fr. Pat. 440,778, May 10, 1911.

"Sulphited glycerophosphates" are obtained by the combination of a glycerophosphate, especially ammonium glycerophosphate, with sulphurous acid or one of its compounds. Thus by saturating a solution of ammonium glycerophosphate with sulphur dioxide, a solution is obtained containing about 20 per cent. of each of the constituents. In the manufacture of wine these products may be employed in place of the sulphiting and phosphating treatments of vintages and musts, since they combine an antiseptic and a nutrient action.—T. F. B.

6.6-Diquinolyl-4.4-dicarboxylic acid and derivatives thereof ; Manufacture of phenylated ——. Chem. Fabrik auf Actien, vorm. E. Schering, Berlin. Eng. Pat. 4799, Feb. 26, 1912. Under Int. Conv., Feb. 28, 1911.

See Ger. Pat. 246,078 of 1911 ; this J., 1912, 605.—T. F. B.

6.6-Diquinolyl-4.4-dicarboxylic acids ; Process for preparing phenylated and substituted-phenylated ——, *and also their homologues.* Chem. Fabr. auf Actien. vorm. E. Schering. Fr. Pat. 440,669, Feb. 26, 1912. Under Int. Conv., Feb. 28, 1911.

See Ger. Pat. 246,078 of 1911 ; this J., 1912, 605.—T. F. B.

Compounds containing hydrogen peroxide ; Process of making stable ——. V. Stanek, Prague, Assignor to Chem. Fabrik Gedeon Richter, Budapest. U.S. Pat. 1,035,756, Aug. 13, 1912.

See Eng. Pat. 26,960 of 1911 ; this J., 1912, 557.—T. F. B.

Barbituric acid ; Process for producing derivatives of ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 440,458, Feb. 21, 1912. Under Int. Conv., March 3, 1911.

See Ger. Pat. 247,952 of 1911 ; this J., 1912, 795.—T. F. B.

Barbituric acids ; Process for the production of substituted ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 441,209, March 11, 1912. Under Int. Conv., March 16 and 17, 1911.

See Eng. Pat. 27,112 of 1911 ; preceding.—T. F. B.

Esters [of alkylaryl-malonic and -cyanoacetic acids] ; Process for the production of ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 440,689, Feb. 27, 1912. Under Int. Conv., March 10, 1911.

See Eng. Pat. 26,503 of 1911 ; this J., 1912, 795.—T. F. B.

Pentachloro-ethane and hexachloro-ethane ; Process for making ——. Salzbergwerk Neu-Stassfurt und Theilnehmer. Fr. Pat. 441,249, Jan. 8, 1912. Under Int. Conv., May 6, 1911.

See Eng. Pat. 1105 of 1912 ; this J., 1912, 458.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Patents.

Colour photography ; Process for the production of gapless granular three colour screens for ——. J. Bamber, London. Eng. Pat. 15,775, July 7, 1911.

A suitable support, such as glass or celluloid, is coated with a layer of varnish consisting of gum sandarac, 1 part, castor oil, 1 part, lavender oil, 2 parts, alcohol, 4 parts ; whilst this is still adhesive, the colour grains are applied to it in a thin layer : these are prepared by colouring with suitable dyes the grains obtained from a mixture of 4 parts of gum sandarac, 1¼ parts of castor oil, and 12 parts of alcohol. By using these mixtures, the colour grains absorb the oil from the varnish and become permanently plastic. The screen is now subjected to the action of a solvent vapour, such as alcohol, wood naphtha, or acetone, and allowed to dry ; by this means the grains momentarily dissolve and the solvent evaporates so rapidly that the grains form a continuous layer, but yet the colours do not intermingle.—T. F. B.

Colour photography. C. Courmont, Paris. Eng. Pat. 16,201, July 13, 1911.

In preparing composite prints by superposition of different coloured images on films of transparent material, such as gelatin or celluloid, it is proposed to use two films of each colour, in order to compensate for the fading of the colours caused by exposure of the transparencies to light.—T. F. B.

Cellulosic films for use in photography and cinematography, for glazing purposes, printing, and making various other articles. P. A. Cattaert. Fr. Pat. 441,146, May 18, 1911.

A cellulose film is immersed in a benzene solution of acetic anhydride or acetyl chloride together with a small quantity of sulphuric acid, and also containing a cellulose ester (*e.g.*, acetate); the benzene may be replaced by other suitable solvents. The film is thus allowed to take up a certain portion of cellulose ester at about 30° C., and is then washed in benzene, alcohol, ethyl acetate, acetone, or amyl acetate. It is now covered with a thin layer of celluloid or cellulose acetate, alone or mixed with a small quantity of cellulose nitrate, and dried at 60°—70° C. Similarly, impermeable films may be produced by impregnating cellulose films with phenol or phenolic products, and then treating them with a solution of formaldehyde, after which they are dried and covered with a thin layer of nitrocellulose, celluloid, or cellulose acetate.—T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Nitroglycerin; Behaviour of ——, when heated. W. O. Snelling and C. G. Storm. U.S. Bureau of Mines, Technical Paper 12, 1912.

A strong steel chamber, 2½ feet cube, with a thick plate-glass window, was constructed, in which the apparatus was placed and the experiments carried out. An electric lamp in the chamber gave the requisite light, and thermometers, etc., were observed through the window. The explosion of 2—3 grms. of nitroglycerin in the chamber was perfectly safe. Nitroglycerin begins to decompose about 50° C., and at 70° C. gives off sufficient nitrous fumes to turn iodide-starch paper blue in 15—30 minutes. Even at these temperatures, too, it slowly volatilises. At 135° C. the liquid turns red from the absorption of the rapidly evolved nitrous fumes, and at 145° C. the liquid "boils," from the evolution, partly of products of decomposition, partly of its own vapour. As soon as this occurs the heat evolved is enough to maintain and even to raise the temperature and thus increase the rapidity of the action. At 215° the ebullition is very violent, and at 218° C. the substance explodes. When, by applying or removing heat, the temperature is kept between 145° and 210° C. distillation takes place. The distillate consists of nitroglycerin, nitric acid, water, and other products of decomposition; the residue is chiefly glycerin, with the mono- and di-nitroderivatives. By carefully raising the temperature, this residue can be charred without explosion occurring.—J. T. D.

Patents.

Explosive. F. Raschig. Fr. Pat. 440,625, Feb. 26, 1912. Under Int. Conv., Feb. 3, 1912.

The explosives are composed of nitrates or perchlorates mixed with sulphonates or disulphonates of higher phenols such as cresol, xylenol, cumenol or naphthol. The components may be mixed together in presence of small quantities of water and the mixture dried, or the components may be dissolved together in water and the solution evaporated. In order to prevent unequal separation of the two components during evaporation, the latter is effected by allowing the solution to drop slowly on to rotating cylinders heated to above 100° C. by means of steam. The solution is thus evaporated almost instantaneously and the dry material is removed from the cylinders by scrapers.—A. S.

Ammonium nitrate explosive. [Utilisation of waste sulphite-cellulose lyes.] F. Raschig. Fr. Pat. 441,419, March 16, 1912. Under Int. Conv., Feb. 12, 1912.

The use of the evaporation residue of the waste lyes from the manufacture of sulphite-cellulose as combustible substance in ammonium nitrate explosives is claimed. The lye may be evaporated and the dry residue mixed with powdered ammonium nitrate, or ammonium nitrate may be dissolved in the lye and the latter then evaporated, preferably on heated rotating drums. The explosives thus obtained detonate readily with fulminate caps, and may be admixed with up to 30 per cent. of an inert substance, and yet be capable of detonating. The products containing an admixture of an inert substance are specially suitable as safety explosives for mines.—A. S.

Nitrocelluloses; Process of stabilising ——. J. Delpech. Fr. Pat. 441,481, March 19, 1912.

The nitrocellulose, after the usual washing process, is stabilised by treatment with superheated water in an autoclave. The water is circulated by means of a pump, and a mass of chalk, marble or the like, capable of neutralising traces of acid present in the water or liberated during the treatment, is interposed in the circuit, in order to keep the water perfectly neutral and thus prevent hydrolysis of the nitrocellulose.—A. S.

XXIII.—ANALYTICAL PROCESSES.

Viscostagonometer; The ——. Methods for the determination of surface tension, inner friction (viscosity), and adsorption. I. Traube. Biochem. Zeits., 1912, 42, 500—503.

The instrument described possesses certain advantages over the author's stalagmometer (compare this J., 1911, 448). It consists essentially of a tall narrow graduated tube ending below in a capillary which in turn ends in a "dropping surface." The tube is filled with the liquid under examination by means of a pump, and for determining the surface tension, it is only necessary to read the number of scale divisions corresponding to one drop or a number of drops of the liquid and of water respectively. The viscosity is determined in the usual way by comparing the times required for the outflow of the liquid and of water from the zero mark to the 500 mark on the tube. In the determination of adsorption or partition coefficients, the simplest way is usually to measure the surface tension of the aqueous phase before and after adsorption or partition.—A. S.

Titanium; Determination of —— in presence of iron. W. M. Thornton, jun. Amer. J. Sci., 1912, 34, 214—217.

The method is a modification of that of Gooch (Proc. Amer. Acad. Arts and Sci., N.S., 12, 435). The iron present is separated by adding to the solution three times as much tartaric acid as there are oxides to be held in solution, and proceeding as follows. The iron is reduced to the ferrous state by means of hydrogen sulphide, ammonia added until the solution is slightly alkaline, and hydrogen sulphide again passed in until all the iron is precipitated, the solution being left slightly alkaline. The precipitate is washed with dilute solution of ammonium sulphide. The whole of the titanium is now in the filtrate. To enable the titanium to be precipitated by the basic acetate method, the tartaric acid is destroyed by boiling with an excess of sulphuric acid, and adding potassium permanganate until a precipitate of manganese hydroxide appears, which is dissolved by means of sulphurous acid. The manganese thus introduced is precipitated with the titanium to some extent, necessitating a double precipitation. If much aluminium is present, it is also precipitated in the same way, though the presence of a small quantity only of aluminium does not interfere. The author has found that the tartaric acid can be satisfactorily destroyed by the action of a mixture of sulphuric and fuming nitric acids, so that in cases where the amount of aluminium present is small compared with that of the titanium, one precipitation will suffice. Experiments were carried out and showed that the titanium could be completely recovered from such a solution. To the filtrate from the ferrous sulphide, 12 c.c. of concentrated sulphuric acid are added, and the solution is evaporated till as much charring and frothing as possible has taken place. Then 5 c.c. of fuming nitric acid are added cautiously, under a cover, and the mixture heated slowly till sulphuric acid fumes appear. After cooling and diluting to 100 c.c., ammonia is added till the solution is nearly neutral. After adding 1 c.c. of a strong ammonium bisulphite solution to prevent precipitation of any iron accidentally present, and then 5 c.c. of glacial acetic acid and 15 grms. of ammonium acetate, the solution is diluted to 350 c.c. and boiled for 2 minutes. The titanium is precipitated in a flocculent form which is easily filtered. After filtration, the precipitate is washed well with water containing a little acetic acid, and finally with water, after which it is ignited over a Meker burner for 20 minutes.—R. W. N.

Lanthanum from yttrium; Quantitative separation of ——. C. James and T. O. Smith. Chem. News, 1912, **106**, 73—74.

THE separation of lanthanum from yttrium by crystallisation as the double magnesium nitrate, in the presence of bismuth magnesium nitrate (see Urbain; this J., 1903, 1365), although imperfect, has been found superior to that effected by the potassium double sulphate method. Attempts to separate the metals as sodium double sulphates, formates, and cacodylates yielded unsatisfactory results.—F. SODN.

Naphthenic acids and their reaction with ferrous oxide. Pyhälä. *See* IIA.

Application of adsorption to the detection and separation of certain dyes. Chapman and Siebold. *See* IV.

Determination of sodium hydroxide in "black liquor." Sutermeister and Rafsky. *See* V.

Detection and determination of small quantities of nitrous acid. Miller. *See* VII.

Titration of phosphoric acid and boric acid. Biltz and Marcus. *See* VII.

Determination of the relative proportions of the constituents of hardened cement mortar and concrete. Burchartz. *See* IX.

Modification of Ritter's method of determining cholesterol. Corper. *See* XII.

Turpentine standards. Parry. *See* XIII.

Determination of citric acid soluble phosphoric acid in basic slag. Popp. *See* XVI.

Direct determination of sucrose in presence of reducing sugars. Cross and Taggart. *See* XVII.

Determination of traces of iron in cane and beet sugar factory products. Eastick and others. *See* XVII.

Detection of benzoic acid in milk. Revis. *See* XIXA.

Modification of the Sweeney method for crude fibre. Kennedy. *See* XIXA.

Determination of benzaldehyde in Maraschino cherries and liqueur. Woodman and Davis. *See* XIXA.

Determination of lithium [in mineral waters]. Milford. *See* XIXA.

Separation and identification of cocaine. Fuller. *See* XX.

Test for brucine in strychnine. Dott. *See* XX.

Detection of small quantities of coumarin in factitious vanilla extracts. Wichmann. *See* XX.

Determination of eucalyptol (cineol) in essential oils. Dodge. *See* XX.

Chloroform. Chemistry of anæsthetics. IV. Baskerville and Hamor. *See* XX.

Determination of nitrates in Bismuthi Carbonas, B.P. Pratt. *See* XX.

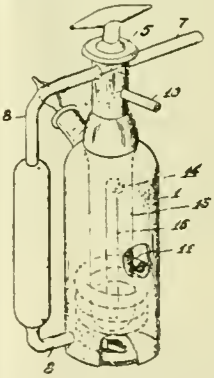
PATENTS.

Gases of varying density; Apparatus for and actuated by ——. J. F. Simmance and J. Abady, London. Eng. Pat. 27,484, Dec. 7, 1911.

THE apparatus is for indicating or recording the density of gases. The gas is caused to flow into a chamber containing a vertically movable piston which is formed as a bell sealed in liquid or as a flexible diaphragm. The gas outlet from this chamber is by a vertical tube having an orifice at the end, open to the atmosphere. The piston or bell is suspended from a spring or from one arm of a balance beam with a long indicating pointer, and the balance is adjusted so that with air in the chamber, the pointer is at 1·0. When a gas is then passed through the chamber, the piston is subject to a force equal to the difference between the weights of air and gas occupying a volume given by the area of the piston and the height from the piston to the outlet orifice of the chamber, and the pointer indicates the specific gravity. The apparatus may be used to indicate the percentage of carbon dioxide in flue gases, by means of the changes in density. Or the bell may carry a tapered plug working in the gas inlet pipe, as in a gas governor, whereby the rate of flow of the gas is made constant in spite of variations in the density, a separate pressure governor being used to keep the pressure constant.—A. T. L.

Potash-bulb. G. P. Vanier, Steelton, Pa. U.S. Pat. 1,034,170, July 30, 1912.

THE apparatus (see Fig.) includes a container, 1, for potash solution, and an interior drying chamber, 13, for solid potash. The top of the latter is connected with the neck of the apparatus and is closed by the valved stopper, 5. The only communication between the body of the container and the drying chamber is through an inlet, 14, in the wall of the latter, leading almost to the bottom of the chamber by the tube, 15. The gas enters the apparatus by the tube, 7, traverses a passage through the stopper, and is led by the tube, 8, into the spiral tube, 11, which is open at both ends and covered by potash solution in the container. After leaving the upper end of the spiral and escaping from the solution, the gas passes through the inlet, 14, and the tube, 15, to the bottom of the drying chamber, up which it travels, finally emerging from the apparatus by the outlet-tube, 10. The valved stopper, 5, controls simultaneously the inlet-tube, 7, 8, and the outlet-tube, 10.—J. H. L.



Oxidase-content of plant-juices; Method for determining the ——. H. H. Bunzel, Washington. U.S. Pat. 1,034,400, July 30, 1912.

THE plant juices, together with oxidisable material, are maintained at a fixed temperature in an oxidase apparatus, and agitated until the maximum absorption of oxygen has occurred. The quantity of carbon dioxide formed is found by absorption in alkali and titration. (See also this J., 1912, 705.)—J. H. L.

Analysis of gases, especially furnace flue gases; Automatic recording absorption apparatus for the ——. O. Hüfner. Fr. Pat. 440,357, Feb. 19, 1912.

SEE Ger. Pat. 244,335 of 1910; this J., 1912, 799.—T. F. B.

XXIV.—MISCELLANEOUS ABSTRACTS.

Adsorptive power of the hydroxides of silicon, aluminium, and iron. P. Rohland. Z. anorg. Chem., 1912, **77**, 116—118. (See also this J., 1909, 1250; 1910, 89, 755.)

The fact that crystalloid dyestuffs of complex composition have been found to be adsorbed by plastic clays, whereas those of simple composition are not adsorbed, is explained on the ground that the former, although functioning as crystalloids in very dilute solution, behave as colloids in stronger solutions, such as were employed in the author's experiments.—F. Sodn.

Photolysis of ketoses by solar and ultraviolet rays. D. Berthelot and H. Gaudechon. Comptes rend., 1912, **155**, 401—403.

Organic compounds containing a carbonyl group show exceptional sensitiveness towards light (see this J., 1910, 1080, 1081). Solutions of ketoses, protected from the air, were found to be slowly decomposed by sunlight. One c.c. of a 10 per cent. solution of dihydroxyacetone evolved 0·2 c.c. of almost pure carbon monoxide on exposure to sunlight for 12 hours. Erythrulose, lævulose, sorbose and perséulose were decomposed much more slowly, for with increase in the length of the carbon chain the photo-sensitiveness diminishes. A solution of lævulose produced only 0·54 c.c. of gas per c.c. between May 21 and July 25. In all cases the gas evolved was almost pure carbon monoxide. The reaction which takes place under these conditions consists in the elimination of the carbonyl group and the conversion of the ketose into an alcohol containing one carbon atom less in the molecule. A similar reaction occurs under the influence of ultra violet rays from a quartz mercury-lamp, but it then proceeds much more rapidly and is accompanied by subsidiary reactions, with the result that the carbon monoxide produced contains some carbon dioxide, hydrogen and methane. Ketoses in the solid state are decomposed by ultraviolet rays in the same way as when dissolved in water.—J. H. L.

Trade Report.

Chemical exports from the United States. Oil, Paint, and Drug Rep., Aug. 12, 1912.

The following figures show the amounts or values of various chemical products exported from the United States during the financial years ended June 31st, 1911, and 1912:—

	1911.	1912.
Alcohol (including pure, neutral, or cologne spirits), pf. gals.	35,231	25,440
Asbestos, manufactures of[3]	——	$520,894
Asphaltum—		
Unmanufactured,[1] tons	——	32,001
Manufactures of[1]	——	$462,885
Candles, lb.	3,191,492	2,782,439
Celluloid and manufactures of	$1,694,214	$2,034,371
Chemicals, drugs, dyes, and medicines—		
Acids—		
Sulphuric, lb.	5,777,462	7,002,444
All other	$319,900	$364,207
Alcohol, wood, gals.	1,962,336	2,565,368
Baking powder, lb.	2,187,727	2,615,138
Bark, extracts of, for tanning	$336,600	$404,024
Calcium carbide, lb.	26,607,824	32,207,802
Copper sulphate, lb.	[4]6,218,042	6,401,928
Dyes and dyestuffs	325,519	$314,694
Ginseng, lb.	153,999	155,308
Lime, acetate of, lb.	70,191,256	69,235,145
Medicines, patent or proprietary	$6,783,020	$7,541,650
Roots, herbs and barks n.e.s.	$563,862	$549,877
Sulphur or brimstone, crude, tons	17,269	41,269
Washing powder and fluid, lb.[6]	[4]3,476,704	8,387,197
All other	$8,880,676	$9,321,477
Dynamite, lb.	10,114,310	12,595,242
Fertilizers—		
Phosphate rock, ground or unground, not acidulated, tons	1,208,340	1,212,957
All other, tons	54,251	63,563
Glucose, lb.	137,461,782	126,395,015
Glue,[6] lb.	——	3,059,952
Grape sugar, lb.	44,501,264	44,761,124
Graphite—		
Unmanufactured,[1] lb.	—	3,935,884
Manufactures of[1]	—	$167,299
Grease—		
Lubricating[2]	——	$2,193,863
Soap stock and other[2]	——	$4,186,829
Gunpowder, lb.	910,956	1,500,133
Ink—		
Printers'	$406,672	$409,722
All other	$235,362	$231,099
Lard, lb.	476,107,957	532,255,865
Lard compounds and other substitutes for lard, lb.	73,754,400	62,522,888
Lard, neutral, lb.	37,866,812	62,317,909
Naphthas and all lighter products of distillation, gals.	111,098,260	171,010,150
Oils—		
Animal—		
Fish (except whale),[7] gals.	[4]42,058	1,198,835
Lard,[7] gals.	[4]120,094	207,337
All other, gals.	1,019,478	1,019,412
Oil cake and oil-cake meal—		
Corn, lb.	83,384,870	72,490,011
Cottonseed, lb.	804,596,955	1,293,690,138
Linseed, lb.	559,674,653	596,114,536
Oil—		
Corn, lb.	25,316,799	23,866,146
Cottonseed, lb.	225,520,944	399,470,973
Linseed, gals.	175,210	246,965
All other	$292,757	$339,391
Lubricating and heavy paraffin oil, gals.	173,642,495	202,125,197
Mineral—		
Crude (including all natural oils without gravity), gals.	185,190,761	208,110,365
Peppermint, lb.	123,420	155,740
All other essential	$377,588	$322,164
Residuum (including tar) and all other, from which the light bodies have been distilled, gals.	123,398,188	168,339,478
Oleo, lb.	138,696,906	126,467,124
Oleomargarine, lb.	3,794,939	3,627,425
Paints, pigments, and varnishes—		
Carbon black, gas black, and lampblack	$640,911	$907,623
Varnish, gals.	1,074,264	1,114,413
Zinc oxide, lb.	27,866,979	32,792,882
All other (including crayons)	$3,604,384	$3,864,307
Paraffin and paraffin wax, lb.	218,592,330	249,502,699
Quicksilver, lb.[5]	— —	24,231
Rosin, brls.	2,189,607	2,474,460
Seeds—		
Cotton, lb.	13,224,347	64,060,276
Linseed, bu.	976	4,323
Soap—		
Toilet or fancy	$1,741,971	$1,840,037
All other, lb.	47,581,259	57,643,228
Starch, lb.	158,239,178	83,858,824
Tallow	29,813,154	39,451,419
Tar, turpentine, and pitch, brls.	40,380	50,107
Turpentine, spirits of, gals.	11,817,751	19,599,241
Zinc and manufactures of—		
Ore, tons	15,211	19,968
Dross, lb.	8,674,999	3,868,317
Pigs, bars, plates and sheets, lb.	12,894,298	19,460,365
All other manufactures of	$127,580	$135,042

Notes.

[1] Included in "all other articles" prior to July 1, 1911.

[2] Not separately stated prior to July 1, 1911.

[3] Included in "all other chemicals" prior to July 1, 1910.

[4] Figures cover period after January 1.

[5] Included in "all other articles" from July 1, 1910, to June 30, 1911.

[6] Included in "all other chemicals" from July 1 to December 31, 1910.

[7] Included in "all other animal oil" from July 1 to December 31, 1910.

Books Received.

Chemical Analysis and Composition of Imported Honey from Cuba, Mexico, and Hayti. By A. H. Bryan, A. Given, and S. Sherwood. U.S. Dept. of Agriculture, Bureau of Chemistry, Bulletin No. 154. April 29, 1912. Price 5 cents.

This booklet contains 21 octavo pages, including a bibliography of the chemical literature on honey from 1907 to 1911.

THE PATENT LAW IN RELATION TO CHEMISTRY. By RIDSDALE ELLIS, B.Sc. Gill and Ellis, Chartered Patent Agents, 55 and 56, Chancery Lane, London, E.C. Price 3d.

SMALL work in pamphlet form, containing 40 pages of subject matter. The whole subject is treated under the following heads:—I. Historical. II. British Patent Law. III. New product. IV. New or improved processes. V. Analogous use of old Process. VI. Chemical Equivalents in old process. VII. Old reactions in a new combination. VIII. Simplified process. IX. Control of known processes. X. Commercial utility. XI. Novelty. XII. Patent specifications. XIII. Statement of theory. XIV. Sufficiency of description. XV. Patent rights. XVI. Joint patentees. XVII. Master and employee. XVIII. Questions of infringement. XIX. Secret use of invention. XX. Compulsory working.

TREATMENT OF EFFLUENTS FROM DYEHOUSES AND TEXTILE FACTORIES. By J. H. GARNER, B.Sc. (Prize Essay, for which the Silver Medal of the Society of Dyers and Colourists was awarded.) Offices of the Society of Dyers and Colourists, Pearl Assurance Buildings, Market Street, Bradford. 1912. Price 2s. 6d. net.

QUARTO volume, in which this reprint from the J. Soc. Dyers and Col. for February, March, April and May 1912, occupies 26 pages, and contains 20 illustrations and 11 tables.

THE CHART OF THE ELEMENTS. Published by The Metallic Compositions Co., London, 265, Gray's Inn Road, London, W.C. Second Edition. 1912. Price 8s. 6d. (post, 3d.).

IT takes the form, on folding, of a book, measuring 9 in. by 6 in., and is mounted on linen. With the chart, in a pocket, is a copy of the descriptive "Introduction," which is specially written for those "not versed in chemistry and unacquainted with the Periodic Law of the elements," and explains the principles upon which the chart is founded, stating the methods by which it may be brought into practical use. In the "Introduction"—a pamphlet with 43 8vo pages, and portraits, both of Newlands and Mendeléef, all due credit is given to the prior claims of the English chemist through his Law of Octaves. The chart itself, on unfolding, covers a space of 2 ft. 10½ in. high by 3 ft. 6 in. wide.

PER-ACIDS AND THEIR SALTS. [Monographs on Inorganic and Physical Chemistry]. By T. SLATER PRICE. Longmans, Green and Co., 39, Paternoster Row, London, New York, Bombay, and Calcutta. 1912. Price 3s. net.

8vo volume, containing 109 pages of subject matter, followed by "LITERATURE REFERENCES." (i), Introductory. (ii), The persulphuric acids and persulphates. (iii), Perselenates. (iv), Perborates. (v), Percarbonates. (vi), Pernitrates. (vii), Perphosphates, etc. (viii), Pertitanates. (ix), Perzirconates, etc. (x), Perstannates. (xi), Pervanadates. (xii), Percolumbates. (xiii), Pertantalates. (xiv), Perchromates. (xv), Permolybdates. (xvi), Pertungstates. (xvii), Peruranates, and also an alphabetical index of subjects.

A TREATISE ON COMMERCIAL PHARMACY. INTENDED AS A REFERENCE BOOK AND A TEXTBOOK FOR PHARMACISTS AND THEIR CLERKS. By D. CHAS. O'CONNOR. J. B. Lippincott Company, Philadelphia, U.S.A., and London. 1912. Price 10s. 6d. net.

8vo volume, containing frontispiece, 397 pages of subject matter, with 22 illustrations, and an alphabetical index. The text is subdivided as follows:—I. PHARMACY ESTABLISHMENT. (i), Financing, planning, and arranging. (ii), Present and future problems. II. PHARMACY MANAGEMENT. (i), Thorough knowledge of your business. (ii), Business economics. (iii), System and store service. (iv), Buying goods. (v), Salesmanship. III. PHARMACY DEVELOPMENT. (i), Advertising. (ii), Window displays. (iii), Special sales, and side lines. (iv), Business building.

THE EXTRA PHARMACOPŒIA OF MARTINDALE AND WESTCOTT. Revised by W. HARRISON MARTINDALE and W. WYNN WESTCOTT. Fifteenth Edition. In two volumes. H. K. Lewis, 136, Gower Street, London, W.C. 1912. Price, Vol. I., 14s. net, and Vol. II., 7s. net.

THIS work has increased still further in size since the fourteenth edition appeared, and now fills two volumes (foolscap 8vo). Vol. I. contains 1114 pages of matter, inclusive of the alphabetical index of subjects and posological table. There is also a "Schedule of poisons," and a "Therapeutic index of Diseases and symptoms," and this is followed by a list of poisons and their antidotes. Vol. II. contains 370 pages of matter, with (i), Analytical addenda to materia medica, official and non-official. (ii), Synthetic notes, physiological effect in comparison with chemical constitution. (iii), Physiological standardisation, etc. (iv), Mineral water table with proportions of active ingredients. (v), Notes on antiseptic power of chemicals. (vi), Analytical memoranda. (vii), Water, Milk, and Butter analysis. (viii), Carbon monoxide and dioxide tests. (ix), Ptomaines. (x), Stomach contents examination, etc. (xi), Bacteriological water examination. (xii), Action of acids on common metals and their oxides, a new table. (xiii), Glossaries of words and phrases in foreign prescriptions, in the Danish, Dutch, French, German, Italian, Portuguese and Spanish languages. Tables of weights and measures, of approximate equivalent doses and of the metric weights and measures and their equivalents in the British Pharmacopœia.

HANDBOOK OF PATENT LAW OF ALL COUNTRIES. By W. P. THOMPSON, Chartered Patent Agent, etc. Fifteenth Edition, completely revised, 1912. Stevens and Sons, Limited, 119, Chancery Lane, London. 1912. Price 2s. 6d.

A SMALL volume (a little over med. 24mo), for pocket, containing 233 pages of subject matter, preface, and a table of contents. The text is classified as follows:—I. Regulations, methods, and laws relating to patents taken out in Great Britain and Ireland. II. Registration of designs. Patent medicines. Registration of Trademarks. III. Copyright. IV. Foreign and Colonial Patents. The aim of the volume is said to be for the purpose of acting as a useful guide to patentees, manufacturers, and investors in patents.

FARBSTOFFTABELLEN. Von Dr. GUSTAV SCHULTZ, Professor der Chem. Technologie an d. K. Technischen Hochschule zu München. Fünfte vollständig umgearbeitete und stark vermehrte Auflage der im Handel befindlichen künstlichen organischen Farbstoffe von Gustav Schultz und Paul Julius. Lieferungen 4 und 5. Weidmannsche Buchhandlung, Berlin. 1912. Price M. 3 each.

LARGE 8vo volumes of tables of dyestuffs. Each dyestuff is described in four columns, *viz.*: (1) Trade name and scientific name; (2) Constitution and preparation; (3) Literature; and (4) Properties and behaviour. Employment and shade. The dyestuffs in No. 4, commence with 372, Rosazurin B and end with 505, Lichtgrün SF; those in No. 5 commence with 506, Erioglaucin A, and end with 592, Erythrosin extra bläulich [B].

JOURNAL OF THE MUNICIPAL SCHOOL OF TECHNOLOGY, MANCHESTER. Vol. V. Published by the Education Committee, Sackville Street, Manchester. 1912.

A RECORD of investigations by members of the teaching staff and students during 1911. The papers in it on Applied Chemistry, have already appeared in full or in abstract, in this Journal.

MINES AND QUARRIES. GENERAL REPORT, WITH STATISTICS, FOR 1911. Part I. District Statistics. [Cd. 6340.] Wyman and Sons, Fetter Lane, E.C. Price 6½d.

FOOLSCAP volume of 48 pages with map.

Die Chemische Analyse. Sammlung von Einzeldarstellung auf dem Gebiete der chemischen, technisch-chemischen und physikalisch-chemischen Analyse. Herausgegeben von Dr. B. M. Margosches. Bd. XIV. XV. Die Analyse der seltenen Erden und der Erdsäuren. Ceriterden Yttererden, Zirkonerde und Thorerde, Titansäure, Niobsäure, und Tantalsäure. Von Prof. Dr. R. J. Meyer und Dr. O. Hauser. Ferdinand Enke's Verlag, Stuttgart. 1912. Price M. 10.

8vo volume, containing 360 pages of subject matter, with 14 illustrations and 31 tables, followed by alphabetical indexes of subjects and names of authors. The subject matter has received the following classification:—Introduction—The occurrence of the rare earths, etc. Tabulated arrangement of the most important minerals. Qualitative Section. A. Cerite and yttrium earths. (i), General characteristics. (ii), Comparative behaviour of the cerium and yttrium earths to reagents. (iii). Special behaviour. B. Titanium, zirconium, and thorium. C. Niobium and tantalum. General methods of investigating the composition of a mixed earth. Quantitative Section. A. Cerite and yttrium earths. B. Thorium and zirconium, with special analytical methods followed in thorium manufacture and the incandescent light industry. C. Titanium, niobium, and tantalum. (i), The bisulphate-, hydrofluoric acid-, and sulphur chloride-methods. (ii), Determination of titanium in absence of niobium and tantalum. (iii), Separation of titanium from niobium and tantalum. (iv), Separation of niobium and tantalum. (v), Course of investigation of titanium, niobium, and tantalum minerals.

Bericht über die Tätigkeit der technischen Aufsichtsbeamten der Berufsgenossenschaft der chemischen Industrie (Deutschlands) im Jahre 1911. Chem. Industrie, 1912. **35**. [14].

This Report forms an appendix to the issue of the chemische industrie for July 15, 1912. It fills 50 pages, and contains 35 illustrations and two large tables, as well as such statistics of the branches of chemical industry of Germany, as the number of persons employed, and the number injured and killed in the course of employment, with apparatus, arrangements, and precautions recommended in combating dangers or for purposes of prevention, alleviation or restoration. The subject matter is subdivided as follows:—I. General. (i), Authorities and Inspection Departments. (ii), Review of the whole service, etc. II. Regulation and Control of the System. (Enforcement of the methods for preventing accidents, etc.). New Protective Arrangements and Devices (35 illustrations). (i), Devices in connection with steam boilers, steam- and other service pipes, etc. (ii). Transmission of power, etc. (iii), Protection against fire and injury to health from dangerous gases and vapours. (iv), Dangerous liquids, and appliances, etc. (Carboys, siphons, presses, etc.). (v). Machinery. (vi). Various dangers and their avoidance. (vii). Influences, etc., injurious to health. III. Accidents, in course of regular Work. (i). Statistics, followed by large table with classified data arranged under definite branches of industry. (ii). Motors. (iii). Transmission of power. (iv). Special machinery. (Table with statistics of accidents classified under 16 branches of chemical industry). (v). Hoists, lifts, etc. (vi). Steam boilers. (vii), Explosives. (viii). Inflammable, hot, and corrosive substances. (ix). Collisions, ruptures, or falls, etc. (Pillars, roofs, walls, floors, ladders, steps, stairs, etc.). (x). Railroad management. (xi), Tools, etc. (xii), Various dangers. (xiii), Causes and reasons of accidents. IV. Dangers, etc., not included in foregoing.

The Toxicity of Caffeine. An Experimental Study on different species of Animals. By W. Salant and J. B. Rieger. U.S. Dept. of Agric., Bureau of Chemistry, Bulletin No. 148, April 4, 1912. Price 15 cents.

Consists of 96 8vo pages of text, together with a bibliography

Subject List of Works on Mineral Industries in the Library of the Patent Office, Parts 2 and 3. The Patent Office, 25, Southampton Buildings, London, W.C. Price 6d. each.

Part 2, which contains 70 small 8vo pages, deals with works on iron manufacture, alloys, and metallography, whilst part 3 (134 pages) enumerates the books on metallurgy, non-ferrous and general, assaying and fuel combustion.

*New Books.

[The Roman numerals in thick type refer to the similar classification of abstracts under "Journal and Patent Literature" and in the "List of Patent Applications."]

I. *Hausbrand*, E.: Drying by Means of Air and Steam. 2nd ed., Revised. Cr. 8vo, pp. 80. Scott, Greenwood. London. 1912. Net 5s.

Snow, W. G.: Pipe fitting charts for steam and hot water; also galvanized iron piping for fan and indirect systems; appendix relating to piping, containing reprints of articles from the "Metal Worker" and other publications. N.Y., D. Williams Co. c. 57+285 p. il. diagrs., 8°. 1912. $1.50.

IIA. *Engler*, Prof. C., and *Hofer*, Prof. H. v.: Das Erdöl, seine Physik, Chemie, Geologie, Technologie u. sein Wirtschaftsbetrieb. In 5 Bdn. Hrsg. v. Proff. C. Engler u. H. v. Höfer. Lex. 8°. Leipzig, S. Hirzel.

I. Bd. 1. Abtlg. Chemie u. Physik. Die, des Erdöls. Bearb. v. Prof. C. Engler. (XIV, 593 S. m. 45 Abbildgn). 1912. M. 12.28.

Bd. II. u. III. appeared in 1909 and 1911.

Statutory Rules and Orders, 1912. No. 634. Mines—Coal Mines. Order of the Secretary of State, dated June 22. 1912, under Section 118 of the Coal Mines Act. 1911 (1 and 2 Geo. 5. c. 50). 1d.

IIB. *Snow*, W. G.: Principles of heating; a practical and comprehensive treatise on applied theory in heating. N.Y., D. Williams Co. c. 12+7–224 p. il. diagrs. 8°. 1912. $2.

V. *Cross*. C. F., and E. J. *Bevan*,: Researches on Cellulose III. 1905—1910. Cr. 8vo. Longmans. London. 1912. Net 7s. 6d.

VII. *Jaubert*. G. F.: Les acides minéraux de la grande industrie chimique, in-8°. Gauthier-Villars, Paris. 1912. 15 fr.

Lerch. Dr. F. v.: Ueber langsame Veränderungen der β-Strahlung radiumhaltiger Präparate. (I. Mitteilg.) [Aus: "Sitzungsber. d. k. Akad. d. Wiss."] (17 S. m. 1 Fig.) gr. 8°. Wien, A. Hölder. 1912. 60 Pf.

Mitteilungen aus dem Institute f. Radiumforschung. gr. 8°. Wien, A. Hölder.

XII. *Przibram*, Dr. K.: Ein einfacher Versuch zur Demonstration der Reichweite (Range) der α-Strahlen. (6 S. m. 1 Fig.) 1912. 44 Pf.

XIII. *Flamm*, L., u. H. *Mache*: Ueber die quantitative Messung der Radiumemanation im Schutzringplattenkondensator. (20 S. m. 2 Fig.) 1912. 78 Pf.

XIV. *Przibrom*, Dr. K.: Ueber den Phosphorgehalt der Phosphornebelteilchen. (8 S.) 1912. 34 Pf.

XVII. *Meyer*. S., u. V. F. *Hess*: Zur Definition der Wiener Radiumstandardpräparate. (29 S. m. 4 Fig.) 1912. M. 1.04.

Müller. H.: Kristallographische Untersuchungen am Turmalin aus Brasilien. [Aus: "Verhandlgn. d. phys.-med. Gesellsch. zu Würzbg."] (96 S. m. 11 Abbildgn., 1 Tab. u. 4 Taf.) gr. 8°. Würzburg, C. Kabitzsch. 1912. M. 4.

IX. *Bertelli*, L.: Cementi o calci idrauliche: fabbricazione, proprietà, applicazioni, argille calcari, analisi e classificazione. Milano. 8°. Fig. p. xvi, 573, con 4 piante e 44 tabelle. 1912. Lire 10.50.

Unna: Die Bestimmung rationeller Mörtelmischungen unter Zugrundelegung der Festigkeit, Dichtigkeit u. Kosten des Mörtels. 4. verb. u. vervollständ. Aufl. (15 S. m. 5 farb. Taf.) gr. 8°. Köln, P. Neubner. 1912. Cloth M. 2.

X. *Amaduzzi*, L.: Gli elettroni nei metalli. Bologna. 8°. 1912. Lire 3.

Ascione, E.: Lavorazione dei metalli. Milano. 8°. Fig., p. 316. 1912. Lire 10.

Blair, A. A.: The chemical analysis of iron; a complete account of all the best-known methods for the analysis of iron, steel, pig-iron, iron ore, limestone, slag, clay, sand, coal, coke, and furnace and producer gases. 7th ed. Phil., Lippincott. Various p. il. tabs., diagrs. 8°. 1912. $4.

Heise, F., et F. *Herbst*: Leçons sur l'exploitation des mines. T. II, 566 fig., in-8°. Ch. Béranger. Paris. 1912. Cloth 25 fr.

Kühn, Dr. E.: Die chemischen Vorgänge bei der Cyanlaugung v. Silbererzen. (VI, 108 S. m. 34 Abbildgn.) gr. 8°. Halle, W. Knapp. 1912. M. 6.

Levy, D. M.: Modern Copper Smelting. 8vo, pp. 272. C. Griffin. London. 1912. Net 10s. 6d.

Rogers, A. F.: Introduction to the Study of Minerals. Cr. 8vo. Hill Pub. Co. London. 1912. Net 15s.

XI. *Pitaval*, M. R.: Die elektrochemische Industrie Frankreichs. Ins Deutsche übertr. v. Dr. M. Huth. (VIII. 140 S. m. 35 Abbildgn.) gr. 8°. Halle, W. Knapp. 1912. M. 12.9.

XIV. *Wiesner*, J. v.: Ueber die chemische Beschaffenheit des Milchsaftes der Euphorbia-Arten, nebst Bemerkungen üb. den Zusammenhang zwischen der chemischen Zusammensetzung u. der systematischen Stellung der Pflanzen. [Aus: "Sitzungsber. d. k. Akad. d. Wiss."] (23 S.) gr. 8°. Wien, A. Hölder. 1912. 68 Pf.

XVI. *Aducco*, A.: Chimica agraria. 5a ediz. riveduta ed ampliata. Milano, 16o, p. xii, 560. (Man. Hoepli). 1912. Lire 4.

Grandeau, L., et C. *de Saint-Cyr*: L'agriculture et les institutions agricoles du monde au commencement du xx^e siècle. T. V. La France et le monde de 1900 à 1910. Coup d'œil sur les engrais minéraux. L'acide nitrique et l'agriculture. 1 portr. 62 phot., in-8°. M. Rivière et Cie., Paris. 1912. 20 fr. Ouvr. complet 70 fr.

Molisch, H.: Ueber das Treiben v. Pflanzen mittels Radium. (19 S. m. 2 Taf.). Mitteilungen aus dem Institute f. Radiumforschung. XVI. gr. 8°. Wien. A. Holder. 1912. M. 1.04.

Pantanelli, E.: Fermentazione dei prodotti agrari. Milano. 16°. Fig., p. 363. 1912. Lire 4.

Sitzungsberichte der Heidelberger Akademie der Wissenschaften. Stiftung Heinrich Lanz. Mathematisch-naturwissenschaftliche Klasse. Abteilg. A. Mathematisch-physikalische Wissenschaften. Jahrg. 1912. Gr. 8°. Heidelberg, Carl Winter.

7. Abhandlung. *Curtius*, T., u. H. *Franzen*: Ueber die Bestandteile grüner Pflanzen. 3. Mitteilg.: Ueber das Vorkommen v. Formaldehyd in den Pflanzen. (22 S.) 1912. 90 Pf.

8. Abhandlung. 4. Mitteilg.: Ueber weitere flüchtige Aldehyde der Hainbuchenblätter. (20 S.) 1912. 80 Pf.

9. Abhandlung. 5. Mitteilg.: Ueber die flüchtigen Alkohole der Hainbuchenblätter. (13 S.). 1912. 50 Pf.

—— Abteilg. B. Biologische Wissenschaften. Jahrg. 1912. Gr. 8°.

6. Abhandlung. *Lieske*, R.: Untersuchungen üb. die Physiologie denitrifizierender Schwefelbakterein. (28 S.) 1912. M. 1.

XVII. *Abraham*, K.: Die Dampfwirtschaft in der Zuckerfabrik. 2. verm. Aufl. (175 S.). 8°. Magdeburg, Schallehn und Wollbrück. 1912. Cloth M. 6.

Annuario delle fabbriche di zucchero, raffinerie, distillerie, ecc. del regno d'Italia, per l'anno 1912 (Associazione fra gli impiegati dello zucchero, dell'alcool ed affini). Bologna, 16°. p. 184. 1912. Lire 2.50.

XVIII. *Gayon*, U., et J. *Laborde*: Vins. Vins ordinaires, vins mousseux, vins liquoreux et vins de liqueur (Coll. des manuels pratiques d'analyses chimiques), fig., in-18. Ch. Béranger, Paris. 1912. Cloth 7 fr. 50.

Kiby, Dr. W.: Handbuch der Presshefenfabrikation. (XIV, 669 S. m. 255 Abbildgn. im Text u. auf 7 Taf.) Lex. 8°. Braunschweig, F. Vieweg und Sohn. 1912. M. 24; cloth M. 25.50.

Kusserow, Dr. R.: Mitteilungen f. Brennerei u. Presshefe-Fabrikation. Nebst Anh.: Adressbuch der Lieferanten f. das Brennereigewerbe. Nr. 44. Juni 1912. (16 S.) 8°. Sachsenhausen (Mark, Chausseestr. 8), Selbstverlag. 50 Pf.

Mohr, Prof. O.: Physik u. Chemie der Gärungsgewerbe. Ein Hilfsbuch f. Studierende u. Praktiker der Gärungsgewerbe. 2. Tl. Chemie. (VIII, 414 S. m. 40 Abbildgn.) gr. 8°. Berlin, P. Parey. 1912. Cloth M. 15.

XIXA. *Plimmer*, R. H. A.: The Chemical Constitution of the Proteins. Part 1: Analysis. 2nd Ed. Revised and enlarged. Royal 8vo. Longmans. London. 1912. Net 5s. 6d.

XIXB. *Tillmans*, Dr. J.: Wasserreinigung u. Abwässerbeseitigung. (XII, 157 S. m. 21 Abbildgn.) gr. 8°. Halle, W. Knapp. 1912. M. 7.50; cloth M. 8.25.

XX. *Knaffl-Lenz*, E. V., and W. *Wiechowski*: Ueber die Wirkung v. Radiumemanation auf Mononatriumurat. (9 S.) Mitteilungen aus dem Institute f. Radiumforschung. XV. gr. 8°. Wien, A. Holder. 1912. 44 Pf.

Skita, Prof. A.: Ueber katalytische Reduktionen organischer Verbindungen. (VII, 94 S. m. 5 Fig.) gr. 8°. Stuttgart, F. Enke. 1912. M. 3.20; cloth M. 4.

Zörnig, Dr. H.: Tabelle zur mikroskopischen Bestimmung der offizinellen Drogenpulver. (VII, 54 S.) gr. 8°. Berlin, J. Springer. 1912. Cloth M. 2.40.

XXIII. *Weston*, F. E.: A Scheme for the Detection of the More Common Classes of Carbon Compounds. New edition. Longmans. London. 1912. 3s.

XXIV. *Bigelow*, S. L.: Theoretical and physical chemistry. N.Y., Century Co. c. 13+544 p. il. diagrs., 8°. 1912. $3.

Bragg, W. H.: Studies in Radio-activity. 8vo, pp. 208. Macmillan. London. 1912. Net 5s.

Ekeley, J. B.: A Laboratory Manual of Inorganic Chemistry. Cr. 8vo. Chapman and Hall. London. 1912. Net 4s. 6d. New York, Wiley.

Festschrift, W. Nernst zu seinem 25jährigen Doktorjubiläum gewidmet v. seinen Schülern. (VI, 487 S. m. Fig., eingedr. Kurven u. 1 Bildnis.) gr. 8°. Halle, W. Knapp. 1912. M. 21.60.

Hoffmann, F.: Atomprozente u. Gewichtsprozente sowie die Methoden zu ihrer gegenseitigen Umwandlung. Ein metallograph. Beitrag zur graph. Technik der physikal. Chemie. (20 S. u. 8 S. Fig. m. 1 Taf. u. 1 Paus bog.) Lex. 8°. Halle, W. Knapp. 1912. M. 1.80.

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* Compiled by H. Grevel and Co., 33, King Street, Covent Garden, London, W.C., from whom all the works in the preceding list can be obtained.

Journal of the Society of Chemical Industry.

No. 18, Vol. XXXI. SEPTEMBER 30, 1912. No. 18, Vol. XXXI.

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Prof. Ira Remsen	1909—1910.
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Rudolph Messel, Ph.D., F.R.S.	1911—1912.

† Deceased.

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PROCEEDINGS

OF THE

THIRTY-FIRST ANNUAL MEETING.

NEW YORK.

TUESDAY, SEPTEMBER 3RD, 1912.

The Thirty-first Annual General Meeting of the Society was held in the Rumford Hall of the Chemists' Club, New York City, on Tuesday, September 3rd. The President (Dr. Rudolph Messel, F.R.S.) occupied the chair, and was supported by a large gathering of members, including Prof. Marston T. Bogert (President-Elect), Prof. C. F. Chandler, Sir William Ramsay, and Dr. W. H. Nichols (Past Presidents), Dr. Russell W. Moore and Dr. Maximilian Toch (Vice-Presidents), Dr. M. O. Forster (Ordinary Member of Council) Prof. M. C. Whitaker (Chairman, New York Section), Dr. P. C. McIlhiney (Secretary, New York Section), Dr. A. McGill (Chairman, Canadian Section), Mr. Alfred Burton (Secretary, Canadian Section), Prof. W. H Perkin, Prof. A. G. Green, Prof. W. Hodgson Ellis (Toronto), Dr. Carl Duisberg, Mr. Russell Grimwade (Melbourne), Dr. L. H. Baekeland, Dr. F. W. Frerichs, Dr. J. B. F. Herreshoff. Mr. Henry Howard, Mr. G. W. McDonald, Dr. T. J. Parker, Dr. S. Rideal, Dr. K. F. Stahl, and the Secretary (Mr. C. G. Cresswell). Apologies for non-attendance were read from Dr. J. Lewkowitsch (Foreign Secretary), Mr. H. Hemingway, Prof. W. R. Hodgkinson, Mr. N. H. Martin, and Mr. W. F. Reid.

The Minutes of the last Annual Meeting, held at Sheffield, having been read and confirmed,

The Hon. JOHN PURROY MITCHELL (Acting Mayor), in welcoming the members to New York, spoke as follows :—Mr. President and Gentlemen, it is my agreeable duty to extend to you the heartfelt welcome of the City of New York. In your Society you represent a profession and group of industries to which society at large, and perhaps in a special manner this city, owe much of their development, their physical comfort, and their well-being. Your profession is the pioneer of industry, and yours, in a very large measure, is the genius that points the way of civilisation and progress. The industries you represent are the builders of society and the State. Your organisation, because of whom and what it represents, should receive the glad recognition of any city which it might select for its place of convention, and as for New York, I assure you that we feel that the debt which we owe to your profession is no light one. My own experience teaches me that there is no industry or great public work which is not touched and deeply affected by your profession. From our pavements to our sanitation, from our large public buildings to our water supply, whether it be in the purchase of our supplies or in the testing of materials that enter into our great construction works, we must turn constantly to our chemists for guidance and for advice, and the fact that this is appreciated in New York finds its latest proof in the establishment, about a year ago, of the city's testing laboratories, under the direction of Mr. Otto Kline, who has already, in the brief period of his activities, rendered valuable aid. For the city we express the hope that your meeting may be successful and satisfactory to you, and your deliberations and activities may result in a continuance, and, if possible, a heightening of service to civilisation that has been rendered by men of your profession so conspicuously in the past.

The PRESIDENT thanked Mr. Mitchell most cordially for the welcome which he had extended. It was a great pleasure to them to learn that the City of New York would honour them by extending to them an official welcome. Chemists, like women, liked appreciation, and they most heartily appreciated the welcome which had been extended to them.

ELECTION OF PRESIDENT AND COUNCIL FOR 1912-1913.

Proceeding, the PRESIDENT announced that the Council had elected Prof. Marston T. Bogert for the office of President for the ensuing year, and Mr. E. Grant Hooper, Prof. W. J. Pope, F.R.S., and Dr. Maximilian Toch as Vice-Presidents. According to the by-laws, he himself had also been nominated a Vice-President. Mr. Thomas Tyrer and Dr. J. Lewkowitsch had been re-appointed to the offices of Hon. Treasurer and Hon. Foreign Secretary, respectively. The following had been elected to fill the four vacancies among the ordinary members of Council, viz., Mr. Eustace Carey, Mr. C. C. Carpenter, Mr. R. H. Clayton, and Dr. Charles A. Keane. He was very glad to see the cordial way in which the name of Prof. Bogert had been received because the Council had been unanimous in his nomination, and as it was likewise an American choice they were delighted to see the wishes of Council endorsed. Prof. Bogert was well known to all of them, and to Americans most intimately, because he had been for many years Director of the Laboratories of Columbia University, and had done a large amount of work, the best known of which was on the constitution of the quinolines, with which his name would be ever identified. He had been for two years President of the American Chemical Society and had done much towards largely extending the membership of that Society. Looking at the membership of those Societies now, and the position they occupied, it would be agreed that their work was as important as that of chemistry itself. During the last few years Prof. Bogert had very deeply interested himself in, and identified himself with, one of the most important questions of New York State, namely, the conservation of natural resources. His conspicuous organising power and personal qualities would be of great value to the Society.

Prof. BOGERT said he was glad indeed to have that opportunity of thanking his fellow-members for doing him the great honour of electing him to the presidency of the world's greatest Chemical Society, which was an honour of which any man might well be proud. At the same time, he felt somewhat oppressed by the sense of responsibility thrust upon him, and the consideration of his own unworthiness to follow the distinguished President now occupying the chair, and the other distinguished gentlemen who had served as President. He took comfort in the fact, however, that not one of those gentlemen had a more serious desire to be of service to the Society of Chemical Industry than he had, and he assured them that he would do his best to so discharge the duties of his office that they might never have occasion to regret the cause of their action in appointing him their President.

The SECRETARY then read the Report of Council as follows :—

REPORT OF COUNCIL.

The number of members on the register is now 4285 as compared with 4300 at the last Annual Meeting. During the year 237 new members have been elected as compared with 245 last year: and the losses have been 253 as compared with 244 last year.

The Council regrets that the losses by death amount to 49 as compared with 29 last year, viz.: E. E. Babb, J. W. Baird, E. Beanes, H. vom Berge, H. Court, R. Burns Cuming, Dr. E. Divers, C. A. Drake, B. Dukes, Dr. H. V. Frost, W. K. Gaylord, Read Gordon, R. Graesser, T. Griffiths, Dr. G. Grottanelli, Wm. Gutcher, D. Harris, A. Harrison, Dr. A. Hess, J. A. Hicks, Dr. P. L. Hobbs, A. Huntzinger, J. Jekyll, H. A. Kittle, R. J. Levy, Dr. J. Muter, B. E. R. Newlands, Jas. Oddie, John Pattinson, Thos. Pears, W. J. Peet, S. V. Peppel, F. G. Perkins, C. E. Pickett, H. Rogers, Sir Samuel Sadler, P. G. Sanford, Dr. M. Shimosé, Hermann Spies, C. E. Stuart, S. J. Studer, J. Pim Strangman, W. B. Syme, Dr. J. H. Wainwright, L. Weeple, W. Whitehouse, W. A. Wilson, S. M. Winkler, and Wm. Wood. Dr. Divers was President of the Society in 1905-6, and he, Mr. Newlands, and Mr. Pattinson worked for many years on the Publication Committee with devotion and zeal. Dr. Shimosé was the inventor of the Japanese explosive identified with his name. Messrs. Levy and Pears were among the victims of the "Titanic" disaster.

Four ordinary members retire from the Council and four nominations have been made to the vacancies. No ballot is required.

The following Chairmen of Local Sections retire :—Dr. A. McGill (Canada), Mr. Arthur Carey (Liverpool), Mr. E. Grant Hooper (London), Mr. E. F. Hooper (Newcastle) Prof. T. Gray (Scotland), Mr. Thos. Steel (Sydney), and Mr. E. A. Brotherton (Yorkshire). The following have been elected to succeed them :—Mr. W. P. Cohoe, Prof. F. G. Donnan, Mr. G. T. Holloway, Mr. T. W. Lovibond, Dr. Thos. Ewan, Mr. Loxley Meggitt, and Mr. George Ward. The Council desires to express its thanks to the retiring Chairmen for their services.

The Journal in 1911 numbered 1478 pages of text besides supplement and advertisements, as against 1482 pages in 1910. On the recommendation of the Publication Committee, the list of British patent applications has been placed in the Supplement in such a way that it can be bound with the Journal if desired.

The tenancy in Palace Chambers, Westminster, having expired, offices have been taken at Broadway Chambers, Westminster, at about the same rental.

The Balance Sheet and Annual Statement of Account, which has already appeared in the June 29th issue of the Journal, will be laid before the meeting.

The Council has appointed the President, Dr. Messel, F.R.S., to represent the Society on the Governing Body of the Imperial College of Science and Technology in the place of the late Dr. Divers, F.R.S. The Council will be glad to receive suggestions in connection with the establishment of an efficient system of education in Chemical Technology.

Mr. Thomas Tyrer has been elected a representative of the Society on the Board of the National Physical Laboratory. A special Committee of the Laboratory has just commenced an investigation into the properties of glass for optical and other scientific purposes.

The first volume of International Annual Tables of Constants, to which attention has been called recently in the Journal, has now appeared and justifies the support given by the Council, as mentioned in last year's report. The cost having been greater than was anticipated, a second donation has been given.

The Society is taking part with other institutions in several inquiries of common interest ; with the Textile Institute as to the dyeing of textiles with indigo, with the Chemical Society into the possibility of so preparing abstracts as to avoid duplication, and with the Institute of Metals in considering the nomenclature of non-ferrous alloys. It has also taken part in a recent conference on the International Interchange of Students.

The Royal Commissioners for the Exhibition of 1851, who have recently established a system of Industrial Bursaries, and are subsidising young graduates in science who propose to take up industrial positions, have invited the Society to express its opinion thereon. Great diversity of opinion on the subject was expressed by the Sections, and the Council sent to the Commissioners a synopsis of the various views expressed. The Royal Commissioners have expressed their indebtedness to the Society for its assistance.

The Society's medal, founded in 1896, and awarded once in every two years for conspicuous service rendered to Applied Chemistry by research, discovery, invention, or improvements in processes, has this year been awarded to Sir William Crookes, O.M., F.R.S., for his epoch-making discoveries in physical chemistry and the rare metals.

At the celebration of the 250th Anniversary of the foundation of the Royal Society the Council was represented by the President of the Society, who presented an address. A copy of this address appeared in the Journal for July 31st.

An International Exhibition will be held in San Francisco in 1915 to mark the opening of the Panama Canal, and the Board of Trade has expressed the opinion that Great Britain should take part in it. The Council of the Society is of the same opinion and trusts that the Exhibition will be supported by the Chemical Industry.

The Council has done its utmost to give publicity in Great Britain to the Eighth International Congress of Applied Chemistry, now about to commence its sittings.

Prof. C. F. Chandler moved the adoption of the Report of Council, which was duly seconded and carried unanimously.

REPORT OF HON. TREASURER.

Before reading the Report, the President said that Mr. Tyrer, who had for many years acted in the capacity of Hon. Treasurer, had asked him to express his sincere regrets at his inability to be present at that meeting; he was prevented by the serious illness of his wife. The President then read the report as follows :—

In apologising, on account of serious and long-continued illness in my home, for my absence, under medical advice, I regret greatly the deprivation of meeting old friends whose welcome in 1896 and 1904 will never be forgotten, and the opportunity of renewing acquaintance and making more friends.

I have satisfaction, however, in presenting formally the statement of income and expenditure and the balance-sheet of the Society for the year ending December 31st, 1911, duly certified by the Auditors (see Journal of June 29th, 1912). There are no features in it out of the ordinary. The investments are in what are called gilt-edged or trustee securities. These are, as a whole, somewhat depreciated, but the dividend is the same as on the original stocks when purchased. In course of time, in the opinion of competent judges, these will appreciate and the value from the selling point of view be raised and possibly enhanced. As no sales are probable or necessary, this consideration may be dismissed. The expenditure has been normal. The excess of receipts over expenditure may be similarly described. Yet, it may be well to bear in mind that by the Charter of Incorporation (By-law 58) all Entrance and Life Composition Fees must be invested as the Council shall direct. In the case of Life-Composition, these with accumulated interest must not be considered as excess of income over expenditure.

With this reservation I commend the balance to your approval, and again regret being prevented from doing so in person.

Prof. Bogert moved that the meeting send its kindest regards to Mr. Tyrer, and with that he would like to have coupled a wish for the speedy recovery of Mrs. Tyrer. The Society had no more faithful worker than Mr. Tyrer.

The motion was seconded by Mr. T. J. Parker and carried.

Sir Wm. Ramsay, F.R.S., moved that the report of the Treasurer be adopted, and endorsed what Prof. Bogert had said about him.

Dr. L. Baekeland, in seconding the motion, said that Mr. Tyrer had done excellent work for the Society, and had contributed to the development and success of the industry. They very greatly regretted that they would not have the opportunity of welcoming Mr. Tyrer and thanking him personally for the fine stewardship he had shown.

The President then delivered his address, as follows :—

PRESIDENT'S ADDRESS.

At a time when the latest discovery of interest may be instantly flashed to the remotest part of the world by wireless telegraphy, and the technical press discusses every possible problem as it arises, a presidential address seems to me to be almost an anachronism. In very few cases is it possible to communicate anything not already known. Whatever issue a speaker may desire to consider is sure to have been dealt with till it is almost threadbare, and I fear that the topics I venture to bring before you must be enrolled in the latter category.

I propose to deal with some aspects of the remarkable progress made within my recollection. The ceaseless energy with which industry has availed itself of the achievements of pure science has made possible the manufacture, on a large scale, of products, either unknown but a few years ago, or seen as specimens in scientific collections, or produced only by nature. That I shall refer to relatively very few of these triumphs of chemical research and invention and mainly to inorganic products, must be evident when I mention that the period covered embraces the discovery of the aniline dyes and that of artificial rubber, as well as the invention of the first electric telephone and of wireless telegraphy.

As my recollections unfortunately go back over so long a period, I feel tempted to drag in here one which may be of interest to some of my audience, though it has no connection with the matter I propose to deal with. In 1861, when I was at school at Friedrichdorf, in Germany, my master, Philip Reis, invented the first telephone. I was present at its birth, and assisted Reis in making the mechanical parts of some of his instruments and also repeatedly in his experiments, Reis being at one end of the circuit speaking or singing, I listening at the other, or *vice versa*.

The introduction of synthetic processes may be said to be the keynote of progress of modern industrial chemistry.

One of the most fascinating compounds recently introduced into industry is *calcium carbide*, CaC_2. It had lain dormant since its discovery in 1862 by Wöhler, until your countryman, Wilson, and Moissan made use of the electric furnace to produce it; now its manufacture constitutes a mighty industry, close on 300,000 tons being produced annually. Serving as it does as raw material for the manufacture of calcium cyanamide, it is now the parent of numerous other products of great importance. Among these may be mentioned *acetylene*, C_2H_2, so largely used as an illuminant, and for welding and cutting metals, and I may remind you that the possibility is foreshadowed that this gas will be of use as the starting point in making other chemicals. *Calcium cyanamide*, apart from its undoubted great value as a fertiliser, is coming to the fore as a source of *cyanides*, now so largely used in extracting gold. What may be of far greater importance, it is convertible by the action of superheated water into *ammonia*, which in turn may be converted into *nitric acid* and nitrate of ammonia by oxidation with air under the catalytic influence of platinum.

I have recently noticed alarming reports in the press that the impossibility of procuring supplies of nitrate of soda from Chili in time of war may prove a serious handicap to any country in the production of explosives and powder. Considering that the quantity of nitrate of soda used for the purpose is but a fraction of that required in agriculture and that large stocks are held for this purpose almost everywhere, I cannot share the writers' fear. But in view of the fact that ammonium salts are produced by all gas works and of the many attempts to produce it synthetically, the catalytic method of producing nitric acid from ammonia may deserve more attention than it has received up to now, especially if ammonia, no matter how produced, should become a sufficiently cheap raw material.

The most interesting feature in the production of calcium cyanamide is the use of pure *nitrogen*. Of the various methods of preparing the gas, that which involves fractional distillation of liquefied air seems to be preferred. We are becoming familiar in industry with the impossible, but who could have expected such a possibility only a few short years ago? Think of the excitement caused in the scientific world when, in 1877, Pictet and Cailletet first succeeded in liquefying oxygen. Pictet's work was then described as the most brilliant achievement in modern science. The barrier between condensible and permanent gases was broken down and the latter term was deprived of its significance; but how much work remained to be done, what ingenuity had yet to be exercised, to translate this scientific discovery into a process for the industrial preparation of nitrogen? Success has been achieved by the exertions and ingenuity of several of our greatest authorities in physical and chemical science; nowadays, every gas that is required is readily procurable in the liquefied form (chlorine, sulphur dioxide, nitrous oxide, carbon dioxide, ammonia, etc., etc.) in the well-known steel cylinders capable of withstanding enormous pressures.

If I have laid stress on the conversion of ammonia into nitric acid, the reason is that ammonia is obtainable locally everywhere, either as a by-product of the manufacture of illuminating gas or Mond gas and from coke ovens, and that the installation for converting it into the acid is a relatively cheap one. The numerous attempts to produce ammonia synthetically from its elements, nitrogen and hydrogen, or from various *nitrides*, such as those of titanium, boron, magnesium, aluminium, and calcium, can moreover only be of benefit in solving the problem. True, the direct production of *nitric acid* by means of *the electric arc* from atmospheric air may appear to be a more rational process, but so long as this industry is tied to water power, and the difficulties of transporting nitric acid as such in aluminium or iron packages be not overcome, the case seems different in my judgment, particularly in countries where water power is not available and other power as yet too expensive. It is to be remembered that to carry nitric acid safely in iron packages, about 10 per cent. of concentrated sulphuric acid has to be added, and that if one or the other of the ammonia processes under trial should make it possible to transport it as nitrate of ammonia, from which it can readily be liberated at the place of consumption, the difficulty of carriage in the event of war would still remain.

My reason for referring at such length to the production of these compounds of nitrogen is their importance in agriculture. Food the nations must have and it seems that to this end they will require the services of the chemist more and more as population grows. The great stimulus our medallist, Sir William Crookes, has given to the production of nitric acid by calling attention to the near approach of the exhaustion of the deposits of nitrate of soda, is well known. His suggestion to utilise Cavendish's discovery of the direct interaction of the constituents of the atmospheric air and the success so far achieved, have often been referred to; the work done by Birkeland and Eyde, by Schoenherr, Pauling, and others, is also well known, but it gives me particular pleasure to point out that here again America was the first to attempt the realisation of this great problem. The realisation of that other great problem, *i.e.*, the production of *ammonia from its elements*, appears likewise on the eve of accomplishment, and I hope it will not be long before we shall have details of the manner in which it has been solved in practice, and how the great technical difficulties have been overcome. It will likewise be interesting to learn something about the relative efficiency of the various uranium and iron catalysts used, etc. If the published particulars as to temperature (about 650°) and pressure (about 150 atmospheres) be correct, the task to be solved was one of no mean order. Meanwhile, we can only offer our best wishes to the ever-enterprising Badische Anilin und Soda Fabrik.

Two of the other processes mentioned before, namely, that of the production of ammonia from *calcium nitride* and from *aluminium nitride*, are likewise most interesting, the former for chemical reasons, *i.e.*, the conversion of metallic calcium first into *calcium nitride*, Ca_3N_2, then by the action of hydrogen on this compound into *calcium hydride* and ammonia, the calcium hydride being subsequently reconverted by means of nitrogen into calcium nitride and ammonia—so that a relatively small quantity of calcium is theoretically sufficient to produce an infinite quantity of ammonia. Numerous processes have been devised for producing *hydrogen*; one of the latest is Pictet's, who splits up hydrocarbons either directly into hydrogen and carbon or by means of steam, at the melting point of iron, into hydrogen and carbon monoxide, thus materially increasing the yield.

Inasmuch as *aluminium nitride* yields on hydrolysis, together with ammonia, a particularly pure form of *aluminium hydroxide*, starting from an impure raw material, it may become of great importance to the aluminium industry. I well remember aluminium and more often magnesium being made by Bunsen by the electric arc on a diminutive scale as a lecture experiment. We students used to cough violently when the white fumes which were given off began to fill the lecture room, until Bunsen, smiling pleasantly, mentioned that the white fumes were due to the ammonium chloride he had added to keep the surface of the metal bright and that ammonium chloride was an excellent remedy for a cough. The coughing then stopped. As a curiosity, bars of the metal about 3 in. by 1 in. by $\frac{1}{2}$ in. were handed round and weighed by every one in his hand; the metal was doubtless produced by St. Claire Deville's sodium process. The annual output of aluminium in 1909 was over 21,000 tons, produced electrically. Now that the problem of autogeneous welding of the metal, which so long defied all efforts, has been solved, the use of aluminium for chemical apparatus has become practicable: apart from its utility in handling nitric acid, the metal has proved to be of the greatest value in breweries, in the food industry, and in varnish works.

The application of aluminium as a fuel by Goldschmidt has further led to the production, by his Alumino-thermite process, of many metals in a relatively pure form otherwise only producible by the agency of the electric current. Chromium, manganese, and molybdenum prepared by this method, besides various alloys of nickel, iron, and copper with these metals or with titanium and vanadium, have found a use mainly in the iron industry. The ingenious process of welding rails and repairing castings by means of the Thermite process is of course known to all, as well as the use of tungsten and tantalum as filaments in electric incandescence lamps. The fact that tantalum filaments, of vastly greater strength than those formerly produced by compression of the metal in powder form, can now be obtained by drawing the metal through diamond dies will doubtless give an increased stimulus to the use of the element. The mention of tantalum may call to your mind the fact that the expression "rare" is fallen into disuse, as the earths once known as rare are in everyday use and, owing to the scientific acumen displayed by Auer von Welsbach, the gas industry is now well able to hold its own against the electrical. But electricity is in evidence everywhere in our industry. It threatens to displace the furnace in the alkali works, it provides us with chlorine and the time may not be distant when hydrochloric acid is made electrically. We are indebted to the electric furnace for the sodium industry (with its application to the cyanide, sodium amide, and other manufactures) and to the production of ferrosilicon, carborundum, and graphite, for which, in the form of electrodes and lubricants, America, thanks to Mr. Acheson, remains as yet unsurpassed. The manufacture of nickel by the remarkable Mond carbonyl process should not be forgotten. This metal would appear to have some future in the elimination of carbon bisulphide from coal gas and possibly as a catalytic in other industries. We do not, however, always want to get rid of sulphur. A most original idea, successfully carried into practice by Frasch, in Louisiana, is that of liquefying sulphur in the bowels of the earth and then pumping it up.

After thus rambling through the highways and byways of inorganic chemistry, we now arrive at a different class of industries. There is no need to go into any detail but suffice it to say that their influence has been of momentous importance industrially, and in turn has acted and reacted greatly on science. Merely to mention them is sufficient. I refer of course to dyestuffs and synthetic organic products, including drugs.* I will not weary you by repeating what has been related so often and so fully. It is, however, noteworthy how, from the outset, the establishment of new industries, based on the discovery of aniline dyes, and of methods of producing alizarin and indigo artificially, has in turn given rise to many others, as the organic and inorganic chemicals they required, which were little if at all known to commerce at the time, had to be produced on a large scale. Benzol, nitrobenzol, aniline, to mention only a few, were among the newcomers; later on came anthracene.†

The coal tar industry is now the largest consumer of inorganic products and was the cause of the invention of the catalytic process of manufacturing sulphuric anhydride. May I be allowed to relate how I came to be connected with this industry? I was a pupil of Professor Strecker at Tübingen in the later 'sixties. When subsequently, quite in the beginning of the 'seventies, I again met him and his brother—who was a chemist at Hoechst—and Dr. Brüning, one of his pupils, he spoke of the importance of fuming sulphuric acid in the alizarin industry. The process of sulphonating anthraquinone had been introduced or was about to replace Perkin's dichlor-anthracene process, the use of ordinary concentrated oil of vitriol having proved to be very destructive to the anthraquinone at the elevated temperature that had to be employed. To my question how this fuming acid could best be made, he replied "that is a problem for you to solve." A few experiments convinced me that, given pure gases, the catalytic action of platinum was the rational solution of the problem; I had to wait, however, for an opportunity of carrying my idea into practice. This came when, in April 1875, a telegram reached me from my then principal, Mr. W. S. Squire, asking me to read up that night about Nordhausen acid as it was required by an alizarin works. I showed Squire how simple a matter it was to bring about the combination of sulphur dioxide and oxygen by means of platinum and other catalysts, but it was not until at his request I had carried out a number of experiments with bisulphates, etc., which were not very successful, that he asked me "to try my dodge"; henceforward we worked conjointly on the production of the anhydride by catalytic action. Though the process was patented in Squire's name, Sept., 1875, as others were afterwards or in the name of Neal (a clerk in a Patent Agent's office), they are the joint work of Squire and myself. Soon after, in the 2nd October Heft of Dingler's polytechnisches Journal, Winkler published an account of his process which was practically identical with ours. Both of us erred at that time in believing that stoichiometrical proportions of the gases were the best to use and the various similarities gave rise to unpleasant comment. In letters, however, which I possess, Winkler freely acknowledges the independence of our work and only regrets that he had deprived himself of the benefit of the invention by his publication, but he was anxious to work with us.

I cannot leave this chapter without paying my tribute to the work done by others in developing the catalytic process, and foremost, to the late Dr. Knietsch and his co-workers in the Badische Anilin und Soda Fabrik. At the same time, I will let you into one or two secrets. The one is that so far I have not been successful in working with the spent oxide of gas-works. It has the advantage of relative freedom from arsenic but the drawback of producing an acid which is not so bright and colourless as that made from pyrites. The colour is due to the organic matter in the raw material and to the formation of nitric oxide from its nitrogenous constituents. Nitric oxide can be traced in the burner gases and it is not eliminated in the washing process to which the gases are submitted. Another point is that there is a loss of platinum amounting to about 1 grain per ton of monohydrated acid produced; the loss must be of a mechanical nature and can be detected in the drips although platinum is not discoverable in the gases at this enormous dilution. I believe I can find confirmation of the assumption that the platinum is carried forward owing to the rapidity of the current because in none of the processes I have worked at a relatively low velocity have I found any loss of platinum, except such as is unavoidable in extracting the asbestos.

Fuming sulphuric acid has found its chief use in the coal tar colour industry, in refining certain petroleum oils—mainly the Russian oils—and vaseline, and in the explosives industry. As nitro-cotton forms the basis of the celluloid industry, which has been so greatly developed of late, I must mention it and the rivals which it has found in acetyl and cuprammonium cellulose and last but not least in the viscose discovered by Cross and Bevan. These materials are used in large quantities for the production of artificial silk, photographic films, and artificial hair; nor must I omit to mention the important wood pulp industries depending on chemical processes.

Sufficient examples have been given to illustrate my case: to show that science and industry are working hand in hand, and the importance of the result which such co-operation has produced.

In fact, no branch of industry has been left untouched by the ceaseless and irresistible advance of chemical science and technology.

And now when we look back on this long list of chemical industries which I have brought before you and their

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* Amongst synthetic drugs there figures now the famous indicator phenolphthalein. Being colourless and tasteless itself whilst turning pink on the addition of soda, it had been added by Government to earmark certain kinds of hock. The quite unexpected result is that the indicator is now sold as an aperient under the name of "Purgene."

† It is interesting to note that in the early days of aniline dyes, certain chemicals were smuggled in the works under a wrong name to hide their identity. I was at the time in the employ of Dr. Eugen Lucius, later a member of the firm Meister, Lucius, und Co., hence this recollection. Great difficulties were experienced in recovering arsenic or disposing of the residues. A story is told with reference to these difficulties, amusing perhaps to all except those concerned in it. All troubles seemed to be over when some stranger appeared who undertook to dispose of these residues and was richly paid for his services. Ostensibly he had interested some capitalist in a "perfect process" for the recovery of the arsenic and had been advanced considerable sums for the alleged purchase of the residues which were warehoused as a security. As may be imagined, the *chevalier d'industrie* presently disappeared and the illegal storage and the strict regulations as to the disposal of arsenical material entailed a further considerable expenditure on the enterprising capitalist.

William Crookes, 1911.

great variety, we have to ask ourselves: Can a chemist be so trained that on entering into any kind of works he will at once be of use and efficient, apart from the expectation that, as a matter of fact, he is supposed to be a proficient analyst? My answer is in the affirmative, provided that the employer himself knows something about the industry in which he is engaged; in that case, he will be patient and not expect too much from a beginner.

My illustrations must serve to show that if the student is but to know the chemical and physical principles which underlie so wide a range of activity as any one of the industries I have pictured provides, his time will be more than occupied; to expect him to be conversant also with the technical and economical aspect of industrial problems and to be able to apply his knowledge forthwith is going too far. Technical training can only be of real value after a sound foundation in the principles and practice of pure science has been acquired. Again do I ask: Can such technical knowledge be acquired by the student before entering into practice as well as the scientific knowledge that will be of use to him and his employers in all or the majority of the industries I have enumerated? It is evident it cannot; and if it cannot be done, is it worth the student's while to sacrifice much time at the most important and critical part in his life, as far as learning is concerned, in acquiring technical knowledge which may be of no assistance to him in after life?*

Too early concentration on special subjects must have a bad effect on the development of the power and habit of thinking independently and on the development of the faculty of imagination in the student. If he can find time, apart from his bread and butter education, it is much better for him to turn his mind to subjects of general culture, such as history, art, and literature. Experience teaches me that technique is very readily acquired in practice by one who has been scientifically trained. The most important task of the employer in industry, as in every other walk in life, is to find the right man; and the right man with scientific knowledge, who has imagination and power of observation and can select and command competent subordinates, is immeasurably more useful than the otherwise right man without scientific knowledge. Before all things, it is necessary to find the right man; experience and inventive faculty must do the rest. It is not that we do not possess sufficient knowledge when we leave our colleges as students, what we lack is experience and the power of applying our knowledge. Our great chemical industries have been originated and developed by scientifically trained men: to name only a few, men such as Perkin, Caro, Brunck, Solvay and Mond, Young, the Siemens's, Duisberg, have never found any difficulty in securing the co-operation of engineers or electricians competent to construct any kind of plant they have required to carry out their problems.

In fine, Carlyle has well said: "He who has learned how to learn can learn anything": the best system of education is the system which teaches each man how to educate himself.

Our education really begins when we leave college and the storm of life forms our character. We have to study, as nothing in this world is given to us for nothing; books, our scientific and technical societies,† must assist us.

Had time permitted much might have been said of industries which are almost specifically American and of developments that are now taking place in connection with the manufacture of food supplies. My difficulty has been merely to indicate the vast number of directions in which the chemist is now rendering service to society. Each one of my hearers will be able to enlarge upon one or the other of the topics to which I have referred. I can only ask you now to reflect how much lies behind my story. The progress witnessed in my time is inconceivable. It is impossible for one in my position to do justice to such a theme, but of its infinite importance to our civilisation, there can be no question.

Prof. Bogert, in proposing a vote of thanks to the President, said they had all listened with great pleasure and profit to his remarkable address. He moved a most hearty vote of thanks to the President; it was particularly interesting to note the services Dr. Messel had rendered in connection with the catalytic process of manufacturing sulphuric anhydride.

Prof. Chandler, in seconding the motion, said it had been a pleasure to listen to a progressive review of what had been accomplished in the great problems so important to the health and welfare of all men, and also most interesting to learn some things which they did not know, that their President had taken part in some of these great movements. He had been particularly interested in the portion of the address which related to the instruction of students who proposed to be chemists. It had been a serious problem to decide how the time of the student in college could be devoted to the scientific and technical foundation subjects, all of which were necessary to chemists. There had been two rather radically different schemes for the education of chemists. One plan was to give the young chemist a thorough training in all the foundation subjects in the first, second, and perhaps even in the third year in his course of study, dividing the latter part of his time to special technical subjects connected with applied chemistry and putting the research side of the work into a post-graduate course. That was the plan which had been chiefly adopted at Columbia University. He was very glad the President had taken up the subject, and cheerfully seconded Dr. Bogert's motion for a vote of thanks.

The motion was carried unanimously.

THE MEDAL.

The President then announced the award of the Medal of the Society. Unfortunately, Sir William Crookes, who had been nominated as medallist, was unable to be present, but his name was a household word. Sir William was now eighty years of age, and he found it too much to undertake this journey. (The President then read Sir Wm. Crookes' letter appointing him as his proxy to receive the medal.) When he said that the Council had unanimously elected to give Sir William the medal, it needed no apology. It was a great honour to the Society that he has accepted the greatest honour they could have conferred on him. They would like to have him as President, but he (Sir William) had declined on account of his advanced age. He would not read every title which Sir William possessed; they amounted to 28; his medals included the Royal Society's Medal, the Albert Medal, the Gold Medal of the French Academy, and quite a number of others, and of his titles he need only mention his Knighthood.

The President then gave a few details of Sir Wm. Crookes' life, as follows:—

Sir William Crookes, O.M., For. Sec. R.S., LL.D., D.Sc., etc., was born in 1832, and became a student of Hofmann at the College of Chemistry in 1848. He discovered thallium, which he recognised by spectrum analysis in 1861, and received a medal in 1862 of the International Exhibition for this discovery and for the preparation of the metal from some sludge resulting from the production of sulphuric acid, the insoluble iodide serving as a method of separation. The name thallium is derived from "Thallos," green twig. Notwithstanding the minute quantities at his disposal he determined its equivalent.

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* To a father's request to lay stress on his son obtaining particular knowledge about his own (the father's) industry, one of my professors replied: "You do not teach your son gymnastics in order that he shall be efficient when a man in turning somersaults in competition with others."

† These societies, the intercourse with professional friends engaged in the same pursuit as ourselves or in kindred industries, are invaluable to our education and so are their papers and periodicals. Unfortunately, most of us have to keep not one but quite a number of scientific periodicals, and here we are faced with the fact that they all contain abstracts and that the same matter is abstracted in most of them, yet we cannot find this out till we have waded through them. Professor Noyes made an attempt to prevent this overlapping about ten years ago and the International Association of Chemical Societies, which held its first meeting in Paris in 1910 and met again in Berlin this year, will consider this problem amongst others in London in 1913. In the case of purely scientific chemistry, there should not be much difficulty in succeeding; as regards applied chemistry, objections have been raised, which our Council is now considering. Were it possible to rid ourselves of the incubus of overlapping abstracts, it would doubtless be a great saving of time to all of us and its realisation should not be lightly set aside.

In those researches he was the first to use a vacuum balance so as to avoid correction for flotation of weighed matter and of weights by air.

He made use of the Sprengel pump to secure vacua, very high vacua, and observed phosphorescence. Before that stage was reached Crookes observed the action of light on small suspended objects; this resulted in a series of papers, termed "Repulsion by Radiation," published in the Phil. Trans. of the R.S., in 1873, in which the radiometer was described.

Describing some phenomena of phosphorescence he showed that phosphorescent "streams" were deflected by the magnet and also demonstrated the mutual repulsion of two "streams" from the cathode pole of a vacuum tube. He concluded that, inasmuch as the phenomena produced by "cathode streams" (viz., propagation at right angles to the cathodic surface; concentration to a point by an aluminium mirror of parabolic section; great heat effects in the focus; mechanical effects, such as the rotation of paddle wheels; radiometer effects, etc.), the effects were to be attributed to "a fourth state of matter"; the gas was supposed to exist in an ultra-gaseous state, the free paths of the gases being so enlarged that they behaved as minute projectiles. (This has subsequently been recognised as independent of the nature of the gas in the tube; the particles are now accepted as streams of electrons; fresh researches by Lenard, J. J. Thomson, and many others, have given the true interpretation of the phenomena first observed by Crookes.)

Crookes also carried out long and very careful investigations on the rare earths; he was led to this by the presence of a "citron band" in the phosphorescent spectrum of these bodies and of many ordinary minerals, which he observed during an investigation of the action of cathode rays in inducing phosphorescence in various chemical compounds. The citron band was finally traced to yttrium. But Crookes carried out enormous numbers of fractionations of salts of the rare metals and effected numerous separations. He gave an account of some of these investigations in his Presidential address to the Chemical Society in 1887, and pointed out that by systematic fractionation it was possible to separate yttrium into five portions, each of which could be characterised by a different spectrum. He evolved a hypothesis of the "evolution of the elements," in which a new solid model was proposed to represent the periodic classification of the elements. Later on he prepared in a pure state and analysed many compounds of scandium.

Crookes was the first to notice that purification of uranium salts by ammonium carbonate or by extraction with ether had for the effect the separation of a substance which he named uranium X. This was the first clue to the so-called X-bodies from radio-active matter, which has led to such important results in Rutherford's and Soddy's hands.

He also was the first to observe that radium rays (the "α-rays") when allowed to fall on a phosphorescent screen of zinc sulphide emitted scintillations; as a result in 1903 he introduced the "spinthariscope," which has since made it possible to determine the actual number of α-particles (proved by Ramsay and Soddy to consist of molecules of helium) emitted from a known weight of radium and so to determine the actual rate of change of radium and its products into helium.

Crookes has published numerous papers on other subjects. For many years he was one of the chemists who controlled the purity of the London water supply. He has owned and edited the "Chemical News" since 1859 (more than half a century). In spite of his advanced age he is still in full possession of mental and bodily vigour and lets no day pass without spending many hours in his private laboratory in 7, Kensington Park Gardens, London. He was President of the British Association in 1898 and gave an address in which he drew the attention of the whole world on the food supply of the world. He pointed out the necessity of combining the nitrogen of the air with oxygen by electrical means in order to furnish cereals with nitrogenous food which is essential to their existence. Here again Crookes was first in the field in demonstrating the possibility of a "nitrogenous flame" in which air could be made to "burn" by stimulation with a Tesla discharge.

It is thus seen that Crookes' great genius has placed him in the very highest rank as a pioneer of science. His astonishing power of insight is unequalled in this generation and he has contented himself in indicating the way in which science may be advanced, rather than in reaping the fruits of his labour in gaining a fortune by its industrial application.

The President then exhibited the Medal, and also a portrait of Sir William Crookes (a copy of which appears in this issue of the Journal).

Prof. Bogert moved that a cable be sent to Sir Wm. Crookes, congratulating him on the award of this Medal, and expressing their respectful homage.

This was carried by acclamation.

ELECTION OF AUDITORS.

The President said that last year the meeting elected Messrs. Norton, Feasey, and Slade as Auditors, but recently the firm had been dissolved and Mr. Feasey had started business as an Auditor under the style of Feasey and Company. As Mr. Feasey had always given personal attention to the Society's audit, it was proposed that the latter firm should continue the Society's work. He asked, therefore, if some member would move the appointment of Messrs. Feasey and Company as Auditors at a fee of £21.

Mr. Henry Howard (Boston): I would propose Messrs. Feasey and Company as Auditors, at a fee of £21.

Mr. Toch seconded the motion, which was unanimously agreed to.

PLACE OF MEETING FOR 1913.

The President announced that the Liverpool Section had extended a hearty invitation to the Society to meet there next year, and he asked if it was the pleasure of the meeting to accept that invitation.

Prof. Bogert moved that the next meeting be at Liverpool. The motion was seconded by Dr. Herreshoff and carried unanimously.

The President, in announcing the meeting closed, thanked most cordially the Board of Governors of Rumford Hall for the use of the hall and the many other courtesies which they had extended. It also gave him pleasure to mention how excellent the arrangements had been, and to testify to the excellence of the acoustic properties.

After the meeting, the members lunched at the Chemists' Club, at the invitation of the New York Section.

THE ANNUAL DINNER.

The Annual Dinner of the Society was held at the Waldorf-Astoria Hotel, New York, on Friday, September 13th. Over two hundred members were present, including Dr. Rudolph Messel, Prof. Bogert and Mrs. Bogert, Sir William and Lady Ramsay, Prof. C. F. and Mrs. Chandler, Dr. W. H. and Mrs. Nichols, Prof. Giacomo Ciamician, Prof. Samuel Eyde, Dr. C. Duisberg, Prof. G. Bertrand, Dr. F. Raschig, Prof. L. Knorr, Prof. H. Bernthsen, Dr. E. F. Ehrhardt, Mr. and Mrs. Russell Grimwade, Mr. F. W. Cuming, Dr. and Mrs. M. O. Forster, Dr. W. Lash Miller, Prof. and Mrs. M. C. Whitaker, Dr. and Mrs. McIlhiney, Dr. and Mrs. Toch, Dr. H. Schweitzer, Mr. G. C. Stone, Dr. and Mrs. Russell Moore, Dr. L. Baekeland, Mr. and Mrs. W. E. Rowley, Mr. and Mrs. Bertram Blount, Mr. and Mrs. R. Brandeis, and Prof. J. Yemori. The retiring President, Dr. Rudolph Messel, occupied the chair.

After the toasts of "The President of the United States" and "The King of England" had been proposed and drunk with musical honours, the President welcomed the guests, and paid a high tribute to American hospitality, expressing his pleasure at seeing so many present. He then introduced Professor Bogert, the new President, as Toastmaster.

Prof. Bogert said it was a great honour to succeed such a distinguished scientist as Dr. Messel. Before proceeding to the regular toast list, he proposed the health of Mr. Tyrer, the Hon. Treasurer, than whom the Society had no more faithful servant. The Society was most fortunate in being able to command the services of Mr. Thomas Tyrer as Honorary Treasurer and Mr. C. G. Cresswell, the General Secretary, who for many years had rendered faithful and efficient service.

He then proposed the health of Sir William Crookes, the Medallist, whose name was familiar to scientists the world over; societies honoured themselves in doing him honour.

The Toastmaster next called on Dr. Messel to respond to the toast of "The Society of Chemical Industry."

Dr. Messel, after commenting on the great success the Society had achieved, referred to the long list of eminent chemists who had guided their destinies for upwards of 30 years. He mentioned that, having visited all the local Sections in England, he hoped to likewise visit all those in North America. His object was to show the great interest taken at headquarters in the various Sections, and to maintain the excellent relations existing between them. Referring to the various chemical societies represented in the United States, he remarked there was room for them all, and as for rivalry among chemists all over the world, he reminded his audience of Goethe's saying, after Schiller's death, when all Germany discussed who was the greater of the two poets, "Just like my countrymen, discussing who is the greater of us instead of rejoicing in possessing two such fellows."

Prof. Bogert then called upon Prof. Chandler, doyen of American chemists, to respond to the toast of the "New York Section of the Society."

Prof. Chandler made a humorous speech, referring to his experiences of the analysis of spirits in the days when the retailer was held responsible for adulteration.

Prof. Bogert paid high tributes to Prof. Whitaker, chairman of the New York Section, who had done so much to ensure the comfort of the guests and the success of the meeting, and also to Dr. W. H. Nichols, Acting-President of the Congress, whose energy and administrative ability had been of such great value.

Dr. Nichols said that the success they had achieved was due to the magnificent work of all those who had co-operated during the last two years in making preparations for the Congress. Especially should they thank Mr. Matheson, their Treasurer, whose work had been invaluable.

Mr. J. J. Broderick (British Vice-Consul in New York), responding to the toast of "Our Guests," expressed the gratitude which all the guests felt at the splendid hospitality which had been extended to them.

Mr. L. S. Burchard responded to the toast of "The Ladies," and referred to Mme. Curie and other women who had made their mark in sciences.

Sir William Ramsay paid tribute to the memory of Willard Gibbs, who, to his mind, was one of the greatest chemists the world had yet seen. Only now were his theories being developed, and his great genius fully realised. In conclusion, he asked the meeting to drink the health of the new President, Prof. Bogert.

After briefly expressing his thanks, Prof. Bogert declared the proceedings closed.

Obituary.

SIR ROBERT PULLAR.

Sir Robert Pullar, was born in 1828, and was educated in his native city of Perth. His grandfather had started a weaving factory in 1820, and about 1824, a dyeing department was added by Sir Robert's father. This dyeing department prospered steadily, but it was not until 1848, when Sir Robert, who entered the weaving factory at the early age of 13, was taken into partnership with his father, that the business gave promise of development into the great industry it ultimately became. It was through Sir Robert's great business capacity and energy that the concern expanded as it did. Branches were established throughout the country, and the development of railways about this time, provided opportunities for going even further afield than was at first thought of. The subject of dyeing received Sir Robert Pullar's constant attention, and he was intimately associated with the late Sir W. H. Perkin in his first experiments at the Perth works in 1856, in the application of coal tar dyestuffs. A knighthood was conferred upon him in 1898, and in his 80th year he represented his native city (from 1907 to 1910) in Parliament. Sir Robert Pullar was an original member of this Society, and chairman of the Scottish Section from 1901 to 1902. He took an active interest in public affairs, and was specially identified with philanthropic and educational matters. His generosity was not confined to his native city—religious, charitable and philanthropic institutions all over Scotland sharing in his benefactions. He was a member of the Technical Education Committee of Scotland, and a trustee of Mr. Carnegie's University Student's Fund. Sir Robert had been in indifferent health for some time, and died September 9th, at his residence, Tayside, Perth.

Journal and Patent Literature.

Patent Specifications may be obtained by post by remitting as follows:—

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German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

Filter-press: Factors determining the capacity of a ——. C. Almy, jun., and W. K. Lewis. J. Ind. Eng. Chem., 1912, 4, 528—532.

The results of experiments in a 6-in. corner-feed laboratory filter-press with a sludge of precipitated chromium hydroxide are tabulated and plotted. It is shown that the rate of flow is expressed by the formula: $R = K\frac{P^m}{V^n}$, in which R is the rate of flow, P is the pressure, V is the volume of filtrate (proportional to the thickness of the filter-cake), and K, m, and n are constants which vary considerably with the nature of the precipitate but are constant for any particular sludge. It is stated that the values of these constants for a given sludge can be ascertained with sufficient accuracy for technical purposes from the results of two trials at different pressures in a small laboratory press. In determining the rate of washing, the effect of the change of viscosity of the liquid has to be taken into account, and some preliminary experiments showed that the rate of flow during washing is approximately inversely proportional to the viscosity of the liquid. The results obtained would appear to indicate also that the value of the volume-coefficient, n, is roughly proportional to, and that of the constant, K, varies directly with, the viscosity of the liquid.—A. S.

Patents.

Drying air. B. Heine, Berlin. Eng. Pat. 16 972, July 24, 1911.

The removal of moisture from the air is effected exclusively by the cooling produced by rarefaction (expansion): the air is delivered by a rotary blower at reduced pressure into a drying chamber provided with baffles and is there further reduced in pressure by the action of a turbine exhauster coupled to the same shaft as the blower. The rarefaction causes the moisture to be deposited, and the air is withdrawn from the chamber and delivered by the exhauster at any desired pressure.—W. H. C.

Drying apparatus; Steam heated ——. R. Simon and Sons, Ltd., and W. G. Simon, Basford, Notts. Eng. Pat. 17,671, Aug. 3, 1911.

A CAST iron trough containing the material to be dried is provided on its outer periphery with a series of longitudinal pipes through which high-pressure steam can be passed without risk of damage from fracture. The pipes open at either end into annular steam supply and exhaust chambers.—W. H. C.

Drying or drying and moistening substances; Machines for ——. T. M. Coyle, Saint Louis, Mo., U.S.A. Eng. Pat. 24,261, Nov. 1, 1911.

THE material to be dried, or dried and moistened, *e.g.*, by alternate treatment with hot air and steam, as in the case of spaghetti, is suspended upon a number of horizontal bars, arranged transversely, which are carried backwards and forwards through the drying or steaming chambers by means of endless band conveyors, the latter having slots to engage the bars and being arranged in pairs vertically one above the other. The bars are transferred from one conveyor to another by means of rotating arms, having grooves at the ends, which pick up the bars, carry them round a curved guide, and deposit them upon the next conveyor. Where there are two or more conveyors, the lower one may travel at a substantially lower speed than the upper, the rods being spaced nearer together on the slowly moving conveyor.—H. H.

Furnaces [; Reducing loss of heat of ——]. R. C. Royston, Birkenhead, Eng. Pat. 20,890, Sept. 21, 1911.

IN order to reduce the loss of heat by radiation from the outer walls of the furnace, the latter are surrounded by a series of shallow, hollow, metal boxes, the interiors of which are connected with a vacuum pump or other means of producing a more or less complete vacuum within the boxes.—W. H. C.

Tunnel kilns; Method of increasing the temperature of ——. A. Ramen, Helsingborg, Sweden. Eng. Pat. 4496, Feb. 22, 1912.

VERY finely divided solid fuel is carried into the furnace by the low quality gaseous fuel and serves to increase the heating effect by providing solid particles of incandescent carbon which give the same radiating effect as the solid carbon particles separated during the combustion of gases rich in hydrocarbons.—W. H. C.

Conveying and grading materials; Apparatus for simultaneously ——. W. C. Fairweather, Glasgow. From H. Marcus, Cologne, Germany. Eng. Pat. 26,678, Nov. 29, 1911.

THE bottom of a reciprocating-trough conveyor is provided with a number of inclined discharge surfaces extending downwards in the direction opposite to that in which the material is conveyed, the discharge apertures increasing progressively in size, so that while the larger particles are carried forward, the smaller ones are graded and discharged. The inclined surfaces may be formed of independently adjustable pivoted plates.—H. H.

Pumping elastic fluids; Apparatus for ——. H. A. Humphrey, London, and W. J. Rusdell, Dudley, Worcestershire. Eng. Pat. 28,187, June 2, 1911.

THE apparatus comprises an internal combustion pump, without a flywheel, for compressing elastic fluids, wherein a solid mass or linked solid masses, such as a piston or pistons, reciprocate freely and continuously without control otherwise than by work done or energy stored, or both, at each stroke, the said mass being capable of acquiring momentum sufficient to limit the velocity of the fluid through the valves to that required in practice. The combustible mixture is compressed in the combustion chamber by the return stroke of the piston, which may be brought about by the expansion of an elastic cushion compressed during the outward stroke, and is immediately ignited. The apparatus operates and is controlled in the manner described in Eng. Pat. 11,818 of 1911 (this J., 1912, 707), the gas being compressed either by the solid piston itself or by a body of liquid interposed between the solid piston and the gas. The valves may be operated in the manner described in Eng. Pat. 11,527 of 1911 (this J., 1912, 626).—H. H.

Separators; Centrifugal ——. T. David, Lyons, France. Eng. Pat. 8632, April 11, 1912.

IN centrifugal machines having a spiral groove on the rotating drum, the threads are formed substantially perpendicular to the axis of rotation, so that the path of the liquid is nearly parallel with, rather than inclined to, the lines of centrifugal force.—W. H. C.

Separating suspended particles from gaseous bodies; Apparatus for ——. F. G. Cottrell, Berkeley, and H. A. Burns, Oakland, Assignors to International Precipitating Co., San Francisco, Cal. U.S. Pat. 1,035,422, Aug. 13, 1912.

THE separation is effected by means of electric charges in an apparatus comprising a number of discharge electrodes (mica sheets secured to an electrically-conducting, supporting structure from which the mica edges protrude) arranged in combination with a series of collecting electrodes. (See also this J., 1911, 1037.)—W. E. F. P.

Mixing vessel. H. W. Jordan, Syracuse, Assignor to The Solvay Process Co., Solvay, N.Y. U.S. Pat. 1,036,253, Aug. 20, 1912.

THE vessel consists of a cylinder with a corrugated circumferential wall and surrounded by a water-jacket. It is provided with an agitator or rotary stirrer, and the inlet pipe to the water-jacket is arranged tangentially so that the liquid within and without the vessel is caused to move intermittently away from the wall of the vessel.—W. H. C.

Liquefaction of gases. A. Levi-Cases, Padua, Italy. Eng. Pat. 18,386, Aug. 14, 1911.

SEE Fr. Pat. 433,639 of 1911; this J., 1912, 218.—T. F. B.

Solid substances from liquids; Method of and apparatus for continuously obtaining —— *by crystallisation or solidification.* N. Ceipek, Vienna. Eng. Pat. 27,823, Dec. 11, 1911.

SEE Fr. Pat. 441,184 of 1912; this J., 1912, 803.—T.F.B.

Evaporating apparatus. H. Kayser, Nuremberg, Germany. U.S. Pat. 1,036,637, Aug. 27, 1912.

SEE Fr. Pat. 437,302 of 1911; this J., 1912, 523.—T. F. B.

Fire-extinguishing compound; Process of making a ——. E. M. Davidson, New York, Assignor to Pyrene Manufacturing Co., Delaware. U.S. Pat. 1,036,461, Aug. 20, 1912.

SEE Eng. Pat. 12,233 of 1910; this J., 1911, 272.—T. F. B.

Drying of liquids, pasty materials, or solid matter; Column for the ——. G. P. Guignard, Melun, and H. L. A. M. Watrigant, Lille, France. U.S. Pat. 1,036,486, Aug. 20, 1912.

SEE Fr. Pat. 427,458 of 1910; this J., 1911, 1102.—T.F.B.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal; Constituents of ——, *soluble in phenol.* J. C. W. Frazer and E. J. Hoffman. U.S. Dept. Interior, Bureau of Mines, 1912. Technical paper 5.

THE material employed in the investigation was a non-coking, bituminous coal from Zeigler, Franklin County, Ill., containing 11·82 per cent. of moisture and 5·42 of ash; calculated on a basis free from moisture and ash, the coal contained 33·43 per cent. of volatile matter and 66·57 of fixed carbon, or, ultimately, 4·99 per cent. of hydrogen, 82·01 of carbon, 10·83 of oxygen, 0·55 of sulphur and 1·62 of nitrogen. The finely powdered coal was repeatedly extracted with phenol (generally at 140° C.), three or four treatments of ten hours each being required for 1000 grms. of the material. The filtered extract, after concentration under reduced pressure at 105°—115° C., yielded a thick, tar-like mass; 393 grms. (or 10·87 per cent.) of soluble matter were thus removed by the phenol from 36·13 grms. of the pure coal substance (free from moisture and ash). An outline of the procedure followed in the treatment of the extracted matter is given in a table or chart, together with the ultimate analyses and molecular weights of the substances (apparently almost pure hydrocarbons containing small quantities of oxygenated compounds) isolated.—W. E. F. P.

Gas producer; The slagging type of ——, *with a brief report of preliminary tests.* C. D. Smith. U.S. Dept. Interior, Bureau of Mines, 1912. Technical paper 20.

An account is given of a series of tests made with mixtures of coke and limestone in a producer of the "slagging" or blast-furnace type; the coke used contained about 11 per cent. of ash (mainly aluminium silicate), and the proportion of limestone varied from 4 to 28 lb. per 100 lb. of coke charged. The operation of the producer and the character of the slag obtained were most satisfactory when from 12 to 20 lb. of limestone per 100 lb. of coke were employed, runs of 100 hours duration (both continuous and intermittent) being made under these conditions. The author is of opinion that low-grade (high ash) coals may be successfully utilised in producers of this type and further experiments on these lines are in progress. —W. E. F. P.

Hydrocarbon mixtures, Analysis of ——. O. Routala. Ann. Acad. Scient. Fennicae, Helsingfors, Ser. A. 2, No. 13. Chem. Zentr., 1912, 2, 638.

Experiments with artificial mixtures of American light petroleum spirit and amylene or hexylene showed that the iodine value is of use in the determination of olefines in hydrocarbon mixtures only if the time of action, the temperature, the degree of exposure to light, and the quantity of iodine solution are kept constant. The bromine value determined by Frank's method (this J., 1901, 566) is stated to give quantitatively the proportion of olefines, and may be advantageously used when the quantity of material available is small, and it is desired to ascertain the degree of refining of colourless or pale-coloured petroleum products, or the degree of purity of liquid olefinic hydrocarbons. From the bromine value, the percentage of olefinic hydrocarbons (A) can be calculated directly by the formula: $A=[K+(n-5)c]\cdot G$, where n is the mean number of carbon atoms (at least 5) of the molecules of the olefinic hydrocarbons boiling within the same limits as the original substance, G is the bromine value, and K and c are constants. The value of $c=$ is 0·0875, whilst K is 0·4375 for amylene, 0·5950 for hexylene, 0·6075 for heptylene, and increases by about 0·0875 for each additional CH_2 group. In the case of a mixture of amylene and isopentane of sp. gr. 0·6424 at 15° C., for example, the bromine value, G, was found to be 138, hence the mixture contained 0·4375 × 138 = 60·37 per cent. of amylene. The accuracy of the results obtained by the bromine method was also confirmed by the sulphuric acid method.—A. S.

Coal; Oxidation and deterioration of ——. A. J. Cox. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **10**, 109—128.

Samples of coal from mines in the Philippine Islands were examined before and after storage in glass bottles containing air and oxygen respectively. The coals contained 6 to 12 per cent. of moisture, 37 to 46 of volatile combustible matter, 40 to 47 of fixed carbon, and 4 to 8 per cent. of ash, the calorific value being about 6000 Cals. per kilo. The samples were passed through a sieve of 5 meshes to the inch and over a sieve of 4 meshes to the inch, and 250 grms. of each sample were stored in a 7-litre bottle for 9 months at a temperature of about 30° C. The calorific value, calculated on coal free from moisture and ash, was reduced as follows:—Coal No. 1, in air, 1·2 per cent., in oxygen, 1·3; Coal No. 2, in air, 0·8, in oxygen, 0·4; Coal No. 3, in air 1·4, in oxygen 1·7 per cent. Analysis of the residual gases after storage for 9 months, and also after a further 15 months, showed that a further deterioration of the coal took place in the second period, and that carbon dioxide was evolved subsequently to the absorption of oxygen. When stored with relatively small quantities of oxygen, the absorption was complete after 12 months. The rate of absorption was measured by noting the reduction of pressure, with samples ground to different sizes; the rate varies with the previous exposure of the samples to air, and is most rapid with the finest grains. The rate of absorption decreases considerably after the first few weeks. The danger of spontaneous ignition is greatest during the early stages of storage, and in practice, reserve coal which has not heated up seriously should be left and coal used from the newest heaps. Exposure to sunlight increases the rate of oxidation. The loss in heating value due to storing coal in air, as well as the danger of fire, can be avoided by storage under water, or by storing the dry coal in carbon dioxide or in nitrogen. Samples weighing 250 grms. stored for 9 months in 10-litre bottles filled with carbon dioxide and nitrogen, at 30° C., increased in calorific value by about ½ per cent., owing to the evolution of carbon dioxide.—A. T. L.

Coal; Influence of temperature on the determination of volatile matter in ——. A. C. Fieldner and A. E. Hall. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **10**, 139—152.

Discordant results are obtained in the determination of volatile matter by the method recommended by the Amer. Chem. Society's Committee on coal analysis (this J., 1900, 174) if the heating is not at a definite temperature. Experiments made with coke, anthracite and four kinds of bituminous coal show that the variations are greater with anthracite and semi-bituminous coal than with bituminous coal. A standard temperature of 1000° C. is recommended. A small platinum crucible, of 10—15 c.c. capacity, having a closely fitting cover, should be used, and heating may be effected in an electric furnace or by a suitable gas burner.—A. T. L.

Sulphur in fuel; Determination of ——. I. C. Allen and T. W. Robertson. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **10**, 25—31.

Sulphur may be determined in slow-burning fuels such as coal and coke by fusion with alkalis and subsequent oxidation with bromine; by fusion with a dry mixture of alkalis and oxidising agents; or by treating with wet alkalis and oxidising agents, but these methods are unsuitable for oils. Sulphur in oil may be determined by oxidation with fuming nitric acid in a sealed tube, but explosions are frequent. A sample of oil may be burnt in a closed 10-litre flask containing oxygen, the oxidation being completed with bromine, but the results are not accurate. An accurate but tedious method for oils consists in burning a sample in a current of oxygen in apparatus of the kind used for carbon and hydrogen determinations. The oxides of sulphur are absorbed by lead peroxide or by potash, and finally weighed as barium sulphate. Burning oils may be burnt in air by means of a lamp, and the products absorbed in dilute alkali and oxidised with bromine, and this method gives accurate results if the sulphur compounds retained in the wick are determined. A rapid, accurate and reliable method for all fuels is by combustion in oxygen at 30—40 atmospheres pressure in a calorimetric bomb.—A. T. L.

Lignitic coals; Investigations relative to the better utilisation of non-coking low-grade ——. E. J. Babcock. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **10**, 41—52.

Large deposits of lignite exist in the western portion of the United States, and the results obtained with a full-

sized experimental plant in North Dakota indicate that this fuel can be treated commercially by dry distillation, whereby a useful gas and by-products are obtained, together with a residue which can be briquetted. The lignite as mined contains from 25 to 35 per cent. of moisture, and the dried coal contains, on the average, 52 per cent. of fixed carbon, 40 of volatile matter, and 8 of ash. The plant comprises one gas retort, taking a charge of 300—400 lb. of air-dried lignite, a condenser, an exhauster, two scrubbers, a purifier and a meter and gasholder. The best results are obtained by heating the retort to 1200°—1500° F. (649°—815·5° C.). Average results show that 1 ton of dry lignite yields 1208 lb. of residue (small shrunken fragments high in fixed carbon), 20—30 lb. of tar, 14·5—15·0 lb. of ammonium sulphate, and 10,663 cb. ft. of unpurified gas containing: illuminants, 3·11; carbon monoxide, 17·24; hydrogen, 45·16; ethane, 0·14; methane, 15·59; nitrogen, 5·49; oxygen, 1·76; and carbon dioxide, 11·51 per cent. This gas has a calorific value of 400 B.T.U. per cub. ft., which would be increased to 500 by purification from carbon dioxide and air. The unpurified gas is free from tar and condensable vapours and can be used for lighting and in gas engines. The tar may be used for impregnating wood. The retort residue is briquetted with a small amount of pitch as binder, mixed with a small proportion of flour or other substances. One ton of briquettes is said to be obtained from 1½ tons of lignite. The briquettes contain from 0 to 6 per cent. of moisture, 2 to 8 of volatile matter, 75 to 85 of fixed carbon, and 10—14 per cent. of ash, and have a calorific value of 11,500—12,000 B.T.U. per lb., as compared with 7500 B.T.U. per lb. for the original lignite as mined.
—A. T. L.

Coke; Neutral ——. J. R. Campbell. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vc., Orig. Comm., **10,** 73—89.

According to the Diehl-Faber process, limestone is mixed with the coal in order to transform the sulphur into calcium sulphide and to improve the physical quality of the coke. The author finds that with a coking temperature of 2100° F. (1149° C.) only one-third of the sulphur is converted into calcium sulphide, and that this temperature is not high enough for the complete formation of calcium silicates. The process is of little value for blast-furnace coke on this account. The total sulphur in the coke is increased by about 10 per cent., owing to the fixation of volatile sulphur. The physical quality of the coke is much improved if too much free lime is not present. The yield of ammonia is increased by 12·5 per cent., the time required for coking is increased by one-third, and the yield of gas is increased and its calorific value decreased by the carbon monoxide formed from the limestone and carbon. The ash of the coke is fusible.—A. T. L.

Hydrocarbons; Synthesis of —— at high temperatures and pressures. J. N. Pring and D. M. Fairlie. Eighth Int. Congr. Appl. Chem., 1912. Sect. Xa., Orig. Comm., **21,** 65—80.

The authors have studied the reaction between carbon and hydrogen at pressures up to 200 atmospheres and temperatures up to 2100° C., in a modified form of the electric furnace used by Hutton and Petavel (this J., 1908, 129), the temperature being measured by means of a Wanner optical pyrometer. The only saturated hydrocarbon formed is methane. Ethylene is formed in small quantities above 1300° C., but its quantity is not appreciable till well over 1500° C., while acetylene does not become noticeable till about 1650° C. It has therefore been possible to measure with some accuracy the methane equilibrium at temperatures between 1100° and 1600° C. (see this J., 1912, 17). The relative amount of methane produced increases with the pressure according to the law of mass action. At atmospheric pressure the percentage of methane is 0·24 per cent. at 1200° C. and 0·07 per cent. at 1500° C., in equilibrium with graphite.—W. H. P.

Acetylene; On the inflammability of —— mixed with about 30 per cent. of air. M. Delepine. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIb., Orig. Comm., **4,** 25—29.

The best results in burning acetylene as an illuminant are obtained by feeding to the burner a mixture of about 30 per cent. of air and 70 per cent. of acetylene under an excess pressure of a few cm. of water. In view of the explosive nature of mixtures of air and acetylene, the author has made investigations with mixtures in about the above proportions, as to their tendency to explode. Pressure, temperature of the igniting agent, extent of the igniting surface, and shape of the containing vessel were all found to be factors. Sparks from an induction coil, iron wire heated electrically to redness, short lengths of thin platinum wire heated electrically, and a weight of 0·005 grm. of detonated mercury fulminate all failed to ignite the mixtures, even when, in some cases, the excess pressure over atmospheric, was made equal to several cm. of mercury. Platinum wire 20 to 30 mm. long and 0·2 mm. in diameter ignited mixtures containing from 26·5 to 32·6 per cent. of air, even under slightly reduced pressure, when the gas was contained in a flask, but no ignition was caused when the gas was contained in a lead pipe 20 mm. in diameter. Detonation of 0·01 grm. of mercury fulminate caused a mixture containing 23 per cent. of air, under an excess pressure equal to 15 cm. of mercury, to explode sharply.—T. St.

Coal gas; Continuous purification of —— with weak ammonia liquor. J. G. O'Neill. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vc., Orig. Comm., **10,** 207—213.

The gas leaving the condensers is washed with weak ammonia liquor instead of with gas liquor in the first scrubber, whereby the whole of the cyanogen is absorbed and the greater part of the hydrogen sulphide. The temperature of the gas and of the wash liquor should not exceed 30° C. The wash liquor from the scrubber is returned to the ammonia still, and the impurities saturate the concentrated ammonia in the condenser of the still. Typical data of the process are :—

		Nov. 11.	Nov. 22.	Dec. 5.	Dec. 7.	Dec. 14.	Jan. 2.
Gas liquor supplied to ammonia still	NH_3 grms. per litre	7·00	5·27	4·25	3·87	6·15	7·00
	H_2S ,, ,,	3·20	2·49	1·98	2·31	3·57	3·20
Wash liquor taken from ammonia still	NH_3 ,, ,,	7·48	6·93	5·50	4·79	5·98	8·48
	H_2S ,, ,,	1·46	1·12	·68	·74	·80	1·46
Wash liquor from first scrubber	NH_3 ,, ,,	7·48	6·83	5·84	5·03	7·82	9·18
	H_2S ,, ,,	6·12	6·00	3·80	4·43	6·13	8·17
Grains of H_2S per 100 cb. ft. of crude gas before scrubbers		807·8	703·8	592·1	703·8	557·0	966·9
,, ,, ,, ,, ,, ,, after ,,		276·4	96·3	33·6	44·0	25·0	30·6
Number of thousands of cubic feet of gas washed per hour		45	40	35	37	45	44
Gallons of wash liquor used per hour........................		720	815	700	900	600	909
Grains of H_2S absorbed per gallon of wash liquor		314	298	279	270	399	574

During six months trial of the process, the oxide in the purifiers was not changed, although these purifiers were insufficient to deal with the gas when the latter was washed with liquor in the ordinary way.—A. T. L.

Petroleum and its products; Methods for the determination of water in ——. I. C. Allen and W. A. Jacobs. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vc., Orig. Comm., **10,** 17—23.

Methods depending on the loss of weight on heating are approximate, and are only applicable to heavy oils and greases. Dilution with gasoline and separation of the water from the diluted oil by gravity, or by a centrifuge, is an approximate method applicable to thin oils. Other approximate methods are by comparing the colour with that of standard mixtures of oil and water, and by agitating the oil, diluted with petroleum spirit, with $N/10$ acid, and then titrating a portion of the separated water. Four accurate methods are described :—

1. *Treatment with calcium carbide.* 17·24 grms. of the sample are placed in a 250 c.c. separating funnel, and a 100 c.c. separating funnel containing 10 grms. of powdered calcium carbide, is fitted to the neck of the first funnel. The neck of the second funnel is fitted with a stop-cock. The apparatus is brought to a standard temperature in a water-bath, the cocks are then closed, and the carbide mixed with the petroleum. The apparatus is again brought to the standard temperature, and is connected with a gas burette which measures the volume of gas generated. 1 grm. of water generates 580 c.c. of acetylene, and the oil absorbs on the average 1·1 times its volume of acetylene.

2. *Treatment with sodium.* The method is the same as with calcium carbide, about 2 grms. of finely cut sodium being used for 1 grm. of water. This method is very accurate, since hydrogen is insoluble in the oil.

3. *Distillation with a non-miscible liquid.* 100 grms. of the oil are mixed with 200 grms. of toluene, benzene, or xylene, and distilled. The water separating in the distillate is measured. The results are accurate to within 0·033 grm. of water per 100 c.c. of distillate.

4. *Direct distillation of the water.* 200 grms. of the oil are distilled in the ordinary way, and the water in the fractions between 100° and 150° C. is separated and weighed. The condenser should be cooled to 2° C. Bumping is prevented by passing a current of dry carbon dioxide through the oil. The method is accurate within 0·03 per cent.

Emulsions may be subjected to the action of a high-tension electric current (2200 volts) in order to cause the water to separate. The emulsion is placed in a glass cylinder containing a roll of copper gauze for one terminal and a central copper wire or rod for the second terminal. The water in the emulsion is reduced to 0·5 per cent. in half an hour.—A. T. L.

[Mineral] Lubricating oils ; New researches on ——. A. M. Nastukoff. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vc., Orig. Comm., 10, 201—202. (Compare this J., 1911, 201.)

The liquid hydrocarbon, $C_{15}H_{28}$, obtained by treating the fraction of kerosene of b. p. 200°—250° C. with formalin in presence of less sulphuric acid than is required for the formation of formolite, has also been obtained from the fraction of b. p. 150°—200° C. The fraction of b. p. 250°—300° C. yields, by similar treatment, a heavy oil of sp. gr. 1·0113, formolite number 130, molecular weight 294, refractive index $n_D = 1·5769$, and iodine value 20·46. The viscosity is about that of a cylinder oil. —A. T. L.

Asphaltum ; Formation of —— in petroleum deposits. R. Zaloziecki and C. Zielinski. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vc., Orig. Comm., 10, 335—341.

It has already been shown that the action of sulphuric acid on crude petroleum leads to the formation of asphaltum. The effect of other reagents in causing polymerisation and condensation has now been studied. The petroleum used was of Galician origin, with sp. gr. 0·8539 at 15° C., paraffin content 1·54 per cent., carbon 85·29, hydrogen 14·41, sulphur 0·19, and oxygen 0·11 per cent. The oil was free from asphaltum. It was mixed with 5 per cent. of a powdered reagent, and (*a*) left for 4 weeks at the ordinary temperature in darkness ; (*b*) left for 89 days at the ordinary temperature in sunlight ; (*c*) heated for 166 hours on a water-bath ; (*d*) heated to 140° C. for 35 hours in a sealed tube. The results were as follows :—

Reagent.	Asphaltum formed, per cent.			
	(a)	(b)	(c)	(d)
Anhydrous ferric chloride	0·87	2·12	1·13	0·64
Sodium ethoxide	0·28	0·32	0·70	—
Anhydrous aluminium chloride . .	1·28	3·46	7·94	6·28
Anhydrous zinc chloride	0·63	3·06	2·10	2·18
Phosphorus pentoxide	4·44	3·17	5·37	3·80
Anhydrous cuprous chloride	0·86	1·12	1·24	0·96
Sulphur and aluminium chloride .	—	—	—	6·37
Phosphorus and aluminium chloride	—	—	—	6·33

Metallic sodium, sodium carbonate, manganese dioxide, sodium sulphide, sulphur, barium sulphide, barium peroxide, and phosphorus, were tried in some of the experiments but with negative results. The greatest yield, 10·28 per cent., was obtained by heating to 150°—155° C. with 5 per cent. of aluminium chloride for 60 hours. The asphaltum contained 6·04 per cent. soluble in benzene, 0·14 per cent. soluble in carbon bisulphide, and 4·10 per cent. soluble in chloroform. Analyses of the asphaltum by combustion, at successive dates, showed that it gradually becomes oxidised. The asphaltum contains a much greater proportion of sulphur than the crude petroleum. It is probable that natural asphaltum is formed from petroleum by the action of certain mineral substances and by subsequent oxidation of the products. Sulphur compounds in the petroleum appear to take part in the condensation. —A. T. L.

"*Ironcoke.*" [*Coke containing metallic iron.*] Lidoff. *See* X.

Outer dressing [of incombustible material] as a safety precaution in blasting in presence of firedamp or coal dust. Volf. *See* XXII.

PATENTS.

Explosions in coal and other mines ; Method and means for reducing or limiting the effects of ——. J. Wetter, London. From J. F. Balfour, Edinburgh. Eng. Pat. 18,210, Aug. 11, 1911.

An annular frame formed by water-pipes is mounted across the gallery, and the pipes are split longitudinally so as to deliver sheets of water forming a pyramid pointing towards the source of the explosion. The water-valve is opened by a weight or spring which is released by the closing of an electric circuit. The circuit comprises a mercury contact closed by the movement of a vane which hangs in the path of the air current produced by the explosion. In another arrangement, flap doors are mounted on vertical axes along the wall of the gallery. Each door comprises two flaps at opposite sides of the hinge, set at an obtuse angle, the larger flap being housed in a recess in the wall and facing towards the danger point when the smaller flap lies along the wall, leaving a clear passage. Pressure due to an explosion swings the doors so as to bring the smaller flaps across the gallery, thus closing it, and this movement may control the water valve of the device described above. The safety devices may all be connected electrically, so that an explosion at one point brings the devices into action in all the workings leading into the main gallery.—A. T. L.

Coal, ores of the precious metals, and other ores and minerals ; Apparatus for washing ——. J. Dodds, Glasgow. Eng. Pat. 24,406, Nov. 3, 1911.

The apparatus is a development of that described in Eng. Pat. 5970 of 1910. The coal or ore is placed upon a perforated annular rotating table in a cylindrical tank. The table is mounted on the outside of a central rotating drum, open at the lower end and covered by a gauze screen at the upper end. Water is admitted to the central drum and is forced downwards by a propeller so that it flows along the curved base of the tank and up through the coal or ore on the rotating table. The lighter and heavier parts of the coal or ore are delivered by centrifugal action through openings in the wall of the tank at different heights. The water circulates repeatedly in the washer, and its consumption is low.—A. T. L.

Fuel : Apparatus for burning finely divided ——. Babcock and Wilcox, Ltd., London. From The Babcock and Wilcox Co., New York. Eng. Pat. 18,712, Aug. 19, 1911.

The fuel, which may be gas, oil or solid fuel, is projected into the furnace from a suitable burner, and the air is drawn or forced into the furnace through openings in a plate having inclined blades, so that the air is given a whirling motion and mixes thoroughly with the fuel. The burner is arranged at the centre of the plate, and delivers the fuel as a conical jet. The plate may have two or more concentric sets of blades, which whirl the air in opposite directions.—A. T. L.

Fuel in plastic form ; Manufacture of —— from methylated alcohol. B. E. D. Kilburn, London. From E. Bertini, Rome. Eng. Pat. 2137, Jan. 26, 1912.

The fuel is made by dissolving 50—75 grms. of sodium stearate in 500 grms. of methylated alcohol of 90° Beaumé, and mixing the solution with a solution of 50—75 grms. of white soap and 10 grms. of sodium carbonate in 500 grms. of the same alcohol. The paste thus produced is packed in a tin box which serves as a pocket stove.—A. T. L.

Peat-drying apparatus. A. S. Cairncross. Assignor to S. T. Wolfe, St. Paul, Minn. U.S. Pat. 1,036,072, Aug. 20, 1912.

The peat is charged into a vertical beater where it is broken up and fed into a rotary drying drum by a worm conveyor. Steam from a boiler is passed through a coil within the drum ; the coil is capable of rotation and has stirring and conveying blades attached to it. The dried peat is withdrawn from the drum by a worm conveyor. The waste gases from the boiler furnace are conducted through the drum in a reverse direction to the peat. —W. H. C.

Coking ovens and the like ; Regenerative ——. Soc. Anon. Burkheiser-Eloy, Liége, Belgium. Eng. Pat. 16,226, July 11, 1912. Under Int. Conv., July 19, 1911.

The patent relates to ovens having longitudinal retort chambers and vertical heating flues, of the type in which air for combustion is introduced at two points, one above the other, in the heating flues. According to the invention, the primary air only is taken from the regenerators, and the secondary air is taken from the arches beneath the battery of ovens. This arrangement cools the lower part of the heating flues, and gives a more even temperature. When the directions of flow of the air and gas are reversible, separate air pipes are provided under each half of the oven, with branches for leading the secondary air to the heating flues, and valves in these pipes are operated by the mechanism controlling the flow of the gas and primary air.—A. T. L.

Gas producer. A. F. Matlack. Fr. Pat. 442,194, March 30, 1912.

See U.S. Pat. 1,025,198 of 1912, this J., 1912, 526. The hearth is composed of a number of excentric discs, fixed above one another on a rotating shaft.—T. F. B.

Oil [for lubricating, etc.]. E. Roche, Washington, D.C. U.S. Pat. 1,036,339, Aug. 20, 1912.

An oil of non-gumming character and good lubricating qualities, and which has also good heating qualities when used as a fuel, is obtained by precipitating oily and waste matter deposited in the mains or pipes in the manufacture of illuminating gas. It has approximately the composition, C_nH_{2n-6}, is of a clear yellowish colour, has "a viscosity of about 48·5 seconds," a freezing point below −108° F. (−78° C.) and a flash point of 38° F. (3·3° C.) —W. H. C.

Coking stills [for petroleum], and method of and means for heating them. J. Weiser, Schonberg, Austria. Eng. Pat. 18,063, Aug. 9, 1911. Under Int. Conv., Jan. 17, 1911.

A petroleum still is formed with flame-tubes passing through the lower part, and is set with heating flues beneath it and around its walls. A single fire-box, or two fire-boxes, may be provided, with a damper so arranged that the heating gases can be passed through the tubes, or beneath the still and through the flues in the setting. To prevent the formation of burnt-on coke, the bottom surface of the still is not heated after the deposit of coke commences to form. Very little coke is deposited on the flame tubes, and these are made renewable. The bottom of the still and the flame tubes may be double-walled, as described in Eng. Pat. 14,251 of 1909.—A. T. L.

Crude petroleum ; Separation of water, salt, and sludge from —— by heating. W. Graaff. Ger. Pat. 248,872, March 25, 1910.

The crude petroleum is heated with fresh water, in a vessel fitted with a condenser, until drops of water pass over, whereupon the heating is stopped, and after allowing to stand, the water and other impurities are run off, and the petroleum distilled as usual.—A. S.

Hydrocarbons such as paraffin, ceresin, or ozokerite ; Process for separating solid —— from mineral oil residues and tars. J. Tanne and G. Oberländer. Ger. Pat. 249,593, Jan. 5, 1911.

Mineral oil residues or tars are dissolved in a mixture of a lower fatty acid (acetic, propionic, or butyric acid) and a halogen substitution product of a saturated or unsaturated hydrocarbon, *e.g.*, carbon tetrachloride or dichloroethylene : when the solution is cooled the solid hydrocarbon separates out. The quantities of fatty acid and halogen-hydrocarbon are varied according to the consistency of the material to be treated ; in general, they amount to about 5 to 10 per cent. and 50 to 100 per cent. respectively, of the weight of the material (see also this J., 1910, 747, 1367 ; 1911, 409, 1368 ; 1912, 633).—T. F. B.

Fuel briquettes ; Process for making ——. G. F. Forwood and A. A. A. Zimmer. Fr. Pat. 441,975, March 30, 1912.

See Eng. Pat. 5288 of 1911 ; this J., 1912, 423.—T. F. B.

Coke from horizontal and inclined retort-ovens ; Method of and apparatus for effecting graded delivery of ——. H. Koppers, Essen on Ruhr, Germany. U.S. Pat. 1,036,648, Aug. 27, 1912.

See Eng. Pat. 27,624 of 1911 ; this J., 1912, 323.—T. F. B.

Carbonaceous materials ; Methods and apparatus for treating —— for the production of coal or like gas and water gas. E. R. Royston, Liverpool. From General Reduction, Gas, and By-Products Co., New York. Eng. Pat. 15,964, July 10, 1911.

See Fr. Pat. 432,217 of 1911 ; this J., 1912, 20.—T. F. B.

Illuminating gas ; Manufacture of liquid ——. Blaugas Patentges. m. b. H., Augsburg, Germany. Eng. Pat. 18,936, Aug. 23, 1911. Under Int. Conv., Aug. 30, 1910.

See Fr. Pat. 433,948 of 1911 ; this J., 1912, 220.—T. F. B.

Gas ; Method of generating ——. F. Jordy and C. Harting, Berlin. Eng. Pat. 19,960, Sept. 7, 1911.

See Ger. Pat. 245,059 of 1911 ; this J., 1912, 481.—T. F. B.

Carburetted gas ; Manufacturing ——. W. J. Watkins, and Oxine Gas Manufacturing Co., Fort Worth, Texas, U.S.A. Eng. Pat. 2617, Feb. 1, 1912.

See U.S. Pat. 1,019,705 of 1912 ; this J., 1912, 377.—T.F.B.

Gas producers; Revolving grates for ——. Deutsche Hüttenbau-Ges. m. b. H. Fr. Pat. 442,256, April 6, 1912.

See Eng. Pat. 6907 of 1912; this J., 1912, 676.—T. F. B.

Carbon disulphide from gases; Process for the removal of ——. E. Knoevenagel, Heidelberg, Assignor to Athion-Ges. m. b. H., Mannheim-Waldhof, Germany. U.S. Pat. 1,035,972, Aug. 20, 1912.

See Eng. Pat. 3043 of 1912; this J., 1912, 526.—T. F. B.

Ammonium sulphite or sulphate; Process for recovering —— *in the manufacture of gas.* K. Burkheiser. Fr. Pat. 441,573, March 20, 1912.

See Eng. Pat. 6471 of 1912; this J., 1912, 676.—T. F. B.

Petroleum; Process for solidifying ——. C. Gérard. Fr. Pat. 441,624, March 21, 1912. Under Int. Conv., March 22, 1911.

See Eng. Pat. 12,158 of 1911; this J., 1912, 632.—T. F. B.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Hardwoods; Relative yields obtained by the destructive distillation of different forms and species of ——. L. F. Hawley and R. C. Palmer. Eighth Int. Cong. Appl. Chem., 1912. Sect. IV. Orig. Comm., 6, 138—146.

The authors give the results of comparative laboratory tests with the three hardwoods (beech, birch, maple), commonly used for wood distillation on the large scale in the United States and also with red gum, chestnut, hickory, and oak. The retort used was a horizontal iron tube, 3 ft. long by 15 in. diameter, enclosed in a 4-in. oil jacket heated by a row of gas burners. The maximum temperature attained in the different tests varied from 327° C. to 415° C., but the temperature (above 320° C.) appeared to have little influence on the yields of wood spirit and acetic acid. The wood was usually employed in the form of sticks a little less than 18 in. long and from 2 to 4 in. in diameter. The data for the several woods are given in tables, the yields from sapwood, bodywood, slabs (bodywood plus bark), etc., being also given separately in some cases. The yields of wood alcohol and acetic acid from the different species of wood, expressed as percentages on the dry weight of the wood, are given in Table I.

In Table II. are given the yields from each species of wood, expressed in terms of commercial products and referred to the basis of a cord (90 cb. ft.) of air-dried wood (15 per cent. of moisture).

Table I.

Species.	Wood alcohol, 100 per cent.			Acetic acid, 100 per cent.		
	Bodywood.	Slabs.	Average.	Bodywood.	Slabs.	Average.
Beech	1·95	1·79	1·87	5·23	5·82	5·55
Birch	1·45	1·55	1·50	6·39	6·60	6·50
Maple	1·94	1·91	1·93	5·02	4·89	4·95
Red gum	1·76	1·73	1·75	5·30	5·02	5·16
Chestnut	0·90	0·87	0·88	5·42	5·22	5·32
Hickory	2·08	—	2·08	4·61	—	4·61
Oak	1·34	1·33	1.335	4·79	4·62	4·70

Table II.

Species.	Wood alcohol, 82 per cent., gallons.			Calcium acetate, 80 per cent., lb.				Weight of 1 cord of air-dried wood, lb.
	Bodywood.	Slabs.	Average.	Bodywood.	Slabs.	Average.	Average including settled tar.	
Beech	11·8	10·9	11·4	283	315	299	318	3785
Birch	8·3	8·9	8·6	329	340	334	349	3600
Maple	11·8	11·6	11·7	278	271	275	292	3875
Red gum	9·4	9·2	9·3	253	236	245	258	3330
Chestnut	3·7	3·6	3·6	196	189	193	195	2520
Hickory	15·3	—	15·3	304	—	304	338	4590
Oak	9·2	9·2	9·2	295	286	291	300	4320

The yields of charcoal are not included, because the results as to composition and yield of charcoal in the laboratory tests are not comparable with those obtainable on the large scale.—A. S.

Patents.

Metal filaments for electric lamps. E. R. Grote, Merton Park, Surrey. Eng. Pats. 18,351, Aug. 14, and 27,290, Dec. 5, 1911.

The uncarbonised filament is passed through an electric arc to sinter it, or the uncarbonised material, in the form of rods or sticks, is passed through an electric arc and then drawn into filaments.—W. H. C.

Filaments for incandescent electric lamps. H. Hoge and The "Z" Electric Manufacturing Co., Ltd., London. Eng. Pat. 18,392, Aug. 14, 1911.

As the paste for metallic filaments is squirted from the die, it is heated in a suitably shaped funnel to cause it to take a looped or spiral form. It is deposited in a tray in which it is afterwards baked. The filament, which is in the form of a continuous spiral, is then hung from a rod or from hooks in a chamber, and weights are, if necessary, hung from the bottom of the loops. The chamber is exhausted and the filament is sintered by passing an electric current through it.—W. H. C.

Metallic glowing filaments for electric incandescent lamps; Manufacture of exceedingly thin ——. A. Lederer, Atzgersdorf, Austria-Hungary. U.S. Pat. 1,035,883, Aug. 20, 1912.

See Eng. Pat. 7189 of 1906; this J., 1907, 144.—T. F. B.

Arc-lamp electrode. G. Egly, Assignor to Gebr. Siemens und Co., Berlin. U.S. Pat. 1,036,815, Aug. 27, 1912.

See Eng. Pat. 21,374 of 1909 ; this J., 1910, 408.—T. F. B.

III.—TAR AND TAR PRODUCTS.

Benzylamine ; Note on the preparation of ——. M. O. Forster and H. M. Judd. Eighth Int. Cong. Appl. Chem., 1912. Sect. IV. Orig. Comm., **6**, 118.

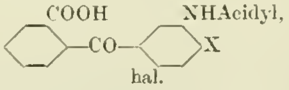
In view of the high market price of benzylamine (M. 33 per 100 grms. or about 9s. per oz.), the authors describe a simple process by which considerable quantities have been prepared on a laboratory scale at a cost, for materials, of about one-third of that amount. Twenty grms. of benzyl chloride are dissolved in 100 c.c. of 96 per cent. alcohol, and the solution is mixed with 15 grms. of sodium azide dissolved in the least possible quantity of water, and shaken at intervals during three days. Strong brine is then added, the precipitated benzylazoimide is removed by extraction with ether, the ethereal solution is evaporated, and the residue mixed with 100 grms. of 50 per cent. acetic acid and reduced with 18 grms. of zinc dust, the mixture being cooled with water and the zinc dust added in small quantities during at least 1 hour. After addition of excess of caustic soda, the benzylamine is separated by distillation with steam, the distillate is treated with caustic soda and extracted with ether, and the ethereal solution shaken with 40 c.c. of hydrochloric acid (1 : 1). On evaporation, the acid solution yields 16·5 grms. of pure benzylamine hydrochloride.—A. S.

Antiseptic tests of wood-preserving oils. Dean and Downs. *See* IX.

Patents.

2-Halogen-5-acidylaminobenzoylbenzoic acids ; Manufacture of ——. Act.-Ges. f. Anilinfabr., Treptow, Germany. Eng. Pat. 13,241, June 5, 1912. Under Int. Conv., Nov. 1, 1911.

Acidyl derivatives of 5-aminobenzoylbenzoic acids or their derivatives are treated with halogens or substances which liberate halogens ; the reaction proceeds equally well with the above acids themselves and with their derivatives containing substituents in the 4-position to the carbonyl group. The halogen enters the 2-position to the carbonyl group, forming compounds of the general formula,



where X represents hydrogen or a substituent. It is advantageous to use acetic acid or acetic anhydride as the acidylating agent, as then the acidylation and halogenation can be performed in one solution. The following new substances are described :—2-Bromo-5-acetylaminobenzoylbenzoic acid, m. pt. 218° C. ; 2-bromo-5-acetylamino-4-methylbenzoylbenzoic acid, m. pt. 226° C. ; 2-bromo-5-acetylamino-4-carboxybenzoylbenzoic acid, m. pt. 264°—266° C. The products may be utilised in the manufacture of 1·4-halogenamino-anthraquinones or their derivatives. —T. F. B.

Halogen phenol-alkali salts and process for the manufacture of same. P. Flemming, Hamburg, Germany. U.S. Pat. 1,036,087, Aug. 20, 1912.

See Fr. Pat. 434,548 of 1911 ; this J., 1912, 277.—T. F. B.

Manufacture of varnish from tar oil. Fr. Pat. 442,618. *See* XIII.

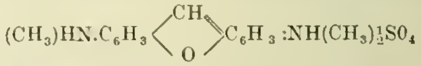
IV.—COLOURING MATTERS AND DYES.

Amines ; Action of sulphur on ——. *I. o-Toluidine.* H. H. Hodgson. Chem. Soc. Trans., 1912, **101**, 1693—1701.

100 grms. of o-toluidine, 50 grms. of o-toluidine hydrochloride, and 50 grms. of sulphur were heated together at 185°—190° C. for 2—3 hours. After addition of a slight excess of sodium hydroxide, the unattacked o-toluidine was removed by steam-distillation, the residue diluted to 500 c.c., neutralised, and heated on the water-bath with 100 c.c. of hydrochloric acid of sp. gr. 1·15. The hot acid solution was filtered, and allowed to cool, whereupon a new compound, trithio-o-toluidine hydrochloride, $S_3(CH_3.C_6H_3.NH_2)_2,2HCl$, separated, the yield being almost quantitative ; after purification the hydrochloride melted at 226°—227° C. (uncorr.). The free base could only be obtained as a resinous or amorphous mass. By reducing the hydrochloride with zinc dust and hydrochloric acid, dithio-o-toluidine, $S_2(CH_3.C_6H_3.NH_2)_2$, was obtained : this melts at 112° C. (uncorr.) and its hydrochloride at 256°—257° C. (uncorr.). Trithio-o-toluidine hydrochloride is almost insoluble in cold water, more readily soluble in hot, and more easily still in hot water acidulated with hydrochloric acid ; it is insoluble in ether and sparingly soluble in hot alcohol. It forms a crystalline benzoyl derivative, $S_3(CH_3.C_6H_3.NH.C_6H_5CO)_2$, m. pt. 187° C. (uncorr.). When diazotised it yields a soluble yellow bisdiazo-compound ; this unites with such compounds as *a*-naphthol-4-sulphonic acid to form dyestuffs which have little or no affinity for cotton, but are easily taken up by wool, giving shades of remarkable fastness to milling, potting (action of hot and cold water), bleaching, stoving, acids, alkalis, and light. (See also Eng. Pat. 15,446 of 1911 ; this J., 1912, 765.)—A. S.

Dyestuffs of the pyronine group ; Two new methods of formation of ——. J. Biehringer, R. Glücksberg, and A. Tanzen. Annalen, 1912, **391**, 308—325.

The two new methods are :—(1). The formation of tetramethylbenzopyronine (tetramethylrosamine or tetramethylbenzorhodamine, this J., 1890, 489) by the condensation of benzil with dimethyl-*m*-aminophenol on the water-bath for 4—5 hours in an atmosphere of carbon dioxide. (2). The formation of symm.-dimethylformopyronine by the autocondensation of dimethyl-*m*-aminophenol in presence of concentrated sulphuric acid at 180°—200° C. The dyestuff obtained in this way



$$(CH_3)HN.C_6H_3\left\langle\begin{matrix}CH \\ O\end{matrix}\right\rangle C_6H_3{:}NH(CH_3)\tfrac{1}{2}SO_4$$

is identical with that produced from formaldehyde and monomethyl-*m*-aminophenol. When the reaction is complete, the product is stirred with water, neutralised with the calculated quantity of calcined sodium carbonate, and the dye-base filtered off, washed, and dried. From its solution in dilute hydrochloric acid, it is precipitated as a double salt by concentrated stannous chloride or zinc chloride solution. The zinc chloride double salt dyes silk, wool, and tannin-mordanted cotton in bluish red shades.—A. S.

Dyes and pigments ; Rapid testing of ——. W. D. Bancroft, A. S. Elsenbast, and G. E. Grant. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IX., Orig. Comm., **20**, 91—99.

A series of oxidation tests is described, in which a number of dyes and lakes were examined comparatively as to their behaviour towards certain oxidising agents and light. Methylene Blue, Methyl Violet, Victoria Green, Magenta, Azo Red, and Eosin are bleached by hydrogen peroxide solutions at the ordinary temperature. Taking the point of complete fading as the indication of stability, the order was: Methylene Blue, Azo Red, Methyl Violet, Eosin, Victoria Green, and Magenta, the last being the most fugitive. The rates of fading vary considerably with some of the dyes, being in some cases rapid at first and slower later, and in other cases slow at first and then increasing, so that, with shorter intervals of time, the order of stability is: Methylene Blue, Methyl Violet, Eosin, Azo Red, Victoria Green, Magenta. Similar results are obtained when potassium persulphate is used as the oxidising agent. Solutions of all the above dyes bleach in sunlight and also in the light of the mercury vapour lamp; the order of stability differs from that given above, owing partly to the fact that the oxidation is not due to light of the same wave-length; the stabilities to light are in the following order:—Victoria Green, Magenta and Azo Red, Methyl Violet, Methylene Blue, Eosin. The action of hydrogen peroxide and sunlight on several colour lakes was also studied; all the lakes, except the greens, "bled" badly, and all were much bleached by hydrogen peroxide, but they were much more stable to both agents than the corresponding dyes. The dry lakes were not much affected by exposure to sunlight, Eosin lakes being the most fugitive. It is suggested that a rapid series of tests might be worked out on the above lines, which might be an aid in the study of the relative stability of dyes and pigments.—T. F. B.

Patents.

Vat colouring matters; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 22,455, Oct. 11, 1911.

Isatin-α-chloride or isatin-α-bromide or an analogous compound is condensed with carbazole or its derivatives or analogues, *e.g.*, in presence of benzene. Products are obtained which dye animal or vegetable fibres fast shades from the vat. The shades produced by the dyestuffs from isatin-α-chloride and carbazole or N-methylcarbazole are Bordeaux-red.—T. F. B.

Indigo white preparations; Process for making highly concentrated, stable —— which will not become dry. Badische Anilin und Soda Fabrik. Ger. Pat. 248,837, Jan. 17, 1911.

Indigo white is made into a paste with a solution of calcium chloride or a salt of similar character, with or without addition of other substances which aid in the production of stable products, *e.g.*, zinc dust, etc. Very concentrated pastes may be rendered more fluid by addition of sulphite-cellulose waste lyes.—T. F. B.

Indigo-white-alkali preparations; Process for preparing highly concentrated ——. Chem. Fabr. von Heyden. Ger. Pat. 248,836, Oct. 12, 1911.

When solutions of alkali salts of indigo white are treated with common salt or other "salting out" agents, the indigo white salt separates as a thick or solid mass, readily liquefied by heat, and readily separated from the mother liquors. The products thus obtained are only with difficulty oxidised by air, and may be converted into dry substances by addition of quicklime or by drying in a stream of air or other indifferent gas.—T. F. B.

Phthalic acid derivatives; Manufacture of —— and [vat] dyestuffs therefrom. R. B. Ransford, London. From L. Cassella und Co., Frankfort on Maine, Germany. Eng. Pat. 28,874, Dec. 21, 1911.

When carbazole derivatives having substituted imino groups are condensed with phthalic anhydride or its halogen substitution products (*e.g.*, by means of aluminium chloride in presence of nitrobenzene), substituted carbazole-diphthaloylic acids are produced. By heating these with sulphuric acid or other dehydrating agents, compounds are obtained which possess the characteristic vat-dyeing properties of the anthraquinone dyestuffs; the dyeings, which are yellow, are fast to washing, light, and chlorine. —T. F. B.

Vat dyestuffs; Process for producing solid preparations of —— by the use of soluble carbohydrates or syrups. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 248,992, Oct. 26, 1910.

Vat dyestuffs are mixed with carbohydrates or syrups soluble in water, and the mixture is dried in a suitable hot-air drying apparatus (*e.g.*, Huillard's system). In this manner, a product is obtained in the form of small dry fragments, which are suitable for use in preparing vats, and can be readily worked into pastes with cold water.—T. F. B.

Vat dyestuffs of the anthracene series; Manufacture of ——. F. Ullmann, Charlottenburg, Germany. Eng. Pat. 2949, Feb. 5, 1912. Under Int. Conv., July 11, 1911.

See Fr. Pat. 441,245 of 1912; this J., 1912, 809.—T. F. B.

Triphenylmethane dye; Red-violet ——. M. Weiler Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,034,173, July 30, 1912.

See Eng. Pat. 11,083 of 1911; this J., 1912, 182.—T. F. B

Alizarin from anthraquinone; Production of ——. C. Möllenhoff, Leverkusen, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,036,881, Aug. 27, 1912.

See Ger. Pat. 241,806 of 1911; this J., 1912, 223.—T. F. B.

Anthraquinone derivatives; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. First Addition, dated March 23, 1912, to Fr. Pat. 432,279, July 17, 1911. Under Int. Conv., March 27, 1911.

See Eng. Pat. 9111 of 1911; this J., 1912, 426.—T. F. B.

Anthraquinone derivatives containing sulphur; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 441,772, March 26, 1912. Under Int. Conv., April 1, 1911.

See Eng. Pat. 7699 of 1912; this J., 1912, 809.—T. F. B.

Vat dyestuffs; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 441,911, March 29, 1912. Under Int. Conv., July 7, 1911.

See Ger. Pat. 247,321 of 1911; this J., 1912, 678.—T. F. B.

Monoazo dyestuffs. Badische Anilin und Soda Fabrik. Fr. Pat. 441,620, March 21, 1912. Under Int. Conv., July 6, 1911.

See Eng. Pat. 25,903 of 1911; this J., 1912, 765.—T. F. B.

Anthraquinone derivatives. Badische Anilin und Soda Fabrik. Fr. Pat. 441,621, March 21, 1912. Under Int. Conv., July 10, Dec. 1 and 2, 1911.

See Eng. Pats. 18,240 of 1911 and 10,835 of 1912; this J., 1912, 678, 766.—T. F. B.

Vat [anthracene] dyestuffs; Process for making —— and their application in dyeing. Chem. Fabr. Griesheim-Elektron. Fr. Pat. 442,190, April 4, 1912.

See Eng. Pat. 8422 of 1912; this J., 1912, 766.—T. F. B.

Benzoquinone derivatives [dyestuffs]; Process for making ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 442,565, April 15, 1912. Under Int. Conv., June 24, Aug. 17, Nov. 6, and Dec. 1, 1911.

See Eng. Pat. 8886 of 1912; this J., 1912, 766.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Cotton cellulose; Action of water and sodium hydroxide on ——. M. Robinoff. Papierfabrikant, 1912, 10, 968. (See also this J., 1911, 277.)

The author has studied the behaviour of cotton towards dry heat, water at high temperatures, dilute acids, concentrated and dilute sodium hydroxide. His main conclusion is that cellulose which has become modified in the course of industrial chemical treatments possesses totally different properties from normal cellulose. Normal cellulose is extremely resistant and is only slightly modified when boiled with water under pressure. On the other hand, cellulose which has been subjected to boiling and bleaching processes, is very considerably attacked by boiling water under pressure, especially at temperatures above 150° C., and is completely broken down to hydrocellulose when digested under a pressure of 20 atmospheres. The duration of treatment does not appear to have any appreciable influence. Cold and hot (100° C.) dilute sodium hydroxide lyes have no effect on the structure or chemical properties of cellulose, but these effects enter with increase of temperature. A concentration of 4 per cent. of sodium hydroxide appears to be particularly dangerous. The time of action has little effect. Dilute acids hydrolyse the cellulose. In souring after bleaching, it would seem that dilute acids act more strongly on the cellulose than acid of double of four times the strength. Acetic acid appears to have as great an action as hydrochloric acid. The author also found that normal Egyptian cotton, after treatment in the beating engine for 4 hours, showed an increase in hygroscopic moisture, copper value, and hydrolysis value.—J. F. B.

Fibrous materials; Specific heat of ——. O. Dietz. Wochenbl. Papierfab., 1912, 43, 3119—3123.

The specific heats of various fibrous materials were determined in the following manner:—Between 2 and 3 grms. of the material were thoroughly dried and the dry weight ascertained. The sample was then heated in a steam-oven for 4—5 hours so that it was uniformly heated to 100° C., then dropped quickly into a Bunsen ice-calorimeter, and the quantity of ice melted in reducing the temperature of the sample to 0° C. was determined. The variations between duplicate experiments averaged 0·5 per cent.; maximum 2 per cent.; this is sufficiently accurate for all technical purposes. The values found for animal and vegetable fibres differed but little from one another, but the mineral fibres showed much smaller specific heats. The influence of temperature, between 0° and 100° C., on the specific heat is negligible, being smaller than the experimental error. The specific heat of fibres containing moisture is the sum of the specific heats of the quantities of dry fibre and moisture present; the specific heat of the fibre substance is practically unaffected by the presence of moisture. From the following table it will be noticed that in the case of vegetable fibres the specific heat decreases as the purity of the cellulose increases.

Fibrous material.	Sp.heat.	Fibrous material.	Sp.heat.
Asbestos..........	0·251	Artificial silk	0·324
Glass wool........	0·157	Filter paper	0·319
Cotton	0·319	Sulphite wood pulp	0·319
Akon	0·324	Soda wood pulp ...	0·323
Kapok	0·324	Straw pulp.........	0·325
Nettle	0·321	Mechanical pine pulp	0·327
Linen	0·321	Wool roving	0·325
Hemp	0·323	Combed wool.......	0·326
Jute	0·324	Raw silk...........	0·331
Manila hemp	0·322	Degummed silk	0·331

—J. F. B.

Wool; Action of the alkaline-earths [and lithia] on ——. T. Valette. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IVa., Orig. Comm., 7, 29—30.

Wool can absorb the alkaline-earth oxides and lithium oxide from their solutions in the following proportions, the strengths of the solutions being in proportion to the molecular weights of the oxides:—Barium oxide, 3·69 per cent.; calcium oxide, 2·4 per cent.; strontium oxide, 2·4 per cent.; lithium oxide, 0·7 per cent. The products have a much greater affinity for dyestuffs than untreated wool, greater even than that of wool treated with chlorine. The action is a maximum for barium and calcium oxides, slightly less for strontium oxide, and least for lithium oxide. Treatment with dilute acid (which removes the whole of the oxide) or with hydrogen peroxide solution does not modify these properties, whence it is concluded that the increased affinity is due to modification of the fibre and not to the presence of the oxide (compare this J., 1909, 700).—T. F. B.

Artificial silks, celluloses, and starches; Action of formaldehyde on ——. F. J. G. Beltzer. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IVa., Orig. Comm., 7, 7—21.

When cotton, wood pulp, and other forms of cellulose are treated with formaldehyde ("sthenosised"), their properties are modified to such an extent that they cannot be mercerised, even by aid of heat, nor converted into xanthic derivatives; flour and starches, when similarly treated, also become insensitive to boiling water and to caustic soda. This property of cellulose may be taken advantage of, especially in the case of viscose silk, to produce threads or fabrics of greatly increased strength. For example, when skeins of viscose "silk" were heated in an autoclave at 60° C. for 8 hours, with five times their weight of a solution of 40 per cent. formaldehyde (5 kilos.), sulphuric acid (0·05 kilo.), and acetone (100 kilos.), and dried in air, their breaking strain had increased from 146 grms. to 230 grms. in the dry state, and from 40 grms. to 105 grms. when moist; the elasticity showed a slight decrease, but this can be avoided if the skeins are dried in a vacuum at a low temperature. Apart from their increased strength and resistance to boiling water and alkalis, these "sthenosised" artificial silks differ from untreated silks in their affinity for dyestuffs: they are only feebly coloured by the direct cotton dyes. To dye them with the various anthracene dyestuffs, it is best to mordant with tannin followed by chrome alum or potash alum. The various "aniline colours" (rhodamines, auramines, phthaleins, Aniline Blue and Green, Fuchsin, etc.), may be applied by means of tannin and tartar emetic. Aniline Black and the *p*-nitraniline colours are dyed in the usual manner by formation on the fibre, whilst logwood, brasilein, hematin, and other vegetable colours are preferably applied in the form of solutions reduced by sulphites or hydrosulphites, and after oxidation treated with ammoniacal copper solutions and finally with bichromate. "Sthenosised" fibres of viscose may also be distinguished from untreated fibres by their behaviour towards solutions of iodine in potassium iodide, Methylene Blue, and Ruthenium Red, in none of which are the former stained (see this J., 1911, 1206). The "sthenosised" fibres appear to be true formals of cellulose; the whole of the formaldehyde may be removed from them by boiling with sulphuric acid, this reaction serving for the determination of the degree of "sthenosisation," as follows:—The fibres are boiled with water to remove any free formaldehyde or trioxymethylene, washed, and distilled with a solution containing 50 grms. of sulphuric acid (66° B.) per litre, and also a little sodium sulphate, distillation being continued until 80 per cent. has passed over: the formaldehyde is determined in the distillate by adding ammoniacal silver nitrate solution in excess, and weighing the silver precipitated. The amount of formaldehyde taken up by celluloses and carbohydrates varies with the concentration and with the temperature; at high temperatures, brittle and non-elastic products are obtained. The absorption of formaldehyde appears to increase with the degree of hydration of the cellulose. Hydrocelluloses and oxycelluloses absorb large quantities and become very tough; denitrated Chardonnet silk, in particular, becomes much tougher after a prolonged "sthenosising."—T. F. B.

Artificial silk; Method of recovering materials (alkali sulphydrates) employed in the manufacture of collodion ——. O. Dony-Hénault. Eighth Int. Cong. Appl. Chem., 1912. Sect. II., Orig. Comm., 2, 83—89.

The crude sulphur obtained in the treatment of waste liquors from collodion silk factories is dried and treated with water-gas, at a temperature above 300° C.; hydrogen sulphide, which may be mixed with a little carbon bisulphide, is thus readily produced, and, by passing the gaseous product through a saturated solution of alkali or alkaline-earth sulphide, a sulphydrate liquor is obtained, which may contain some polysulphides and a little sulpho-carbonate and is suitable for use in the denitration stage of the silk-making process.—F. Sodn.

Cellulose acetate. L. Clement and C. Riviere. Eighth Int. Cong. Appl. Chem., 1912. Sect. VII., Orig. Comm., **9**, 59—69.

Cellulose acetate is about twice as costly as nitrocellulose but in the form of finished articles is only 10 per cent. dearer than celluloid, and the non-inflammability is a great advantage. Cellulose acetate itself is either fibrous, horny, or spongy. The acetates vary in properties with the degree of polymerisation. The main groups are those only soluble in chloroform, tetrachloroethane, di- or epichlorhydrin, and those also soluble in acetone or methyl or ethyl acetate. The temperature of decomposition is about 210° C. Cellulose acetate is itself plastic but a "solid solvent," *e.g.*, triacetin, is added to increase the plasticity. A substance such as triethyl phosphate is added to make the mass absolutely non-inflammable. One method of working is to mix the substances in a mill in presence of tetrachloroethane. The thick smooth paste is then sheeted for, say, 8 hrs. The mass can be blocked like celluloid in a hydraulic press but at a higher temperature. It can be planed when cold. The mass is dried at about 40° C. for 24 hrs. per mm. thickness, to remove all the tetrachloroethane. It is then compressed and polished (by strong compression).—H. E. P.

Mechanical wood pulp ; Effect of variable grinding conditions on quality and production of ——. M. Cline and J. H. Thickens. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa., Orig. Comm., **13**, 83—99.

In systematic experiments on the grinding of mechanical pulp the authors have arrived at the following conclusions : The power supplied to the grinder increases directly with the speed and pressure and inversely with the degree of sharpness of the stone. There is also a very slight increase with the temperature. Other conditions being equal, the power supplied to the grinder is less for steamed wood than for green or untreated seasoned wood. The production of pulp in 24 hours varies directly with the pressure, speed and sharpness of the stones. Less pulp is obtained in 24 hours from seasoned wood than from green, and still less from steamed wood, other conditions being equal. The consumption of power per ton of untreated wood increases as the pressure decreases ; it is lower on sharp stones than on dull and it increases as the speed decreases in much the same manner as in the case of pressure. There is however not so much difference between the power consumption per ton at low speed and at high speed as there is at low pressure and high pressure. The temperature has very little influence, the power consumption being slightly lower at high temperatures. The power consumption per ton is higher for seasoned wood than for green wood, and still higher for steamed wood than for either seasoned or green wood under the same conditions. Conifers require more power per ton of pulp produced than hard woods. The yield of pulp, as also of screenings, per cord of wood is greater at high pressures than at low ; there is less fine matter lost in the water. The surface of the stone has little influence on the yield per cord ; this is slightly higher at high speed than at low and is directly proportional to the dry weight per cubic foot of wood. The quality [strength] of the pulp varies greatly with the surface of the stone, less with the pressure and least with the speed. Pulp of better quality is obtained at higher temperatures. Green wood yields pulp of the best colour and steamed wood the greatest strength. Under like conditions the strength of the pulp increases with the power expended per ton in the grinding.—J. F. B.

Wood ; Consumption of caustic soda in cooking [pulping] ——, and its influence on the yield and bleaching properties of the fibre. E. Sutermeister. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 265—269.

The author has studied the consumption of soda in the digestion of poplar and spruce woods, determining the free and total soda in the black liquors after the digestion. The conditions of digestion were varied within very wide limits, the steam pressure ranging from 70 to 130 lb. per sq. in. and the caustic soda added from 22 to 50 per cent. of the dry weight of the wood. Nevertheless the yield of pulp seems to be perfectly definite for any given consumption of soda, regardless of the manner in which such consumption is caused to take place. In the case of poplar, between the points of 14 and 19·5 per cent. of sodium hydroxide consumed, the relation between yield and consumption is not so definite as it is beyond these points. Between these points the conversion of the wood from chips to fibre takes place, being practically all chips below 14 per cent. and all fibre above 19·5 per cent. The consumption of 15 per cent. of sodium hydroxide (calculated on dry weight) appears to represent a critical point, below which the non-cellulose components of the wood are chiefly dissolved, whilst beyond this point the residue, being nearly pure cellulose, is dissolved as a whole. There is little, therefore, to be gained as regards purity of product by causing a consumption of more than 15 per cent., although more severe treatment may impart certain desirable physical qualities to the pulp. So far as bleaching qualities are concerned, the proportion of soda consumed had less influence than might be expected, but it would appear that, with an equal consumption of soda, a digestion which was terminated with a fair excess of free soda in the black liquor gave a more easily bleaching product than when the excess of soda remaining was only small. The free soda in the lyes was determined by adding barium chloride to the diluted lye and titrating with phenolphthalein as an external indicator ; the total soda was determined after incineration.—J. F. B.

Sulphite wood pulp manufacture ; Scientific control of ——. C. M. Bullard. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 77—82.

Since 1884, 102 sulphite pulp mills have been built in America, the daily output of which is about 5100 tons of fibre ; the average consumption of materials being 2¼ cords of wood, 280 lb. of sulphur, and 235 lb. of lime per ton of product, costing $18·00 (£3 15s.) for wood, $3·64 (15s.) for sulphur, and $0·71 (3s.) for lime. According to the author much avoidable waste takes place in all departments of the mill, owing to lack of scientific methods and control. Waste of good wood and excessive cost of labour are met with in the lumbering operations ; unsystematic handling, storage and delivery of the wood at the mill is another source of loss ; in the cleaning operation the average loss of wood with the mechanical barker runs about 25 per cent. Under proper conditions this loss can be reduced to 21 per cent. or less, but in many mills it is as high as 30 per cent. ; improvements can generally be effected by increasing the speed of turning the wood, increasing the speed of the barking-disc and decreasing the set of the knives. Where practicable, the barking should be done in the forest, as this entails less loss of wood and effects a saving in freight. In the chipping room, determinations of sawdust and large splinters, whilst varying the adjustment of the machine, will show in what manner wastage from this source may be avoided. Strict chemical control of the sulphur-burning is of the utmost importance to ensure the maximum strength of gas and minimum formation of sulphur trioxide. The results of the digestion process are regulated by the pressures and temperatures prevailing in the digesters and the manner of relieving the gas during the operation. High temperatures are extremely harmful, particularly in the early stages of digestion, and it is very desirable to maintain the strength of the acid during the digestion process.—J. F. B.

Sulphite pulp ; New technical determination of the bleaching quality of ——. E. Richter. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 233—236.

In a previous paper (this J., 1912, 530) the author proposed a modification of the Hempel-Seidel method for the estimation of lignin in pulp, jute or wood. He has now applied a similar method for estimating the quantity of bleaching powder required by sulphite pulps. The method is based on the colouration developed by the action of 13 per cent.

nitric acid on the non-cellulose of the pulp, and this colouration is compared with that produced by a standard pulp of known bleach-consumption. Five grms. of the air-dry pulp are broken up in thin pieces, placed in a wide-necked bottle with 100 c.c. of 13 per cent. nitric acid, well shaken, and kept for about one hour in a dark place. After that time the pulp is shaken again and the liquor drained off through a funnel containing a plug of cotton-wool. Five grms. of the standard pulp are treated in a similar manner. Twenty-five c.c. of each liquid are measured off into small bottles, and water is added to the paler one from a burette until the two are approximately equal in colour. Portions of the two are then placed in a pair of Eggertz carbon tubes and compared by looking down from above against a piece of white paper at the bottom. Quantities of 5 c.c. and 10 c.c. are compared respectively and if necessary a greater depth of the paler liquid is used to bring the two to exact equivalence. The bleaching quality of the pulp to be tested is then calculated by simple proportion from the known amount of bleaching powder required for the standard. Sometimes a very strongly digested pulp will not colour the acid in one hour. If the test cannot be delayed the bottles in such a case are placed in a water-bath at 40° C. and frequently shaken; in about 15 minutes the acid becomes coloured and the comparison is made in the ordinary way after cooling.—J. F. B.

Cellulose; Determination of ——. Cellulose methods versus "crude fibre" methods. C. F. Cross and E. J. Bevan. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 101—102.

The authors criticise the paper by König and Hühn (this J., 1912, 427), and the methods of determining cellulose in industrial fibres, based on acid hydrolysis followed by oxidation. The chlorination process, regarded by König and Hühn as a purely oxidative process, when properly controlled shows a minimum of secondary oxidising action, being mainly confined to a specific chlorination of the lignin groups. The "crude fibre" methods favoured by König and Hühn yield residual products of degradation by treatments more or less arbitrary because they are relatively non-selective in their actions, which are ill-defined through the complex and unascertained relation of the products to the mother-substance. Moreover the manipulation is too lengthy for technical purposes. The authors are confident that the chlorination process, which has been repeatedly approved by workers in this domain of chemistry, will remain the standard method for the estimation of cellulose.—J. F. B.

Cellulose and lignocellulose; Hydrolysis of ——. F. E. Gallagher and I. L. Pearl. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 147—149.

The authors have made a series of experiments on the hydrolysis of sawdust from long-leaf pine wood screened through a 10-mesh sieve. The proportion of sulphuric acid used was 1 per cent. of the dry weight of wood, the proportion of liquor was 3 : 1, the maximum pressure was 135 lb. per sq. in., maintained for 30 minutes, and the total duration of the treatment was about 70 minutes. The digested material was extracted with water, evaporated to a density of 1·045 and fermented. Subsequent hydrolysis of the residue gave a further yield of fermentable sugars. The following table illustrates some of the results obtained :—

Material.	Total extract.	Reducing material.	Fermentable sugars.	Ratio of fermentable sugars to total extract.	Cellulose.	
					Before digestion.	After digestion.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
a. Long leaf pine sawdust	22·0	19·3	11·8	0·53	54·0	52·0
b. Residue from (a)	6·3	4·7	3·0	0·47	52·0	42·0
c. Residue from (b)	2·8	1·7	1·6	0·57	—	—
d. Bleached cotton	3·1	1·6	1·4	0·44	—	—
e. Residue from (d)	4·5	2·8	2·5	0·55	—	—
f. Bleached soda wood pulp	17·7	16·0	6·3	0·36	—	—
g. Residue from (f)	7·5	4·3	3·8	0·51	—	—

From the results with sawdust, owing to the fact that the cellulose in the residue from the first digestion is sensibly the same as in the original material, and that the ratio of fermentable sugars to total extract is the same as in the digestion of pure cellulose, it is concluded that the sugar is derived equally from the lignin and from the cellulose and that the wood is attacked integrally as a chemical compound, lignocellulose. A few digestions were made using 0·2 per cent. of chlorine in the form of chlorine water instead of sulphuric acid and the results were very similar to those recorded above.—J. F. B.

Bamboo cellulose. W. Raitt. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa., Orig. Comm., **13**, 219—232.

The specific gravity of seasoned bamboo of two years' growth ranges from 0·8410 to 0·9555 for the internodes and from 0·8091 to 0·9170 for the nodes; thus bamboo is about twice as heavy as the coniferous pulp woods. A series of typical analyses of stems at different ages shows only slight differences after one year's growth. The following figures for a stem two years old are representative: Soluble in boiling water (starch, etc.), nodes 9·83, internodes, 8·70; soluble in 1 per cent. sodium hydroxide at 100° C. (pectose, fat, wax), nodes 26·44, internodes 20·19; soluble on digestion above 130° C. (lignin), nodes 17·60, internodes 15·29; cellulose (by chlorination), nodes 46·13, internodes 55·82 per cent. on dry substance. Difficulties previously recorded in the digestion of bamboo chips for paper making may be summarised as follows: Impossibility of digesting nodes, even with a large excess of alkali; tendency of the chips to float, owing to air enclosed in capillary canals; mass resistance to penetration, varying with size of chips; resistance with increasing age; resistance of gelatinised pectose. The author has found that all these difficulties are overcome if the material be subjected to a heavy crushing pressure instead of being chipped before digestion, and it is then possible to digest indiscriminately nodes and internodes of stems of all ages. A further difficulty which has stood in the way of the commercial utilisation of bamboo pulp is the difficulty of bleaching. This is largely due to the constituents of the first group, the starchy derivatives soluble in boiling water. The removal of these by preliminary extraction gave improved results with economy of alkali, but it was found that a further improvement in bleaching was obtained by employing a lye containing sodium sulphide and sodium hydroxide in the proportion of 1 : 3. The final prescription for digesting the Indian bamboo, *B. polymorpha*, runs as follows: seasoned bamboo only to be used; raw material to be reduced by crushing; matters soluble in boiling water to be extracted previous to digestion; digestion to be effected by the sulphate process. The following figures are illustrative: total alkali (calc. as sodium hydroxide) 20·5 per cent. on air-dry weight; initial temperature of digestion, 177° C. for 1 hour; subsequent temperature, 162° C. for 4 hours; total time of digestion, 5 hours; yield of unbleached pulp (air-dry) 46 per cent.; bleaching powder used, 17 per cent.; yield of bleached pulp, 44 per cent.—J. F. B.

Hedychium coronarium; Papermaking qualities of ——. C. Beadle and H. P. Stevens. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa., Orig. Comm., **13**, 39—45.

This plant, of the order of *Zingiberaceæ*, is a tropical herb found in Southern Asia and South America, spreading on cleared land most vigorously, by means of its rhizomes, to the exclusion of all other vegetable growth, and reaching a height of 1—2 m. The crushed stems, when boiled with 5 per cent. of caustic soda under a pressure of 3—5 atmospheres, gave a yield of 60 per cent. of washed pulp, but on separating the numerous pith cells the yield of unbleached pulp was reduced to 50 per cent. The crushed material is stated to contain 44·0 per cent. of cellulose (air-dry weights). The fibres of the pulp are of two kinds: long. wide fibres, somewhat like those of coniferous wood, and numerous shorter, solid-looking fibres, more highly lignified. Measurements of the fibres gave an average length of 2·6 mm. with very wide variations between maximum and minimum. The pulp is characterised by the presence of a large proportion of oval pith cells, amounting by weight to about 14 per cent. The paper-making quality of the pulp is considerably influenced by the presence of these cells, which may be left in or removed by washing on sieves, according to the effect desired. Their presence imparts a "greasiness" to the beaten stuff, without however impeding to any material extent its draining quality on the paper machine. Such pulp is particularly adapted for the manufacture of parchment-like, grease-proof papers; it is also capable of yielding papers of exceptional strength either bleached or unbleached.—J. F. B.

Patents.

Retting of flax straw. O. Silberrad, Buckhurst Hill, Essex. Eng. Pat. 10,812. May 4, 1911.

Cultures of retting bacteria prepared from various vegetables or fruits greatly accelerate the retting of flax straw. Example: 1 lb. of thoroughly cleaned potatoes, free from diseased parts, is pulped, then diluted to about one gallon with water previously boiled and allowed to cool to a temperature of 35°—40° C.; the addition of a trace of pepsin, ammonium phosphate or other nitrogenous material is of advantage. After maintaining this temperature for about 12 hours, the decoction is run into a retting tank also at 35°—40° C. The flax straw is next immersed in this bath and allowed to steep for 12—72 hours according to the degree of retting required.—P. F. C.

Drying washed goods such as linen, textile goods, feathers, wool and the like. K. J. Breh, Zurich, Switzerland. Eng. Pat. 18,018, Aug. 8, 1911. Under Int. Conv., Aug. 6, 1910.

The goods, contained in a rotatable drum, are first heated thoroughly by dry steam and a vacuum is then produced inside the drum by means of a water blast. During the latter process the drum is rotated alternately in opposite directions. The water used in producing the vacuum is collected for soaking and washing the next batch of goods.—P. F. C.

Scouring textiles, even in the wet state, by means of fluid fat-solvents; Process for ——. Crefelder Seifenfabrik Stockhausen und Traiser. Ger. Pat. 246,606, March 10, 1910.

In order to produce a solvent for fats which is soluble in petroleum spirit and also in water. it is proposed to add to the usual solvents (petroleum. petroleum spirit, benzol, etc.). a mixture of ethyl acetate and carbon tetrachloride or a homologue which has been rendered soluble in water by addition of a soap or a sulphonated soap.—T. F. B.

Mineral oil stains on tissues; Process for recognising ——. H. Lubberger. Ger. Pat. 248,522, April 30, 1911.

Mineral oil stains are rendered visible by staining with small quantities of aniline colours soluble in fats, especially with fatty acid salts of basic dyestuffs.—A. S.

Pulp; Apparatus for the production of ——. G. A. Stebbins, Watertown, N.Y. U.S. Pat. 1,035,395, Aug. 13, 1912.

A vertical digester is provided with a tapered lower end, and with upper and lower feed and outlet openings, a radiator, extending vertically and located centrally, being in alignment with the openings. The lower end of the radiator extends at an angle, and is connected with the adjacent wall forming the tapered portion of the digester, thus providing a clearance for the lower opening of the digester. The radiator is in the form of a steam pipe, closed at its upper end, and provided adjacent to its lower end with a condensation valve and steam inlet. A vent pipe. extending vertically, is disposed centrally in the radiator; it is open at its upper end and provided with a valve at its lower end, "spiders" being provided for supporting the vent pipe in the steam pipe, and the latter in the digester.—B. N.

Sulphite cellulose waste lyes; Process for removing a portion of the colouring matter from ——. A. Stutzer. Ger. Pat. 246,658, Jan. 1, 1911.

A sufficient quantity of an alkaline-earth carbonate is added to the waste liquors to neutralise the stronger acids, the mixture is filtered, and a small quantity of phosphoric acid (*e.g.*, 0·1 per cent.) is added to the filtrate, which is then evaporated, filtered from the separated colouring matter, again evaporated, and mixed with sufficient calcium carbonate to remove the free phosphoric acid. It is stated that the greater part of the colouring matter is in this way removed from the liquors, rendering them suitable for use in dressing textiles or for mixing with tanning extracts.—T. F. B.

Textile fabrics and yarns; Processes for the preservation of —— and rendering the same impermeable and fireproof. M. Boucherie, Paris. Eng. Pat. 23,857, Oct. 27, 1911. Under Int. Conv., Nov. 24, 1910.

See Fr. Pat. 422,917 of 1910; this J., 1911, 535.—T. F. B.

Wood pulp and half-stuff from resinous kinds of wood; Process for the manufacture of ——. J. Aktschourin, Aktschurin-Tupik, Russia. Eng. Pat. 18,191, Aug. 11, 1911.

See Fr. Pat. 433,424 of 1911; this J., 1912, 225.—T. F. B.

Corks; Process for providing —— with a durable neutral coating. L. Pink, Berlin. Eng. Pat. 3612, Feb. 13, 1912. Under Int. Conv., March 8, 1911.

See Ger. Pat. 240,563 of 1911: this J., 1912, 67.—T. F. B.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Hydrosulphites; The development of —— in their relation to modern dyestuffs. P. S. Clarkson. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IVa., Orig. Comm., 7, 23—27.

The author traces the development of the use of hydrosulphites, sulphoxylates, and their formaldehyde compounds, in dyeing and printing, and describes the processes used. He states that the largest indigo printers in America have adopted the use of white-discharge pastes containing sulphoxylate, anthraquinone, and zinc oxide, with highly satisfactory results. The consumption of hydrosulphite compounds in the textile industry in the United States in 1911 probably approached one million pounds.—T. F. B.

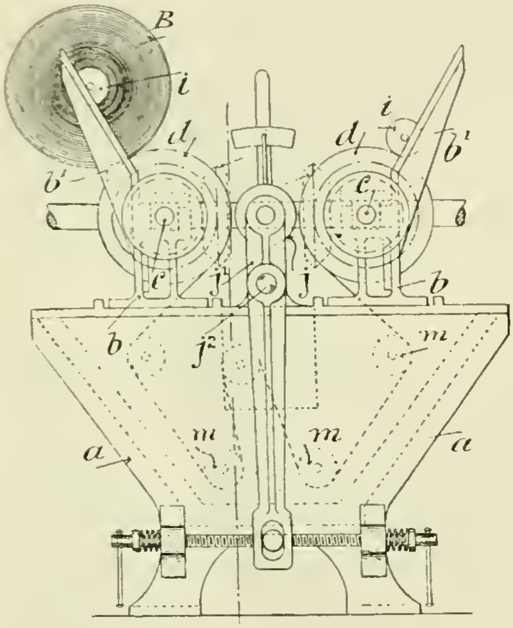
Patents.

Multicolour effects on fabrics; Process for producing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 247,102, Sept. 13, 1910.

It has been found that the compounds of nickelous oxide or hydroxide increase the affinity of vegetable fibres for direct dyestuffs (even those which do not possess mordant properties towards the usual metallic mordants), and for sulphide and acid dyestuffs. This property is used to produce multicolour effects by dyeing with direct dyeing sulphide or acid dyestuffs, not possessing mordant properties, fabrics prepared by weaving together fibres mordanted with nickelous compounds, and untreated, dyed or undyed fibres.—T. F. B.

Dyeing and padding fabrics and such like; Apparatus for ——. S. Barlow and Co., Ltd., T. B. Cross, and J. Taylor, Castleton, Lancs. Eng. Pat. 20,291, Sept. 13, 1911.

A JIGGER body, *a*, has brackets, *b*, *b*, supporting shafts, *c*, *c*, of two driving bowls, *d*, *d*, driven through a clutch. The brackets, *b*, *b*, have extensions, b', b', to support the batching rollers, *i*, *i*, from and on to which the fabric is wound after passing through the vat. Supported between the driving bowls is the padding bowl, *j*, which is carried on short swing arms, j', mounted on a shaft, j^2. This shaft is so actuated that the padding bowl can be brought into contact with either of the driving bowls, *d*, *d*. When working, the batch of cloth, B. is lifted on to one set of brackets, b', b', and the fabric is drawn down over one bowl, *d*, around guiding rollers, *m*, then between the other driving bowl, *d*, and the padding bowl, *j* (which presses against it), and is wound on a batch roller, *i*, bearing on the driving bowl, *d*.—P. F. C.



Yellow shades on the fibre; Process for producing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 248,250, June 24, 1911.

THE products soluble in alkali, obtained according to Ger. Pat. 247,155 (this J., 1912, 679) by treating with alkalis the insoluble products of the action of benzoyl chloride on indigo, are applied to the fibre in the form of their alkali or ammonium salts, furnishing fast yellow shades.—T. F. B.

Dyeings on vegetable and animal fibres; Process for producing ——. F. A. Bernhardt Kommanditges. Ger. Pat. 249,069, July 5, 1910.

NEUTRAL gels of substantive dyestuffs, prepared by neutralisation of their alkaline solutions in presence of a gel which is unaffected by alkali (*e.g.*, wheat starch), are applied to the fibre by padding, fixed by steaming, and finished in the usual manner. It is stated that by impregnating the fabric between rollers and steaming for a short time, even the darkest shades may be fixed on the fibre by using 3 or more per cent. of dyestuff on the weight of the goods.—T. F. B.

Dyeings or printings on fabrics, fast to washing; Process for producing ——. E. Schiendl. Ger. Pat. 249,678, July 2, 1911.

THE dyestuff solution and the substances necessary to render it insoluble, or the different constituents of insoluble colouring matters or colour lakes, are simultaneously sprayed, by means of compressed-air jets, on the fabric, in such a manner that the jets of liquid do not intermingle, so that the insoluble dyestuff is only formed on the fibre, producing a variety of colour effects.
—T. F. B.

White or coloured discharge effects on vat or sulphide dyestuffs; Process for producing —— by means of formaldehyde-sulphoxylate, formaldehyde-hydrosulphite, hydrosulphites, or other reducing agents. Badische Anilin und Soda Fabrik. Ger. Pat. 246,519, June 12, 1910. Addition to Ger. Pat. 231,543, Oct. 15, 1909.

THE processes described in the chief patent (see Fr. Pat. 414,937 of 1910; this J., 1910, 1247) and in the additions thereto (addition to Fr. Pat. 414,937; Eng. Pat. 27,038 of 1910; Ger. Pat. 246,252; this J., 1911, 617, 1053; 1912, 638), may also be applied to the production of white or coloured discharge effects with sulphide dyestuffs.
—T. F. B.

Multicolour effects on dyed union goods; Production of —— by a single discharge-printing with a printing roller. R. Bondy. Ger. Pat. 247,224, July 19, 1910.

A COLOURED discharge mixture is printed by means of a roller on union fabrics, the various fibres of which have been dyed in different shades, some capable of being discharged, and others fast.—T. F. B.

Fibre; Process for decorating ——. H. P. Taber, Wilmington, Del. U.S. Pat. 1,036,163, Aug. 20, 1912.

THE vulcanised fibre, or like material, which is to be permanently decorated with designs, is first cleansed, and the design placed thereon with impermeable ink or varnish of acid-resisting qualities. The fibre is subjected to a bath of water slightly acidulated with acetic acid, which prepares the uncovered fibre for receiving in a better manner the colouring matters, the latter being then applied in the form of suitable salts of aniline dissolved in a suitable solvent. The fibre is thoroughly dried, the impermeable ink or varnish removed by means of a solvent, and finally the colour is fixed by subjecting the fibre to a bath containing ethylene tetrachloride and trichloride, Japan wax and alcohol.—B. N.

Bleaching apparatus. R. Weiss, Kingersheim, Germany. U.S. Pat. 1,036,941, Aug. 27, 1912.

SEE Eng. Pat. 15,284 of 1908; this J., 1908, 1201.—T. F. B.

Mercerisation-lyes; Process of purifying waste ——. P. Krais, Tübingen-Lustnau, Assignor to M. Petzold, Zittau, Germany. U.S. Pat. 1,035,882, Aug. 20, 1912.

SEE Eng. Pat. 17,626 of 1911; this J., 1912, 184.—T. F. B.

Dyeing, bleaching, and otherwise treating, and removing the liquid from textile and other products; Machine for ——. Sulzer frères. Fr. Pat. 442,403, April 10, 1912. Under Int. Conv., April 11, 1911.

SEE Eng. Pat. 8582 of 1912; this J., 1912, 813.—T. F. B.

Blue shades on wool [by means of azo dyestuffs]; Process for producing fast ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 442,322, March 28, 1912. Under Int. Conv., April 3, 1911.

SEE Eng. Pat. 9432 of 1911; this J., 1911, 1448.—T. F. B.

Brown shades on wool [by means of azo dyestuffs]; Process for producing fast ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 442,605, April 16, 1912. Under Int. Conv., May 18, 1911.

SEE Eng. Pat. 12,877 of 1911; this J., 1912, 227.—T. F. B.

Dyeing fibrous materials; Process for ——. W. R. Smith and J. D. Larkin. Fr. Pat. 442,576, April 16, 1912.

See U.S. Pat. 1,025,323 of 1912; this J., 1912, 533.—T. F. B.

Aromatic ammonium compounds [for use in indigo printing] and process of making same. H. S. A. Holt, Ludwigshafen, and O. Schmidt, Mannheim, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,036,241, Aug. 20, 1912.

See Eng. Pats. 15,722 and 17,099 of 1910; this J., 1911, 206.—T. F. B.

Finishing, filling, loading, or dressing textile fabrics and spun goods; Process of ——. L. Lilienfeld, Vienna. U.S. Pat. 1,036,282, Aug. 20, 1912.

See Fr. Pat. 436,087 of 1911; this J., 1912, 383.—T. F. B.

Finishing or filling and colouring, or only filling, fabrics; Process for ——. J. A. Sackville. Fr. Pat. 442,439, April 11, 1912. Under Int. Conv., April 12, 1911.

See Eng. Pat. 9073 of 1911; this J., 1912, 533.—T. F. B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Phosphoric acid and boric acid; Titration of ——. W. Biltz and E. Marcus. Z. anorg. Chem., 1912, **77**, 131—136.

Phosphoric and boric acids together in solution and in the presence of magnesium chloride, may be determined with moderate accuracy by first neutralising the solution as indicated by "dipping out" on methyl orange, and then titrating with $N/1$ sodium hydroxide, using phenolphthalein as indicator. After adding mannitol, the solution is again titrated with sodium hydroxide, to determine the boric acid. An alternative method is to make the solution neutral to methyl orange, and add mannitol before titrating as in the previous case. Both acids are thus determined together and they both act as monobasic acids. The titration may be done in the presence of calcium chloride, but allowance must be made for the tertiary calcium salt formed, which acts as a tribasic acid, any excess only acting as a monobasic acid. Gerhardt's statement (this J., 1905, 293), that free phosphoric acid remains in solution when a solution of it is shaken with calcium carbonate is contradicted.—F. Sodn.

Boric acid; Volatility of —— in steam, and ebullition of its saturated solutions in presence of a solid phase. R. Nasini and F. Ageno. Atti R. Accad. dei Lincei, Roma, 1912, **21**, II., 125—132.

The authors have shown previously (Gaz. chim. ital., 1911, **41**, I., 131) that in aqueous solutions even of high concentration and at both high and low temperatures, boric acid exists in the form of either H_3BO_3 or HBO_2, and that the formula of metaboric acid is HBO_2 not $H_2B_2O_4$. As the result of a large number of experiments on the distillation of aqueous solutions of boric acid, it was found that on the average the distillate from a 5 per cent. solution contains 0·006, from a 15 per cent. solution, 0·0149, and from a 20 per cent. solution, 0·0172 per cent. of boric acid. A saturated solution of boric acid in presence of solid boric acid, if heated very carefully, has a constant initial boiling point of 103·12° C. at 760 mm., and the distillate contains 0·039 per cent. of boric acid. If proper precautions be not taken, the temperature of the boiling solution and the amount of boric acid in the distillate rise, as is shown by the following figures: 104°—105° C., 0·06; 105°—106° C., 0·075; 110°—111° C., 0·106; 115°—116° C., 0·25; and 119°—120° C., 0·343 per cent. of boric acid. On heating the saturated solution (with solid phase) and passing a weak current of air, boric acid did not appear in the distillate until the temperature rose to between 50° and 60° C. On heating under diminished pressure so as to obtain true ebullition, the proportions of boric acid in the distillates obtained at the boiling temperatures given were: 43° C., 0·009; 54° C., 0·015; 65° C., 0·018; and 80°—82° C., 0·035 per cent. No boric acid appeared in the distillate from a saturated solution of borax, even when the latter contained up to 5 per cent. of free boric acid. (Compare also Skirrow, this J., 1901, 805.)—A. S.

Gold salts; Reaction of —— with m-phenylenediamine. J. A. Siemssen. Chem.-Zeit., 1912, **36**, 931.

If a 0·5 per cent. aqueous solution of gold chloride be treated with a solution (5 : 1000) of *m*-phenylenediamine sulphate, a colouration varying from yellow to dark brown, according to the quantity of gold, is produced. The sensitiveness of the reaction is such that a violet colouration is obtained even with a 0·5 per cent. solution of gold chloride diluted 100-fold.—A. S.

Thorium peroxide. F. Calzolari. Gaz. chim. ital., 1912, **42**, II., 21—28.

The author has obtained results differing from those of Pissarjewsky (Z. anorg. Chem., 1902, **31**, 359) with regard to the precipitates produced by the action of hydrogen peroxide on thorium salts. With thorium nitrate, the precipitate contains 3 atoms of active oxygen and 2 equivalents of combined nitric acid to 2 atoms of thorium. With thorium chloride, the precipitate contains 3 atoms of active oxygen and 1 equivalent of combined hydrochloric acid to 2 atoms of thorium. With thorium sulphate, the precipitate contains according to the conditions, from 2 to 3 atoms of active oxygen and 2 equivalents of combined sulphuric acid to 2 atoms of thorium. Incidentally it was observed that on adding hydrogen peroxide to a dilute solution of thorium chloride containing a little oxychloride, the solution becomes acid, but no precipitate is produced, the thorium peroxide produced remaining in colloidal solution. After purification by dialysis, the solution is clear, colourless, and neutral, and may be evaporated on the water-bath without the formation of a precipitate. Small quantities of electrolytes (ammonium chloride or nitrate, sodium chloride, or sulphuric acid) cause immediate coagulation of the thorium peroxide. The precipitate and also the colloidal solution contain 3 atoms of active oxygen to 2 atoms of thorium. The peroxides of zirconium and titanium can be obtained in colloidal solution in a similar manner.—A. S.

Quartz; Reduction of —— by hydrogen. H. von Wartenberg. Z. Elektrochem., 1912, **18**, 658—660.

The author has carried out experiments to elucidate the course of the reaction which results in the deposition of silicon on thermo-elements which are heated in hydrogen in the presence of, though not in contact with silicates. The question to be decided is whether the reduction takes place with the formation of silicon hydride, SiH_4, which is subsequently decomposed, or whether silicon vapour is directly liberated. Investigation of the equilibrium conditions, at various temperatures, of the reactions: $Si+2H_2 \rightleftarrows SiH_4$ and Si (solid)$\rightleftarrows$Si (gas), leads to the conclusion that the formation of silicon hydride plays little or no part in the reaction. If hydrogen is passed through a quartz tube 1 cm. in diameter, which is heated to about 1300° C., and the escaping gas is quickly cooled by passing it through a water-cooled quartz capillary, a brown powder is deposited which gives off hydrogen with potassium hydroxide. As the cooling is not instantaneous, a considerable quantity of quartz is found in the deposit, produced by the reversal of the action, $SiO_2+2H_2 \rightleftarrows Si+2H_2O$. If no rapid cooling is attempted the cooler ends of the heated tube become filled with deposits of quartz wool. No silicon hydride can be detected in the escaping gases, and if nitrogen is used instead of hydrogen no sublimation of quartz takes place at all, even at much higher temperatures. It is probable that the reducing action of hydrogen is responsible for the apparent sublimation of quartz at comparatively low temperatures in blast-furnaces, volcanoes, etc. It is also concluded from the figures obtained that the silicon vapour is not monatomic, a view which is supported by the fact that silicon contracts on melting. A. Coehn in the discussion stated that in ultraviolet radiation quartz is reduced by hydrogen in the presence of water vapour at temperatures very little above 100° C.—W. H. P.

Sulphuric acid industry in the United States. U. Wedge. Eighth Int. Cong. Appl. Chem., 1912. Sect. II. Orig. Comm., **2**, 241—248.

The approximate annual consumption of sulphuric acid in the United States is (reckoned as at 50° B.), for the manufacture of phosphatic fertiliser, 2,400,000 tons; for refining petroleum products, 300,000 tons (acid equivalent to about 500,000 tons being actually employed in this industry, taking into account its repeated use); for use in the iron and steel and coke industry, 200,000 tons; for the manufacture of nitrocellulose, nitroglycerin, celluloid, etc., 150,000 tons; and for other purposes, 200,000 tons. Of this acid, 2,665,000 tons were, in 1911, made from pyrites, 275,000 tons from copper sulphide ores smelted in blast-furnaces, 285,000 tons from zinc sulphide ores, and 25,000 tons from brimstone. It is found most economical to erect combined sulphuric acid and fertiliser works adjacent to the agricultural districts where the fertiliser is consumed, such works being especially numerous in the Southern States where cotton is grown. Acid works are similarly located near the oil refineries, and there is said to be a growing tendency for steel companies to manufacture their own acid. Contact processes have been installed wherever nitrocellulose and similar products are manufactured, and about 10 per cent. of the total production of acid is made by one or other of the contact processes. The practice of nodulising cinder from pyrites burners is said to have become general in all localities where there is a market for the nodulised cinder as iron ore.—F. Sodn.

Sulphuric acid; Combination of the contact process with the ordinary lead chamber or tower systems in the manufacture of ——. W. Wilke. Eighth Int. Cong. Appl. Chem., 1912. Sect. II. Orig. Comm., **2**, 249—251

The gases from the pyrites burners are conducted into an iron oxide contact shaft, in which the sulphurous gases undergo conversion into sulphur trioxide, to the extent of about 30 per cent., and thence, by means of a fan, are passed through the Glover tower, to the chambers. The combination of the two processes is said to increase the capacity of the chamber plant by at least 30 per cent. and to allow of more uniform working, besides effecting a saving of 30 per cent. in the nitre consumed, and it was found that the total production of the chamber system could easily be concentrated to 60° B., or higher, in the Glover tower, the acid produced being colourless. The iron oxide also eliminates 95 per cent. of the arsenic carried by the gases, and prevents dust from getting into the chambers.—F. Sodn.

Sodium hypochlorite production; Some factors in the cost of ——. W. H. Walker and R. E. Gegenheimer. Eighth Int. Cong. Appl. Chem., 1912. Sect. Xa. Orig. Comm., **21**, 127—138.

The cost of electrolytic bleaching solution as measured by the cost of salt and electrical power consumed, is influenced by a large number of factors, and the maintenance of one particular condition may from different points of view influence the cost in opposite ways. General consideration of the effect of varying the initial concentration of the salt solution, the rate of flow of the solution through the apparatus and the amount of available chlorine per gallon, shows that the use of a large quantity of salt will produce economy in electric power and *vice versa*. The question arises as to the adjustment of the consumption of salt and power under varying conditions as to the price of both. The authors have made experiments in a continuous flow apparatus with twenty-four compartments separated by bipolar electrodes of graphite. Using 5 and 10 per cent. brines they have conducted tests with varying rates of flow, taking samples for analysis from various compartments when the apparatus had reached a condition of equilibrium. After analysing the samples it was found that the cost in power per lb. of available chlorine increased gradually from the beginning to the end of the series, while the cost in salt decreased gradually. A minimum value for combined cost was found at one of the compartments, say the twelfth. This meant that the particular rate of flow in this experiment should be doubled so as to get the same minimum combined cost per lb. of available chlorine at the end of the apparatus, for the particular strength of brine taken. Taking $R = \frac{\text{cost of power per kilowatt hour}}{\text{cost of salt per lb.}}$ the authors give two series of curves for 5 and 10 per cent. brines and for values of R from 2 to 20 in each case, showing the relation between rate of flow and cost per lb. of available chlorine. From these curves the optimum rate of flow can be read for either brine under varying conditions of cost for power and salt. A third chart shows (*a*) the minimum combined cost in its relation to R, and (*b*) the optimum rate of flow in its relation to R, in both cases for 5 and 10 per cent. brines. The 5 per cent. and 10 per cent. curves in (*a*) cross at about $R=4$, indicating that where the cost of 1 kilowatt-hour of power is less than four times that of 1 lb. of salt, it is cheaper to use a 5 per cent. brine and *vice versa*. If the cost of power is very great in relation to that of salt, it may be necessary to modify the apparatus so as to allow of more rapid flow. It must also be noted that in using more concentrated brine, when $R > 4$, the current density will be higher and cost for renewal of electrodes greater.—W. H. P.

Silicates of sodium. A. Vesterberg. Eighth Int. Cong. Appl. Chem., 1912. Sect. II. Orig. Comm., **2**, 235—239.

A mixture of 1 volume of ordinary water-glass solution, 1 vol. of water, 2 vols. of sodium hydroxide solution (sp. gr. 1·26), and 2 vols. of alcohol separates into two layers, of which the lower forms, after a time, an almost solid mass of crystals of the salt, $Na_2SiO_3,9H_2O$. The same salt may be prepared by mixing 1 vol. of water-glass with 1 vol. of water and 2 vols. of sodium hydroxide solution (1·26), when the whole will solidify after a few hours, if a little of the solid salt be added. The salt, which melts at about 48° C., may be recrystallised from sodium hydroxide solution of the above strength. By drying over 50 per cent. potassium hydroxide solution, water is slowly lost until the hydrate, $Na_2SiO_3.3H_2O$, is obtained, and this gradually takes up water when exposed over sodium hydroxide solution (sp. gr. 1·26), with the probable formation of the hydrate, $Na_2SiO_3,6H_2O$. The anhydrous salt is obtained only by strong heating, and it is noted that the molten metasilicate, at the moment of solidification, gives off a quantity of gas, so that the solidified salt is more or less porous.—F. Sodn.

Radium-barium salts; Fractional adsorption of —— and the fractional electrodialysis of the obtained adsorption compounds. E. Ebler. Eighth Int. Cong. Appl. Chem., 1912. Sect. II. Orig. Comm., **2**, 91—93.

All colloids do not resemble silicic acid in selective adsorptive power towards radium salts (this J., 1911, 1210, 1380), this property being exhibited by the various colloids in very different degrees, and the adsorption is also found to depend on the nature of the radium salt concerned. Hydrated manganese peroxide is an example of a colloid with a very pronounced power of adsorbing almost all radium salts, and basic ferric carbonate shows a strong adsorptive power towards radium carbonate. Colloids generally may be separated from adsorbed radio-active substances by dialysis, which is best aided by electrolysis, and by fractional dialysis a further fractionation of the adsorbed material may be effected. In the case of the manganese dioxide-radium-barium adsorption compound and the silicic acid gel-radium-barium adsorption compound, it is not necessary to bring the colloid into the sol state before dialysis.—F. Sodn.

Reduction of some metallic chlorides by sodium. Hunter. *See* X.

Patents.

Exothermic gas reactions; Process of effecting ——. [*Production of sulphur trioxide.*] G. Eschellmann and A. Harmuth, St. Petersburg, Assignors to General Chemical Co., New York. U.S. Pat. 1,036,473, Aug. 20, 1912.

The process, which refers specially to the production of sulphur trioxide from sulphur dioxide and oxygen, consists in passing a current containing the reacting gases first into contact with a body of catalytic material and then, preferably at a higher velocity and without cooling, diluting, or removing the reaction products, into contact with another body of catalytic material. For example, the gases may be passed successively through a thin wide layer and a narrower thicker layer of the catalyst.—F. Sodn.

Aluminium nitride; Process for the manufacture of ——. Soc. Générale des Nitrures, Paris. Eng. Pat. 8348, April 6, 1912. Under Int. Conv., Dec. 9, 1911.

A mixture of carbon and an aluminous substance, such as bauxite, kaolin, or the like, is heated in a current of nitrogen containing free or "nascent" hydrogen, with the production of aluminium nitride greatly exceeding the yield that would be obtained in the absence of hydrogen. A suitable way of generating the "nascent" hydrogen at the temperature of the reaction (1400°—1500° C.) is provided by the addition of a hydrocarbon or of hydrogen sulphide to the nitrogen which is used for the reaction. —O. R.

Aluminium nitride; Process for the manufacture of ——. Soc. Gén. des Nitrures, Paris. Eng. Pat. 8349, April 6, 1912. Under Int. Conv. Jan. 10, 1912.

Aluminium nitride is produced by heating a mixture of alumina and carbon, to which catalytic substances, such as metallic oxides, hydroxides and carbonates, or metals, are added, in a current of nitrogen to which varying proportions of free or nascent hydrogen are added. —W. C. H.

Compounds of aluminium, carbon, and nitrogen; Producing ——. S. Peacock, Chicago, Ill., Assignor to E. I. du Pont de Nemours Powder Co. U.S. Pat. 1,035,727, Aug. 13, 1912.

The nitride, having the formula $Al_2C_3N_6$, is produced by mixing finely-divided alumina and carbon, the latter being in excess of that required to produce the nitride, and subjecting the mixture, under a pressure less than 500 mm. of mercury in an atmosphere of nitrogen, to the temperature necessary to produce the nitride.—B. N.

Alumina and potash from felspar; Extracting ——. S. Peacock, Assignor to American Acid Co., Baltimore, Md. U.S. Pat. 1,035,812, Aug. 13, 1912.

A mixture of felspar and calcium carbonate is prepared, containing one and not more than two chemical equivalents of lime to each equivalent of silica contained in the felspar, in order to form at a later stage an insoluble calcium silicate. The mixture is suitably heated to a temperature sufficient to destroy the crystalline structure of the felspar, and to volatilise all the potash present whilst liberating the carbon dioxide, the potash thus separated being recovered in a suitable manner. Sufficient alkali is added to the charge to provide one equivalent of potash for each equivalent of alumina, the mass being then boiled with water to render the alumina soluble and the silica insoluble, and the major portion of the potash is separated from the soluble alumina. Amorphous silica is added to the aluminate in the proportion to form a mixture containing one equivalent of silica to each equivalent of alkali remaining in the alumina, and finally the alumina is suitably separated from the potash and silica.—B. N.

(1) *Aluminium fluoride and* (2) *alumina; Processes of producing* ——. D. H. Childs, Alfred, N.Y. U.S. Pats. 1,036,453 and 1,036,454, Aug. 20, 1912.

(1) Hydrogen fluoride or other suitable volatile compound of fluorine is made to pass through a mass of a compound of aluminium, which is kept moist by a constant supply of water, so that, the gas being absorbed by the water and the solution attacking the aluminium compound, forming aluminium fluoride which dissolves, the water is left free to dissolve more gas, and a further attack of the aluminium compound is brought about, until complete separation of the aluminium is effected. (2) A substance containing aluminium silicate is heated with aluminium fluoride (with or without water) to a temperature at which a volatile compound of silicon and fluorine is formed, without fusion of the silica, so that aluminium oxide is left as a solid residue. Kaolin, for example, is heated with about twice its weight of aluminium fluoride to 1600°—1800° F. (871°—982° C.)—F. Sodn.

Salt; Method of removing —— *from evaporators.* S. M. Lillie, Philadelphia, Pa. U.S. Pat. 1,036,127, Aug. 20, 1912.

Brine is concentrated in an evaporator, and the concentrated brine, with its suspended salt, is transferred, in a rapid stream, to another vessel, in which a large body of brine is maintained, in such a manner that the suspended salt is deposited in this vessel, from which it is continuously removed. The brine is preferably circulated in the evaporator and made to pass through a body of sufficiently quiescent brine therein, so that a preliminary deposition occurs in this vessel; the deposited salt is then transferred in a current of brine to the second vessel, from which the brine is returned to the evaporator, after deposition of the suspended salt, together with fresh brine which has been utilised in washing the deposited salt in process of removal.—F. Sodn.

Detergents [*washing soda*]; *Manufacture of* ——. W. R. Ormandy and J. W. Spensley, Manchester. U.S. Pat. 1,036,316, Aug. 20, 1912.

A mixture of sodium carbonate, in the form of crystals of varying degrees of hydration, and sodium silicate, is heated to a temperature just below that at which the decahydrated carbonate begins to form when a solution containing silicate and carbonate is cooled from a higher temperature, *i.e.*, the mixture is heated until it just begins to soften, but does not actually liquefy. It is maintained at this temperature, with constant stirring, whereby a transfer of water of crystallisation from the more highly hydrated to the less highly hydrated carbonate takes place, and a mixture is produced containing the carbonate with approximately uniform amounts, *e.g.*, five to seven molecules, of water of crystallisation. For practical purposes the mixture is stable, and will not tend to cake.—B. N.

Ammonia; Process for obtaining —— *from cyanides derived from coal-gas purifiers.* H. Burgevin. Fr. Pat. 440,331, May 1, 1911.

The cyanide compounds mentioned in the title are intimately mixed with slaked lime or with quicklime, according as the products are solid or liquid, and are distilled in retorts at a red heat, with the liberation of 95 per cent. of their contained nitrogen in the form of ammonia.—O. R.

Halogens [*bromine*]; *Method of making* ——. C. W. Jones and A. E. Schaefer, Assignors to The Dow Chemical Co., Midland, Mich. U.S. Pat. 1,036,121, Aug. 20, 1912.

The halide of a metal belonging to the iron group (iron bromide, for instance) is treated with a "tri-oxygen haloid" salt, in aqueous solution, without the addition of an acid.—F. Sodn.

Atmosphere; Process and apparatus for the direct separation in a pure state of the constituents of the ——. G. F. Jaubert. Fr. Pat. 440,702, May 9, 1911.

In a refrigerating apparatus liquid air is cooled below the boiling point of nitrogen, and is introduced at that temperature into a rectifying column, with the object of obtaining on the one hand complete liquefaction of the oxygen and nitrogen, with simultaneous separation of the lighter portions of the rare gases, and on the other hand complete separation of pure nitrogen and pure oxygen in the rectifying column. The apparatus comprises an interchanger, in which the air to be liquefied circulates in counter current to the cold oxygen and nitrogen issuing from the final stage of the process. From this interchanger the air proceeds through a bath of liquid oxygen contained at the foot of a rectifying column, from which it passes into a second interchanger, which it traverses in counter current to cooling gases from a later cycle, to fall completely liquefied into a container at the bottom of the apparatus. Here the lighter rare gases are eliminated through worms contained in the second interchanger, and an expander transfers the mixture of liquid nitrogen and liquid oxygen into the rectifying column, from which pure oxygen escapes at the base and pure nitrogen at the top, by way of worms, which supply the refrigerating currents of the first interchanger. The elements of the rectifying column consist of superimposed concave and convex surfaces, which are in contact at their edges with the rectifying cylinder, and which are finely perforated, so as to force the gaseous currents to ascend in counter current to the descending liquids to be rectified.—O. R.

Hydrogen; Process for the manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 440,780, Feb. 29, 1912. Under Int. Conv., June 26, 1911.

In the preparation of hydrogen by the alternate action of steam on iron and of reducing gases on ferric oxide, the iron soon loses its activity owing to fritting, etc. As remedies are claimed: The use of fused iron oxides, especially in conjunction with refractory and difficultly reducible oxides, such as magnesia, zirconia, or the like, the iron oxides being prepared by the fusion of metallic iron in the presence of air or an oxidising agent; the use of fused iron oxides in conjunction with a silicate; and the use of a similar, naturally occurring mineral, such as magnetite.—O. R.

Copper liquors; Treatment of ——. J. H. Thwaites, Peterborough. Eng. Pat. 26,320, Nov. 24, 1911. Addition to Eng. Pat. 9174, April 13, 1911.

See Fr. Pat. 437,686 of 1911; this J., 1912, 489.—T. F. B.

Alkaline and earthy alkaline nitrates; Process of manufacturing ——. P. A. Guye and G. Darier, Geneva, Switzerland, and A. van Vloten, Haarlem, Holland. U.S. Pats. 1,036,611 and 1,036,833, Aug. 27, 1912.

See Fr. Pat. 415,143 of 1909; this J., 1910, 1306.—T. F. B.

Hydrosulphites; Method for the production of anhydrous ——. E. von Portheim, Prague, Austria-Hungary. U.S. Pat. 1,036,705, Aug. 27, 1912.

See Eng. Pat. 25,872 of 1910; this J., 1911, 422.—T. F. B.

Alkali-metal cyanides; Process of manufacturing ——. J. A. Kendall, Streatham, Assignor to J. W. Swan, Overhill. U.S. Pat. 1,037,019, Aug. 27, 1912.

See Eng. Pat. 26,258 of 1909; this J., 1910, 1454.—T. F. B.

Nitrogen compounds; Process of manufacturing ——. A. Schweitzer and F. Hauff, Stuttgart, Germany. U.S. Pat. 1,037,061, Aug. 27, 1912.

See Fr. Pat. 439,872 of 1912; this J., 1912, 721.—T. F. B.

Iodine solution. J. Wemer, New York. Reissue No. 13,462, Aug. 27, 1912, of U.S. Pat. 1,013,913, Jan. 9, 1912.

See this J., 1912, 204.—T. F. B.

Nitrogen from the air; Process of obtaining substantially pure ——. C. Blagburn, Antioch, Cal. U.S. Pat. 1,036,788, Aug. 27, 1912.

See Eng. Pat. 25,535 of 1908; this J., 1909, 794.—T. F. B.

VIII.—GLASS; CERAMICS.

Stoneware manufacture, with special reference to Westerwald ware. E. Berdel. Sprechsaal, 1912, **45**, 449—451, 464—466, 479—481, 496—499, 514—515, 528—530, 543—545.

Stoneware is defined as including all pottery which is close and not white and transparent. The non-porosity must be due to the body and not to the glaze with which it may be covered. Stoneware clay falls within the limits of composition: SiO_2 60—75, Al_2O_3 18—30, FeO 1—5, R_2O 1·5—4, MgO 0·2—2, CaO 0—3 per cent. To the clay are added, according to need, thinning materials and fluxes. The best agents for thinning are flint or quartz and "rough stuff," but Westerwald clays are available containing only 20—25 per cent. of clay-substance. Fluxes are fluorspar, felspar, pegmatite, Cornish stone, granite, eruptive rocks such as phonolite, and marls. The average composition of the Westerwald mixing is: clay 50, quartz 45, felspar 5. For casting 0·1—0·2 per cent. of sodium carbonate is added and the mixing milled for 4—8 hours. Stoneware may be divided into three kinds: saltglazed ware burnt at cones 2—8, glazed ware burnt at cones 2—6, and glazed ware burnt at cones 8—10. The greater part of Westerwald ware comes under the first two classes. For the improved action of salt, a dipped underglaze is recommended. A mixture of loam with red lead, pyrolusite or borax serves the purpose. For the second class, ware burnt at cones 2—8, various recipes of the normal type are given. A matt glaze has the composition: 0·06 K_2O, 0·26 MgO. 0·68 CaO, 0·45 Al_2O_3, 2·8 SiO_2. The third clasa includes this mixture for casting: Goldhaus clay 30, quartz 42, felspar 28, sodium carbonate 0·15 per cent. Glazes for ware burnt above cone 8 are based on Seger cone 4. Two types are: (a) 0·2 K_2O, 0·12 MgO, 0·68 CaO, 0·4 Al_2O_3, 3·5 SiO_2; (b) 0·2 K_2O, 0·2 BaO, 0·6 CaO, 0·4 Al_2O_3, 3·5 SiO_2. An engobe for this temperature is: kaolin 36, quartz 36, felspar 28. Crystalline glazes may be obtained by adding rutile to the glaze: 0·35 Na_2O, 0·25 K_2O, 0·4 CaO, 0·1 Al_2O_3, 3·5 SiO_2, 0·2B_2O_3.—H. H. S.

Patents.

Glass; Furnaces for use in drawing ——. W. W. Pilkington, Prescot, Lancs. Eng. Pat. 18,289, Aug. 12, 1911.

In order to prevent or retard the accumulation of dirt in the gas passages of furnaces designed for heating pots from which glass is drawn, the gas passages are arranged in one or more pairs, and each gas passage of each pair is used in turn to supply gas to the furnace, while the other passage of the pair is disconnected from the gas supply and allowed to remain idle. The walls of the gas passages are heated by conduction from the gas outlet passage or passages, which are built close to the gas supply passages. (Cf. Eng. Pat. 9244 of 1911; this J., 1912, 490).—W. C. H.

Sheet-glass; Method and apparatus for drawing ——. J. Player, River Forest, Ill. U.S. Pat. 1,032,239, July 9, 1912.

A sheet of glass is drawn in an upward direction from a mass of molten glass by the application of power, and the sheet is then turned downwards. The drawing operation is continued until the weight of the downward-turned portion is sufficient to continue the draught on the sheet by the action of gravity, whereupon the application of power is discontinued.—O. R.

Kilns [for bricks and pottery]. F. D. Shaw, Athens, Ga., U.S.A. Eng. Pat. 17,066, July 25, 1911.

The claim is for a tunnel kiln, open at each end, through which the bricks or other articles to be burned are carried on trucks. The tunnel is divided into four compartments, of which the first serves as a drying chamber and has a metallic roof over which water is sprayed to condense the water vapour given off. The second portion serves as a preheator, the third as the kiln proper or firing chamber, and the last as a cooling chamber. Several stacks are provided so that with the aid of dampers the temperatures in the various portions of the kiln can be maintained at any desired point. The fuel is burned in external combustion chambers and only the hot gases are allowed to act upon the bricks being burned.—W. H. C.

Refractory article and method of making it. S. F. Hall, Niagara Falls, N.Y., Assignor to Norton Co., Worcester, Mass. U.S. Pat. 1,030,999, July 2, 1912.

Articles of refractory oxides, especially alumina, are made by fusing the material in an electric furnace, dipping into the molten mass a mould having an internal surface of graphite corresponding with the external surface of the desired article, withdrawing the mould together with the adhering layer of solidified material, and separating the article from the mould, after which the article is treated under oxidising conditions.—O. R.

Clay, etc.; Process of purifying ——. H. Gruber, Leipzig-Plagwitz, Assignor to F. Schulz, jun., Akt.-Ges., Leipzig, Germany. U.S. Pat. 1,036,831, Aug. 27, 1912.

See Fr. Pat. 432,866 of 1911; this J., 1912, 130.—T. F. B.

IX.—BUILDING MATERIALS.

Portland cement kept in air [after setting]; The boiling test and the constancy of volume of ——. F. Schüle. Tonind.-Zeit., 1912, 36, 1416—1417.

Under the supervision of Tetmajer of Zürich, slabs made from the same cements were subjected on the one hand to the boiling water test at 100° C., and on the other hand to the action of the atmosphere ("dry storage") for a number of years. Of the cements, which did not pass the boiling test satisfactorily, that is either cracked or fell to pieces, a large percentage showed the same defects after being kept in the atmosphere for varying periods up to 16 years; conversely, only a very small percentage of the cements, which passed the boiling test, developed any defects in the atmosphere. The conclusion is drawn that the boiling test may be relied on to determine the suitability or the reverse of a cement for constructions which are to be exposed to dry air; where cement is to be exposed to the action of water or damp air, the boiling test appears to be of minor importance.—O. R.

Portland cement and magnesium salts. O. Kallauner. Tonind.-Zeit., 1912, 36, 1377—1379.

An investigation of the influence exerted by solutions of various magnesium salts on the soundness and strength of gauged cement, and also on the chemical action of such solutions, has shown that all soluble magnesium salts destroy Portland cement. Cement which had been re-ground 24 hours after gauging and was then kept for four months in magnesium salt solutions was found to undergo very appreciable chemical change, small quantities of silicic acid (as such), and also sulphuric acid (as calcium sulphate) and lime (chiefly as the calcium salt corresponding to the magnesium salt chosen) going into solution, the last even to the extent of 70 per cent. of that originally present in the cement. The chloride, nitrate, and thiosulphate were found to have the most marked effect, the sulphate and sulphite being less active, which is explained by supposing that, in the latter case, the sparingly soluble calcium salt, which is formed by the action of calcium hydroxide (liberated by hydrolysis) on the magnesium salt present, assists the magnesium hydroxide, similarly produced, in filling the pores of the cement and so protecting it from further action. The tests for soundness were made by immersing pats in the magnesium solution, 24 hours after gauging, and, in this case, the salts giving rise to insoluble or sparingly soluble calcium salts were found to cause disintegration, by reason of these salts crystallising with expansion; the other salts affected the pats only at the surface. Tensile and compression tests, carried out on the cement gauged with 3 parts of normal sand and 8 per cent. of water (the test pieces being placed in the solution after 24 hours), showed the most marked effect with salts (chloride and nitrate) giving readily soluble calcium salts. The results of the experiments are given in tabular form.—F. Sodn.

Cement; Swelling of ——. P. Rohland. Z. Chem. Ind. Kolloide, 1912, 11, 83—84.

If cement and water, both at 17° C., be stirred together, there is first an increase of volume of the cement owing to the absorption of water by the colloidal constituents of the latter, and at the same time there is a slight fall of temperature. As the cement sets, however, the volume slowly and continuously decreases, whilst the temperature rises with considerable rapidity to a point depending upon the nature of the cement, *i.e.*, higher with quick-setting than with slow-setting cements. The sudden rise of temperature is due to the coagulation of the colloidal constituents of the cement, which is accompanied by expulsion of water and diminution of volume. By the time setting is complete, a not inconsiderable diminution of volume has taken place and this should always be taken into consideration when concrete or reinforced concrete is used.—A. S.

Creosote found in two treated piles after long service; Quantity and quality of ——. E. Bateman. U.S. Dept. Agric., Forest Service Circular 199, May 22, 1912.

This paper gives an account of the examination of two piles of pine which had been in the teredo-infested waters of the Gulf of Mexico for 30 years. One pile was sound, but the other was much attacked, especially at the water line. Photographs of sections are given. The quantity of creosote found in the treated portion of each pile was from about 15 to 17 lb. per cb. ft., except in the portion of the sound pile above water, which had evidently lost much of its original creosote. On examining the creosote extracted from the piles by chloroform, almost no light oils, b. pt. up to 205° C., were found, so that if present originally they had been lost by evaporation and leaching. There were 40 per cent. of naphthalene oils in the creosote from the sound pile, but none in the unsound pile. The characters of the fractions indicated that probably coal-tar creosote had been used for the sound pile and water gas-tar creosote for the unsound pile. The chief change in the composition of the creosote by exposure was the loss of the fraction distilling below 225° C. in the portion of the pile in the water, and the loss of the fraction distilling below 245° C. in the portion of the pile above the water.
—J. H. J.

Wood-preserving oils; Antiseptic tests of ——. A. L. Dean and C. R. Downs. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa., Orig. Comm., 13, 103—110.

From the results of the authors' experiments with *Polystictus versicolor*, the commonest of the wood-rotting fungi, it is evident that coal tar creosote is a stronger antiseptic than water-gas tar creosote, and that the latter is distinctly more effective than the liquid oil of the anthracene fraction of coal tar. The greater value of the coal-tar oil appears to depend upon the presence of the tar acids and especially on the tar bases. Water-gas tar creosote was found to be almost identical in antiseptic power with the coal-tar oil with its tar acids removed. Alleman has shown that the oils remaining in wood treated with coal tar creosote are almost free from tar acids after a few years of service, and that under conditions allowing evaporation, the lighter hydrocarbons are nearly all lost. Loss of antiseptic power from the disappearance of the tar acids cannot take place with water-gas tar oils, since they are free from phenols in the beginning. Since the amount of creosote injected into wood is commonly 10 lb. or more per cub. ft., the difference in antiseptic power between coal-tar oils and water-gas tar oils does not appear to be of much significance, particularly as the tar acids tend to disappear from the wood treated with coal tar oil. In the authors' view water-gas tar creosote has a distinct value for the preservation of wood.—J. F. B.

Wood preservatives; Tests to determine the commercial value of ——. H. F. Weiss. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 279—300.

The depth to which timber can be impregnated with oils varies as some inverse function of their viscosity. It is therefore concluded that to secure the best results, both the wood and the preservative should be heated to the proper temperature during the pressure period. Owing to the low thermal conductivity of wood, the treatments should not be made too rapidly. With saline preservatives soluble in water, these precautions are not important. With coal tar creosote it appears that the fractions of greatest stability are the least toxic. Present practice rather favours the retention in treated wood of the more volatile fractions by an admixture of the more stable ones. The quantity of preservative commonly employed is many times greater than the quantity indicated by toxicity tests as necessary to prevent decay. More economical results should be secured by diffusing the preservative more thoroughly through the wood than by saturating the outer fibres and attempting to retain the volatile constituents in the wood by the admixture of non-volatile substances. In general the flash point of an oil affects the inflammability of the wood treated with it. Of greater importance, however, is the length of time the treated wood has been seasoned, as the prolonged seasoning of such wood considerably raises its ignition temperature; treated timber should therefore first be seasoned before it is placed in positions subject to fire. Wood treated with saline preservatives was generally found to be more easily ignited than untreated wood, nevertheless the presence of such preservatives almost invariably renders the wood slow-burning and easily extinguishable. Of the various preservatives tested, coal tar creosote and "copperised oil" had the least deleterious effect on steel, and their action in practical operations can probably be neglected. All the metallic salts (zinc salts, sodium fluoride, etc.) were much more pronounced in their action, whilst certain wood tars were highly corrosive owing to the presence of acetic acid.—J. F. B.

Patents.

Timber; The seasoning or hardening of ——. W. Powell, London. Eng. Pat. 18,041, Aug. 9, 1911.

The timber is immersed in a saccharine solution at about 140° F. (60° C), and after some time the temperature of the solution is raised and maintained at approximately the boiling point. The liquid is then cooled to about 140° F. (60° C.) and the timber removed and allowed to dry either naturally or in a drying chamber. In the latter case, the air in the chamber initially contains about 80 per cent. of moisture, and this amount is gradually reduced to about 20 per cent. after the temperature of the chamber has been raised. When the saccharine solution has been maintained at the boiling point for a sufficiently long time, it may be cooled by the introduction of cold saccharine solution, which is thus heated ready for treating the next batch of timber. —W. C. H.

[Wood] blocks; Process of manufacturing artificial ——. M. P. Andrews, Petersburg, Va. U.S. Pat. 1,031,505, July 2, 1912.

Wood fibre is successively treated with dry steam, dry steam containing creosote vapour, and with a viscous, liquid binding material maintained at a high temperature by means of steam, after which it is moulded to the desired shape.—O. R.

Cement, lime, and the like; Methods of and means for conveying, forcing or mixing semi-fluid mixtures such as ——. J. von Vass, Dresden, Germany. Eng. Pat. 1548, Jan. 19, 1912. Under Int. Conv., March 21, 1911. Addition to Eng. Pat. 142 of 1912 (this J., 1912, 776).

Semi-fluid mixtures such as cement, lime, etc., which are to be sprayed against a working surface, are forced from the containing vessel, by air pressure, through a flexible tube or hose, and a separate additional air pressure is also applied at the mixing nozzle, situated at an intermediate point in the length of the hose. Various binding or filling agents may be introduced, either by means of separate flexible tubes or by mixing them with the compressed air, and mixed with the material delivered to the mixing nozzle.—W. C. H.

Concrete; Method of making —— *impervious to liquids.* Nederlandsche Betonyzerbouw A. G., Amsterdam, and J. Mijs, Bussum, Holland. Eng. Pat. 16,157, July 10, 1912.

A solution prepared by dissolving 1 part of gelatin size in 4 parts of water and adding one-tenth part of glycerin is applied, whilst warm, to the surface of the concrete; when dry, this coating is treated with formaldehyde. It is claimed that by this means porous concrete is rendered impervious to oil and other liquids.—W. E. F. P.

[Concrete] waterproofing compound. U.S. Pat. 1,031,003. *See* XIII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Pig-iron; Vanadium in ——. P. W. Shimer. Trans. Amer. Inst. Min. Eng., 1912, 883—886.

The iron ore mixtures smelted in the Lehigh Valley (U.S.A.) district contain varying amounts of New Jersey magnetite in which vanadium and titanium commonly occur to the extent of 0·05 and 0·60 per cent. respectively. The pig-iron produced, which generally contains 0·02—0·05 per cent. of vanadium and 0·10—0·20 of titanium, is fine-grained and soft and possesses unusual strength, these qualities being ascribed to the influence of the former element, although the latter probably has a similar action. It was found that practically the whole of the vanadium and titanium contained in such pig-iron is insoluble in dilute hydrochloric acid, indicating that these elements are present in combined form, probably as carbides; even in a steel containing 0·143 per cent. of vanadium, about one-half of the latter was found to be present in an unalloyed condition. In explanation of the beneficial effect of vanadium and titanium upon pig-iron, it is suggested that, in addition to eliminating nitrogen and oxygen, these elements modify the structure of the metal by separating out first in finely-divided form (probably as carbides) during the solidification and thus providing uniformly-distributed nuclei around which the iron rapidly crystallises. Various iron ores from other districts were found to contain from 0·006 to 0·023 per cent. of vanadium, and it is stated that the latter sometimes occurs in limestone and in the ash of coke. By remelting in a cupola, the vanadium content of a charge of cast-iron was reduced from 0·0313 to 0·027 per cent.—W. E. F. P.

Steel; Determination of carbon in ——. A. G. Levy. Analyst, 1912, **37**, 392—395.

It is stated that the direct combustion method for determining carbon in steel gives slightly high results in comparison with those obtained by solution methods. The differences appear to be due possibly to the presence of carbonaceous gases dissolved in the metal, the carbon-content of these gases being included in the results obtained by direct combustion. Various workers have found that steel and iron contain appreciable quantities of such gases, and from their results, the author shows that the carbon-content of the metal, as found by direct combustion, may be 0·03 per cent. too high or even more. Since iron and steel also contain small quantities of hydrogen, it is evident that a drying tube should be interposed between the combustion tube and potash bulbs, a precaution which is sometimes liable to be omitted.—L. E.

Cyaniding of concentrate; Notes on the ——. R. Linton. J. Chem. Met., and Min. Soc., S. Africa, 1912, **13**, 14—15.

The metallurgical features are given of a series of tests recently made on the cyaniding of a concentrate having the following composition: insoluble, 41; iron, 26·5; copper, 1·3; zinc, 1·2; manganese dioxide, 0·41; alumina, 1·4; lime, 1·75; magnesia, 0·47; arsenic, 0·03; sulphur, 18·2; silver, 4·29; and gold, 0·06 per cent. The silver was present as sulphide, and also carried the gold. The concentrate was ground to pass a 200-mesh screen and the tests run in a model Pachuca tank. During the tests the alkalinity of the solution increased though no lime was added after the commencement. After 32 hours, the alkalinity had increased from 0·1 to 0·358 per cent., the cyanide consumption being about 55 lb. per ton. This is attributed to the following reactions:

$$(1)\ FeS+6KCN=K_4Fe(CN)_6+K_2S;$$
$$(2)\ K_2S+KCN+O+H_2O=KCNS+2KOH.$$

Lead acetate in quantities less than 1 per cent. had little or no effect; over 1 per cent., the alkalinity disappeared gradually, the cyanide consumption increasing greatly. Tests were run with varying amounts of cyanide and alkalinity, and with and without lead acetate. It would seem that the best treatment is to grind in a solution containing about 0·2 per cent. of potassium cyanide, and agitate in a 0·6 per cent. cyanide solution, increasing the strength to 0·8 per cent. towards the end. High protective alkalinity is of little use: 0·1 to 0·15 per cent. suffices. A small amount of lead acetate keeps the solutions clear, but does not prevent destruction of cyanide.
—R. W. N.

Copper; Electrolytic determination of —— in pyrites. W. D. Treadwell. Chem.-Zeit., 1912, **36**, 961.

Three to four grms. of the pyrites are decomposed with *aqua regia*, and the solution, without filtering, is diluted to about 150 c.c. Ammonia is added until a cloud is produced, then 12 grms. of Rochelle salt to keep the iron in solution, 5 grms. of ammonium sulphate, and 20 c.c. of strong ammonia. The solution is then electrolysed with a current at about 2 volts. With a rotating gauze-cathode, 0·5 grm. of copper is deposited in about one hour. The iron may first be reduced with hydrazine sulphate or sodium bisulphite, when 0·5 grm. of copper may be deposited in half an hour. If the deposition of the copper may be carried out overnight, a lead accumulator, connected directly with the electrodes, will serve. The solution should then be lukewarm, and not more than 0·3 grm. of copper be deposited. The copper always contains iron, and lead also, if this be present in the pyrites, and the deposit must be dissolved in nitric acid and subjected to electrolysis a second time. The presence of lead is indicated by a darkening of the anode. When arsenic is present, the iron must not be reduced by chemical means, as it would then also be reduced and deposited with the copper.—T. St.

Brassfounding; Attempts to diminish loss of metal in ——. F. Bensel. Metallurgie, 1912, **9**, 523—531.

Direct addition of zinc to melted copper in a crucible heated electrically produced hardly any alloy, the zinc volatilising and oxidising. Several attempts to substitute for the zinc an equivalent quantity of blende, the copper being in sufficient excess to form cuprous sulphide with the sulphur of the blende, and sodium sulphide being used as a flux, were also unsuccessful; the brass produced never contained more than about 12 per cent. of zinc, and great quantities both of copper and zinc were lost in the slags. Sodium and calcium carbonates used to flux the blende were also unavailing. Finally, the metals were melted together in a closed egg-shaped furnace through the centre of which passed carbon electrodes joined by a rod of resistance-carbon. The furnace could be rotated so as to agitate and mix the metals, and had a covered opening through which the alloy could be poured. There was practically no loss of zinc, and the resulting brass was almost exactly of the composition (70 : 30) calculated for. The cost of melting a ton of brass was about 6s. 3d. for power (in a furnace taking 50 kilos. at a time) and about 2s. 3d. for resistance carbon. The saving in zinc, as compared with the ordinary process of manufacture, may be taken at 2s. 6d. per ton of brass.—J. T. D.

"*Iron coke.*" [*Coke containing metallic iron*]. A. P. Lidoff. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIa. Orig. Comm., **3**, 111.

By passing the dust from blast-furnaces repeatedly through magnetic separators, a product is obtained rich in ferric oxide. This is mixed with caking coal slack in the proportion of one part of dust to three parts of coal, and heated to a high temperature under pressure. A porous coke is obtained, stated to contain metallic iron regularly distributed through it, and it is suggested that this material may be utilised for electrodes, as a filtering medium, and for decolourising solutions.—A. H. C.

Cupola; Fuel efficiency of the ——. J. J. Porter. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIa. Orig. Comm., **3**, 135—145.

The laws governing and proposals for increasing the fuel economy of the cupola are discussed and the conditions limiting fuel economy are compared with those prevailing in the blast-furnace. The cupola discussed was 5 ft. internal diam., 15 ft. high, with a 9 in. lining. 300 lb. of wood were used for lighting a bed charge of 2000 lb. of coke and 4000 lb. of iron with nineteen subsequent charges of 400 lb. of coke and 4000 lb. of iron. 80 lb. of limestone were used per charge and there was a melting loss of 4 per cent. The top gases averaged 15·1 per cent. of carbon dioxide and 10·0 per cent. of carbon monoxide, with an average temperature of 1600° F. (871° C.). The calculations for the following heat balance in B.T.U. per lb. of iron charged in are given.

Sources of heat.

1. Combustion of fuel	1470·4
2. Oxidation of iron	74·0
3. ,, silicon	31·5
4. ,, manganese	7·4
5. Sensible in coke	1·1
6. ,, iron	7·2
7. ,, limestone	0·3
8. ,, blast	12·6
9. Formation of slag	12·0
	1616·5

Heat used and lost.

1a. In molten iron	432·0
2a. ,, slag	44·8
3a. To decompose limestone	15·4
4a. To evaporate moisture	2·1
5a. To heat up lining	80·8
6a. To decompose moisture	38·8
7a. Sensible in gases	424·7
8a. Potential in gases	403·7
9a. Radiation and error	174·2
	1616·5

The great source of wasted heat is here shown to be in the gases escaping at the top; if these losses could be eliminated it should be possible to charge some 22 lb. of iron for each pound of coke and have the gases coming off at the top perfectly cold and free from carbon monoxide, and the iron satisfactorily melted. This is impossible since the temperature of the top gases depends on the amount of heat absorbed by the stock and any increase in the rate of blowing necessary to prevent the formation of carbon monoxide will increase the velocity of the gases and give less opportunity for the absorption of heat by the stock. The relationship between the rate of blowing and the temperature and composition of the top gases is illustrated by a series of curves, and the influence of an increased height of the cupola, a second row of tuyères, hot blast, dry blast, and the Balliot heat recovery cupola are discussed with reference to the fuel economy.
—A. H. C.

Electric steel refining; Function of slag in ——. R. Amberg. Eighth Int. Cong. Appl. Chem., 1912. Sect. Xa. Orig. Comm., **21**, 7—18.

The author deals with the special features and behaviour of electric furnace slags, as distinct from those in the open-hearth furnace. Where cheap power is available and the original charge of pig and scrap is melted down electrically, the higher temperature of the electric furnace is accompanied by a great solubility of ferrous oxide in the molten metal, and therefore by a more energetic oxidation of manganese and non-metallic impurities. In a properly constructed electric furnace the whole of the oxygen required has to be supplied in the form of oxide, which consequently forms a much greater proportion of the charge than in the open-hearth process. Dephosphorisation, which reaches its maximum velocity about the melting point of soft iron, takes place more rapidly in the induction furnace than in the arc furnace, the former having a comparatively colder slag. The most important slag processes, however, are those which belong to the second or deoxidising stage of the process. The arc furnace will admit of slags containing up to 75 per cent. of lime, which are still sufficiently fluid. This lime displaces iron, manganese, nickel, and chromium from combination with silica and alumina in the slag; the oxides thus liberated are reduced by the carbon and join the metal phase, so that the final slag can be brought down to 0·5 per cent. of ferrous oxide. Even silica is sometimes reduced in this way when the slag is very basic and the temperature very high. The large amount of lime in the slag promotes desulphurisation by calcium carbide or silicon, according to the equations: $2CaO+3FeS+CaC_2=3Fe+3CaS+2CO$ or $2FeS+2CaO+Si=2Fe+2CaS+SiO_2$ (see this J., 1909, 208). In the arc furnaces the very high temperature leads to considerable volatilization of slag materials and from this point of view the cooler induction furnace is to be preferred.—W. H. P.

Silver ores containing cobalt, nickel, and arsenic; Sampling and assaying of ——. J. O. Handy. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIa. Orig. Comm., **3**, 89—95.

The following details are given of the sampling and assaying of an ore containing the arsenides of cobalt, nickel, and silver, and also metallic silver. Having been first sampled while being unloaded and a determination made of the moisture, the low-grade ore is passed through a jaw crusher to reduce it to 1½ in. or smaller, and is then divided by shovelling two parts to the storage bin and one to the sampling floor, from which it is again divided, one shovel to bin and one to sample. It is then reduced to ½ in.-size and quartered to not less than 1700 lb. The ore is then crushed again to pass a ¼ in.-screen, turned over twice, quartered to not less than 300 lb., crushed to pass a 10-mesh screen, mixed and quartered to not less than 60 lb., when it is ground to pass a 20-mesh screen and cut down by a Jones sampler to about 4 kilos., which is ground in a pebble mill to pass a 120-mesh screen. The high-grade ore containing over 500 oz. of silver per ton is crushed to 1 in.-size, and alternately shovelled to the storage bin and to the rolls which reduce it to ½ in.-size. The "metallics" on the screen are collected, weighed, melted, and cast into bars which are assayed. The ½ in. ore is coned and quartered to about 2400 lb., crushed to pass a ¼ in.-screen, again coned three times, and quartered to about 400 lb. It is then crushed in rolls to pass a $\frac{1}{10}$ in.-screen, and cut down by a Jones sampler to about 75 lb., again ground to pass a 1/20 in.-screen and reduced to about 5 lb. It is then finely ground, and screened on a 120-mesh screen to give "metallics" and "pulp." The samples are assayed in a gas-fired muffle furnace by the crucible fire assay method, using the following fluxes. 1. Silver flux containing 40 per cent. each of sodium and potassium carbonates and 20 per cent. of borax glass. 2. Litharge. 3. Borax glass for cover. The charge for the crucible contains 0·2 assay ton of pulp, 30 grms. of silver flux, 60 grms. of litharge, and 1 grm. of flour. These are mixed by rolling in a rubber cloth, transferred to the crucible, covered with borax glass, and heated to a medium red-heat for twenty minutes. The door of the muffle is then shut and the crucible heated to a bright yellow for thirty minutes, the contents poured into a conical iron mould, and when cold hammered free from slag. The metal is then cupelled at as low a temperature as possible, using a freely oxidising atmosphere without excessive draught; the temperature and draught control are important factors. The following table gives examples of results obtained by independent assayers:—

Sample.	Silver, oz. per ton.	
	a.	b.
37396	142·46	142·64
37691	54·07	53·79
37252	2521·38	2518·95

—A. H. C.

Copper ores and concentrates; Sulphatising and roasting of ——. U. Wedge. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIa. Orig. Comm., **3**, 151—158.

The principal reactions which enter into the sulphatising of copper ores are stated to be that copper sulphide decomposes into cuprous sulphide and sulphur, and the free sulphur burns to sulphur dioxide at temperatures above 350° C. (662° F.). The cuprous sulphide at furnace temperatures below 500° C. (932° F.) is oxidised as follows: $2Cu_2S+5O_2=2CuO+2CuSO_4$, and at higher temperatures: $Cu_2S+2O_2=2CuO+SO_2$. In roasting to obtain the highest yield of water-soluble copper (copper sulphate), the formation of copper oxide is the chief obstacle to be overcome, and it is shown that ferrous sulphide roasting to ferric sulphate, which decomposes into ferric oxide and sulphur dioxide, assists in the sulphatising of any copper oxide formed. The analyses of the ores and the percentages of copper soluble in water and in acid produced by roasting in a multiple hearth furnace in seven tests are given, and they show a total extraction of over 90 per cent. of the available copper.—A. H. C.

Blue gelatin-copper. W. D. Bancroft and T. R. Briggs. Eighth Int. Cong. Appl. Chem., 1912. Sect. Xb., Orig. Comm., **22**, 7—12.

By the electrolysis of a solution of copper acetate containing gelatin, the cathode (copper or a metal such as nickel, brass, or platinum not capable of decomposing solutions of copper salts) becomes coated with a thin pale brown deposit containing gelatin in addition to copper. If the coated cathode be rinsed in cold water and immersed in a 5 per cent. solution of copper acetate, the deposit undergoes a remarkable series of colour changes, until finally a deep blue colour is produced. The best results are obtained by using a neutral or very slightly acid electrolyte containing 1 or 2 parts of crystallised copper acetate or propionate to 100 parts of water and also from 0·25 to 0·66 per cent. of gelatin; the current density should be between 0·15 and 0·45 amp. per sq. decimetre. The pale brown gelatin-copper deposit is considered to be an irreversible gel of colloidal copper, which, when immersed in copper acetate solution, adsorbs hydrous copper oxide from the latter, the series of successive colour changes observed being caused by the progressive increase of the concentration of adsorbed copper oxide. If the electrolysis be performed at 50°—55° C., a bright red or brick red deposit is produced, which is unaffected by copper acetate solution, whilst a short electrolysis with low current density at 55°—60° C. causes the deposition of a very thin gold-coloured film; these red and gold-coloured films can be successfully lacquered.—A. S.

Aluminium alloys; Influence of pouring temperature on ——. H. W. Gillett. Eighth Int. Cong. Appl. Chem., 1912. Sect. II., Orig. Comm., **2**, 105—112.

Comparative experiments on the tensile strength of castings of aluminium and a series of aluminium alloys, made with a view to ascertaining the effect of the pouring temperature on this property, have shown that, on the average, bars poured hot (at 818·5°—871° C.) are nearly 20 per cent. weaker than bars of the same material poured cold (at 649°—704·5° C.), owing to slower crystallisation in the former case, and it is suggested, therefore, that in all tests of cast aluminium alloys, the pouring temperature should be recorded, as well as the dimensions of the test piece and the composition of the mould, which also affect the rate of crystallisation (that is, the fineness of grain) of the metal. The addition of small amounts of manganese, titanium, iron, or antimony to the alloy containing 8 per cent. of copper (that most used for casting) was found to increase the strength when poured hot, but at the same time to cause brittleness and to decrease the resistance to impact. It is stated that at the most modern [United States] foundries, aluminium castings are now poured at the lowest temperature at which the mould will fill without the production of blow holes. The author finds platinum thermo-couples unsuitable for taking the pouring temperature, owing to "lag," and recommends, for quick readings, the use of base metal couples or "fire rods, of the welded end, rod, and tube type."—F. Sodn.

Alloy with acid-resisting properties. S. W. Parr. Eighth Int. Cong. Appl. Chem., 1912. Sect. II., Orig. Comm., 2, 209—213.

Attempts to prepare an acid-resisting alloy suitable for casting purposes, have resulted in the preparation of a metal composed of nickel 66·6 per cent., chromium 18, copper 8·5, tungsten 3·3, aluminium 2·0, manganese 1·0, titanium 0·2, boron 0·2, and silicon 0·2 per cent. The alloy may be drawn into wire and readily spun, and a calorimeter bomb made from it has shown no sign of corrosion after use in an extended series of heat determinations upon coal, etc.—F. Sodn.

Metallic chlorides; Reduction of some —— by sodium. M. A. Hunter. Eighth Int. Cong. Appl. Chem., 1912. Sect. II., Orig. Comm., 2, 125—138.

Experiments on the reduction of chlorides by means of sodium, in a steel bomb, showed that titanium and beryllium chlorides are readily reduced, a considerable proportion of the metal appearing in the form of beads (if sufficient material be taken), owing to the heat of the reaction. Titanium was prepared thus in a pure state and in good yield. Carbon tetrachloride and carbon bisulphide were reduced with the production of considerable heat and pressure, and most of the liberated carbon was in the amorphous condition (with a little graphite), but a colourless crystalline product, which appeared to possess some of the properties of crystalline carbon, was also observed in microscopic amount; some sodium carbide was produced as a by-product and, with a deficiency of sodium, carbon hexachloride was also formed from carbon tetrachloride. Silicon chloride was reduced with difficulty, and neodymium chloride gave the metal in a finely divided condition not admitting of easy separation. —F. Sodn.

Waste and losses in the production of minerals in the United States. Oil, Paint, and Drug Rep., Sept. 2, 1912. [T.R.]

The director of the United States Bureau of Mines in a statement just issued describes some of the losses sustained in the yearly production of minerals in the United States. During the last year, in producing a billion tons of coal, a quarter of a billion tons of coal were wasted or left underground and a quantity of natural gas, larger than the total output of artificial gas during the same period in all the towns and cities of the United States, was allowed to escape. Many valuable mineral deposits are lying idle, while the products are being imported from other countries. In mining coal in the United States, probably one-third of the bituminous coal and one-half of the anthracite are left in the mine. Fully 80,000,000 tons of anthracite are now being left behind in the mine each year, and, it is estimated that since mining begun in this country fully 2,000,000,000 tons of anthracite and 3,000,000,000 tons of bituminous coal have been left in the ground under conditions which made future recovery highly impossible. Probably not over 11 per cent. of the energy in coal is being effectively utilised. The losses in making coke by the old-fashioned process wasted $40,000,000 in the United States last year. These coke ovens, without taking into account the value of the by-products that were possible, wasted more than 1,000,000 horsepower in the year. Almost inestimable losses of sulphur, arsenic, and bismuth are now taking place in the flue dusts and flue gases. In proportion to output the losses of zinc are probably greater than those of any other metal, and are especially important because there is almost no recovery of zinc from manufactured products and almost no conservation of zinc by accumulation. Besides these losses in the mining and concentration of zinc ores, there are incalculable losses, which undoubtedly exceed the total value of the zinc mined in slags and waste products from other processes. In combined, but unfortunately in relatively insoluble form there are unlimited supplies of potash in the United States, but economical methods of extraction are unknown. The waste of nitrogen is almost inconceivable. Although last year over 406,000,000 tons of bituminous coal was produced, only $3.800,000 worth of the $160,000,000 worth of recoverable nitrogen in the coal was obtained. Of 63,000,000 tons of coal converted into coke in 1910, containing $22,000,000 worth of recoverable nitrogen, only about one-sixth was treated in ovens or retorts which could make that recovery possible. The waste and the utilisation of sulphur are both enormous and depend largely on local conditions. The United States is producing annually about 3,000,000 tons of sulphuric acid of which approximately one half is used in the manufacture of fertilisers. The total amount of sulphur dioxide discharged into the air in the United States would unquestionably suffice to make more than 8,000,000 tons of sulphuric acid per year.

Patents.

Iron; Refining molten pig ——, for steel making and other purposes. T. Twynam, Redcar, Yorks. Eng. Pat. 18,406, Aug. 15, 1911.

The molten iron from the blast-furnace, before passing to the steel furnace, is treated with dry, powdered sodium carbonate (either alone or in admixture with sodium nitrate or finely divided iron oxide) in an intermediate basic-lined vessel provided with a perforated bottom. It is claimed that, by the passage of the charge through the relatively small openings in the latter vessel, intimate contact between the reagents and the molten metal is effected, resulting in the removal from the iron of a large proportion of the silicon and sulphur and in the conversion of part of the graphitic, into combined, carbon. —W. E. F. P.

Iron ore; Treated ——. E. F. Goltra, St. Louis, Mo. U.S. Pat. 1,035,960, Aug. 20, 1912.

Claim is made for a clean, porous furnace-material consisting of calcined and concentrated iron ore free from gangue.—W. E. F. P.

[*Iron*]. *Blast-furnace.* A. J. Moxham, Wilmington, Del. U.S. Pat. 1,036,137, Aug. 20, 1912.

With the object of preventing the escape of iron-ore dust, the upper part of the furnace is provided with several tiers of electromagnets which extend horizontally through the furnace wall, but not beyond the interior surface of the latter. Means being provided whereby the electric current is automatically switched on or off with the blast, the dust accumulated by the magnets during the blowing of the charge is returned to the latter when the blast is shut off. —W. E. F. P.

Steel; Manufacture of ——. W. R. Walker, New York. U.S. Pat. 1,035,280, Aug. 13, 1912.

For the manufacture of steel of uniform quality, the metal obtained by the treatment of iron in basic converters is transferred to a non-acid mixer from which it is conducted to a series of acid electric refining furnaces. From the latter the metal is passed to another mixer in which further purification and the elimination of slag are effected before the material is finally transferred to the casting ladles. —W. E. F. P.

Steel and other metals; Compound for hardening ——. *Case-hardening compound.* P. W. Brennan, Philadelphia, and M. Meehan, Williamstown, Pa. U.S. Pats. 1,036,434 and 1,036,435, Aug. 20, 1912.

A MIXTURE of potassium cyanide and the bicarbonates of sodium and potassium, with or without bone dust.
—W. E. F. P.

(1) *Steel: Process of making* ——. (2), (3), *Metallurgical furnace.* F. B. Lamb, Bettendorf, Assignor to A. B. Frenier, Davenport, Iowa. U.S. Pats. 1,036,498 to 1,036,500, Aug. 20, 1912.

THE purification of iron and the conversion of the product into steel are effected in a single tilting-furnace of the open-hearth, regenerative type, the hearth of which—fired by means of gas or oil—is also provided with adjustable electrodes and communicates with the lower end of a blowing-chamber or converter, the upper end of the latter being open. The transference of the molten charge from the hearth to the converter, and *vice versa*, is effected by tilting the furnace, operative communication being maintained between the hearth and the other parts of the apparatus during and after the movement. In the manufacture of steel, the charge of iron is partly liquefied upon the hearth and the furnace is tilted to allow the molten portion to flow into the blowing chamber without interrupting the melting operation. After the blowing, the metal, now at a considerably higher temperature, is returned to the hearth, thus facilitating the melting of the remainder of the charge. The fusion being completed, the final purification and the conversion of the metal into steel are effected upon the hearth in a non-oxidising atmosphere.—W. E. F. P.

Boron compounds; Reduction of ——. [*Production of ferro-boron.*] F. J. Tone, Niagara Falls, N.Y. U.S. Pat. 1,035,919, Aug. 20, 1912.

AN electric current is passed through a fused bath composed of a boron compound, fluxing material, a reducing agent, and metalliferous material (*e.g.*, calcium borate, carbon, and iron), which is interposed as a resistance-conductor between electrodes, the current being sufficient to reduce the boron compound and metalliferous material, so as to form a boron alloy (such as ferro-boron) which is collected, without reducing the fluxing material.
—F. SODN.

[*Gold and silver*]. *Cyanide solutions; Precipitating apparatus for* ——. D. Bosqui, Monahan, Wash., Assignor to Merrill Metallurgical Co. U.S. Pat. 1,035,941, Aug. 20, 1912.

THE apparatus consists of a receiving vessel for the solution, into which a predetermined quantity of precipitant is automatically fed, the feeding mechanism being actuated by a float within the vessel. Means are also provided for varying the level at which the feeder is operated, and for discharging the mixture after the solution has remained in contact with the precipitant for a given time.
—W. E. F. P.

Zinc; Electro-deposition of ——. E. Ballegeer, Uccle-lez-Brussels, Belgium. Eng. Pat. 11,271, May 11, 1912.

THE article, after being cleaned, is dipped into a bath composed of water (100 litres), a zinc chloride solution of 46° Bé. (40 litres), ammonuim chloride (8 kilos.), sodium chloride ($2\frac{1}{2}$ kilos.), and tartaric acid ($2\frac{1}{2}$ kilos.). An electric current is passed through the cold bath, using a pure zinc plate as anode, and employing a current density of 100 ampères per sq.m. of cathode surface.—B. N.

Metallurgical heating process. B. E. Eldred, Bronxville, Assignor to The Commercial Research Co., New York. U.S. Pat. 1,035,331, Aug. 13, 1912.

IN a process for heating metal objects, the latter are placed in a furnace chamber through which a current of hot combustible gas is passed; air being injected at suitable points near the roof of the chamber, the objects are heated by radiation from the air-flames so produced. In the operation of furnaces of the kind in which the combustion chamber is provided with a pair of regenerators at each end, claim is made for a method of firing in which the combustible gas is conducted to the chamber through one of each pair of regenerators alternately, while air is supplied from one of the opposite pair; the products of combustion are removed through the companion regenerator upon the "air" side, that upon the "gas" side being closed.—W. E. F. P.

Sulphide ores; Method of smelting ——. S. B. Ladd, Washington, D.C. U.S. Pat. 1,035,608, Aug. 13, 1912.

THE ore is smelted (for the production of matte) above a bath of molten matte and slag, the cross-sectional area of which is uniformly heated by means of an electric current.—W. E. F. P.

Ores or minerals; Process for reducing and melting —— *in an electric furnace, the hearth of which receives the hot gases from the melting furnace.* F. Tharaldsen. Fr. Pat. 442,660, April 18, 1912.

SEE U.S. Pat. 1,007,990 of 1911; this J., 1911, 1392. Gases containing carbon dioxide are passed through the covering of carbonaceous matter surrounding the charge.
—T. F. B.

Hardened steel plate and like article. H. A. Richardson, London. U.S. Pat. 1,035,908, Aug. 20, 1912.

SEE Eng. Pat. 9406 of 1910; this J., 1910, 1209.—T. F. B.

[*Iron*] *alloy. Alloy manufacture.* R. B. Carnahan, jun., Middleton, Ohio, Assignor to The International Metal Products Co., Newark, N.J. U.S. Pats. 1,035,947 and 1,035,948, Aug. 20, 1912.

SEE Eng. Pat. 5015 of 1911; this J., 1912, 77.—T. F. B.

Separation of ores; Apparatus for the ——. H. Dallemagne, Clichy la Garenne, Assignor to Comp. d'Entreprises de Lavage de Minerais, Paris. U.S. Pat. 1,035,864, Aug. 20, 1912.

SEE Eng. Pat. 8155 of 1911; this J., 1911, 1263.—T. F. B.

Ore-treating apparatus. A. J. Arbuckle, Johannesburg, Assignor to The Anglo French Exploration Co., Ltd., London. U.S. Pat. 1,036,535, Aug. 27, 1912.

SEE Fr. Pat. 400,626 of 1909; this J., 1909, 1043.—T. F. B.

Ore-roasting furnace. T. Edwards, Ballarat, Victoria U.S. Pat. 1,036,814, Aug. 27, 1912.

SEE Fr. Pat. 422,958 of 1910; this J., 1911, 903.—T. F. B.

Electrodeposition of metals. J. A. Corey, Datchet. U.S. Pat. 1,036,571, Aug. 27, 1912.

SEE Eng. Pat. 2002 of 1910; this J., 1910, 1015.—T. F. B.

Nickel-copper mattes; Process for treating ——. A. McKechnie and F. G. Beasley. Fr. Pat. 441,785, March 27, 1912. Under Int. Conv., July 8, 1911.

SEE Eng. Pat. 15,850 of 1911; this J., 1912, 780.—T. F. B.

Metals and alloys; Process and apparatus for the heat treatment of ——. T. V. Hughes. Fr. Pat. 442,172, April 4, 1912. Under Int. Conv., April 4, 1911.

SEE Eng. Pat. 8362 of 1911; this J., 1912, 439.—T. F. B.

Metallic surfaces; Composition for protecting —— *against corrosion.* The New Jersey Zinc Co. Fr. Pat. 442,347, Feb. 22, 1912.

SEE U.S. Pat. 1,031,377 of 1912; this J., 1912, 784.—T. F. B.

Electric refining crucibles. The Patents Purchasing Co. Fr. Pat. 442,517, April 15, 1912.

See U.S. Pat. 1,026,281 of 1912; this J., 1912, 591.—T. F. B.

Apparatus for washing coal, ores of the precious metals, and other ores and minerals. Eng. Pat. 24,406. *See* IIa.

XI.—ELECTRO-CHEMISTRY.

Contact difference of potential and the action of ultra-violet light. A. Anderson and H. N. Morrison. Phil. Mag., 1912, **24**, 302—307.

The surface of a metal, whether from oxidation or from some other cause, changes with lapse of time so as to make the metal more electro-negative. For example the contact difference relative to a plate of uncleaned copper was 0·060 volt for freshly cleaned copper, 0·466 volt for uncleaned zinc, and 0·826 volt for freshly cleaned zinc. It has now been found that when exposed to a powerful source of ultra-violet light, zinc becomes decidedly more electronegative, the effect disappearing slowly when the source of light is removed.—A. S.

Carborundum furnace; Study of a small ——. W. D. Bancroft, L. V. Walker, and C. F. Miller. Eighth Int. Cong. Appl. Chem., 1912. Sect. Xa., Orig. Comm., **21**, 19—33.

The furnace was 27″ long by 13″ wide and 23″ deep, built of fire-bricks laid in mortar. The walls were 4″ thick and the lower two bricks in the side walls were staggered to cut down dead space. The electrodes were of graphite 2″ × 4″ × 24″, clamped tightly in water-cooled electrode holders, and passing through the end walls 5·5″ towards the centre of the furnace. The electrodes made direct contact with a coil of granular carbon weighing 4 lb., 2″ wide by 4″ deep and 16″ long. The normal charge of 200 lb. was made up of sand 53·5, coke 40, sawdust 5 and salt 1·5 per cent., giving an excess of 10 per cent. of carbon over the theoretical quantity. The temperature of the coil was measured by means of a carbon tube as described by Gillett (this J., 1911, 555). A platinum rhodium thermo-couple was placed 8″ to the left of the Gillett tube and 4·5″ from the core. Several runs were made, some with 30 kilowatts and some with 20 kilowatts, the temperature being read every 5 or 10 minutes. At the end of the run the various products could be easily separated and weighed. It was found that with such a furnace results could be duplicated with considerable accuracy. The temperature readings, and the absolute yields of graphite, carborundum and siloxicon for different lengths of run are given in diagrams. The curves relating to yield indicate that the yield of carborundum reaches a maximum after a period of about 6 hours at 30 kilowatts or 10 hours at 20 kilowatts. At this point the rate of formation of graphite begins to decrease slightly, while that of siloxicon increases slightly. In a 14-hour run at 20 kilowatts, it appeared that the yield of carborundum would actually decrease considerably if the run were continued too long. A comparison of relative yields and efficiencies for the two rates of heating shows that a 6-hour run at 30 kilowatts is cheaper than a 10-hour run at 20 kilowatts, but that from 6¾ hours onwards the runs at 20 kilowatts begin to have the greater efficiency. With a furnace of the dimensions given, 30 kilowatts softened the brick walls towards the end of the run.—W. H. P.

Some factors in the cost of sodium hypochlorite production. Walker and Gegenheimer. *See* VII.

Fractional adsorption of radium-barium salts and fractional electro-dialysis of the obtained adsorption compounds. Ebler. *See* VII.

"*Iron coke.*" [*Coke containing metallic iron.*] Lidoff. *See* X.

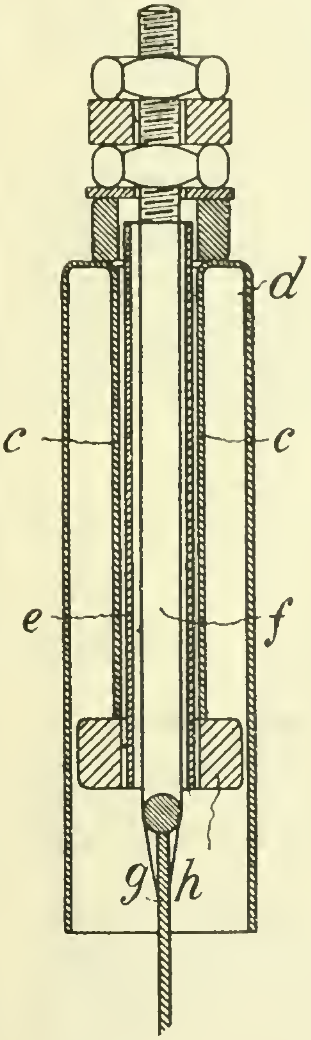
Electrolytic determination of copper in pyrites. Treadwell. *See* X.

Patents.

Electrolytic apparatus. A. E. Knowles, Wolverhampton. Eng. Pat. 22,759, Oct. 16, 1911.

In apparatus for the electrolysis of water for the production of hydrogen and oxygen, the current leads on alternate gas bells are disposed in similar positions, and on the intervening bells in midway positions, the leads to adjacent electrodes being thus arranged in a zig-zag manner along the length of the bells. "The distance for the current from one electrode to the next is thus the same in whichever direction the current is passed."—B. N.

Electrolytic apparatus. A. E. Knowles, Wolverhampton. Eng. Pat. 15,103 of 1912; date of appl., Oct. 16, 1911.



The apparatus is employed for the electrolytic production of gases (*e.g.*, hydrogen and oxygen), and the collection of these in separate gas bells through which the current leads to the electrodes are carried. A pendant tube, *c*, is secured or formed within the bell, *d*, extending downwards so that it is sealed by the liquid within the bell. The tube, *c*, is insulated from the plate, *g*, by means of an insulating distance ring, *h*, and the conductor, *f*, is enclosed in a loose insulating tube or sleeve, *e*, which rests on the plate, *g*.—B. N.

Cell; Electrolytic ——. E. A. Allen, Portland, Me., Assignor to J. F. Preston, Lowell, Mass. U.S. Pat. 1,035,133, Aug. 13, 1912.

The cell, duplex in form, comprises a main vessel, with open sides, end walls, a base, and upper side walls constituting an anode chamber. Frames, each with two diaphragms spaced apart and confronting each other, are fixed to the open sides of the vessel, the walls of each side frame together with the two diaphragms forming an electrolyte compartment. A casing is fixed outside the outer diaphragm on each frame, thus forming cathode compartments; a cathode in each confronts the outer diaphragm. Two anodes are placed in the anode compartment each confronting and in contact with an inner diaphragm, the anodes being suitably connected together by a stem. —B. N.

Battery ; Storage ——. T. A. Edison, Llewellyn Park, Assignor to Edison Storage Battery Co., West Orange, N.J. U.S. Pat. 1,036,471, Aug. 20, 1912.

Nickel hydroxide and a substance containing bismuth are crushed to powders, and an intimate mixture of the materials made, containing 20 per cent., or less, of the substance containing bismuth. A perforated non-deformable enclosing pocket is loaded under pressure with the mixture, so as to form a depolarising electrode —B. N.

Electrically conductive layer ; Method for applying an —— upon an electrically non-conductive surface. H. E. Goldberg, Chicago, U.S.A. Eng. Pat. 3644, Feb. 13, 1912.

The non-conducting surfaces are coated with the conductive inks described in U.S. Pats. 1,034,103 and 1,034,104 (this J., 1912, 784), and allowed to dry.—T. F. B.

Ozone ; [Electrical] Apparatus for the production of —— J. Steynis, Bay Shore, N.Y., Assignor to Steynis Ozone Co., New York. U.S. Pat. 1,035,489, Aug. 13, 1912.

The apparatus comprises two oppositely-disposed chambers connected by hollow elongated tubes forming one electrode, each tube being provided with a sliding dielectric tube which can be easily removed. An elongated rod is supported concentrically within each dielectric tube and spaced therefrom by insulators, the rod acting as the inner electrode and being provided with a series of discharge rings spaced from the dielectric tube. The ends of the inner electrodes rest on electrical contacts in one of the chambers. Observation windows are provided in line with the electrodes, through which the inner electrodes may be withdrawn and inserted.—B. N.

Endothermic gas reactions ; Process of producing —— and apparatus [electric furnace] therefor. H. Grohmann. Assignor to Salpetersäure-Ind.-Ges., Cologne, Germany. U.S. Pat. 1,035,873, Aug. 20, 1912.

See Eng. Pat. 919 of 1912 ; this J., 1912. 592.—T. F. B.

[Electrical] method of and apparatus for producing carbon black. U.S. Pats. 1,036,362 and 1,036,363. *See* XIII.

XII.—FATS ; OILS ; WAXES.

Fats in oleaginous fruits ; Formation of ——. *II. Investigation of Japanese privet (Ligustrum japonicum)* F. Scurti and G. Tommasi. *III. Investigation of the leaves of the Japanese privet.* F. Scurti and M. Fornaini. Ann. R. Staz. Chim-Agrar. Sperim. di Roma, 1911, **5**. 103—121, 223—239.

An investigation similar to that previously carried out on the olive (this J., 1911. 1021). has shown that the formation of fat in the fruits of the Japanese privet (*Ligustrum japonicum*) proceeds in an exactly analogous manner to that observed in the former case. The oleanol of the olive is replaced in the privet fruit by an isomeric alcohol, *ligustrol*, and oleic and linolic acids by erucic acid. The ethereal extract of the privet fruit, amounting to from 11 to 15 per cent. of the dry substance, also contains a small quantity of a wax, of the type of carnaüba wax, having the sp. gr. 0·960 at 15° C., ester value, 78·6° C. ; m. pt., 55°—56° C. In view of the wide distribution of the Japanese privet, the use of its fruit as a source of erucic acid, which is employed in certain pharmaceutical preparations, and of the wax just described, is worthy of attention.—A. S.

Fatty acids ; Solubilities of the lead salts of the higher —— in ether and in petroleum ether. G. B. Neave. Analyst, 1912, **37**, 399—400.

The solubility of lead oleate in ether finds application in the determination of oleic acid in mixtures ; in order to discover whether the results obtained may be vitiated by solution of the lead salts of saturated acids, the author has determined the solubilities of these salts. The solubilities, which are expressed in the following table in grams per 100 c.c. of solution, are very small, whereas that of lead oleate is very great :

	Ether.		Petroleum ether. (b. pt. 40° 60° C.)	
	20° C.	Boiling-point.	20° C.	Boiling-point.
Lead caproate ..	—	1·3640	—	0·0608
Lead heptylate ..	0·2397	1·4900	0·0200	0·0528
Lead caprylate .	0·0938	0·5460	practically insoluble	0·0384
Lead nonylate ..	0·1115	0·2404	,,	0·0450
Lead caprate ...	0·0290	0·4285	,,	0·0170
Lead myristate .	practically insoluble	0·0555	,,	0·0210
Lead laurate ...	,,	0·0205	,,	practically insoluble
Lead palmitate .	,,	0·0261	,,	,,
Lead stearate ..	,,	practically insoluble	,,	0·0170

—L. E.

Acids of the oleic series ; Relation between the iodine value and the structure of ——. G. Ponzio and C. Gastaldi. Gaz. chim. ital., 1912, **42**, II., 92—95.

It is known that the iodine value of oleic acid, as determined by the usual methods, approaches the theoretical value, whereas that of crotonic acid is much too low. Comparative experiments, using the methods of Hübl, Wijs, and Hanus, have now shown that undecylenic acid (in which the double linkage is distant from the carboxyl group) behaves like oleic acid, whilst 2·3-hypogæic acid (prepared by the action of potassium hydroxide on *a*-iodopalmitic acid) and 2·3-oleic acid (prepared by the action of potassium hydroxide on *a*-iodostearic acid) behave like crotonic acid in this respect. The low values obtained in the case of the acids having the double linkage near the carboxyl group appear to be due to a retardation of the velocity of the reaction, for on prolonging the action, values closely approaching the theoretical were obtained with 2·3-oleic acid, using the Wijs reagent. The results obtained show that the determination of the iodine value of an unsaturated acid may be of value in ascertaining the position of the double linkage in the molecule.—A. S.

Cottonseed foots ; Factory method for the determination of total fatty acids in ——. F. N. Smalley. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vd. Orig. Comm., **11**, 27—29.

The following method in which the fatty acids are calculated from the iodine value has been in continuous use for some years. Exactly 0·5 grm. of the sample is introduced into a flask the stopper of which can be sealed with potassium iodide solution. Five c.c. of carbon tetrachloride and 20 c.c. of Wijs's iodine chloride solution are now added, and the flask closed and shaken until the fat has dissolved, after which the stopper is sealed with potassium iodide solution, and the iodine value determined in the usual way. The result divided by 1·24 gives the percentage of fatty acids. This factor was obtained by comparative determinations of the fatty acids of 150 samples by this method and by the Official Method of the Inter-State Cotton-seed Crushers' Association. The results showed that to obtain reliable figures with this factor the cottonseed foots must not be more than a week old. In the case of old samples in which fermentation had taken place, differences of about 4 to 7 per cent. between the two sets of results were obtained. (See also this J., 1911, 906.)—C. A. M.

Lipase ; Studies on ——. *[Preparation of lipolytic powder.]* Y. Tanaka. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vd. Orig. Comm., **11**, 37—43.

In a previous communication (this J., 1912, 1259) it was shown that the concentration of the acid required to start the lipolytic activity of castor seeds was not the main factor in the lipolysis. Further experiments here described show that the addition of the optimum quantity of acid liberates the enzyme present as zymogen in the seeds, and does not make the lipolytic medium acid. The liberated lipase acts best in a neutral medium, and is absolutely insoluble in water. On these facts has been based the following method of preparing an active "lipase powder. One hundred grms. of pressed or extracted castor seeds are triturated with 600 to 700 c.c. of $N/10$ acetic acid (or about 500 c.c. of $N/10$ sulphuric acid) at 30° to 35° C. for 30 minutes, after which the milky liquid is filtered, and the residue is thoroughly washed with water and dried at a temperature not exceeding 40° C. The "lipase powder" thus obtained is white, odourless and free from soluble matter. One preparation had the following composition: Water, 5·3; fat, 37·2; nitrogenous substances, 16·3; mineral matter, 1·2; and non nitrogenous organic matter, 10·0 per cent. It rapidly hydrolyses fats in the presence of water alone. For example on allowing a mixture of 25 grms. of tallow with one grm. of the "lipase powder" and 8 c.c. of water to stand for an hour at 38° C., 50·6 per cent. of the fat was hydrolysed, whilst after six hours the proportion hydrolysed had risen to 84·4 per cent. The hydrolysed products are very pure and require no further treatment. The "lipase powder" can be kept for a long time without any material loss of its activity. Its lipolytic power is greatly increased by the addition of neutral (normal) alkali salts, but is retarded by salts of magnesium, calcium, barium and, especially, copper. Manganese, however, has a stimulative action, as was also observed by Hoyer in the case of his "ferment." The activity of the powder is also promoted by the addition of an extract of castor seeds, this being attributable to the action of the alkali salts and the proteose in the seeds. Apparently the globulin and other coagulable albumins in the seeds do not affect the activity. A pronounced stimulative effect is produced by leucine, asparagine, and similar products of the decomposition of proteins.—C. A. M.

Soaps of heavy metals. I. W. Fay and S. C. Hamilton. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vb. Orig. Comm., **11**, 7—11.

Stearates and oleates of calcium, iron, aluminium, zinc, copper, and lead, and chromium stearate were prepared by treating aqueous solutions of the respective alkali soaps with solutions of salts of the different metals. As a rule the oleates were darker in colour and melted at lower temperatures than the stearates. Both stearates and oleates were insoluble in cold petroleum oils, linseed oil and oil of turpentine, but zinc oleate and all the stearates mentioned dissolved to clear solutions in hot linseed oil, turpentine oil and kerosene oil. Concentrated solutions of calcium stearate and aluminium stearate and oleate in hot petroleum oils solidified to transparent jellies when cold, whilst the other stearates and oleates formed pastes. In the case of dilute solutions of stearates and oleates in kerosene oil, the soaps separated as precipitates on cooling. —C. A. M.

Patents.

Oleaginous material and the like; Machines for expressing ——. E. Zander, Stettin, Germany. Eng. Pat. 11,932, May 20, 1912. Under Int. Conv., Feb. 19, 1912.

In machines in which the material is expressed between two concentric perforated cylinders by the action of a vertical press, the steel at the edges of the perforated openings is liable to break away, necessitating the renewal of the entire cylinder. This is obviated by fitting perforated removable blocks into each of the perforations of the cylinders.—C. A. M.

Vegetable and other oils, and fats or essences; Process and apparatus for extracting ——. W. S. Simpson. Fr. Pat. 441,970, June 7, 1911.

See Eng. Pat. 4661 of 1910; this J., 1911, 814.—T. F. B.

Substitutes for oils, caoutchouc, resins, and the like; Process of manufacturing ——. L. Lilienfeld, Vienna. U.S. Pat. 1,037,158, Aug. 27, 1912.

See Fr. Pat. 417,392 of 1910; this J., 1911, 36.—T. F. B.

Glycerin; Process of condensing ——. W. Rintoul and A. G. Innes, Stevenston, Scotland, Assignors to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,036,715, Aug. 27, 1912.

See Eng. Pat. 21,608 of 1910; this J., 1911, 1396.—T. F. B.

Manufacture of detergents [washing soda]. U.S. Pat. 1,036,316. *See* VII.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Amorphous substances [zinc oxide]; The effect of pressure on the colour of ——. E. F. Farnau. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IX., Orig. Comm., **20**, 129—132.

The fact that zinc oxide darkens when compressed or when heated, is due to its being yellow in colour when in the amorphous state in mass (*i.e.*, the supercooled liquid): the pressure, or heat, causes the particles to coalesce and to become amorphous masses. When zinc oxide is ground under liquid air, no discolouration takes place, whilst when zinc oxide discoloured by grinding, is ground under liquid air, it becomes colourless.—T. F. B.

Rapid testing of dyes and pigments. Bancroft and others. *See* IV.

Notes on fluorescence and phosphorescence. Andrews. *See* XXI.

Patents.

Paint for metallic surfaces; Anti-corrosive or protective ——. A. Schror, London, and J. Raschen, Oxton. Eng. Pat. 18,308, Aug. 12, 1911.

Graphite is heated to about 120° C. and mixed with raw or boiled linseed oil, and the mixture incorporated with tar (which has previously been saturated with quicklime to eliminate ammonia and acids) in the proportion of, say, 5 parts to 1 of the tar. Finally an addition of about one-fifth of copal or similar lacquer is made. The paint is more especially intended for the protection of boiler plates. —C. A. M.

Carbon-black; [Electrical] Method of and apparatus for producing ——. J. A. Snee, West Elizabeth, Pa. U.S. Pats. 1,036,362 and 1,036,363, Aug. 20, 1912.

(1) The retort is heated to a higher temperature above than at the bottom, the heat of the upper portion being sufficiently high to dissociate a hydrocarbon, whilst the temperature of the bottom is sufficiently low to prevent coking of the deposited carbon black. A stream of hydrocarbon gas is passed horizontally through the highly-heated zone, from which flames are excluded. (2) The apparatus comprises a retort having a valved exit, a hydrocarbon inlet, and an arch of refractory material forming the top and side walls. The arch is heated electrically to a higher temperature than the bottom surface of the retort.—B. N.

Black pigments by destructive distillation of organic substances; Preparation of ——. A. Metzner. Ger. Pat. 248,891, May 28, 1911.

The finely divided lignite dust carried mechanically by the steam from the drying apparatus in the manufacture of lignite briquettes, is boiled with the condensed water in order to prevent danger of spontaneous combustion, and is then subjected to destructive distillation, and the residue cooled.—A. S.

Black colour for oils, oil varnishes, and fats; Preparation of a ——. F. Riemann. Ger. Pat. 249,033, Jan. 23. 1910.

A MIXTURE of clays with oils, fats, resins, and the like is heated so as to carbonise the organic substance, and the product is finely ground.—A. S.

Pigments; Manufacture of oil ——. E. Villette. Fr. Pat. 442,304, June 17, 1911.

A WHITE pigment is made by mixing a solution of sodium silicate (25° B.) with a solution of aluminium sulphate (18° B.) taking 42 parts of dissolved silicate to 30 parts of dissolved sulphate. The precipitate is well washed, separated by filter-pressing or the like, dried and powdered This white pigment is mixed with water, lithophone or zinc oxide or antimony oxide, "white oil," drying oil, etc., as required, adding 1 per cent. of calcium carbonate if lithophone or zinc oxide is added. For submarine work when antimony oxide is used, 3 per cent. of arsenic and 1 per cent. of benzene are added.—H. E. P.

Pigment colours; Process for preparing —— by means of kieselguhr. C. Grüne. Ger. Pat. 248,619, Dec. 20, 1910.

KIESELGUHR is treated with a substance or mixture of substances capable of separating casein or albumin from solutions thereof; it is then immersed in milk or a solution of albumin, and finally suitably coloured. The first two treatments may be repeated as often as necessary.—T. F. B.

Coating and impregnating material; Chemically inert ——. C. F. Boehringer und Söhne. Ger. Pat. 248,779, Aug. 23, 1910.

CLAIM is made for the use of the chlorination products (containing at least 30 per cent. of chlorine) of vegetable and animal oils, fats, and waxes, of resins and their distillation products, of petroleum and petroleum distillates, and of mineral and montan wax, or of solutions of such chlorination products. These chlorination products are stated to possess a high resistance to chemical agents. —A. S.

Varnishes and paints; Manufacture of ——. F. E. Matthews, London. Eng. Pat. 16,277, July 14, 1911.

CINNAMENE (styrolene) may be polymerised by heat or by contact with sodium, forming a hard, transparent, horny substance, which is almost colourless; when this product is dissolved in a volatile solvent, such as xylene or naphtha, it forms a quick-drying varnish or a vehicle for paints. The varnishes are said to be very adherent, and the paints to have great covering power. Solutions containing 5 to 10 per cent. of polymerised styrolene are sufficiently strong to be used as pigment vehicles. (Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 17,378 of 1900; this J., 1901, 1123.)—T. F. B.

[*Turpentine*] *Distillation process.* S. Neal, Assignor to The Neal Naval Stores Co., Cordele, Ga. U.S. Pat. 1,036,306, Aug. 20, 1912.

TURPENTINE is distilled from crude gum by subjecting the latter in a still to a temperature of 260° F. (127° C.). Water is then added and the temperature is allowed to rise to 306° F. (152° C.), when the supply of water is cut off. The temperature is next allowed to rise to 316° F. (158° C.) to soften the residue left in the still, which is then drawn off.—W. H. C.

Russian turpentine oil and the like; Purification and improvement of ——. E. Tassilly and E. Sterkers. Fr. Pat. 441,501, May 27, 1911.

RUSSIAN turpentine oil is subjected to some or all of the following treatments: addition in the cold of a concentrated solution of an alkali or alkaline-earth permanganate, about 5 parts of permanganate in 100 of water per 1000 of turpentine; after decantation, agitation in the cold with a concentrated solution of alkali or alkaline-earth bisulphite; after decantation, prolonged agitation in the cold with about 5 per cent. of soda lye (36° B.); distillation in steam or *in vacuo* of the oil (preferably decanted); filtration.—H. E. P.

Turpentine; Extraction of —— from resinous wood. Soc. Anon. Le Camphre. Fr. Pat. 442,235, June 16, 1911.

RESINOUS wood is treated with an emulsion of turpentine and water, if desired with the addition of sodium carbonate or the like. The treatment is effected at about 100° C. Example: 100 parts of wood may be treated with 8 parts of turpentine, 160 of water, and 2 of sodium carbonate.—H. E. P.

Phenols and formaldehyde; Manufacture of soluble condensation products of ——. K. Albert and L. Berend. Fr. Pat. 441,547, Feb. 16, 1912.

SOLUBLE products are obtained from phenol and formaldehyde (or substances yielding it) by effecting condensation in presence of natural resins, oils, fats, waxes of all kinds, balsams, their free acids, all kinds of tars or mixtures thereof, as catalysts. These may be saponified after condensation or the saponified products employed as catalysts. The product, with or without resins or the like, is dissolved in suitable liquids. Less formaldehyde than usual is said to be required.—H. E. P.

Lacquers and varnishes. S. H. Cohn. Fr. Pat. 441,703, March 25, 1912. Under Int. Conv., Feb. 6, 1912.

ESSENTIAL oils, oils, terpenes or their derivatives, in each case of high boiling point, are added to Chinese wood oil to make a lacquer or varnish.—H. E. P.

Varnish; Manufacture of —— from tar oil. O. Sprenger. Fr. Pat. 442,618, April 17, 1912. Under Int. Conv., Sept. 18, 1911.

IN order to obtain a varnish from tar oil, preferably purified in known manner and with addition of a fatty oil, it is treated with concentrated sulphuric acid at not much above 50° C.; the oil separated from the precipitated acid resin is treated with lime, then oxidised, *e.g.*, by ozone or by air containing ozone, and the varnish thus obtained is separated from the precipitated residue. —H. E. P.

Copals; Process for converting —— into a mass resembling natural amber. A. Spiller. Ger. Pat. 247,734, June 22, 1911. Under Int. Conv., June 30, 1910.

THE copal is freed from the outer crust produced by weathering, then softened by treatment with carbon bisulphide, and exposed to a uniform heat and pressure in air-tight moulds.—A. S.

[*Concrete*] *waterproofing compound.* A. C. Horn, New York. U.S. Pat. 1,031,003, July 2, 1912.

THE claim is for a waterproofing compound for concrete composed of a basic lime soap of tung oil.—O. R.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Vulcanised rubber; Defects ["Schwindflecken"] in ——. A colloid-chemical phenomenon. R. Ditmar and R. Thieben. Z. Chem. Ind. Kolloide, 1912, **11**, 80—83.

A DEFECT which is frequently observed on soft and especially on hard vulcanised rubber is the appearance of so-called "*Schwindflecken*," *i.e.*, larger or smaller depressions of varied shape in the surface of the material. From the results of experiments the author concludes that the fundamental condition for the formation of these depressions is the use of mixtures of a high degree of dispersion: they are due to a diminution of surface (contraction). The immediate cause is a too rapid vulcanisation effected in a system of a high degree of dispersion produced by the use of dispersion media (*e.g.*, rosin oil), by an excessive quantity of sulphur, and by addition of substances (*e.g.*, litharge, zinc dust) which accelerate vulcanisation. Preheating of the rubber mixing, the duration of vulcanisation, and the volume of the article to be vulcanised also play an important part. As examples it is stated that with a mixing composed of 25 kilos. of Mozambique rubber, 6 of Mapai rubber, 6 of Madagascar rubber, 4·5 of sulphur, 36 of litharge, 2 of zinc white, and 20·5 of talc, vulcanised for 35 minutes at 4 atmospheres pressure, no "*Schwindflecken*" were produced, but they were with a mixing of the same composition except that the proportions of sulphur and talc were 5·5 and 19·5 kilos. respectively. Again in a hard rubber mixing without litharge, no "*Schwindflecken*" were produced, but they were when litharge was added instead of lampblack. In the case of hard rubber it is advisable to heat to the vulcanisation temperature as rapidly as possible. The defects can be removed to a considerable extent by prolonging the time of vulcanisation. —A. S.

Loading materials for rubber ; Changes produced in the most important —— during steam vulcanisation. R. Ditmar and R. Thieben. Z. Chem. Ind. Kolloide, 1912, **11**, 77—80.

Ten grms. of the pure loading material were intimately mixed with 2 grms. of pure sulphur in a large weighing bottle, which was then placed in an autoclave. The latter was heated so that a pressure of 4 atmospheres was attained in 10 mins., and this pressure was maintained for ¾ hour, after which the steam was rapidly blown off, the material extracted with acetone for 1 day, and the uncombined sulphur determined. In all cases formation of sulphide and sulphate took place, the greatest change being observed with lime, which yielded a dark yellow substance having a strong odour of hydrogen sulphide ; on extracting this with acetone the latter was affected, being converted into a liquid of unpleasant odour which began to distil only at 163° C. With the other loading materials, the proportions of sulphur combined during the treatment were : magnesium carbonate, 7·2 ; magnesia, 80·5 ; zinc oxide, 73·6 ; barium sulphate, 62·33 ; lead oxide, 66·06 ; and calcium carbonate, 76·20 per cent. (see also this J., 1911, 374, 1421). Incidentally it was found that carbon bisulphide is decomposed to a considerable extent when distilled in presence of lime, calcium sulphide and sulphate being formed.—A. S.

Rubber ; Determination of nitrogen in ——. W. Schmitz. Gummi-Zeit., 1912, **26**, 1877—1879.

The author recommends that whenever the Kjeldahl method is used, the particular variation employed shall be mentioned in giving the result. He has examined in detail the breaking-up of the rubber, the distillation and the titration. He recommends the following method : 2—3 grms. of rubber are placed in a 300 c.c. Kjeldahl flask and completely covered with 45—50 c.c. of concentrated sulphuric acid. A funnel is placed in the neck of the flask, which is heated on wire gauze with a small flame till no particles of rubber remain. Frothing, if it occurs at all, may be prevented by addition of a piece of paraffin. After cooling, 0·25 grm. of cupric oxide and 10 grms. of potassium sulphate are added (instead of mercury) and the liquid is heated till completely clear and greenish. Then it is strongly heated for 1 hour, but not more than 4—6 hours in all, otherwise decomposition occurs. Distillation is effected by adding excess of caustic soda through a separating funnel fixed in the cork and blowing in steam. In this way glass flasks can be used and the colour shows when sufficient alkali is present. The ammonia is distilled into excess of standard acid and titrated iodometrically using potassium iodate. Comparative tests were made of various standard substances, and ammonium sulphate is recommended for standardisation. This is distilled in the usual manner. Several precautions are mentioned which are necessary for the highest accuracy, but not for technical analysis. Four samples of the same washed Para rubber contained between 0·4116 and 0·4172 per cent. of nitrogen; plantation Para rubber, between 0·3780 and 0·3797 per cent. - H. E. P.

Rubber ; Determination of —— as bromide. W. Vaubel. Gummi-Zeit., 1912, **26**, 1879—1880.

The author refers to the work of Esch (this J., 1911, 1126) showing that known methods of bromination are inaccurate. A method is proposed which has been used for terpenes, resins, etc., and can be carried out in 15 minutes. Two grms. of Para rubber were dissolved in 200 c.c. of carbon tetrachloride ; 20 c.c. were pipetted into a beaker, 5 grms. of potassium bromide and 200 c.c. of dilute hydrochloric acid (1 : 10) were added. An excess (40 c.c.) of solution of potassium bromate (20 grms. per litre) was added, and the excess titrated back with sulphite solution after addition of a little potassium iodide and frequent shaking. It was found that 0·2 grm. of rubber consumed 11·8 c.c. of bromate solution (= 0·6726 grm. of bromine, or 457·4 grms. per grm.-mol. of rubber). No further bromination occurred in 2 hours. This corresponds to 6 atoms of bromine per molecule, 4 additive and 2 substitutive (allowing for the usual amount of resin). The influence of resin and protein is not yet exactly known.—H. E. P.

Latex ; Nature and properties of Hevea ——. C. Beadle and H. P. Stevens. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vb., Orig. Comm., 9, 17—43.

The authors state that latex preserved with formalin behaves abnormally ; incipient coagulation is not prevented. Latex preserved with ammonia behaves after dialysis similarly to fresh latex. Latex apparently unaltered in appearance may contain a large proportion of globules associated to form small aggregates with only a small proportion of free globules. When the aggregates are sufficiently large, the latex will cream, especially if diluted. Coagulation whether partial or complete is brought about by the action of acid-resisting substances on the free globules only. The form and continuity of the globules is dependent on the proportion of free globules and the violence of the movements induced by the addition of acids ; this may result in the formation of microscopic aggregates, visible flocks, or one compact coagulum. Globules which have united to form aggregates are inseparable : the outlines of the individual globules may be partially obliterated, but the aggregate preserves its irregular contour. Aggregates or small flakes which can be collected on filter paper may be made to unite by gentle pressure. *Castilloa* and Rambong latices are not coagulable by acids in the same sense as *Hevea* latex : they do not form "aggregates" but large globules by fusion of smaller ones, the process resembling the fusion of drops of oil : this fusion may also be observed to a limited extent with *Hevea* latex in the presence of ammonia. Under suitable conditions, very weak acids and salts may bring about cessation of Brownian movement without coagulation. 0·15 per cent. of acetic acid suitably diluted will completely coagulate freshly dialysed latex. Contrary to Parkin's statement, dilution of latex with water increases the minimum amount of acid required for coagulation. Heating latex with acid reduces the minimum amount which will produce coagulation and also increases the maximum amount. The minimum of acid required for coagulation is lower with mineral acids than with acetic acid. The maximum of acid which will produce coagulation is higher with acetic acid than with hydrochloric acid and much higher still with sulphuric acid. *Chemical examination :* the latices were dialysed. The main inorganic constituents are the phosphates of calcium, magnesium, and potassium, the latter preponderating. A great part of the basic matter is probably in combination with organic acids. The constituents of the dialysate were separately estimated. In three latices (total solids 22 to 30 per cent.), the total crystalloids were 1·52 to 2·61 per cent., while sugars, ash and protein amounted to 0·66 to 0·95 per cent. The matter unaccounted for is probably 1-methylinositol. The diffusible nitrogen (in dialysate) was 0·27 to 0·34 per cent., while the non-diffusible nitrogen was from 0·87 to 1·26 per cent. The percentage of total protein calculated on total solids was 5·1 to 5·5 per cent., so that dry crepe rubber contains about half the proteins of the latex.—H. E. P.

Rubber solutions; Relationship between amount of resins and viscosity of ——. J. G. Fol. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vb. Orig. Comm. **9**, 71—73.

In thirteen samples of *Castilloa* rubber a high viscosity of the solution generally accompanied a low resin content. This was confirmed in three cases by comparing the viscosities of the solutions of the acetone-extracted rubber with solutions of the same rubber which had been heated in a sealed tube in the extraction apparatus, when the de-resinified rubber showed a higher viscosity. However the viscosity of the de-resinified rubber was only greater than that of the original (unheated) rubber in two cases, so that deresinification does not always raise the viscosity. —H. E. P.

Rubber; Action of the resins in the vulcanising of ——. L. E. Weber. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vb. Orig. Comm., **9**, 95—99.

Half a pound of Highland sheet Ceylon rubber (3·6 per cent. of resin) was cut up and extracted with acetone for 15 hrs., after which it still contained 0·3 per cent. of resin. Three mixings were made of rubber, litharge, sulphur and whiting, using: (1), the original rubber; (2), the extracted rubber; and (3), the original rubber plus the resins removed in the extraction. After vulcanisation in an autoclave at 120°, 130°, and 140° C. respectively, the rubber strips being immersed in water, it was found on testing mechanically that the maximum strength of (1) and (3) was practically the same, while (2) could not be vulcanised. Thus the resins are essential to vulcanisation and in quantities over 0·3 per cent. High resin content is not necessarily a cause of inferiority.—H. E. P.

Rubber; Direct determination of —— applicable to specifications for vulcanised rubber goods. C. R. Boggs. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vb. Orig. Comm., **9**, 45—58.

The sample is finely ground until it will pass a 20-mesh sieve. It is then thoroughly extracted with acetone and dried in a reducing atmosphere (oxidation leads to low results). An amount of the residue is taken corresponding to about 0·1 grm. of rubber, and placed in a tall 300 c.c. beaker with 20 c.c. of toluene, covered with a watch-glass and boiled gently for three hours. Most of the toluene is then evaporated off on the water-bath, 50 c.c. of carbon tetrachloride are added, the liquid mixture is cooled and 50 c.c. of Budde's mixture (16 grms. of bromine and 1 grm. of iodine in 1 litre of carbon tetrachloride) are added. The beaker is covered and allowed to stand at room temperature for 24 hrs. with frequent shaking. 50 c.c. of absolute alcohol are added, with vigorous stirring, and the precipitate allowed to settle over night. The solution is decanted through a quantitative filter (free from chlorine compounds), and the residue washed first with a mixture of 2 parts of carbon tetrachloride and 1 part of alcohol and then with absolute alcohol. It is then washed by decantation with boiling water until practically free from bromides, transferred to the filter, and washed with a little alcohol and allowed to dry in the air. Most of the residue is then separated from the filter and powdered if necessary. The filter paper is torn into small pieces and put into a 50 c.c. porcelain crucible with a little fusion mixture (2 of sodium carbonate to 1 of potassium nitrate, free from chlorine compounds.) The paper is burnt at a low temperature. The powdered residue is added, together with 15 grms. of fusion mixture, well mixed and covered with a little more of the mixture. The crucible is slowly heated till the contents are fused and the mass is kept just fused for about ten minutes. After cooling, the product is taken up with hot water in a porcelain dish, filtered and washed with hot water till free from bromides, giving about 400 c.c. of solution. This is distinctly acidified with nitric acid and boiled to expel carbon dioxide. About 20 c.c. of $N/5$ silver nitrate are added and the excess titrated back with $N/5$ thiocyanate, using 3 c.c. of ferric alum solution as indicator. The amount of bromine in the rubber bromide, multipled by 0·425, gives the amount of rubber. No correction is applied for sulphur; in specification work this penalises an over-vulcanised product, which is advantageous. An under-vulcanised product can be excluded by physical tests. Oxidised rubber gives low results, and it is suggested that this test should be used as a "life" test by estimating the rubber before and after a standard oxidation. Results are given of analyses of various mixings which agree well with the composition, allowing for about 93 per cent. of pure rubber in the Para rubber used.—H. E. P.

Rubber; Application of osmosis to the deresinification and regeneration of ——. P. Bary. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vb. Orig. Comm., **9**, 7—15.

Porous tubes of porcelain are placed in a xylene solution of the rubber to be purified. Fresh xylene is allowed to flow through the tubes, whereupon the dissolved impurities such as resin or sulphur are removed. Dissociation of the vulcanised rubber is stated to occur and a small quantity of "disulphide," $C_{10}H_{16}S_2$, may be left behind which is insoluble and is removed, together with the fillers, by centrifuging the solution. The xylene is then removed by distillation in steam or under reduced pressure at a low temperature. The quality of the rubber obtained is improved by storing it in a dark airy chamber.—H. E. P.

Rubbered fabrics; Testing of ——. M. B. Šetlík and J. Žofka. Eighth Int. Cong. Appl. Chem., 1912. Sect. Vb. Orig. Comm., **9**, 89—93.

The fabric is first tested empirically by scratching, etc. Then it is made into a bag and filled with water: this is also done with a piece which has been folded and rubbed. In each case the fabric should be impermeable. Pieces are tested by soaking for two days in 5 per cent. acetic acid and 5 per cent. ammonia. The weight per sq. in. and the thickness are determined at three points. A square decimetre (16 sq. in.) is heated for 3 hrs. with 100 c.c. of chloroform under a reflux condenser, washed with chloroform and then with alcohol. It is then spread on a smooth glass and scraped with a knife. This shows the nature of the impregnation; if a compact layer easily comes off, there is at least 50 per cent. of rubber. It can be seen whether the rubber swells and can be easily detached, swells and comes off in small fragments, does not swell and comes off in bits, or does not swell or come off. The rubber is then examined chemically in the usual way. Details are given of the results obtained with samples belonging to each of the above groups.—H. E. P.

Rubber exports from Ceylon. Board of Trade J., Sept. 12, 1912. [T.R.]

The following statistics of the exports of rubber of domestic production from Ceylon during the years ended June, 1911 and 1912, have been extracted from official returns issued by the Ceylon Government:—

To	July–June, 1910–11.	July–June, 1911–12.
	lb.	lb.
United Kingdom	2,888,032	5,712,339
United States	2,112,768	2,814,772
Other countries	427,280	1,566,907
Total exports	5,428,080	10,094,018

Patents.

Caoutchouc; Manufacture of a substance resembling ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 441,655, March 22, 1912. Under Int. Conv., Aug. 7, and Oct. 31, 1911.

The product obtained by autopolymerisation of β-γ-dimethylerythrene (Kondakow, J. prakt. Chem., **64**, 109) is transformed into a substance similar to caoutchouc by treatment with alkaline reagents (*e.g.*, aniline and water) or the polymerisation is effected in presence of alkaline reagents.—H. E. P.

Rubber and other matters soluble in hydrocarbons; Process for purifying natural and regenerated ——. H. Debauge, Paris. Eng. Pat. 1976, Jan. 24, 1912. Under Int. Conv., Feb. 3, 1911.

See Fr. Pat. 426,457 of 1911; this J., 1911, 968.—T. F. B.

Rubber; Attaching —— to metals. L. Daft, Rutherford, N.J., Assignor to Electro Chemical Rubber and Manufacturing Co. U.S. Pat. 1,036,576, Aug. 27, 1912.

See Eng. Pat. 2306 of 1912; this J., 1912, 595.—T. F. B.

Rubber articles; Process for preserving the elasticity of ——. C. Beyer. Fr. Pats. 441,568, March 20, 1912, and 442,331, April 9, 1912. Under Int. Conv., April 19, 1911.

See Ger. Pat. 243,248 of 1911; this J., 1912, 291.—T. F. B.

Caoutchouc, its homologues and derivatives; Process for the production of ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 441,802, Feb. 19, 1912. Under Int. Conv., March 23, 1911.

See Eng. Pat. 27,361 of 1911; this J., 1912, 596.—T. F. B.

XV.—LEATHER; BONE; HORN; GLUE.

Quebracho wood and its substitutes. C. D. Mell and W. D. Brush. U.S. Dept. Agric. Forest Service, Circular 202, May 23, 1912.

Besides the true quebracho (*Quebrachia lorentzii*), the name is applied to several other and inferior species, notably "white quebracho" (*Aspidosperma quebracho-blanco*) and "red quebracho" (*Aspidosperma quebracho-colorado*). The latter belong to an entirely different family (*Apocynaceae*), while the true quebracho belongs to the sumac family (*Anacardiaceae*). The true quebracho is found in Argentina, Bolivia, Brazil, Paraguay and Uruguay and the supply appears practically inexhaustible. The average yields is 2 tons of the wood per acre and a conservative estimate of the total possible yield from the areas where it occurs is 168,000,000 tons. The present yearly consumption of the wood for all purposes is less than 1,000,000 tons. The trees are scattered through open forests of many different species and it is seldom that more than 4 or 5 trees are found on an acre. The best positions for growth are the elevated stretches between the water courses with sandy soil and moderate atmospheric and abundant soil moisture. The heartwood of quebracho is one of the hardest, heaviest and most durable woods known. It weighs about 78 lb. per cb. ft. and has a density of 1·2 to 1·4. Logs left in the woods have been found perfectly sound after 25 years and its great durability is ascribed to the large quantity of tannin which it contains. Nearly the whole annual cut is used in the manufacture of extract or for railway sleepers. The heartwood contains 20 to 24 per cent. of tannin, the sapwood 3 to 4 per cent., and the bark 6 to 8 per cent.; the two latter are seldom used for making extract. The cost of cutting the logs and bringing them to the factory is greater than that of manufacturing the extract itself. Quebracho obtained from the Provinces of Santiago del Estero and Santa Fe, Argentina is particularly rich in tannin and it is there that the trees reach the largest size. White quebracho is common throughout the regions where the true quebracho grows. It is an evergreen tree, reaching a height of 60—100 feet and a diameter of 1—3 feet, and is remarkable for its erect stem and wide-spreading crown. The wood is strong, hard and very heavy and is suitable for use as a substitute for boxwood. Red quebracho is also found in the same range as the others; the wood is red when freshly cut but turns dark-brown with age. Its commercial importance is relatively so small that it is seldom mixed with the other wood. Microphotographs of sections of the wood are given as an aid to distinguishing the wood of the true quebracho from that of the two inferior species.—D. J. L.

Tanning materials; Action of sulphuric acid in the extraction of ——. J. Wladika and E. Kudláček. Collegium 1912, 347—379, 433—460.

The following materials were extracted with water and with sulphuric acid of various strengths: pine-bark, oak-bark, valonia, oak-wood, chestnut-wood myrobalans and sumac. A large number of tables are given showing that the extract obtained with the acid solution contains much less tannin, with a corresponding increase of non-tannins, the greater part of the increase of non-tannins being due to substances of a sugar nature produced by the action of the acid. A large number of figures are also given showing the effect of the inversion by acid of the aqueous extracts of the materials. Experiments were also carried out on the fermentation by yeasts of the extracts.—D. J. L.

Tanning extracts; Testing of —— with animalised cotton. A. Gansser. Collegium, 1912, 479—482. (See also this J., 1911, 500, 699.)

The modified form of apparatus for making animalised cotton and for tanning experiments therewith consists of a vessel of tinned copper or aluminium bronze, surrounded by a steam bath, for containing the gelatin solution. Above this bath are fixed two spools on which the cotton strips are rolled. A smaller bath is used for treating the material with formaldehyde and a pair of rollers is fixed above it. The animalised cotton is prepared from cotton, which must be free from dressing, of 1 mm. thickness, in strips 11 cm. wide and 20 metres long, which are wound on the spools. For the 20 metres of material 2 litres of aqueous formaldehyde solution are required and as the cotton leaves this bath it is passed between the rubber rollers which are loaded with a weight of 10 kilos.; 3 litres of a 10 per cent. solution of purest gelatin are placed in the bath, the temperature of which is kept at 60° C. and the material wound through this four times, after which it is passed between the rollers under slight pressure and dried in a well ventilated room. For tanning experiments, strips 6 cm. wide are used weighing, when dry, 3 grms. These are soaked in cold water for half an hour. 18 c.c. of tanning extract of 25° Bé. are dissolved in 57 c.c. of water for a trial with 3 pieces of cotton (9 grms.). The density of the tan liquor is 6° Bé. and the temperature is kept at 20° C. The cotton is introduced in a rolled condition, allowed to stand a few minutes and the tanning cylinders, which are 30 cm. high and 9 cm. wide, are put in a rotating machine making 18 rotations per minute. The tanning is complete in 7 hours. The pieces are then washed with cold water, lightly pressed between the rollers or dried on filter paper and dried in the absence of sunlight. It has been found that a small percentage of copper, especially in quebracho extract, gives a yellowish shade to the tanned animalised cotton and also to leather.

—D. J. L.

Oil of mustard as an antiseptic to prevent the decomposition of tan liquors. J. M. Seltzer. J. Amer. Leather. Chem. Assoc., 1912, 7, 458—461.

The use of artificial mustard oil in the proportion of 0·05 per cent. will preserve tan-liquors almost indefinitely. The oil mixes with the liquor at once but, as it is volatile, samples should not be exposed to the air when preserved by it or its preservative powers are soon lost. Tables are given showing the effect of mustard oil and of thymol, used at the same strength, on the acidity of various liquors during various periods.—D. J. L.

Soaking of dried hides by means of formic acid. J. R. Blockey. Tanners' Year Book, 1912, 98—105. J. Amer. Leather Chem. Assoc., 1912, 7, 467—474.

In the first series of tests, ten dried Central American hides, after one day in clear water, were divided into two packs and half put in 0·5 per cent. sodium sulphide solution and the remainder in 1 per cent. formic acid. In one day the hides in the formic acid were much more swollen than the others and the acidity had diminished to 0·125 per cent. The acidity was increased to 0·5 per cent. and the hides put back and on the next day they were very swollen and the acidity had diminished to 0·25 per cent. After

7 days in clean water soaks, both packs were limed for 12 days on the three-pit system, after which the hides treated with formic acid were plumper than the others. The percentage of pelt weight on green weight was 230 for the hides treated with sulphide and 236 for those treated with formic acid, the latter being plumper and firmer during the tanning but with a slight tendency to harsh grain. A pack of dried Madagascar hides after washing in water was placed, half in 0·5 per cent. sodium sulphide and half in 0·5 per cent. formic acid. After one day the latter were much the more swollen, but not so much as in the previous test. After liming, the rounding table figures gave 223 per cent. for the hides treated with sulphide, and 226 for those treated with formic acid. In the third tests, Central American hides were soaked in 0·25 per cent. formic acid with the addition of 2 per cent. of salt, with a parallel test using sodium sulphide. The rounding table weights were: hides treated with formic acid, 239 per cent.; hides treated with sulphide, 234 per cent. In the fourth series of tests using 0·25 per cent. solutions of formic acid and caustic soda with the addition of 2 per cent. of salt to the acid, the swelling was greater with the caustic soda and the rounding table weights were: hides treated with formic acid, 226 per cent.; hides treated with caustic soda, 219 per cent. It was found preferable from considerations of economy and efficiency to use a strength of 0·1 per cent. of formic acid rather than higher concentrations. Figures given of the amount of hide substances dissolved during the soaking show that in all cases the amount dissolved in the acid soak was less than that in the sulphide or caustic soda solution of the same strength. When using the acid at 0·1 per cent. strength, the cost is less than 1d. per hide and as the liquor is antiseptic, the same liquor can be strengthened and used again many times. The sterilising action of formic acid has the effect of lengthening the time required for liming, but this can be reduced to the normal by the addition of sodium sulphide. The finished leather from the hides soaked in formic acid was harder and firmer than the other, the colour being the same. The increase in finished leather from the raw material in the former case was very marked. With one pack of butts, the percentage of finished weight on the pelt weight was 80 for the hides treated with formic acid and 77·5 for those treated with sulphide.—D. J. L.

Patents.

Dyeing skins; Machine for ——. M. Aujard. Fr. Pat. 441,853, Mar. 22, 1912.

The skins are placed on a circular concave table having a slow and preferably intermittent rotating movement and worked upon by revolving brushes which have a to-and-fro motion such that they are removed from the surface of the skin during their return motion from the periphery to the centre of the table.—D. J. L.

Skins; New method for the treatment of ——. La Peausserie Française. Fr. Pat. 442,062, Mar. 1, 1912. Under Int. Conv., Mar. 4, 1911, and Feb. 16, 1912.

The process is designed for the satisfactory colouring and finishing of skins even of inferior quality. The skin is stretched tightly in a frame by means of hooks and cords during all the operations. Both sides are coated with a solution of gutta-percha in benzene or turpentine, and the skin dried at a suitable temperature. The side to be coloured is then treated with a suitable mordant such as a solution of tin, lead, or iron, followed by the colouring solution having a base of gutta-percha, gum-lac, and sulphur, and the skin finally stoved. The solutions are applied to the skin in a machine, the design of which is described, in which the skin is placed while still stretched on the frame.—D. J. L.

Leather-boards; Process for the production of stock for ——. A. L. Clapp, Braintree, Mass., Assignor to Hide-Ite Leather Co., Boston, Mass. U.S. Pat. 1,033,538 July 23, 1912.

A substantially waterproof filler, constituting stock for leather-board, is prepared by producing an insoluble precipitate in hydrocellulose by means of sodium bichromate, and mixing the resulting product with fibrous leather.—O. R.

Glue and gelatin; Steam apparatus for the extraction of ——. J. Lehmann. Fr. Pat. 441,548, Feb. 17, 1912.

The apparatus consists of an extraction cylinder, with the necessary fittings, containing a rotating cylinder of metal gauze in which is placed the material, previously finely divided, which is to be submitted to the action of the steam delivered from a boiler at the temperature required to obtain pure and complete solution of the hide-matter, bone-glue, etc. The solution is removed from the bottom of the heater by running through taps and the exhausted materials are carried through the cylinder continuously and discharged from the end by means of an Archimedian screw running through the centre.—D. J. L.

Plastic substances from milk; Process of producing ——. O. H. Nowak, Chicago, Ill., Assignor to F. Lebreil and R. Desgeorge, Lyons, France. U.S. Pat. 1,031,814, July 9, 1912.

Soluble matter is eliminated from the curd of milk, after which the latter is itself dissolved and re-coagulated by means of an acid or of an acid salt; a small quantity of a ketone is then added to the coagulum, which is pressed to free it from water, formed into layers, and dried under pressure in a vacuum.—O. R.

Quebracho extracts giving clear solutions at the different temperatures used in tanning; Process for making ——. A. Redlich and G. Deutsch. Fr. Pat. 441,511, March 19, 1912. Under Int. Conv., May 2, 1911.

See Eng. Pat. 7389 of 1912; this J., 1912, 786.—T. F. B.

Leather; Process of making firm, almost entirely waterproof, non-slipping —— F. Kornacher, Auerbach, Germany. U.S. Pat. 1,036,267, Aug. 20, 1912.

See Ger. Pat. 244,066 of 1911; this J., 1912, 447.—T. F. B.

Glue or glue compounds; Process for the manufacture of ——. J. M. Neil, New York. Eng. Pat. 10,373, May 1, 1912. Under Int. Conv., May 27, 1911.

See U.S. Pat. 1,023,523 of 1912; this J., 1912, 504.—T.F.B.

XVI.—SOILS; FERTILISERS.

Calcium cyanamide [nitrolim]; Supposed loss of nitrogen in ——. G. Liberi. Ann. R. Staz. Chim.-Agrar. Sperim. di Roma, 1911, 5, 163—177.

In view of the conflicting statements as to the loss of nitrogen suffered by crude calcium cyanamide on keeping, the author carried out a series of experiments, the loss being ascertained by determining the actual ammonia evolved. It was found that under the most severe conditions, *e.g.*, exposure for 50 days in a constantly changing atmosphere saturated with water vapour, the loss of nitrogen amounted to only 3·057 per cent. of the total nitrogen in the original material. Taking into consideration the severity of the conditions, the author concludes that in practice, when the material is usually in sacks or the like, so that relatively a much smaller surface is exposed, and the conditions are milder, the loss of nitrogen is practically negligible, especially if the fertiliser be kept in a dry atmosphere.—A. S.

Calcium cyanamide [nitrolim]; Instability of the cyanamide-nitrogen in ——. G. Liberi. Ann. R. Staz. Chim.-Agrar. Sperim. di Roma, 1911, 5, 180—197.

When crude calcium cyanamide is kept, the proportion of cyanamide-nitrogen therein diminishes; the decrease is slight in a dry atmosphere but more marked in the open air, whilst if the fertiliser be kept in an atmosphere saturated with water vapour, the cyanamide-nitrogen disappears almost entirely. As the change thus appears to be due to the action of moisture, the behaviour of calcium cyanamide in aqueous solution at 27° C. was studied, the variations in the respective proportions of cyanamide- and dicyandiamide nitrogen on keeping 1 per cent. and 5 per cent. solutions of crude calcium cyanamide being determined. With both solutions the cyanamide-nitrogen diminished rapidly at first and then more slowly until it almost completely disappeared; the change proceeded more rapidly in the stronger solution. The dicyandiamide-nitrogen increased rapidly to a maximum at first and then decreased gradually (after 76 days the percentage of dicyandiamide-nitrogen referred to the original calcium cyanamide was a little over 0·2 per cent. in both solutions); here also the change was much more pronounced in the stronger than in the weaker solution. No appreciable quantity of ammonium compounds was formed in either of the solutions. (See also Ulpiani, this J., 1908, 1167; 1910, 1027.)—A. S.

Urease of Robinia pseudacacia seeds; Technical utilisation of the ——. G. Zemplen. Z. angew. Chem., 1912, **25**, 1560—1562.

The author has shown previously (this J., 1912, 597) that the seeds of *Robinia pseudacacia* contain a relatively large quantity of the enzyme *urease*, and he now describes experiments, the results of which lead him to conclude that the technical production of ammonia (ammonium sulphate) from urine by means of powdered Robinia seeds (compare this J., 1910, 36; 1911, 566) would prove remunerative. It would be possible to obtain 93½ per cent. of the theoretical yield of ammonia from the urea, or 35 kilos. of ammonium sulphate per cubic metre of urine. In the distillation with lime for the recovery of the ammonia, a precipitate is produced, which, after drying, contains 13·7 per cent. of phosphoric anhydride and could be used as a phosphatic fertiliser. The ammonium sulphate possesses the advantage over that prepared from gas-liquor of never containing traces of thiocyanates, which have an injurious action on certain crops, *e.g.*, barley.—A. S.

Arsenic compounds in agriculture. G. Ampola and G. Tommasi. Ann. R. Staz. Chim.-Agrar. Sperim. di Roma, 1911, **5**, 241—377.

The authors review exhaustively the subject of the use of arsenic compounds in agriculture, giving full references to the literature and also a description of their own experiments. The paper is divided into the following sections:—Historical; the arsenic compounds used and possible dangers arising from their use; residual arsenic in foodstuffs from plants treated with arsenic compounds; physiological action of arsenic on plants; arsenic in arable soils. In their conclusions, the authors emphasise the dangers which may arise from the use of arsenic compounds, and whilst it is not feasible to prohibit their use, it is recommended that laws and regulations be imposed in regard to the sale, transport, storage, and use of such compounds. It is stated that foodstuffs prepared from plants which have been treated with arsenic compounds always contain arsenic, usually traces, but often as much as 2 mgrms. or even more per kilo. in fruits and 1·5 mgrms. per litre in wine—quantities exceeding the permissible limits recommended in the report of the English Royal Commission on Arsenical Poisoning (see this J., 1901, 916, 943; 1904, 159).—A. S.

Patents.

Fertiliser; Lawn and general ——. A. Key, Norwich. Eng. Pat. 22,743, Oct. 16, 1911.

The following mixture in parts by volume is claimed to be a suitable fertiliser for all places not more than 200 miles from the sea-board: Yellow clayey loam, 100; slaked lime, 8; bone flour, 12; ammonium sulphate, 20; and ferrous sulphate, 6 parts.—O. R.

Fertilising vegetable growth; Method of ——. A. J. Rossi, Niagara Falls, N.Y., Assignor to The Titanium Alloy Manufacturing Co., New York. U.S. Pat. 1,032,432, July 16, 1912.

Titanium nitride, alone or mixed with earth, is claimed as a fertiliser.—O. R.

XVII.—SUGARS; STARCHES; GUMS.

Glucose; Determination of —— *in presence of foreign substances, by Bertrand's method.* M. Rosenblatt. Biochem. Zeits., 1912, **43**, 478—480.

The author has investigated the influence of various nitrogenous compounds, including amino-acids, urea and peptone, on the determination of glucose by Bertrand's method (see this J., 1907, 60). He concludes that these substances introduce no serious error (rarely more than 3 per cent. of the amount of sugar) even when present in quantities considerably in excess of the sugar.—J. H. L.

Starch; Adsorption of substances dissolved in water by ——. A. Rakowski. Z. Chem. Ind. Kolloide, 1912, **11**, 51—58.

Experiments were made with starches from potatoes, arrowroot, wheat, and rice, and it was found that there is little or no adsorption of inorganic or organic acids or salts from aqueous solutions by starch. Soluble alkalis (except ammonia) are, however, strongly adsorbed from aqueous solutions and the hydroxides of heavy metals from ammoniacal aqueous solutions. The detailed experimental results are given in tables and curves.—A. S.

Dextrose; Preparation of chemically pure —— *from the commercial products.* H. F. Bauer. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 21—23.

The commercial starch-glucose sugars: "anhydrous sugar" (92·8 per cent. of dextrose), "80 sugar" (80·1 per cent.) and "70 sugar" (71·2 per cent.) may be used as starting points for the preparation of pure dextrose. The sugar is steeped with an equal weight of methyl alcohol for 12 hours; the alcohol is removed by suction and replaced by a further portion which is allowed to remain for 6 hours; for "70" and "80 sugars," a third steeping is necessary. The washed crystals are dissolved in water, and alcohol is added to the solution, which is then heated and filtered. The amounts of water and alcohol required per 100 grms. of original material are: for "70 sugar," 25 c.c. and 100 c.c. respectively; for "80 sugar," 30 c.c. and 125 c.c.; for "anhydrous," 40 c.c. and 140 c.c. The solution is concentrated to a syrup and methyl alcohol is added: for "70 sugar," 50 c.c.; for "80 sugar," 60 c.c.; for "anhydrous," 70 c.c. per 100 grms. of original material. After crystallisation starts, the same amount of methyl alcohol is added again, the mass being stirred every 5 minutes. The mass is poured into a percolator, allowed to stand for 12 hours, the mother-liquor is removed by suction, the crystals are steeped for 15 minutes in 25 c.c. of methyl alcohol per 100 grms. of original material, the alcohol is drained off by suction and the washing is repeated twice more in the same way. The crystals are dried *in vacuo* at a temperature not exceeding 90° C. The yield of pure dextrose is 65 per cent. from "anhydrous sugar," 50 per cent. from "80 sugar" and 32 per cent. from "70 sugar."—J. F. B.

Glucose [syrup]; Composition of commercial ——. A. P. Bryant. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 47—56.

The author has investigated several samples of commercial glucose ["corn-syrup"], determining in solutions containing 20 grms. per 100 c.c., the total solids, dextrose equivalent, polarimetric reading on sugar scale, nitrogen and ash, both before and after fermentation with washed brewers' yeast. The figures obtained with one of the samples were as follow for (a) the original and (b) the fermented solution: solids in 100 c.c., (a) 16·88, (b) 9·17 grms.; dextrose equivalent, (a) 7·96, (b) 1·80; polarimetric reading on sugar scale, (a) 64·5 in 100 mm. tube, (b) 85·0 in 200 mm. tube: nitrogen, (a) 0·002, (b) 0·015 per cent.; ash, (a) 0·10, (b) 0·10 per cent. From these data the apparent composition of the syrups was calculated in terms of dextrose, maltose, dextrins and ash. The maltose was calculated in the following manner, on the assumption that no other reducing matter than dextrose and maltose is fermented: Let D = dextrose, M = maltose, K = reducing value (of fermentable portion) calculated as dextrose. F = weight of matter fermented and 0·62 the reducing value of maltose as compared with dextrose; then $D+0{\cdot}62M=K$, and $D+M=F$, hence $0{\cdot}38M=F-K$. The unfermentable residue was in all probability a reducing dextrin, which in the case of normally converted syrups showed $[\alpha]_D=152°$—168° and $K=17{\cdot}4$—20·7. One of the points brought out by these experiments was the approximate agreement between the dextrose value and the total fermentable sugars, the average of all samples showing 44·1 per cent. for the dextrose equivalent and 45·9 per cent. for the fermentable matter. Another point was the strikingly constant proportion of maltose, even in samples of widely different degree of conversion. The maltose averaged 30 per cent. of the dry substance, and it would appear that, at any rate within the range of glucose syrups, the hydrolysis of maltose into dextrose proceeds at approximately the same rate as the production of maltose from the dextrins. The hydrolysis of starch under these conditions appears to yield nearly constant proportions of reducing dextrins and maltose, whilst the dextrose varies widely according to the degree of conversion. —J. F. B.

Starch; Lintner's polarimetric method for the determination of ——. C. E. G. Porst and H. A. Crown. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 213—218.

The authors have investigated Lintner's polarimetric method for the determination of starch in cereal products, particularly as regards the constancy of the readings in relation to time and temperature. The following procedure was finally adopted: 5 grms. of starch, or an equivalent quantity of finely ground material, are mixed with 20 c.c. of water in a mortar and cooled in an ice-bath. To this are added 40 c.c. of concentrated hydrochloric acid previously cooled in a freezing mixture, and the solution is kept at 20° C. for half an hour. The contents of the mortar are transferred to a 200 c.c. flask, 10 c.c. of a 4 per cent. solution of phosphotungstic acid are added and the liquid made up to the mark at 20° C. with hydrochloric acid of 1·125 sp. gr. The flask is then kept for half an hour in a water-bath at 20° C., the liquid is filtered, and 15 minutes after filtering the reading is taken at 20° C. The results are concordant when the same conditions are observed, and agree fairly well with those obtained with the diastase and Sachsse methods; the time required is short, being only 1¼ hours. The results are too low when a large amount of protein is present. With a sample of gluten meal containing 40—50 per cent. of protein, the readings increased with the amount of phosphotungatic acid added, owing to precipitation of protein. A maximum reading was obtained with 10 c.c. of a 20 per cent. solution of phosphotungstic acid. With further quantities of this reagent the reading decreased owing to the precipitation of some of the starch. Result: 44·7 per cent. of starch as against 45·2 per cent. by Sachsse's method. The specific rotatory power of dry maize starch was found to be 199·4°.—J. F. B.

Starch; A new form of soluble ——. A. Fernbach Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 131—132.

If a 1 or 2 per cent. paste of potato starch be poured into a large excess of acetone, a flocculent precipitate is formed. This precipitate is collected, triturated in a mortar with acetone, drained and dried *in vacuo*. A very light, pulverulent white mass is thus obtained which is soluble both in hot and in cold water. A 1 per cent. solution prepared in the cold leaves only a trace of insoluble residue; the solution does not reduce Fehling's solution, it is readily filtered through paper, it gives a pure blue reaction with iodine and is saccharified by malt exactly in the same way as ordinary starch paste. In order to obtain a product entirely soluble in cold water, it is necessary to start with a sufficiently dilute paste: if the paste be stronger than 2 per cent., the product is only partially soluble and the insoluble residue after filtration has all the appearance of starch paste.—J. F. B.

Maltose in acid-hydrolysed starch products; Presence of ——. G. Defren. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 111—112.

The presence of maltose in acid-converted starch glucose products has been widely recognised but not objectively proved by the isolation of the sugar. The author has now isolated maltose from acid-converted products having $[\alpha]_D$ between 144° and 110°. For the removal of the dextose, advantage was taken of the fact that *S. apiculatus* ferments dextrose, whilst leaving maltose almost unchanged. A starch conversion-product, having $[\alpha]_D=144°$ was treated with yeast-water and ammonium phosphate, sown with *S. apiculatus* and fermented. The alcohol was removed by distillation and the residue again fermented. The liquid was poured into a large volume of boiling 90 per cent. alcohol and the precipitate allowed to settle. The supernatant liquid was filtered, concentrated to a syrup and allowed to crystallise. On decolourisation and recrystallisation from boiling water, maltose was obtained and definitely characterised. A conversion product having $[\alpha]_D=110°$ yielded maltose still more easily (*cp*, Ost, Z. angew. Chem., 1904, 1663). —J. F. B.

Dextrins; Effect of acidity and time in the roasting of ——. H. F. Bauer. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIa. Orig. Comm., **13**, 9—19.

Maize starch, having a normal acidity equivalent to 18—20 c.c. of *N*/10 acid per 100 grms., was converted in a kiln heated with steam coils, at a temperature of 300°—340° F. (149°—171° C.), samples being withdrawn periodically. Four series of experiments were made, one with the starch without the addition of any further acid, and the others after acidifying the starch with 4, 8 and 12 per cent. respectively of nitric acid of 38° Bé., diluted to 12° Bé. The general course of all the conversions showed a continuous increase in the acidity of the material, an increase in the proportion of matter soluble in cold water up to a point at which the whole product was soluble, after which point further roasting was accompanied by a progressive decrease in solubility. The proportion of cupric-reducing sugars formed increased with the proportion of acid used, but in no case waa very high; the reversion of soluble matters to insoluble as the result of further heating was accompanied by a decrease of the cupric-reducing sugars. When no acid was added to the starch, 108 hours' heating was required before the product was completely soluble in cold water. When nitric acid was employed, a completely soluble product was obtained in 4—8 hours. The appearance of the insoluble matter was starchy at first, changing to gummy as conversion proceeded; during the period of reversion the appearance of the insoluble matter remained gummy until a very advanced stage, after which, in the case of starch acidified with nitric acid, the insoluble matter gradually assumed a granular form.—J. F. B.

Patent.

Starch flour soluble in cold water; Process for making ——. J. Kantorowicz. Fr. Pat. 442,619, April 17, 1912. Under Int. Conv., April 20, 1911.

See Eng. Pat. 9082 of 1912; this J., 1912, 788.—T. F. B.

XVIII.—FERMENTATION INDUSTRIES.

Maltose : Influence of various acids on the hydrolysis of —— by maltase. W. Kopaczewski. Z. physiol. Chem., 1912, **80**, 182—193.

A TWO per cent. solution of maltose and a 1 per cent. solution of taka-diastase were warmed to 39·5° C., mixed, and 3 c.c. of the liquid added to series of tubes, containing 2 c.c. of the various acids at progressive concentrations, which had been previously placed in a thermostat at 39·5° C. The tubes were replaced in the thermostat and the action was interrupted after 3½ hours. For all the acids used, with the exception of boric acid, the following four characteristic concentrations were observed: (1) the lowest concentration which stimulated the action of the maltase; (2) the concentration at which this stimulation was at its maximum; (3) the concentration at which the acid began to exert an inhibitive action; (4) the concentration at which the acid entirely suppressed the activity of the enzyme; no clear distinction could be drawn between the action of the organic and the inorganic acids. Some of the results obtained were as follow, the figures giving the concentrations at which the acids (1) exerted the most favourable action, and (2) completely inhibited the action of the maltase: hydrochloric acid, 0·0062*N*, 0·05*N*; nitric acid, 0·0062*N*, 0·05*N*; iodic acid, 0·0062*N*, 0·1*N*. Boric acid exerted a slightly stimulating action at all concentrations used (up to 0·4*N*). With few exceptions it was found that the maximum degree of stimulation attained with all the acids was the same, viz., 158·5 per cent. In the series of monobasic, saturated organic acids, the action became weaker as the number of CH_2 groups increased. As a rule, acids of the iso-series were more active than those of the normal series. The entrance or increase of hydroxyl groups in the acids increased their activity. With the stereoisomeric unsaturated dibasic acids, the activity was greater the nearer the carboxyl groups were to each other. Optical isomerism, as in the case of the tartaric acids, had no influence. In the series of chloro-acetic acids, increase of chlorine increased the activity; phenyl groups increased the activity of the acids. If the acids be arranged according to their activity, the order is, on the whole, the same as when they are arranged according to their electrical conductivity or their power of inverting sucrose. Still there are exceptions, which indicate that in enzyme reactions it is not merely the degree of dissociation which counts, but that the qualitative nature of the anion is also a factor: for instance, in the hydrolysis of maltose by maltase, dichloro-acetic acid has a stronger influence than any mineral acid.—J. F. B.

Yeast ; Protective action of sugar in the drying of ——. F. Hayduck and D. Bulle. Woch. Brau., 1912, **29**, 489—494.

ADDITION of 5—10 per cent. of sugar to pressed distillery yeast enables the latter to retain its vital and enzymic powers on subsequent drying (see this J., 1912, 696). After admixture with the sugar the yeast liquefies, owing to the withdrawal of cell-juices by the sugar, but this liquefaction is not attended with injury to the cells. Immediately after the sugar has been added, the yeast should be spread on coarse muslin or brass gauze, and dried at 45°—60° C. It is important that the added sugar should not all be fermented before the drying is complete. The best results were found to be attained by quickly mixing the pressed yeast with 10 per cent. of sucrose and drying on muslin at 50° C., the latter operation occupying about 3 hours. The dried yeast thus produced contained 90 per cent. of its cells living. When submitted to a test of fermentative power, using 4 grms. of the dried product with 400 c.c. of a 10 per cent. solution of sucrose, 1010 c.c. of carbon dioxide were evolved in 2 hours. In carrying out such tests it is very important that the dried yeast should not be mixed directly with the sucrose solution, but should first be exposed for a considerable time (*e.g.*, 20 hours) to moist air, so that the cells may absorb water gradually. Experiments with bottom-fermentation beer yeast (top-fermentation yeast was not investigated) showed that in order to obtain good results by this process the yeast must undergo a preliminary treatment to reduce its protein-content. The authors allowed 100 grms. of beer yeast to ferment, under conditions of strong aeration, for 8 hours at 30° C., in 3 litres of a solution containing 300 grms. of sucrose, 5 grms. of monopotassium phosphate, 10 grms. of magnesium sulphate and 5 grms. of calcium carbonate, but no nitrogenous matter. After freeing the yeast crop from the liquid by means of a Rutsch filter, and treating it by the process described for distillery yeast, a dried product of high fermentative power was obtained, containing 60 per cent. of its cells living. The fermentative power of distillery yeast, dried as described, was found to diminish on keeping, and different samples showed wide variations in this respect. The power of one sample only diminished by 50 per cent. in 37 days, whilst in another case a diminution of 75 per cent. occurred in seven days.—J. H. L.

Yeast fermentation without sugar. VII. Formation of aldol in the fermentation of pyruvic acid. C. Neuberg. Biochem. Zeits., 1912, **43**, 491—493.

WHEN free pyruvic acid is fermented by yeast, the products are acetaldehyde and carbon dioxide (see this J., 1911, 1179, 1465). When the potassium salt of the acid is employed, potassium carbonate is formed, and condensation of the acetaldehyde to aldol occurs. If the living yeast plays a direct part in this condensation, the product formed would probably be optically active. By oxidising aldol formed in this way, the author has isolated the corresponding acid, β hydroxybutyric acid, which was found to be optically inactive; but it is possible that racemisation may have occurred.—J. H. L.

Yeast fermentation without sugar. VIII. Formation of acetaldehyde during so-called auto-fermentation. C. Neuberg and J. Kerb. Biochem. Zeits., 1912, **43**, 494—499.

SMALL quantities of acetaldehyde are formed during the auto-fermentation of pressed yeast in presence of toluene, whether zinc chloride is present or absent (cp. Kostytschew, this J., 1912, 553, 741). A similar formation of aldehyde occurs when "hefanol" undergoes auto-digestion in presence of toluene and zinc chloride. The quantity of aldehyde formed in the latter case, especially in presence of alcohol, is sometimes as great as that produced during the fermentation of sugar by "hefanol." If the "hefanol" is first boiled with water, no appreciable formation of aldehyde takes place. The authors consider that the aldehyde arises, not from the fermentation of sugar, but more probably from the action of carboxylase (see this J., 1912, 1179) on pyruvic or oxalacetic acid formed in some way from amino-acids produced by the autolysis of the yeast.—J. H. L.

Hexosephosphate ; Action of enzymes on ——. V. J. Harding. Proc. Royal Soc., 1912, **85**, B, 418—422.

IN the fermentation of sugar by yeast-juice, the rate of fermentation is dependent upon the rate at which phosphate is regenerated from the hexosephosphate, and any acceleration of this reaction would increase the rate of fermentation of the sugar. The author describes experiments with the object of finding an enzyme capable of hydrolysing hexosephosphate and which therefore might be expected to bring about the above effect when added to a fermenting mixture. Lipase from castor oil seeds was incubated with a solution of sodium hexosephosphate at 25° C. in presence of toluene for several days, when any phosphate liberated was precipitated with magnesium citrate mixture and weighed as pyrophosphate. A considerable amount of hydrolysis was found to take place, but slowly. Autolysed ox pancreas had no action, zymin extract had only a slight action, and autolysed yeast juice had a slow action. From autolysed yeast juice, the author was successful in obtaining by precipitation with alcohol and ether a preparation which possessed considerable activity towards hexosephosphate.—J. H. J.

Bacillus coli communis (Escherich); Chemical action on glucose of a variety of —— obtained by cultivation in presence of a chloroacetate. A. Harden and W. J. Penfold. Proc. Royal Soc., 1912, **85**, B, 415—417.

An investigation was made of the variety of *B. coli* which grows on agar containing sodium chloroacetate and which does not produce gas from glucose in a Durham's tube. The organism was grown in glucose peptone water, with the addition of chalk, in an atmosphere of nitrogen, a culture of the original *B. coli* from which the variety was derived being grown under the same conditions. It was found that the variety yielded 12·6 c.c. of hydrogen per gram of sugar as against 80·6 c.c. yielded by the original organism, and that the variety produced a greatly increased yield of lactic acid and a diminished yield of other products as compared with the original. The authors explain the normal decomposition of the glucose as due to three independent enzymes, one of which converts a portion of the sugar into lactic acid; the second converts the remainder of the sugar into alcohol and acetic and formic acids, and the third decomposes the formic acid into carbon dioxide and hydrogen. These enzymes may occur in different proportions in individual organisms, and the presence of the chloroacetate may encourage the growth of those containing a large amount of the lactic acid enzyme and smaller amounts of the other enzymes. This selective action would account for the difference in the yields of the products in the two cases.—J. H. J.

Wort and beer; Determination of extract in ——. W. Fresenius and L. Grünhut. Z. anal. Chem., 1912, **51**, 643—658. (See also this J., 1912, 247).

From a consideration of the densities of solutions of the various substances which constitute the extract of malt liquors, and the proportion in which these substances are present, the authors have drawn conclusions respecting the validity of various tables proposed for the determination of the percentage extract-content from the specific gravity of malt liquors. They conclude that Windisch's table gives the most accurate results in the analysis of beers, but in the case of unfermented worts and malt-extracts (which contain a large proportion of maltose and very little glycerin, succinic acid and lactic acid) the table compiled by Rüber (see this J., 1908, 61) shows more accurately the percentage amount of extract actually present.—J. H. L.

Alcohols, salts, and water; Equilibria in systems containing ——, including a new method of alcohol analysis. G. B. Frankforter and F. C. Frary. Eighth Int. Cong. Appl. Chem., 1912. Sect. Xb. Orig. Comm., **22**, 87—127.

The authors have investigated the following ternary systems: potassium fluoride, ethyl alcohol, and water; potassium carbonate, ethyl alcohol, and water; potassium carbonate, methyl alcohol, and water; potassium fluoride, propyl alcohol, and water; potassium carbonate, propyl alcohol, and water; and sodium chloride, propyl alcohol, and water. Complete curves for each system are given. Potassium fluoride has a very strong salting-out power for alcohols, *i.e.*, it readily causes aqueous solutions of alcohols to separate into two layers, and its saturated solution is a better dehydrating agent than a saturated solution of potassium carbonate. Anhydrous potassium fluoride is a good dehydrating agent for ethyl alcohol, and owing to its greater solubility therein, acts more rapidly than potassium carbonate. It absorbs 62 per cent. of its weight of water in order to form the lowest hydrate ($KF,2H_2O$), and the alcohol in equilibrium with this hydrate yields a distillate of 97·5 per cent. concentration. A method for the determination of ethyl alcohol, based on the salting-out action of potassium fluoride, is described. A weighed quantity of freshly ignited potassium fluoride is introduced into a weighed stoppered flask, a weighed quantity of the alcoholic solution (*e.g.*, whiskey) is added, and the fluoride is dissolved. The proportion of solution and fluoride are so chosen that the liquid separates into two layers. Water is now added in small quantities, with frequent shaking, until the solution just becomes homogeneous, and the whole is then again weighed. Reference to the following table gives the alcohol concentration of the homogeneous solution, and from this the percentage of alcohol in the original solution can be calculated. The method is not applicable in the case of solutions, such as beer, containing large quantities of dissolved solids. A few experiments indicated that, within certain concentrations, ethyl alcohol can be satisfactorily determined in presence of small quantities of methyl alcohol in this way.

Determination of alcohol by means of the binodal curve of the ternary system: water, alcohol, potassium fluoride.

Grms. per 100 grms. of solveat.		Grms. per 100 grms. of solvent.		Grms. per 100 grms. of solvent.	
Potassium fluoride.	Alcohol.	Potassium fluoride.	Alcohol.	Potassium fluoride.	Alcohol.
60	2·82	40	6·32	20	23·40
59	2·92	39	6·65	19	25·10
58	3·02	38	7·01	18	26·90
57	3·13	37	7·40	17	28·8
56	3·24	36	7·83	16	30·8
55	3·36	35	8·30	15	32·9
54	3·48	34	8·81	14	35·0
53	3·61	33	9·37	13	37·2
52	3·75	32	9·98	12	39·4
51	3·90	31	10·64	11	41·7
50	4·06	30	11·36	10	44·0
49	4·23	29	12·14	9	46·4
48	4·41	28	12·99	8	49·0
47	4·60	27	13·92	7	51·9
46	4·80	26	14·94	6	55·1
45	5·01	25	16·07	5	58·7
44	5·24	24	17·33	4	62·8
43	5·48	23	18·75	3	67·5
42	5,74	22	20·26	2	78·6
41	6·02	21	21·80	—	—

—A. S.

Wine; Determination of phosphoric acid in ——. C. von der Heide and J. Schwenk. Z. anal. Chem., 1912, **51**, 615—627.

In the incineration of table wines, sweet wines, musts or yeast, prior to the determination of phosphorus, the addition of sodium carbonate and salpetre to prevent volatilisation of phosphorus compounds is unnecessary. For the determination of phosphoric acid in wines the authors proceed as follows:—50 c.c. are evaporated and charred in the usual way, sweet wines being first fermented. The charred residue is extracted, not with nitric acid, but with water, and then incinerated. The ash is dissolved in nitric acid, the solution is filtered into the aqueous extract obtained as above, and the phosphorus is determined in the mixed liquids. By employing a suitable electric furnace the incineration can be carried out in one operation, a white ash being obtained. The best method of precipitating the phosphorus is that of v. Lorenz (see Neubauer and Lücker, this J., 1912, 259), but those of Neumann (Z. physiol. Chem., 1902, 37, 115; 1904, 43, 35) and Grete (this J., 1909, 1105) also give good results. Only a small proportion of the phosphoric acid of wine is present in organic combination. The method of v. Lorenz, applied directly to wines, only precipitates the inorganic phosphates, but Grete's method shows the total phosphoric acid, provided the wine does not contain more than 0·5 per cent. of sugar. A separation of inorganic from organic phosphoric acid can be effected by the method of Philippe and Duperthuis, which may be applied as followa:—The wine is made distinctly alkaline with barium hydroxide, and the precipitate formed, containing all the inorganic phosphates, is filtered with the aid of the pump, washed with water and incinerated together with the filter paper. The ash is dissolved in nitric acid and freed from barium salts by addition of sodium sulphate. After filtering from the barium sulphate, the phosphorus is determined in the liquid by the method of v. Lorenz. The filtrate and washings from the precipitate thrown down by barium hydroxide (see above), are concentrated, freed from barium by addition of sulphuric acid, filtered, neutralised with alkali, evaporated in a platinum dish and incinerated. The phosphoric acid in the ash, representing the organically combined phosphorus in the sample, is determined by v. Lorenz's method.—J. H. L.

Lintner's polarimetric method for the determination of starch. Forst and Crown. *See* XVII.

Patent.

Manufacture of fuel in plastic form from methylated alcohol. Eng. Pat. 2137. *See* IIa.

XIXa.—FOODS.

Green fodder; Action of monocalcium phosphate in the preservation of ——. G. Sani. Atti R. Accad. dei Lincei, Roma, 1912, **21**, II., 108—112.

Green clover, with and without addition of 300 grms. of monocalcium phosphate, $CaH_4(PO_4)_2$ per quintal (100 kilos.) was kept in silos for eleven months under similar conditions. The untreated fodder became covered with mould and on exposure to air soon acquired a disagreeable odour; the treated fodder was quite free from mould and even after exposure to the air for 10 days retained a pleasant ethereal odour. The loss of weight was 13·7 per cent. for the treated and 18·68 per cent. for the untreated fodder. whilst the percentages of dry substance in the original fodder, and in the untreated and treated fodder after the storing in silos, were 27·61, 23·99, and 28·32 respectively. Comparison of the composition of the treated green fodder. after storage, with that of clover hay showed that the former is still an excellent cattle food: after drying at 100° C., it contains 16·62 per cent. of crude protein, 10·03 of digestible proteins, 0·91 of amino-acids, 6·03 of crude fat, and 8·88 of starch.—A. S.

Tea: An investigation on the manufacture of ——. S. Sawamura. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIIIc. Orig. Comm., **18**, 313—322.

(1) *Effect of steaming on the activity of the enzymes of tea leaves.* The author has shown previously that the production of the aroma of manufactured tea is due to the action of an enzyme. He has now found that steaming for 30 seconds completely destroys the oxidising enzymes present in tea leaves but not the diastatic enzyme also present. In the manufacture of green tea, the leaves are steamed before rolling, and hence it is probable that in this case, at least, the aroma is produced by the action of an enzyme or enzymes less resistant to steaming than the oxidising enzymes. (2) *Effect of rolling on the solubility of tea.* The results of laboratory experiments show that the rolling of tea leaves has the effect of increasing the proportion of easily soluble matter by crushing the cells and pressing out the juice, which then dries on the surface of the leaves. This effect can, of course, only be detected if whole leaves are used for the determination of the soluble matter. (3) *Effect of "firing" on the chemical composition of tea.* It is usual to "re-fire" both green tea and black tea some days after manufacture. Experiments showed that for green tea the most suitable temperature is 70° C., and for black tea, 80° C. (1 hour); higher temperatures spoil the colour and flavour. The proportions of tannin and theine decrease during the treatment, owing probably to oxidation in the first case and to volatilisation in the second. The amount of soluble matter increases slightly when the tea is not heated too strongly, but both soluble matter and tannin decrease considerably when high temperatures (100° C.) are used.—A. S.

Patents.

Foodstuffs for cattle; Manufacture of ——. V. von Vangel, London. Eng. Pat. 17,759. Aug. 4, 1911.

Foodstuffs containing molasses, and especially mixtures of ground maize cobs and molasses, are sterilised by the addition of lime water (up to 2 per cent. by weight), and preferably, also by treatment with a current of ozonised air.—C. A. M.

Dietetic products and preparations; Manufacture of —— [*Addition of radio-active substances*]. J. Landin, Stockholm. Eng. Pat. 18,001. Aug. 8, 1911. Under Int. Conv., Aug. 8, 1910.

Compounds of radium, polonium, thorium, or actinium or mixtures or solutions of the same, are added to the food product, such as dried milk, bread, malt extract, etc., and the mixture is dried, preferably under reduced pressure —W. P. S.

Food products; Method of preserving ——. E. D. Schmitt, Baltimore, Md. U.S.A. Eng. Pat. 23,357, Oct. 23 1911.

The partially cooked product at a temperature of 180° F. (82° C.) is filled into glass receptacles heated to approximately the same temperature. The receptacles are now gradually heated to about 212° F. (100° C.), then hermetically closed, and further heated to from 240° to 260° F. (115·5° C.—127° C.). The filled receptacles are finally allowed to cool without removing them from the heating apparatus.—W. P. S.

Waste [animal and vegetable refuse]; Process and apparatus for treating ——. E. C. Emery, Los Angeles, Cal U.S. Pat. 1,030,169. June 18, 1912.

Waste material, such as is commonly considered worthless garbage, is introduced into a sealed vat, to which steam is admitted by way of a number of perforated pipes; the pressure of the steam agitates the material and sterilises it without cooking or digesting it; a valved overflow pipe is provided inside the vat, through which the condensed water containing oils, melted fats, and the like is drained off, and the treated material descends into a space, in which a revolving cone provided with vanes grinds it to a pulp, and emits it from the apparatus by centrifugal force. So treated the material forms a valuable food for pigs and poultry.—O. R.

Cherry extract and process of making the same. E. G. Ressencourt; H. Troll, Administrator, Assignor to F. B. Chamberlain Co., St. Louis, Mo. U.S. Pat. 1,036,338. Aug. 20, 1912.

To a mixture of sugar and cherry pulp are added "Cologne spirit," oil of bitter almonds, and the liquid resulting from treating the cherry skins with "Colonge spirit," and the whole mixture is distilled until its volume is reduced by about one-half. The residue is then strained and added to the distillate.—W. P. S.

Sterilising milk and other organic liquids; Process and apparatus for ——. J. Desmaroux, Paris. U.S. Pat. 1,036,806, Aug. 27, 1912.

See Fr. Pat. 376,226 of 1907; this J., 1907. 1025.—T. F. B.

Oil-cakes containing sinigrin and sinalbin; Process for avoiding the formation of mustard-oil in ——. O. Brücke. Fr. Pat. 442,356, March 12, 1912. Under Int. Conv., May 11, 1911.

See Ger. Pat. 247.427 of 1911; this J., 1912, 792.—T. F. B.

XIXb—WATER PURIFICATION; SANITATION.

Water; Bacteriology of aerated ——. G. D. Elsdon and N. Evers. Analyst, 1912, **37**, 395—398.

The number of organisms in water which grow on jelly at 21° C. or on Rebipel agar at 37° C. are much reduced on carbonating the water and allowing it to stand under pressure for 3—7 days. *B. coli* do not die off so rapidly as other organisms, but they die off rather more rapidly than in ordinary water. The growth of bacteria in glucose taurocholate is prevented neither by 10 grains of sodium bicarbonate per pint, nor by excess of carbon dioxide such as is found in carbonated waters. It appears, therefore, that with a water that has been carbonated for more than 24 hours, only the last-mentioned method will furnish a useful indication of the source or purity of the original water, and by this method correct results may probably be obtained for a week after carbonation. —L. E.

Germicidal power; Influence of the chemical constitution of certain organic hydroxyl and aminic derivatives on their ——. G. T. Morgan and E. A. Cooper. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIIId. Orig. Comm., **19**. 243—257.

The authors determined the germicidal power of a number of organic hydroxy- and amino-compounds by the method devised by Martin and Chick (J. of Hyg., 1908, **8**, 654), which consists in determining the "carbolic acid coefficient" of the substance by comparing the respective concentrations of the substance and of pure phenol required to kill an equal number of organisms of the same species in a constant volume (5 c.c.) of the disinfectant solution, during a constant period of time (15 mins.), at a constant temperature (20° C.). For *Staphylococcus pyogenes aureus*, the carbolic acid coefficients of a number of primary aliphatic alcohols were:—methyl alcohol, 0·025; ethyl alcohol, 0·027; propyl alcohol, 0·064; *iso*propyl alcohol, 0·040; *n*-butyl alcohol, 0·250; trimethylcarbinol, 0·055; *iso*amyl alcohol, a saturated (0·5 per cent.) solution failed to kill in 15 mins. Krönig and Paul (this J., 1900, 1033) have shown that alcohol decreases considerably the germicidal action of phenol on anthrax spores. In the authors' experiments with non-sporing pathogenic organisms, however, phenol, resorcinol, and thymol proved more effective in alcoholic than in aqueous solution. The carbolic acid coefficients of the three dihydroxybenzenes, using *Bac. typhosus* as organism, were: resorcinol, 0·29; catechol, 0·48; quinol, 1·1. With *Staphyl. py. aureus* the following coefficients were obtained for some nitro-derivatives of phenol and for the three cresols: *p*-nitrophenol, 2·3; potassium *p*-nitrophenoxide, 0·62; *m*-nitrophenol, 3·5; picric acid, 7·5; *o*-cresol, 2·1; *m*-cresol, 2·0; *p*-cresol, 2·4. On *Bac. typhosus* 2·3- and 2·7-dihydroxynaphthalene gave carbolic acid coefficients of 4·4 and 2·8 respectively, whilst for a number of aliphatic and aromatic amines the following values were obtained: ethylamine, 1·27; ethylenediamine, between 0·03 and 0·4; *iso*amylamine, 2·8; *n*-heptylamine, 24·3; aniline, 0·57; *o*-toluidine, 1·00; *m*-toluidine, 1·30; *p*-toluidine, 1·25; pyridine, 0·18; *ac*-tetrahydro-β-naphthylamine, 5·3; *o*-phenylenediamine, below 0·42; *m*-phenylenediamine, below 0·2; *p*-phenylenediamine, below 0·3; tolylene-1·4-diamine, below 0·2. It is to be noted that the replacement of hydroxy-groups in the benzene nucleus by amino-groups is accompanied by a decrease in germicidal power, whereas in the aliphatic series, the substitution of an amino-group for the hydroxy-group leads to a great rise in germicidal efficiency. It is shown also that aniline and *o*-toluidine which have become coloured by exposure have slightly higher germicidal powers than the colourless substances. Thalhimer and Palmer (J. Infectious Diseases, 1911, **9**, 172) have shown that the same is true for phenol.—A. S.

So-called turpentine-phosphorous acid. Sieburg. *See* XX.

Patents.

[*Water*] *Filters.* F. and F. P. Candy, London. Eng. Pat. 22,955, Oct. 18, 1911.

A filter bed having an upper layer of coarse material separated by a space from a lower layer of fine material is cleaned by means of two rotary water-spraying tubes which respectively inject streams of water downwards upon the upper surfaces of the two layers. The water sprayed upon the coarse material passes through, but that injected upon the fine material merely washes the surface, so that the whole of the washing water may be drawn off from the space between the layers. The washing of the fine material may be supplemented by an upward flow o water from a number of nozzles arranged beneath th layer and protected from choking by a packing of coars material.—H. H.

Water; Mechanical filtration of ——. Ozonair Ltd., an E. L. Joseph, London. Eng. Pat. 14,473, Feb. 21 1912.

In order to clean the material of a filter-bed, a fine spray of air and water is forced into it through nozzles fitted or an air-pipe situated at the lower part of the filter-bed Each nozzle consists of two parts, namely, an inner conica jet and an outer tube which surrounds and extends abov the jet. Lateral holes are provided in the outer tub and the air passing upwards from the jet draws wate inwards through these holes, the nozzle as a whole acting as an injector and mixer.—W. P. S.

Sterilising and purifying liquids and regenerating liquids or perishable substances; Process for ——. D. L. V. Browne, H. Kittley, and J. Masson. Fr. Pat. 441,721, March 25, 1912.

See Eng. Pat. 21,332 of 1911; this J., 1912, 744.—T. F. B.

Filtering water; Apparatus for —— *and for other purposes.* W. Paterson. Fr. Pat. 441,768, March 26, 1912. Under Int. Conv., March 27, 1911.

See Eng. Pat. 7659 of 1911; this J., 1912, 456.—T. F. B.

Disinfectant products which dissolve fats; Process for making ——. K. Rülke. Fr. Pat. 441,933, Nov. 20, 1911. Under Int. Conv., Dec. 15, 1910.

See U.S. Pat. 1,020,624 of 1912; this J., 1912, 406.—T.F.B.

Air-testing apparatus. U.S. Pat. 1,035,337. *See* XXIII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Cinchona bark; Volumetric valuation of ——. M. Kleinstück. Pharm. Zentralh., 1912, **53**, 643—651, 680—684, 705—718. Chem. Zentr., 1912, **2**, 555—556.

The chief difficulties in the determination of the alkaloids in cinchona bark are the quantitative extraction of the bark and the removal of colouring matter from the extract. For the latter purpose the author makes use of oxidation with "platinum-copper-alumina" and adsorption by "fibrous alumina" (see this J., 1910, 844). For the preparation of the "platinum-copper-alumina," ignited fibrous alumina is shaken with a 10 per cent. ammoniacal solution of cupric chloride, then washed, dried, and ignited, saturated with a 1 per cent. solution of platinum chloride in methyl alcohol, a few drops of strong ammonia added, the methyl alcohol burned off, and the product cooled, washed free from chloride, dried and ignited.

In carrying out the determination, 20 grms. of the finely powdered and bolted (sifted) bark are stirred to a paste with 50 c.c. of *N*/1 hydrochloric acid, and after extracting for 3 hours with 250 c.c. of water, with stirring, the mixture is filtered, the first 50 c.c. of filtrate being rejected. The next 150 c.c. are diluted with an equal volume of water, neutralised with *N*/1 sodium hydroxide, oxidised by stirring for 1 hour with 1 grm. of the "platinum-copper-alumina" and filtered. The residue is washed free from alkaloids with an acid solution of sodium chloride (25 grms. of sodium chloride and 5 c.c. of *N*/1 hydrochloric acid per litre), and the filtrate made up to 500 c.c. and filtered through fibrous alumina in a manner similar to that used for the de-tannisation of solutions by means of hide powder, whereby substances capable of interfering with the subsequent titration are removed. 100 c.c. of the filtrate are stirred with 50 c.c. of a solution of picric acid (5·7285 grms. of picric acid and 50 c.c. of *N*/1 hydrochloric acid per litre), filtered, and 15 c.c. of the filtrate are boiled for 10 mins. in an atmosphere of carbon dioxide with a few c.c. of concentrated hydro-

chloric acid and 50 c.c. of a solution of titanium trichloride (a 15 per cent. solution boiled with an equal volume of concentrated hydrochloric acid to expel hydrogen sulphide, then diluted to about 2 per cent. concentration and standardised by means of a ferric chloride solution and potassium thiocyanate so that 1 c.c.=1 c.c. of the ferric chloride solution or 0·00501 grm. of iron). After cooling, the excess of titanium chloride is titrated with ferric chloride solution (1 c.c.=0·00501 grm. of iron) with potassium thiocyanate as indicator. If *t* c.c. are required, the percentage of alkaloid in the bark is 0·775 (*t*—25).
A. S.

Morphine sulphate; Codeine in commercial——. J. B. Williams. Amer. J. Pharm., 1912, **84**, 391—393.

Five samples of commercial morphine sulphate were found to contain from 0·9 to 7·0 per cent. of codeine sulphate. The same number of samples of tablets of morphine sulphate contained from 2·5 to 6·5 per cent. of codeine sulphate. This large amount is probably due to the lack of any test in the U.S. Pharmacopœia which will show the presence of several per cent. of codeine. It appears that when morphine is precipitated from even dilute solutions, the crystals may carry down some codeine when this is present.—F. Shdn.

Ethylmorphine and ethylmorphine hydrochloride (dionine). C. L. Schaefer. Amer. J. Pharm., 1912, **84**, 389—391.

The figures given in the literature relating to ethylmorphine are not altogether reliable. Most commercial samples are contaminated with morphine or by-products. The pure alkaloid has no distinct melting point, and the same remark applies to the hydrochloride. The solubilities of the pure alkaloid are 1 : 480 in water, 1 : 75 in ether and 1 : 1·5 in alcohol at 25° C. It softens at about 88° C. and melts to a clear liquid at 110°—115° C. One part of the hydrochloride is soluble in 11·5 parts of water and 26 parts of alcohol at 15° C., and in 8 parts of water and 20 parts of alcohol at 25° C. To test for impurities, 0·05 grm. is dissolved in 2 c.c. of water at 25° C. and three drops of 10 per cent. ammonia added. When pure, the solution remains clear and after standing deposits needle-shaped crystals of ethylmorphine. When impurities are present, the solution becomes milky and the separation of crystals may be retarded for some hours. Tested in this way, a solution of 1 : 100 of pure methylmorphine hydrochloride remains clear and deposits no crystals.—F. Shdn.

Buphane disticha (Haemanthus toxicarius); Examination of——. L. Lewin. Arch. exp. Pathol. u. Pharmak., 1912, **68**, 333—340. Chem. Zentr., 1912, **2**, 525.

Bulbs of *Buphane disticha* were finely-divided, extracted with alcohol, the alcohol distilled off from the extract, and the residual solution rendered faintly acid with citric acid, shaken with paper pulp, filtered, made alkaline, and extracted with ether. The ethereal solution was shaken with charcoal, then dried with potassium carbonate, and evaporated. The alkaloid, *haemantine*, $C_{18}H_{23}NO_5$, thus isolated is colourless, and from its chemical and pharmacological behaviour, appears to belong to the tropine series. The hydrochloride (m. pt. 161° C. with evolution of gas) and nitrate of the base were prepared. With concentrated sulphuric acid the alkaloid and its hydrochloride give a violet colouration, changing to yellow and green on addition of nitric acid.—A. S.

Oils; Terpeneless and sesqui-terpeneless——. J. C. Umney. Perfum. and Essent. Oil Rec., 1912, **3**, 212.

Comparisons have been made between certain pure chemical substances and terpeneless and sesquiterpeneless oils (tsf oils) containing them. The difference in odour and taste is most marked, pure anethol differing entirely from the "tsf" oils of anise fruit, star anise and fennel. The difference between clove oil and eugenol is most pronounced. The characters of the following "tsf" oils and chemical substances are given: star anise, aniseed, fennel, anethol, caraway, carvone, cloves, and eugenol.
F. Shdn.

Anise oil; Adulterated——. E. J. Parry. Chem. and Drugg., 1912, **81**, 372.

Attention has been drawn recently to some grossly adulterated anise oil which has been circulating in commerce (this J., 1910, 1330). The author has examined a lead of this oil which had the following characters:—

Specific gravity at 20° C.	0·937
Optical rotation	0° 5′
Refractive index at 20° C.	1·5230
Dispersion	33·3
Melting-point	9° C.
Congealing-point	7° C.

On shaking the oil with four times its volume of 90-per cent. alcohol there separated 40 per cent. of oil, which, when again washed with alcohol and separated, had the following characters:—

Specific gravity at 20° C.	0·885
Optical rotation	0
Refractive index at 20° C.	1·4896
Dispersion	37
Melting-point	—
Congealing-point	not solid at —10° C.

On saponifying this oil (traces only of potash were used), it remained unaltered. This anise oil is clearly adulterated with about 40 per cent. of petroleum oil. There is, however, some anise oil arriving in London with quite abnormal characters, as was the case last year. (See "Perfumery Record," 1911, 60 and 273.) The following figures represent two of such abnormal oils which have recently been examined, together with a pure oil, all three having been shipped under the same brand:—

	Abnormal (1)	Abnormal (2)	Pure.
Specific gravity at 20° C.	0·979	0·977	0·9815
Rotation	− 1°	− 0° 50′	−1°
Melting-point	16·5° C.	16° C.	18·5° C.
Congealing-point	13·5° C.	13° C.	15° C.
Refractive index	1·5505	1·5500	1·5548
Dispersion	30	30·2	29·5
Solubility in 90 per cent. alcohol	not in 4 vols.	not in 4 vols.	in 2-3 vols.
Refractive index of first 50 per cent.	1·5486	1·5482	1·5534
Ditto of last 15 per cent.	1·5465	1·5463	1·5550

Essential oil of the leaves of Atherosperma moschatum ("Australian Sassafras"). M. E. Scott. Chem. Soc. Trans., 1912, **101**, 1612—1613.

"Australian Sassafras" (*Atherosperma moschatum*, Labill., N.O. *Monimiaceae*) grows luxuriantly around Healesville and Warburton, Victoria, Australia, and the leaves and bark of the tree have some medicinal repute locally. By steam distillation the leaves yielded from 1·7 to 2·65 per cent. of oil; the first fractions of the oil were lighter and later fractions heavier than water. The oil has a pale yellow colour, sp. gr. 1·027, $[\alpha]_D = -7·5°$; $n_D = 1·5211$. It contains the following compounds in about the proportions indicated: eugenol methyl ether, 50—60; pinene, 15—20; camphor, 15—20; and safrole, 5—10 per cent.—A. S.

Oil from oil of cade; Preparation of an almost odourless and non-irritating——. E. Ganz. Schweiz. Woch. Chem. und Pharm., June 29, 1912, 398. Pharm. J., Sept. 14, 1912, 345.

The objections to the therapeutic employment of oil of cade are its disagreeable and penetrating odour and its irritating action. By prolonged heating at a moderate temperature, both these properties are almost completely removed, without any loss of therapeutic value. The oil may be heated, with stirring, to from 60° to 120° C., until the greenish colour has changed to brown and the odour is reduced to the desired degree; the loss is from 30 to 50 per cent., according to the sample of oil, and the product is of a soft consistence.

Turpentine-phosphorous acid; Contribution to the knowledge of the so-called ——. E. Sieburg. Biochem. Zeits., 1912, **43**, 280—314.

Many conflicting statements have been published as to the action of oil of turpentine on white phosphorus and its efficacy as an antidote to phosphorus poisoning. The author as the result of an experimental investigation, finds that by the action of terpene hydrocarbons (pinene) on phosphorus in presence of oxygen (air), an unstable resinous substance having reducing properties is formed. From its composition and properties this substance appears to be a derivative of hypophosphorous acid, probably a *terpenol-(pinol-)hypophosphorous acid*, $C_{10}H_{16}O : PO(OH)$. It is formed much more rapidly from oil of turpentine (or terpenes) containing peroxides, *i.e.*, partially oxidised oil of turpentine, than from the pure hydrocarbons. On gentle oxidation it is converted into terpenolphosphoric acid, $C_{10}H_{17}OPO(OH)_2$. It is completely non-poisonous, and the author proposes to deal in a future communication with the use of terpenes as antidotes to phosphorus poisoning.—A. S.

Antipyrine; Proposed modification of the method of the Codex for the determination of —— as iodo-antipyrine. C. Astre. J. Pharm. Chim., 1912, **6**, 211—212.

The method of the French Codex for the estimation of antipyrine is modified as follows. To 0·5 grm. of antipyrine in a 100 c.c. flask, there are added 50 c.c. of water, and the whole heated for 10 minutes in a water-bath. The flask is removed and 10 drops of pure ammonia solution of 22 Bé. are added, then a solution of iodine in potassium iodide (60 grms. of iodine, 80 grms. of potassium iodide and 300 c.c. of water) is slowly run in till a yellow colouration has been obtained, which persists after a few minutes' heating on the water-bath. When cold, the precipitate is collected, washed three times with water, using 50 c.c. in all, dried and weighed. 1 grm. of precipitate represents 0·70 grm. of antipyrine.—F. Shdn.

Ether for anaesthetic purposes; Method of purifying commercial ——. G. Guérin. J. Pharm. Chim., 1912, **6**, 212—213.

Commercial ether is shaken with 3 per cent. of its volume of acid mercuric sulphate solution (Denigès' reagent) for half an hour. The aqueous portion is withdrawn, and the ether shaken with fresh amounts of the reagent till there is only a white precipitate or none at all. The ether is dried with lime and calcium chloride and distilled.—F. Shdn.

Ether and chloroform vapours; Gas-volumetric determination of —— in air. M. Kochmann and W. Strecker. Biochem. Zeits., 1912, **43**, 410—417.

For the determination of ether or chloroform vapours admixed with air or oxygen, as in narcotic gas mixtures, the authors recommend the following expeditious method:—The vapours are absorbed from 100 c.c. of the gaseous mixture measured over mercury in a Bunte burette, which is manipulated in the usual manner, by 96 per cent. alcohol, of which two or three portions of about 10 c.c. are applied in succession, followed by two or three small portions of water for the absorption of alcohol vapour. The volume of vapours absorbed is found by difference, with correction for the difference in the moisture-content of the original volume read over mercury and that of the final volume read at the same temperature and pressure but over water. The determination can be completed in less than half-an-hour. Out of eight analyses of test mixtures of ether and air cited by the authors, the maximum deviation was 9·43 per cent. of ether found instead of 9·97. In the case of chloroform the maximum deviation was 3·4 per cent. found instead of 3·7. Quantities of less than 0·4 per cent. cannot well be determined by this method.—J. H. L.

Iodoform reaction of lactic acid [and other substances]. C. Neuberg. Biochem. Zeits., 1912, **43**, 500—501.

It is stated in several text-books that *d*- or sarco-lactic acid, unlike the ordinary inactive acid, gives no iodoform reaction. This statement is incorrect, for both forms answer positively to the test. Pyruvic acid, aldol, β-hydroxybutyric acid, quercitol and inositol also give the iodoform reaction, but in these cases the yellow precipitates formed, which possess the characteristic odour, may possibly consist of homologues or substituted derivatives of iodoform.—J. H. L.

Acetic anhydride. The pure material, its physical properties, and its reaction with bromine. K. J. P. Orton and M. Jones. Chem. Soc. Trans., 1912, **101**, 1720—1723.

Pure acetic anhydride was prepared from the commercial product by fractionating the latter with the use of a still-head of "pear"-form (see Young, this J., 1899, 859) with eight bulbs, and then re-fractionating the higher boiling fractions with a four-bulb still-head: the yield amounted to 50—60 per cent. of the original material. The pure substance boils at 139·55° C. at 760 mm. and has the sp. gr. 1·0876 at 15°/4° C., and 1·0820 at 20°/4° C. 100 grms. dissolve about 2·7 grms of water at 15° C.; its solvent power for water is considerably increased by the presence of small quantities of acetic acid and diminished by small quantities of sulphuric acid. Solutions of chlorine and bromine in pure acetic anhydride are stable in the dark, but on exposure to light, a reaction occurs, which is greatly accelerated by very small quantities of sulphuric or perchloric acid, ferric chloride, or iodine; aluminium sulphate, ferric alum, and tin salts have no such influence. The amount of bromine combined bears a linear relation to the time and is independent of the initial bromine concentration: it is also proportional to the concentration of the catalyst; molecular quantities of perchloric and sulphuric acid are equally effective as catalysts. In presence of water the speed at which the free bromine disappears is markedly retarded and the linear relation no longer holds. When iodine is used as catalyst, however, the addition of water increases the rate of disappearance of the bromine. The reaction between bromine or chlorine and acetic acid is not accelerated in a similar manner by addition of strong acids.—A. S

Belladonna; Effect of cultivation upon the alkaloidal content of Atropa ——. F. H. Carr. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIIIb. Orig. Comm., **17**, 7—13.

A number of experiments extending over several years were made upon wild and cultivated plants of *Atropa Belladonna* grown on chalky soil in Kent. The leaves and stem of the dried wild plant yielded 0·49 per cent. of alkaloid, whilst the average for corresponding parts of the cultivated plants collected during a period of seven years was 0·56 per cent. The effect of common fertilisers on the yield was also studied, but was not found to be striking. Bright sunny weather appears to increase the percentage of alkaloid in the leaves. When the leaves begin to fade, there is a rapid falling off in the alkaloidal content. The roots grown had a fairly uniform alkaloidal content of 0·54 per cent., which showed little variation throughout the year.—F. Shdn.

Belladonna. Effect of cultivation and fertilization on the growth of the plant and on the alkaloidal content of the leaves. F. Ransom and H. J. Henderson. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIIIb. Orig. Comm., **17**, 63—68.

Plots of ground at Hitchin were sown with Belladonna seeds and various fertilisers applied. The application of artificial manures does not materially alter the percentage of alkaloid in the dried leaf, but under certain circumstances the yield of green plant per acre is largely increased. The content of alkaloid appears to be increased by full exposure to sunlight. It does not seem possible to secure anything like uniformity in medicinal potency, even when care is exercised in the collecting and drying the plants.—F. Shdn.

Quinine alkaloid and some of its compounds. G. L. Schaefer. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIIIb. Orig. Comm. **17**, 75—84.

Anhydrous quinine alkaloid, m.pt. 173°—174° C., can be readily obtained by several methods. Quinine hydrate loses all its water of crystallisation when slowly heated to about 50° C., kept at that temperature for 3 hours, and finally heated to 60° C. The anhydrous form can be obtained by precipitating a boiling solution of a quinine salt with ammonia, potassium hydroxide or sodium carbonate. Quinine hydrate and acetone form a gelatinous sticky mass, which deposits needle-shaped crystals of anhydrous quinine after standing for several days. The hydrate containing 3 mols. of water of crystallisation is obtained by precipitating cold solutions of quinine salts with alkalis. It is not very stable, and when freshly made dissolves in a little more than its own weight of ether, and softens without melting at 53°—54° C. Quinine can be made to crystallise with hydrocarbons. Crystals can also be obtained containing hydrocarbon and water.—F. Shdn.

Alkaloids ; Arsenites of ——. A. C. Mangold. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIIIb. Orig. Comm., **17**, 37—43.

Arsenious acid cannot be made to combine with alkaloids such as quinine, cinchonidine, brucine and strychnine. There is no difficulty in forming the arsenates.—F. Shdn.

Benzaldehyde and oil of bitter almond ; Assay of ——. F. D. Dodge. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIIIb. Orig. Comm., **17**, 15—20.

Benzaldehyde can be determined by the following modification of Ripper's method (this J., 1901, 288): 0·15 grm. of the aldehyde is mixed in a flask with 25 c.c. of $N/5$ sodium bisulphite solution and dissolved by gently shaking. The flask is corked and allowed to stand in ice-water for 1½ to 2 hours. It is then titrated cold with $N/10$ iodine, using starch as an indicator. Benzaldehyde can also be determined by treating about 1 grm. with 10 c.c. of $2{\cdot}5N$ alcoholic potassium hydroxide solution, and titrating the free alkali after standing for 24 hours at the room temperature. Oil of bitter almond cannot be assayed by this method. Methods depending on the bisulphite reaction or hydrazone reaction only estimate the free aldehyde, and the effect of the presence of hydrocyanic acid must be kept in mind.—F. Shdn.

Essentials oils ; Oxidation assay of ——. F. D. Dodge. Eighth Int. Cong. Appl. Chem., 1912. Sect. IV. Orig. Comm., **6**, 86—92.

The method of selective oxidation by cold permanganate, proposed by the author for the determination of eucalyptol (this J., 1912, 840), is applicable also for other purposes. Of the compounds likely to be present in essential oils, only camphor, fenchone, bornyl acetate, eucalyptol, paraffins, aliphatic ketones, and a few aromatic compounds are entirely unaffected by cold permanganate. Of other constituents of essential oils, a few, such as borneol and fenchyl alcohol, are oxidised to a stable ketone, but in general the oxidation is destructive and complete. The method may be used for the detection of petroleum products in oil of turpentine and citronella oil : in the latter case the unoxidised portion of the oil may contain camphor (formed by oxidation of the borneol normally present in the oil); this may be removed by treatment with cold 80 per cent. sulphuric acid, and the unattacked paraffins recognised by their immiscibility with castor oil at 0° C. By determining the ester value before and after selective oxidation with permanganate, the relative proportions of oxidisable esters (linalyl, geranyl, and terpinyl acetates) and of unoxidisable esters (bornyl acetate) in an essential oil may be calculated (compare Hesse, this J., 1899, 513).—A. S.

Jamaica ginger ; Essential oil of ——. F. D. Dodge. Eighth Int. Cong. Appl. Chem., 1912. Sect. IV. Orig. Comm., **6**, 77—80.

The author has found that Jamaica ginger oil contains from 2 to 5 per cent. of an aldehyde which becomes concentrated in the earlier fractions when the oil is distilled, and can be isolated therefrom by means of its bisulphite-compound. It is not easily obtained quantitatively from the bisulphite-compound owing to its sensitiveness towards alkalis. The aldehyde is a colourless, optically inactive mobile liquid of sp. gr. 0·828 at 15° C. ; m. pt. of semicarbazone, 98° C. (uncorr.) and of oxime, 63° C. (uncorr.). It is probably identical with the decylic aldehyde present in orange, cassie (*Acacia farnesiana*), iris, and coriander oils. On long standing the aldehyde appears to undergo spontaneous alteration, being converted into a substance, possibly a tertiary alcohol, having an odour resembling that of geraniol.—A. S.

Camphor industry in Formosa. Board of Trade J., Sept. 12, 1912. [T.R.]

H.M. Consul at Tamsui states that the export of camphor (a Government monopoly) showed a decrease of 872,554 lb. in 1911. The quantities shipped to the various countries were as follows:—Germany, 2,374,666 lb.; United States, 2,039,500 lb.; France, 562,267 lb.; United Kingdom, 472,000 lb.; British India, 126,000 lb.; Austria-Hungary, 33,333 lb.; Japan, 5,952 lb.; total 5,613,718 lb. The estimated output of refined camphor by the Monopoly Bureau's refinery during 1911 was 7,267,000 lb. The estimated receipts of crude camphor and camphor oil for the financial year 1911 were 6,264,000 lb. and 7,272,000 lb. respectively. The estimated demand in Japan for Formosan camphor during 1911 was 3,280,000 lb., to be extracted from the oil sent over. The quantity of camphor sent was very small. This demand is expected to increase considerably this year in consequence of the newly established celluloid factories. The improved refining machinery installed by the Bureau last autumn is said to give satisfactory results, producing camphor to the amount of 48 per cent. of the weight of oil used ; this camphor is of superior quality, *viz.*, 93 per cent. pure, containing only 2 per cent. of oil and 5 per cent. of water. As the result of experiments carried on for five years, the Bureau will commence the distillation of camphor from leaves on a practical scale this year. A considerable area has been afforested for this purpose. Leaves will be gathered from the young trees. The best results were obtained from the use of the leaves only, branches not being cut ; 1·3 per cent. of camphor was obtained in this manner together with 0·4 per cent. of oil. Camphor afforestation has been carried on for some time by the Bureau of Productive Industries. The area afforested, now amounting to nearly 10,000 acres, will shortly be handed over to the Monopoly Bureau, which will in 1912-1913 plant another 1,200 acres. From the following year 1913-14 it is intended to plant some 3,000 acres annually with young camphor trees at a cost of £20,000. This is to be continued for 12 years, after which it is estimated that the annual production from this area will be some 6,500,000 lb. of camphor and a like quantity of camphor oil.

Camphor production in Japan. Ch. of Comm. J., Sept., 1912. [T.R.]

The production of camphor in Japan in 1911 was 2,000,000 kin (kin = 1⅓ lb.), which is the largest production so far recorded. The exports were 650,000 kin, 950,000 kin were used by local refineries, 350,000 kin by the celluloid factories, and the remainder by various consumers. Last year witnessed the disappearance from the market of the artificial product, the cost of production of which had become higher than the price of natural camphor. It is stated that the Japanese production of camphor cannot be further increased to any considerable extent without detriment to the camphor forests. The local demand is considerable : 600,000 kin per annum are now required by the celluloid industry, which is rapidly developing, whilst the needs of the refineries increased by 20 per cent. during last year.

Linalool manufacture in Formosa. Board of Trade J., Sept. 12, 1912. [T.R.]

H.M. Consul at Tamsui reports that experiments have been conducted for some time by the Camphor Department of the Monopoly Bureau with a view to the production of linalool on a commercial scale. This substance is found in *shû yu*, the oil obtained from a species of camphor tree called *shû-shô-boku* or stinking camphor tree, the oil of which has an unpleasant smell and is, therefore, unfit for the manufacture of camphor. It is stated that linalool can be obtained from the oil of the true camphor tree, but that the extraction of camphor from it is more profitable. The Monopoly Bureau is now in a position to produce the above-mentioned oil to the extent of about 65,000 lb. a year. The percentage of linalool contained in the crude oil varies greatly, but it is stated that the oil to be produced by the Bureau will contain 60 per cent. of linalool. Linalool has hitherto been produced in Mexico and Venezuela, but only in very small quantities. There is said to be sufficient material in Formosa at present for the production of 2,500.000 to 3.000.000 lb. of the crude oil, and the production is expected to be great. The export will be in the hands of the Monopoly Bureau; the price has not yet been fixed.

Patents.

Pharmaceutical product [diethylbromoacetylurea], Manufacture of a ——. P. A. Newton, London, and The Mersey Chemical Works, Ltd., Bromborough. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 1170, Jan. 15, 1912. Addition to Eng. Pat. 2888, Feb. 5, 1910 (see this J., 1910, 1332).

Diethylbromoacetylurea, $(C_2H_5)_2CBr.CO.NH.CO.NH_2$, may be obtained (1) by the action of ammonia on diethyl-α-bromo-acetylcarbamic acid halides, produced by the action of phosphorus halides on diethylbromo-acetylurethane, or (2) by the action of cyanic acid on diethyl-α-bromoacetamide.—T. F. B.

Cyanamide from calcium cyanamide; Isolation of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 2311, Jan. 29, 1912.

The cyanamide is separated from crude calcium cyanamide in the form of an insoluble lead compound, which is then decomposed by dilute sulphuric or hydrochloric acid and the cyanamide isolated by filtration and evaporation *in vacuo*. The lead compound may be obtained, for example, by adding 100 kilos. of crude calcium cyanamide to 450 kilos. of 20 per cent. sulphuric acid mixed with 300 kilos. of ice; the filtered liquid, if alkaline, is rendered slightly acid, again filtered, and mixed with 100 litres of 20 per cent. ammonia solution and 180 kilos. of lead chloride (in aqueous paste), the lead cyanamide being finally filtered off.—T. F. B.

Glycerophosphoric acid and glycerophosphates; Manufacture of ——. Southall Bros. and Barclay, Ltd., and E. W. Mann, Birmingham. Eng. Pat. 2883, Feb. 5, 1912.

Glycerophosphoric acid and its salts are prepared by the action of phosphoric acid or its salts on the halogen, aliphatic, or aromatic esters of glycerol. Thus, pure monoglycerophosphoric acid may be obtained in almost theoretical yield by heating mono-acetin or chlorhydrin with syrupy phosphoric acid until no more acetic or hydrochloric acid is evolved; it is preferable to use a temperature not exceeding 110° C., at a pressure of 20 to 50 mm. If the acid is to be used for preparing salts, the temperature may be raised to about 140° C., and the di-ester which is formed decomposed by warming the product with an equal weight of water to about 40° C. The acid salts of glycerophosphoric acid may also be prepared directly by heating the glycerol ester with a di-acid phosphate to temperatures between 100° and 220° C., under normal or reduced pressure; when cool the mass is powdered and either extracted with alcohol or used for the preparation of mixed or double salts by adding the oxide, hydroxide, or carbonate of a metal other than that first employed. Neutral salts of glycerophosphoric acid may be obtained by heating the glycerol ester with mono-acid phosphates to temperatures between 140° and 220° C., preferably under reduced pressure: the cooled mass is powdered, extracted with alcohol, dissolved in water, neutralised if necessary, and the salt fractionally crystallised from its aqueous solution or fractionally precipitated by means of alcohol (see also Eng. Pats. 2806 and 2881 of 1912; this J., 1912, 604, 661).—T. F. B.

Isovalerianic acid preparation suitable for subcutaneous injection; Process for the manufacture of ——. T. Teichgraeber, Berlin. Eng. Pat. 10,751, May 6, 1912. Under Int. Conv., March 21, 1912.

The preparation consists of a solution of the isovalerianates of morphine, caffeine, and cocaine in a suitable solvent, preferably sterilised water; the best proportions of the salts to use are one mol. each of caffeine isovalerianate and cocaine isovalerianate and 4 mols. of morphine isovalerianate.—T. F. B.

Morphine and narcotine; Manufacture of double salts of ——. C. F. Boehringer und Söhne, Mannheim-Waldhof, Germany. Eng. Pat. 13,293, June 5, 1912. Under Int. Conv., July 4, 1911.

Double salts of morphine and narcotine with bibasic or polybasic acids are prepared by evaporating aqueous or alcoholic solutions of the components, or by precipitating the alcoholic solutions of the components by ether, or by double decomposition of suitable salts. The new salts are crystalline compounds, most of them easily soluble in alcohol and fairly easily soluble in hot water. Salts containing one mol. of morphine, one mol. of narcotine, and one mol. of meconic acid, are said to be especially valuable in medicine. The other salts described are morphine-dinarcotine benzene trisulphonate, morphine-narcotine phenol-2.4-disulphonate, morphine-dinarcotine salicylic disulphonate, and dimorphine-narcotine salicylic disulphonate.—T. F. B.

Dihydroxydiamino-arsenobenzene derivatives; Process for preparing neutral —— *soluble in water.* Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 441,882, March 28, 1912. Under Int. Conv., May 17, 1911, and March 1, 1912.

See Ger. Pat. 245,756 of 1911; this J., 1912, 604. The products are obtained in a very pure condition when the reaction is carried out in alcoholic solution, *e.g.*, in methyl or ethyl alcohol, glycerol, glycol, etc.—T. F. B.

Ketones; Process for the manufacture of ——. J. Effront, Brussels. Eng. Pat. 2867, Feb. 3, 1912.

See Fr. Pat. 439,683 of 1912; this J., 1912, 711.—T. F. B.

Trimethylethylene and other products produced in the process; Manufacture of ——. Chem. Fabr. auf Actien vorm. E. Schering, Berlin. Eng. Pat. 6497, March 15, 1912. Under Int. Conv., March 17, 1911.

See Fr. Pat. 441,278 of 1912; this J., 1912, 843.—T. F. B.

3.3′-Diamino-4.4′-di[hydr]oxyarsenobenzene; Manufacture of derivatives of ——. Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 7865, April 1, 1912. Under Int. Conv., May 17, 1911.

See Ger. Pat. 245,756 of 1911; this J., 1912, 604.—T. F. B.

5-Nitro-2-aminobenzene-1-arsinic acid. L. Benda, Frankfort, Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,036,784, Aug. 27, 1912.

See Eng. Pat. 29,196 of 1911; this J., 1912, 256.—T. F. B.

Pharmaceutical products [*mercury derivatives of aromatic hydroxycarboxylic acids*]. M. Engelmann, Assignor to Farbenfabr. vorm. F. Bayer und Co. U.S. Pat. 1,034,092, July 30, 1912.

See Fr. Pat. 414,563 of 1910; this J., 1910, 1227.—T. F. B.

Penta- and hexa-chlorethanes; Process of making ——. H. Haberland and W. Schaefer, Assignors to Salzbergwerk Neu-Stassfurt und Theilnehmer, Zscherndorf, Germany. U.S. Pat. 1,036,221, Aug. 20, 1912.

See Eng. Pat. 1105 of 1912; this J., 1912, 458.—T. F. B.

Halogen derivatives of unsaturated hydrocarbons; Process for producing ——. Badische Anilin und Soda Fabrik. Fr. Pat. 442,020, April 1, 1912. Under Int. Conv., April 13 and Oct. 30, 1911.

See Eng. Pat. 5125 of 1912; this J., 1912, 795.—T. F. B.

Iron-albuminous compounds; Art of making ——. F. Zuckmayer, Assignor to Dr. Walther Wolff und Co. Ges. m. b. H., Elberfeld, Germany. U.S. Pat. 1,036,405, Aug. 20, 1912.

See Eng. Pat. 21,610 of 1911; this J., 1912, 256.—T. F. B.

Thyroid-gland extracts; Process for producing ——. E. Hoennicke, Dresden, Germany. U.S. Pat. 1,036,622, Aug. 27, 1912.

See Eng. Pat. 27,023 of 1907; this J., 1908, 1084.—T. F. B.

Phenylethylmalonic ester. Phenylethylcyanoacetic ester. H. Hörlein, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,036,624 and 1,036,625, Aug. 27, 1912.

See Eng. Pat. 26,503 of 1911; this J., 1912, 795.—T. F. B.

CC-Mono-allyl- and diallylbarbituric acids; Process for making ——. Société pour l'Industrie Chimique à Bâle. Fr. Pat. 442,001, April 1, 1912. Under Int. Conv., June 29, 1911.

See Eng. Pat. 9078 of 1912; this J., 1912, 795.—T. F. B.

Isoprene; Process of producing ——. *Process of producing erythrene.* G. Merling and H. Köhler, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,036,875 and 1,036,876, Aug. 27, 1912.

See Eng. Pat. 18,935 of 1911; this J., 1912, 604.—T. F. B.

Erythrene; Process for the production of ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 442,149, April 3, 1912. Under Int. Conv., April 15, 1911.

See Eng. Pat. 448 of 1912; this J., 1912, 409.—T. F. B.

Cyanamide from crude calcium cyanamide; Process for separating ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 442,004, April 1, 1912. Under Int. Conv., April 7, 1911.

See Eng. Pat. 2311 of 1912; preceding.—T. F. B.

Compounds of hydrogen peroxide with organic substances; Process for rendering stable the ——. V. Staněk. Fr. Pat. 442,082, Nov. 20, 1911. Under Int. Conv., Jan. 23, 1911.

See Eng. Pat. 26,960 of 1911; this J., 1912, 557.—T. F. B

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Fluorescence and phosphorescence; Notes on ——. W. S. Andrews. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IX., Orig. Comm., 20, 9—23.

After a general discussion of the phenomena of fluorescence and phosphorescence, and the means for examining these properties by means of different sources of radiation, the author describes the preparation and properties of the following luminescent compounds, and their behaviour under different methods of excitation: Calcined calcium sulphide; calcium sulphide with copper; Balmain's phosphorescent calcium sulphide; calcium tungstate; calcium salicylate; natural calcite; natural willemite or zinc silicate; artificial zinc silicate; phosphorescent zinc sulphide (Sidot's blende); calcined zinc sulphate; strontium sulphide; strontium sulphide with copper; calcined cadmium sulphate; cadmium silicate; barium sulphide; barium platinocyanide; uranium fluoride. The paper concludes with a description of experimental vacuum tubes for showing the fluorescent properties of different compounds.—T. F. B.

Hydroquinone [*quinol*]; *The silver equivalent of* ——. W. D. Bancroft and M. A. Gordon. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IX., Orig. Comm., 20, 101—113.

The silver equivalent of a developer is the number of molecules of silver reduced from a given silver salt by one mol. of the developer. The silver equivalent of quinol varies greatly according to the time, temperature, and presence of alkali, sulphites, etc. In strongly alkaline solutions, using excess of silver bromide, the silver equivalent of quinol is about 6 for short runs and about 8 for long runs, at the ordinary temperature; at 100° C. it is about 9 for short runs: addition of sulphite increases the equivalent to over 8 for short runs but has no effect on long runs; this increase is due to the fact that one mol. of sulphite is oxidised together with one mol. of quinol. Addition of sulphite after the beginning of the run has less effect than if it is added before commencing. The silver equivalent of quinone is about 2 less than for quinol, and it is increased by 1 in presence of sulphite. The complexity of the reactions explains the fact that the equivalents are not integers. The silver equivalent of quinol for ammoniacal silver nitrate is nearly 7 for 5 minutes and for two days, and about 8 at the end of eight days. The silver equivalents of quinol for silver sulphite dissolved in sodium sulphite and for silver oxide and caustic soda are about 8 and 10·5 respectively, for 5-minute runs. The silver equivalent of pyrogallol was found to be a little over 3 for silver bromide (1 hour): Hurter and Driffield found 4 for ammoniacal silver nitrate. Catechol has a silver equivalent of 4·5 for silver bromide in absence of sulphite: Andreson obtained the figure 4 in presence of sulphite.—T. F. B.

Glycerol as sensitiser [*of dyestuffs to the bleaching action of light*]. C. W. Bennett. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IX., Orig. Comm., 20, 121—122.

When glycerol is exposed to light in presence of air, an aldehyde, presumably glyceric aldehyde, is formed. Methylene Blue, Safranine, and Biebrich Scarlet are bleached in the dark by acetaldehyde and by a solution of glycerol which has been exposed to light; high temperatures favour the decolourisation. The observation of von Hübl, that the sensitiveness to light of Methylene Blue is greatly increased by the presence of glycerol, is attributed to the formation of the aldehyde. Since the colour of the dyestuff returns when kept in the dark, the bleaching must have been due to reduction; hence, dyes which are not bleached by reduction cannot be sensitised by means of glycerol.—T. F. B.

Positives: The direct production of —— in the camera by means of thiourea and its compounds. F. C. Frary, R. W. Mitchell, and R. E. Baker. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IX., Orig. Comm., **20**, 141—147.

In the production of direct positives by the Waterhouse process, using thiourea or its double salts, the temperature must be carefully controlled to give good results. When using Perley's modification (bathing in thiourea solution and then developing: see this J., 1910, 1409), a temperature of about 24° C. is best, whilst when the thiourea is added to the developer (the preferable method), temperatures of from 15° to 18° C. give the best results. The double salts of thiourea with ammonium chloride and bromide give better results than thiourea itself. A strongly alkaline quinol developer is recommended the exposure required being about double that necessary to produce a normal negative.—T. F. B.

Direct photographic positives; Preliminary studies on ——. G. A. Perley and A. Leighton. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IX., Orig. Comm., **20**, 267—278.

To produce uniformly good results by the thiourea process, the temperature of the developer must not vary more than 1° C. for a given concentration; the quantity of developer used also governs the quality of the resulting positive. Good results were obtained by developing for 5 minutes at 12° C. in a solution of thiourea, 0·003 grm.; quinol, 0·0378 grm.; anhydrous sodium sulphite, 0·2837 grm.; anhydrous sodium carbonate, 0·0567 grm., and water, 12·7627 grms. per square inch of plate surface. Excess of any constituent which favours an increase in development of the latent image yields a partial negative; insufficient amounts produce uniform development and consequently fog. Excess of thiourea acts as a solvent of the emulsion. Using the same quantities of thiourea and quinol as above, together with 0·2907 grm. of anhydrous sulphite, 0·075 grm. of anhydrous sodium carbonate, and 7·8461 grms. of water per square inch of plate surface, excellent positives were obtained on lantern slides at 18° C. (see also this J., 1910, 1409).—T. F. B.

Sunlight. P. C. Freer and H. D Gibbs. Eighth Int. Cong. Appl. Chem, New York, 1912. Sect. IX. Orig. Comm., **20**, 153—179.

The effect of sunlight in certain chemical reactions is described, and also its action on phenols, hydroxybenzoic acids and esters, quinolcarboxylic acid, aniline, methyl- and dimethylaniline, and methyl alcohol (see this J., 1909. 327, 912; 1910, 871; 1911, 737). A series of tables is given, showing the comparative intensities of sunlight at places of widely differing latitude, as measured by the amount of reduction of a solution of uranyl acetate and oxalic acid, which is catalysed by the ultra-violet and adjacent parts of the visible spectrum. The results show that, on clear days, the rate of reaction is practically the same at all the places; hence the conclusion is drawn that the normal sunlight intensities vary but slightly at the different localities on clear days, while the horizontal intensities are subject to great variations. The remainder of the paper is occupied with an account of the effect of sunlight on human beings and animals.—T. F. B.

Photochemically active rays; Production of —— in ordinary chemical reactions. J. H. Mathews and L. H. Dewey. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IX., Orig. Comm., **20**, 243—246.

The authors have repeated some of the experiments of Matuschek and Nenning (this J., 1912, 155), which appeared to show that various chemical reactions produced photochemically active rays; although some of the results were confirmed, it was also found that by conducting away the gaseous products of the reaction, or by interposing glass plates between the emulsion and the reacting mixture, negative results were obtained. The results obtained by the action of hydrochloric acid on sodium silicate and by the setting of Portland cement could not be confirmed. Similar experiments on the action of water on calcium carbide and on quicklime strengthened the conclusion that the results obtained by Matuschek and Nenning were due to the gaseous products of the reactions, and not to any production of active rays.—T. F. B.

Photochemical effects produced by ultra-violet light; A quantitative study of some ——. J. H. Mathews and L. H. Dewey. Eighth Int. Cong. Appl. Chem., New York, 1912. Sect. IX., Orig. Comm., **20**, 247—257.

The action of ultra-violet light on solutions of sodium sulphite, potassium permanganate, potassium bichromate, and oxalic acid was studied. It was found that sodium sulphite solutions are not oxidised by ultra-violet light in absence of air, but that the oxidation in presence of air is greatly accelerated by such light. Potassium permanganate and potassium bichromate are very stable towards ultra-violet light. Solutions of oxalic acid are decomposed very slowly by ultra-violet light, but the reaction is much accelerated by the addition of uranium salts; in this case the decomposition proceeds regularly, the rate varying directly with the amount of uranium salt present.—T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Explosion of nitro-glycerine; Report on the circumstances attending an —— which occurred in a nitrating and separating house at the factory of Messrs. Kynoch, Limited, Umbogintwini, Natal, on Wednesday, March 1st, 1911. W. H. Pay, Inspector of Explosives, Union of S. Africa. With a covering report by the Chief Inspector of Explosives. Cape Times, Ltd., Government Printers, Cape Town. [U.G. 18—1912.]

The accident occurred at about 6.20 p.m., the charge (the sixth of the day) having been in the separator since 4.30 p.m. The operator stated that the nitroglycerin was quite clear and that there was no "flock." One half-minute before the charge began to decompose, the temperatures were taken and found to be normal. The first sign of decomposition was the presence of yellow fumes. Air was turned on, when the fumes became red and came out very fiercely. The drowning cock was then turned on, and the men on duty escaped from the building. There were no casualties but no vestige of the building was left *in situ*. The area of severe damage was limited to a radius of about 200 feet. No nitration was going on at the time of the explosion, all the explosive in the house (about 4900 lb.) being contained in the two separators. The evidence showed that the explosion could not be ascribed to the accidental introduction of foreign matter, or to deficiency of acid. The unusual length of time the charge had been in the separator may, it is considered, be regarded as a secondary cause, but the explosion appears to be mainly attributable to the glycerin used. This was composed of five parts of imported glycerin and one part of glycerin made from whale-oil at Messrs. Kynoch's factory at Durban. No special measures were taken to blend the two kinds of glycerin, and the proportion of whale-oil glycerin injected into the nitrator at certain times on the day of the accident may therefore have been considerably greater than was supposed. Samples of the imported glycerin, the whale-oil glycerin, and "blended" glycerin were chemically tested. The imported sample is described as "a very good technical product," while the local article is condemned, and glycerin taken from the pipe line (the material which would have been used for subsequent charges), is reported as containing the same impurities as the latter. Tests made on the whale oil used for the purpose proved that there was nothing in that substance which could render it unsuitable for the manufacture of dynamite glycerin. In the covering report, the Chief Inspector of Explosives concurs in the conclusion that the explosion was due, in all probability, to the defective glycerin manufactured at Durban. Analyses of this glycerin subsequent to the explosion showed it to be of variable quality, and its use was prohibited until an article judged to be satisfactory could be produced.—T. St.

Accident [explosion]; Report of an inquiry into the circumstances attending an —— which occurred at the Cape Explosives Works, Somerset West, on Friday, October 13, 1911. W. B. Jackson, Inspector of Explosives, Union of S. Africa. Cape Times, Ltd., Government Printers, Cape Town. [U.G. 20—1912.]

An explosion occurred at 8.30 a.m. in a house in which the mixing of collodion cotton and nitroglycerin to form blasting gelatin was completed. The house contained four pans, each divided into three compartments. In the pans, which were made of copper and heated by water-jackets, the material was kneaded by hand until of the proper consistence (taking about 65 minutes), then placed in suitable wooden boxes and sent to the squirting house to be made into cord. The charges, each consisting of one lump weighing 500 lb., were brought as required from a preliminary-mixing house, and each charge on arrival was divided into three lumps, one for each division of the pan. At the time of the explosion three pans contained charges, one was empty, and the fresh charge for the empty one had just arrived at the door of the house from the preliminary mixer. The latest charge received at the house had arrived at 8.20, the temperature of the water at the pan being then 55° C. At 8.30, the man in charge heard a hissing noise such as is made by lighting a fuse, and saw a whitish-brown flame coming up from the edge of this last-filled pan; the temperature of the water-jacket was then 56° C., having risen only 1° C. since the charging of the pan had been begun. It would appear that the "dope," after burning for a few seconds, generated sufficient heat to cause it to detonate, and the other three charges then exploded sympathetically. The position of the craters formed by the explosion corresponded to the position of the charges. There were no casualties and owing to the massive nature of the protecting mounds, the *débris* was confined for the most part to within a few yards all round. The precautions which are always taken at these works to ensure against the possibility of over-heating, together with the short time the charge had been in the pan quite exclude overheating as an explanation of the explosion. The system of chemical testing at the works is very rigid, and tests made on the dope from the same batches showed the materials to have been quite satisfactory. The evidence was contrary to the idea of extraneous matter having got into the charge, and the system of searching excludes the idea of any of the men having had matches in his possession. The prevailing conditions do not allow of the possibility of the charge having been ignited by an electric spark, by lightning, or by concentrated sun's rays. This process of elimination appears to bring the possible causes of explosion down to the single one of ignition by a spark blown into the house from outside. The only source was a stack (40 ft. high), 75 yards away, connected to the boilers for heating the circulating water. The stack was not provided with an effective spark-catcher, and the wind was blowing direct from the stack to the house. To get to the pan the spark must have made a zigzag course, but no doubt there were eddies of wind about the house. The fact that owing to labour troubles in Great Britain the coal in use at the time was of poorer quality than had hitherto been used, and had only lately arrived at the factory, provides a reason why soot or hot flakes from the chimney had not previously been observed near the mixing house. The following positive evidence was also obtained:—(1) Subsequent to the explosion, on the same day, a foreman, whilst standing near the *débris*, felt something warm strike his cheek. (2) The man in charge of the mixing house had noticed soot on the floor of the house on the day before the accident, but thought it came from the trolley wheels. (3) The ignition of the charge was preceded by a hissing noise. As a precautionary measure it is intended to do away with the boilers inside the Danger Area, and the stacks have been taken down and water sprays interposed between the boiler exit and the stack base.—T. St.

Accident [explosion]; Report on an —— which occurred on the field tram-line in the magazine area of the British South Africa Explosives Company's Works at Modderfontein, Transvaal, on the 1*st April*, 1912. Major A. B. Denne, Chief Inspector of Explosives, Union of S. Africa. Cape Times, Ltd., Government Printers, Cape Town. [U.G. 48—1912.]

Two bogies, coupled together, each containing cases of blasting gelatin, and the foremost one containing cases of gelignite also, were running on the tram-line on a down gradient when an explosion occurred. The bogies were blown in pieces, as were six men who were riding on them. Tests made on samples of material from the same or neighbouring batches as that exploded, preclude the idea of decomposition, and the trucks cannot have been struck by lightning. The line at the place where the explosion occurred is straight, and the probability of a case falling out is very small, though the speed of the trucks was estimated at 10 miles per hour. The cause of the explosion remains a mystery therefore, but the following precautionary measures have been adopted:—(1) Field tram trucks provided with wooden side bars instead of being sheeted only. (2) Speed of field tram trucks not to exceed six miles per hour. (3) Field tram trucks to run single instead of coupled (each truck being in charge of a European) and at intervals of not less than five minutes. (4) Records to be kept of the inspections of the tram-line system and of the examination of trucks. —T. St.

Detonator compositions free from mercury fulminate. E. Herz. Z. ges. Schiess- u. Sprengstoffw., 1912, **7**, 284—285.

The author has prepared detonator compositions containing cupro-tetrammonium thiosulphate, $CuS_2O_3(NH_3)_4$, as the special ingredient. The compositions are not hygroscopic, nor are they affected by damp. They possess the advantages over mercury fulminate compositions of being cheaper, less unhealthy, simpler, and less dangerous to manufacture, and freedom from the evils attending the liberation of metallic mercury in the capsules. They are less sensitive than the fulminate compositions, but this is an advantage in manufacture. For the preparation of the cupro-tetrammonium thiosulphate, strong ammonia solution is added in excess to a hot saturated solution of copper sulphate, and then an equivalent amount of sodium thiosulphate dissolved in a little hot water is added with stirring. The solution is allowed to cool slowly, and the separated cupro-tetrammonium thiosulphate is filtered off, washed several times with a weak aqueous solution of ammonia, and dried at a temperature not exceeding 50° C. The crystals thus obtained are violet-blue in colour, very slightly soluble in water, not hygroscopic, insensitive to light, air and damp, and very stable. Compositions suitable for various purposes are made by mixing with potassium chlorate, and such materials as glass powder, antimony trisulphide and lead thiosulphate. A small amount of the last-named makes the compositions more sensitive. Four mixtures are given and described as to their suitability for special purposes.—T. St.

Firedamp or coal-dust; Outer dressing [of incombustible material] as a safety precaution in blasting in presence of ——. L. Volf. Oesterr. Zeits. Berg- u. Hüttenw., 1912, **60**, 469—472.

Experiments with sand, heaped in front of the shot-hole where a shot was to be fired, showed that with an ordinary blasting-charge, quantities of 2 to 4 kilos. of sand were sufficient to prevent the ignition of coal-dust or firedamp. Even small quantities of combustible material in this sand (coal ashes, for example, containing unburnt carbon) greatly reduced its efficiency. Sand strewed thickly over blowers on the floor, or heaped in front of them where they issue from the side-walls, was found very beneficial in spreading the gas, and thus avoiding the formation of local explosive mixtures in the ventilating current. —J. T. D.

Nitroglycerin; Manufacture of ——. F. Hofwimmer. Chem.-Zeit., 1912, **36**, 961—962.

A mixture of 3 mols. of sulphuric acid and 4 mols. of nitric acid for the nitration of 1 mol. of glycerin has been found to give the highest yields (95 per cent.) of nitroglycerin. The separated acid consists proportionately of 3 mols. of sulphuric acid, 3 mols. of water and 1 mol. of nitric acid. The high yield must be ascribed chiefly to the relative proportions of sulphuric acid and water. —T. St.

Nitroglycerin; The preparation, crystalline structure, and physical properties of the two forms of solid ——. H. Hibbert. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIb. Orig. Comm., **4**, 37—57.

Preparation of the labile isomeride.—Two or three drops of nitroglycerin which has not been previously frozen (and preferably recently made) are absorbed in powdered glass-wool, cooled to —40° C., and stirred with a glass rod at this temperature. A trace of the frozen product is then transferred to another sample of the nitroglycerin also cooled to —40° C., and the sides of the tube just below the surface of the liquid rubbed with a glass rod. After a few seconds crystallisation of the labile form commences.

Preparation of the stable isomeride.—The same method as for the labile form is employed, except that a mixture of wood-pulp and sodium nitrate is used instead of glass-wool, and preferably, though not necessarily, previously frozen nitroglycerin. The labile form crystallises in the triclinic system; has a melting point of 2·0° C., and a freezing point of 1·9° C. The stable form crystallises in the bipyramidal class of the rhombic system; has a melting point of 13·2° C., and a freezing point of 13·0° C. Both forms dissolve readily at —10° C. in acetone, ethyl acetate, ether, and methyl and ethyl alcohols, but more sparingly in butylene nitrate. They are both insoluble at —10° C. in carbon tetrachloride and chloroform. The labile form is comparatively stable below 0° C., but at temperatures below 1° C., the change from the labile form to the stable form is apparently an irreversible one. It was not found possible to convert the stable form to the labile without passing through the liquid phase. On the other hand, the introduction of a trace of the stable isomeride into the solid or partially melted labile form caused a practically instantaneous and complete transformation accompanied by a considerable rise in temperature. If the labile form is melted, warmed to 20°—30° C. for one minute and then cooled to —40° C., scratching the inner surface of the tube will cause the labile form to separate again, but if the temperature is maintained at 20°—30° C. for more than a short period, no spontaneous crystallisation of either form can be induced. The author has also studied in detail the influence of metallic salts in effecting conversion of one form to the other. He shows that there is a striking analogy between the isomeric forms of nitroglycerin and those of benzophenone, and deduces that the isomerism of nitroglycerin is "physical" rather than "chemical." Microphotographs of crystals of the two forms are given. —T. St.

Nitroglycerin; Boiling points of solutions of ——. A. L. Hyde. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIb. Orig. Comm., 4, 59—67.

Attempts were made to determine the mean molecular weights of mixtures of nitroglycerin with allied bodies by the boiling point method, using a modified Beckmann's apparatus. Concentrated solutions were employed in order to make the rise of boiling point considerable. The only solvent with which results independent of the concentration were obtained was ethyl acetate. A test made on a mixture of nitroglycerin and tetranitrodiglycerin gave a molecular weight corresponding to a percentage composition of the mixture which agreed fairly well with the composition as obtained from a nitrogen determination. Boiling point determinations made with acetone as the solvent appeared to indicate a dissociation of the nitroglycerin molecules, and with ether, methyl alcohol and chloroform, an association of the molecules. With the three latter solvents, the rise in boiling point appeared to follow a law of the form: $a = ch^n$, where a is the rise in boiling point, h the percentage composition of the solution, and c and n are constants.—T. St.

Nitroglycerin; Effect of the nitrotoluenes on the determination of —— by means of the nitrometer. C. G. Storm. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIb. Orig. Comm., **4**, 117—125.

Nitrometer estimations of nitroglycerin in known mixtures of nitroglycerin and nitrotoluenes showed that mono-nitrotoluenes are quantitatively converted into dinitrotoluenes by the nitrating action of the nitric acid liberated from the nitroglycerin. If the nitrotoluene is in excess, no gas whatever is liberated. o-Nitrotoluene is converted into 2 : 5-dinitrotoluene, and *p*-nitrotoluene into 2 : 4-dinitrotoluene. Dinitrotoluenes and trinitrotoluenes are unacted upon under the conditions of the nitrometer determination. Estimations of nitroglycerin in unknown mixtures will therefore be low by an amount equivalent to the amount of mononitrotoluene present. The amount present however in the liquid di- or trinitrotoluenes contained in the usual types of low-freezing dynamites is generally so low that the error introduced is not serious.—T. St.

Nitroglycerin; Separation of —— from nitro-substitution compounds. A. L. Hyde. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIb. Orig. Comm., **4**, 69—76.

Although it is not possible by treating a mixture of nitroglycerin and a nitro-substitution compound with solvents to obtain a complete separation of one from the other, yet by adopting a definite method of procedure, the nitroglycerin can be almost entirely removed from the nitro-substitution compound, leaving a fairly definite quantity of the latter. Once this has been determined for a given nitro-compound, the method may be used for determining the amount of that compound in mixtures with nitroglycerin of unknown strength. The method is strictly empirical and the manipulations must be carried out in a definite manner in order to obtain results even approximately quantitative. The method devised by the author is to wash the mixture repeatedly with aqueous acetic acid (in which the nitroglycerin is more soluble) and carbon bisulphide (in which the nitro-substitution compound is more soluble). All but a few mgrms. of nitroglycerin are finally removed from the carbon bisulphide solution, which on evaporation gives a definite proportion of the nitro-substitution compound originally present in the mixture. Results are given of tests made with mixtures of nitroglycerin and, respectively, ortho- and para-nitrotoluene, the three dinitrotoluenes, and liquid trinitrotoluene.—T. St.

Trinitro-anisol; Nitration of anisol to ——. A. L. Broadbent and F. Sparre. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIb. Orig. Comm., 4, 15—17.

The following method of nitrating anisol has been found by the authors to give a product of a high degree of purity, and a yield equal to about 85 per cent. of the theoretical. A mixture of 130 grms. of nitric acid (sp. gr. 1·52), and 220 grms. of sulphuric acid (sp. gr. 1·84), is cooled in a 400 c.c. beaker to —5° C., and then 30 grms. of anisol are added, drop by drop, and at such a rate that the temperature never rises above 0° C. The liquid is continuously stirred by a mechanically driven propeller-shaped stirrer, stirring downwards, and revolving at the rate of about 250 revolutions per minute. After all the anisol is added, the temperature is allowed to rise slowly to 65°–70° C., and kept at this point for 20 minutes, the stirring being continued. On cooling, the trinitro-anisol crystallises out, and after separation from the acid liquid, is washed first with a 2 per cent. solution of sodium carbonate and finally with water. It forms lemon-yellow crystals, melting at 64°–65° C. It is nearly insoluble in water, but dissolves in alcohol, ether, and acetone. Its specific gravity is 1·408 at 20° C.—T. St.

Trinitro-anisol; Hydrolysis of —— by alkalis and water. W. E. Masland and F. Sparre. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIB., Orig. Comm., 4, 77.

Alkali carbonate solutions hydrolyse trinitroanisol, slowly in the cold, more quickly when hot, with formation of alkali picrates. Pure hot water slowly hydrolyses the ester with the formation of picric acid, and pure cold water has the same, but much weaker action.—T. St.

Explosives; A plea for improvement in the methods of chemical testing of mining ——. J. Moir. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIB., Orig. Comm., 4, 79—83.

The official heat-test with iodised starch-paper is quite unsatisfactory for mining explosives except blasting gelatin and kieselguhr-dynamite. On the one hand the volatility of the iodine and the sensitiveness to heat of the starch compound give rise to variable results, and on the other, many of the explosives contain volatile substances which spoil the test by combining either with iodine or with nitric peroxide. Thus the presence of mercuric chloride to the extent of 1 part in 50,000, almost entirely masks the action of the test-paper. Over 1 per cent. of water in gelignite makes the test insensitive by 50 per cent. or so. The pine sawdust used in dynamites evolves terpenes which absorb any nitrogen peroxide that is being formed. Again, the official procedure for testing kieselguhr-dynamite by extraction with water is perfectly useless, as the washed nitroglycerin so obtained gives longer heat-tests than the dynamite samples tested direct. Factors which shorten the test-period are: (1), bright light; (2), finely divided carbon in grey specimens of French chalk, the carbon acting catalytically; and (3), low atmospheric pressure. A point in favour of the starch iodide test as against one of the organic reagents for nitrous acid, is the greater definiteness of the time of appearance of the colour. The author has however got good results with Ilosvay's reagent (0·6 grm. of sulphanilic acid and 0·5 grm. of α-naphthylamine dissolved in 100 c.c. of water with a few drops of acetic acid), which is not affected by mercury, or terpenes, or moisture. A solution of pure indole in 50 per cent. glycerin gives similar results. Guttmann's test [use of filter-paper moistened with a solution of diphenylamine in sulphuric acid; see this J., 1897, 288] is useless for moist explosives, because the green colour is not produced unless the sulphuric acid remains undiluted, which is not the case in practice. Errors in the usual proximate analysis are: (1), complete drying of the sample causes loss of nitroglycerin; (2), ether extracts fatty and resinous matter from the sawdust of gelignite; (3), boiling water generally removes soluble constituents from the wood-pulp. Where the nitro-cotton content alone is required, the author treats the ether-residue with ether-alcohol or ether-acetone, and after allowing to settle, decants an aliquot part. The residue of sawdust and saltpetre can be separated quite satisfactorily with cold water. The use of sodium monosulphide for dissolving nitro-cotton is only possible where wood-pulp is absent. —T. St.

Stability test [for explosives]; On a modified form of ——. H. C. P. Weber. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIB., Orig. Comm., 4, 147—156.

The test consists in dropping the sample into a test-tube kept at a constant temperature by immersion in a paraffin or glycerin bath, and observing the time taken for explosion to occur. The temperatures used by the author are 200° C., 180° C., 170° C., and 160° C. It has been found that duplicate tests at a given temperature give results in close agreement, and that very similar results are obtained on repeating the tests after a period of one month. A mean time for each temperature having been obtained, the time figures are plotted against temperatures. The result is a curve which denotes the rate of change of decomposition velocity with change of temperature, and is, as such, characteristic for each sample. In stable powders the ratio of explosion periods at 200° C., and 160° C., is at least 2 : 9. In unstable samples this ratio falls as low as 2 : 3.—T. St

Nitrocellulose powders; A new stability test for ——. S. A. Weirman. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIB., Orig. Comm., 4, 157—159.

The presence of moisture in nitrocellulose powders may be regarded as an effect and proof of low stability rather than a cause, and therefore the ability of a powder to take up and retain moisture serves as a fair criterion of the keeping qualities of the powder. The author has designed a test based on this principle, which is free from the objection common to all heat tests, in that the measure of stability is not made to depend on the effect of higher temperatures than the powder would be subjected to in storage. Ten grms. of the sample are dried in a vacuum or sulphuric acid desiccator and the loss in weight observed. The sample is then placed in a moisture-saturated atmosphere at the same temperature until the weight remains constant, and the gain in weight is observed. Loss in weight plus gain in weight expressed in per cent. of weight after desiccation equals "observed moisture range." This divided by the surface area of the sample equals "actual moisture range." This figure is comparable for all sizes of powder grains, and is a measure of the stability of the powder.—T. St.

Matches; Phosphorus and its compounds studied especially in relation to the manufacture of ——. E. G. Clayton. Eighth Int. Cong. Appl. Chem., 1912. Sect. II., Orig. Comm., 2, 75—81.

In reviewing the various forms of red phosphorus and phosphorus derivatives which have been suggested as constituents of match compositions (see this J., 1912, 568, 671), the author admits that a useful and, in many ways, satisfactory substitute for yellow phosphorus has been found in tetraphosphorus trisulphide, but he considers that the ideal match product has yet to be discovered. This must be a cheap non-poisonous substance, which will ignite at a temperature sufficiently but not dangerously low, be usable with ease and safety in match works, and give off no injurious vapour during manufacture; it must mix evenly and well with the rest of the ingredients of a match composition, without evolution of gas; it should have no retarding effect upon the drying of the binding medium, and should yield a product as sensitive to friction as the best American "double-tip" match; the match also must be liable neither to ignite spontaneously at any reasonable temperature, nor to be affected detrimentally by a damp atmosphere. —F. Sodn.

Patents.

Explosive charge and explosive body for projectiles, mines, and torpedoes. C. E. Bichel, Hamburg, Germany, Assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,036,176, Aug. 20, 1912.

See Fr. Pat. 427,566 of 1911: this J., 1911, 1089.—T. F. B.

Reducing or limiting the effects of explosions in coal and other mines. Eng. Pat. 18,210. *See* IIa.

XXIII.—ANALYTICAL PROCESSES.

Filter-pumps; Simple valve for ——. H. B. Hutchinson. Chem. News, 1912, **106**, 99.

This is a valve to prevent water from being sucked back into the filtering flask. It consists of a short piece of half inch or three-quarter inch glass tube, supported vertically, fitted with a single bored rubber stopper at either end. Through the lower stopper passes a tube for connection to the filtering flask; this tube is flush with the upper surface of the stopper, or slightly below it, so as not to bulge or curve the flat surface. On this rests the larger end of a smaller rubber stopper, not bored; and the surfaces are lubricated if necessary with a little dilute glycerin. Through the uppermost stopper passes the tube for connection to the pump; the end of this is cut off slanting, and nearly reaches the upper end of the loose cork. The mode of action of the valve is obvious.
—J. T. D.

Aluminium; Use of amalgamated —— in the detection of arsenic. E. Kohn-Abrest. Ann Falsif. 1912, **5**, 384—388.

Amalgamated aluminium evolves hydrogen when placed in contact with water (see this J., 1911, 836), and may be used for this purpose in Marsh's arsenic apparatus. The method of working is as follows:—About 4 grms. of aluminium foil (in small pieces) are washed with nitric acid and then immersed for 4 minutes in 25 c.c. of a 1 per cent. solution of mercuric chloride. The fragments are now rinsed with water and introduced into the flask of the Marsh apparatus together with 220 c.c. of water. After the lapse of 2 hours, the solution to be tested for arsenic is also introduced and the test proceeded with in the usual way. The method is not very sensitive and does not yield satisfactory results with less than 0·0005 grm. of arsenic, but it possesses the advantage of using substances easily obtained free from arsenic.—W. P. S.

Analysis of hydrocarbon mixtures. Routala. *See* IIa.

Influence of temperature on the determination of volatile matter in coal. Fieldner and Hall. *See* IIa.

Determination of sulphur in fuel. Allen and Robertson. *See* IIa.

Determination of water in petroleum and its products. Allen and Jacobs. *See* IIa.

Technical determination of the bleaching quality of sulphite pulp. Richter. *See* V.

Determination of cellulose. Cellulose method versus "crude fibre" methods. Cross and Bevan. *See* V

Titration of phosphoric and boric acids. Biltz and Marcus. *See* VII.

Reaction of gold salts with m-phenylenediamine. Siemssen. *See* VII.

Determination of carbon in steel. Levy. *See* X.

Sampling and assaying of silver ores containing cobalt, nickel, and arsenic. Handy. *See* X.

Electrolytic determination of copper in pyrites. Treadwell. *See* X.

Determination of total fatty acids in cottonseed foots. Smalley. *See* XII.

Solubilities of the lead salts of the higher fatty acids in ether and in petroleum ether. Neave. *See* XII.

Determination of nitrogen in rubber. Schmitz. *See* XIV.

Determination of rubber as bromide. Vaubel. *See* XIV.

Direct determination of rubber, applicable to specifications for vulcanised rubber goods. Boggs. *See* XIV.

Testing of tanning extracts with animalised cotton. Gansser. *See* XV.

Influence of fish glue on sugar determination by Fehling's solution. Bernardi. *See* XVII.

Determination of glucose in presence of foreign substances by Bertrand's method. Rosenblatt. *See* XVII.

Lintner's polarimetric method for the determination of starch. Porst and Crown. *See* XVII.

Determination of extract in wort and beer. Fresenius and Grünhut. *See* XVIII.

Determination of phosphoric acid in wine. [Von der Heide and Schwenk. *See* XVIII.

Equilibria in systems containing alcohols, salts, and water, including a new method of alcohol analysis. Frankforter and Frary. *See* XVIII.

Volumetric valuation of cinchona bark. Kleinstück. *See* XX.

Ethylmorphine and ethylmorphine hydrochloride (dionine). Schaefer. *See* XX.

Assay of benzaldehyde and oil of bitter almond. Dodge. *See* XX.

Oxidation assay of essential oils. Dodge. *See* XX.

Proposed modification of the Codex method for the determination of antipyrine as iodoantipyrine. Astre. *See* XX.

Gas-volumetric determination of ether and chloroform vapours in air. Kochmann and Strecker. *See* XX.

Iodoform reaction of lactic acid [and other substances]. Neuberg. *See* XX.

Effect of nitrotoluenes on the determination of nitroglycerin by means of the nitrometer. Storm. *See* XXII.

Separation of nitroglycerin from nitro-substitution compounds. Hyde. *See* XXII.

Methods of chemical testing of mining explosives. Moir. *See* XXII.

A modified form of stability test. Weber. *See* XXII.

A new stability test for nitrocellulose powders. Weirman. *See* XXII.

PATENTS.

Air testing apparatus. W. H., Assignor to L. J. Flood, Chicago, Ill. U.S. Pat. 1,035,337, Aug. 13, 1912.

IN an apparatus for determining carbon dioxide in air, an alkaline solution (*e.g.*, barium hydroxide) coloured with phenolphthalein is employed; intimate contact between the air and the reagent is effected by causing the latter to flow, drop by drop, over glass beads contained in the absorption vessel, and the proportion of carbon dioxide present is ascertained from the colour of the treated solution by reference to a colour chart.—W. E. F. P.

Testing air and gases; Apparatus for ——. M. Arndt. Fr. Pat. 412,099, April 2, 1912.

SEE Ger. Pat. 242,540 of 1911; this J., 1912, 304.—T. F. B.

XXIV.—MISCELLANEOUS ABSTRACTS.

High temperatures. J. A. Harker. Chem. News, 1912, **106**, 85—87 and 97—98.

A LECTURE delivered at the Royal Institution. The following tables of temperatures are given:—

TABLE 1.

Various temperatures.

	° C.
Absolute zero	—273
Helium boils (0·2 mm.)	—272
Helium boils (760 mm.)	—269
Hydrogen boils	—253
Oxygen boils	—183
Carbonic acid boils	—78
Mercury freezes	—39
Water freezes	0
Water boils	100
Tin melts	232
Lead melts	327
Mercury boils	357
Zinc melts	419
Sulphur boils	445
Aluminium melts	657
Common salt melts	801
Zinc boils	918
Silver melts	961
Gold melts	1062
Copper melts	1083
Cast iron melts	about 1100
Pure iron melts	1500
Firebricks soften	1400—1800
Silica softens	1500—1600
Platinum melts	1750
Silver boils	1950
Tin boils	2270
Copper boils	2310
Lime and magnesia melt	about 2400
Iron boils	2450
Tantalum melts	2900
Tungsten melts	3000
Carbon melts	?

TABLE 2.

Temperatures of flames, etc.

Temperatures attainable in:—

	° C.
Bunsen burner flame	1100—1350
Meker burner flame	1450—1500
Petrol blowlamp flame	1500—1600
Oxyhydrogen flame	about 2000
Oxy-acetylene flame	about 2400
Thermit	about 2500
Electric arc	about 3500
Electric arc (under pressure)	about 3600
Sun	about 5500

TABLE 3.

Some indication of the present range of temperature measuring instruments.

	Practical. ° C.	Extreme. ° C.
Expansion thermometers—		
Gas thermometer	Up to 1200	—272 to 1550
Mercury in glass	—39 to 500	—14 to 575
Mercury in silica	—39 to 600	—44 to 770
Electrical thermometers		
Platinum resistance	—100 to 1100	—250 to 1400
Thermo-couples		
Platinum alloys	300 to 1400	Up to 1750
Base metals	—100 to 1100	—250 to 1200
Total radiation pyrometers	500 to 1400	No upper limit
Optical pyrometers	600 to 3500	No upper limit

TABLE 4.

Temperature and colour of a fire.

	° C.
"Grey," lowest discernible temperature	about 450
Very dull red	,, 500
Dull red	,, 700
Cherry red	,, 900
Orange	,, 1100
White	,, 1300
Dazzling white	,, 1500

In gas furnaces a temperature of 1600° C., or sometimes in large industrial furnaces 1800° C., is the uppermost attainable limit. For higher temperatures electric furnaces are used. These are either arc-furnaces, which are very difficult to control, or resistance furnaces. In these the resisting material is nichrome or platinum wire for comparatively low temperatures (1000° to 1200° C.), or carbon tubes or spirals for high temperatures. The author has also used tubes of zirconia and yttria made conducting by being first raised to a high temperature by an outer wrapping of resistance-wire. In baking these in carbon-tube furnaces, the material was sometimes found to be permeated for some depth by carbon; investigation showed that ionisation of the atmosphere of the furnace took place, and also that very considerable differences of potential occurred between two carbon electrodes inserted into the furnace and kept at different temperatures, so that by moving one of the electrodes backwards and forwards, alternating currents of electricity could be developed in the circuit connecting the two.—J. T. D.

PATENT.

Liquid films; Processes and apparatus for demonstrating certain properties of ——. C. V. Boys. Fr. Pat. 442,528, April 13, 1912. Under Int. Conv., July 20, 1911.

SEE Eng. Pat. 16,732 of 1911; this J., 1912, 260.—T. F. B.

Books Received.

Enzymes. By Otto Cohnheim. A.O. Professor of Physiology, Heidelberg. [Six Lectures delivered in 1910 under the Herter Lectureship Foundation at the University and Bellevue Hospital Medical College, City of New York.] First edition. John Wiley and Sons, New York, U.S.A. Chapman and Hall, Limited, London. 1912. Price 6s. 6d. net.

Small 8vo volume, containing 166 pages of subject matter, with indexes of authors' names and subjects. The text is classified as follows :—I. Methods of obtaining enzymes. II. Purification of enzymes. III. General properties of enzymes. IV. Enzymes as catalysers. V. Reversible action of enzymes. VI. Enzymes and optical activity. VII. Mode of action of enzymes. VIII. Antiferments. IX. Specificity of enzymes. X. Zymogens and activators. XI. Individual enzymes. XII. Lipases or steapsins of the alimentary canal. XIII. Proteolytic enzymes. XIV. Miscellaneous and vegetable enzymes. XV. Hydrolytic enzymes of tissues, or autolytic enzymes. XVI. Proteolytic enzymes of blood, and of tissues. XVII. Urease and nucleases. XVIII. Oxidases. XIX. Metabolism-enzymes. XX. Fibrin ferments.

A Laboratory Manual of Inorganic Chemistry. By John B. Ekeley, Ph.D., D.Sc., Professor of Chemistry, University of Colorado. [To accompany a Text Book of Inorganic Chemistry. By A. F. Holleman, Ph.D., Prof. Ord. of Chemistry, University of Amsterdam.] First edit. John Wiley and Sons, New York. Chapman and Hall, Limited, London. 1912. Price 4s. 6d. net.

Small 8vo volume, containing 128 pages of subject matter, with 46 illustrations. The book contains concise descriptions, sometimes illustrated, of 192 experiments. No experiment is described without a question or questions, being asked, for solution by the reader or student. Prof. Holleman's text-book acts as the key to these questions, and the paragraphs to refer to are numbered and stated.

Annual Report on the Mineral Production of Canada during 1910. By John McLeish. Report No. 143. Canada Department of Mines. Ottawa. 1912.

Large 8vo volume of 328 pages (see this Journal, 1911, 548).

Mica: Its Occurrence, Exploitation and Uses. Second Edition. By Hugh S. de Schmid. Canada Department of Mines. Report No. 118. Ottawa, 1912.

This volume, of large 8vo size, contains 411 pages, together with 38 plates, 67 drawings, and 22 maps. It brings up to date the information contained in the first edition of the work, by Fritz Cirkel, published in 1905 (see this J., 1905, 1261).

How to take out Patents in England and Abroad. By Arthur E. Edwards. Wyman and Sons, Ltd., Fetter Lane, London, E.C. 1912. Price 2s. post free.

Small 8vo volume, containing 105 pages of subject matter, and an alphabetical index. The text is arranged as follows :—I. What is a patent ? II. How to obtain one. III. What may be patented. IV. What is "Novelty" ? V. The specification. VI. How to deal profitably with patents. VII. Foreign and Colonial patents (23 countries specified). VIII. International Convention. IX. Advantages to countries granting patents. Appendix. Acts of Parliament relating to Letters Patent.

Dizionario di Merceologia e di Chimica Applicata alla Conoscenza dei Prodotti della Cave e Miniere, del Suolo e dell' Industria, con speciale riguardo ai Prodotti Alimentari, Chimici, e Farmaceutici. Pel Prof. Dott. V. Villavecchia, con la collaborazione dei Dott. G. Fabris, Dott. G. Rossi, e Dott. A. Bianchi. Terza Edizione, completamente riveduta, corretta, ed ampliata. Vol. II. Lettere N—Z e Indice. U. Hoepli, Milano. 1913. Price Lire 15.

This is the second and concluding volume of a dictionary of commerce and applied chemistry, of which Vol. I. has been noticed previously (see this J., 1910, 1415). It contains 1172 columns of subject matter and an alphabetical index occupying 188 pages. As in Vol. I., there are given in the case of each product dealt with (chemical products, minerals, plants, drugs, etc.), the name, Italian synonyms and foreign equivalents, a brief account of the origin, preparation, commercial character, properties, composition, adulteration, analysis, and uses of the substance, and also statistics of production and of Italian imports and exports, price, and Italian Customs duties.

An Investigation of the Coals of Canada with reference to their Economic Qualities. Vol. II. By J. E. Porter and R. J. Durley, assisted by T. C. Denis, E. Stansfield, and others. Report No. 83. Canada Dept. of Mines, Ottawa, 1912.

Contains 189 large 8vo pages, describing boiler tests and gas producer tests, and the work of the Chemical Laboratory at McGill University, Montreal, on the coals of Canada. There are 71 tables and 42 illustrations in the text.

Chemical Theory and Calculations. An Elementary Text-Book. By Forsyth James Wilson, Ph.D., and Isidor M. Heilbron, Ph.D., Lecturers in Chemistry, The Royal Technical College, Glasgow. Constable and Company, Ltd., 18, Orange Street, Leicester Square, London, W.C. 1912. Price 2s. 6d. net.

Small 8vo volume, containing 132 pages of subject matter, 9 illustrations, tables of logarithms, and an alphabetical index. An Appendix with tables of atomic weights, tension of aqueous vapour, and answers to problems is also given.

Journal of the Society of Chemical Industry.

No. 19, Vol. XXXI. OCTOBER 15, 1912. No. 19, Vol. XXXI.

Journal and Patent Literature.

Patent Specifications may be obtained by post by remitting as follows:—
English.—8*d.* each, to the Comptroller of the Patent Office, W. Temple Franks, Esq., Southampton Buildings, Chancery Lane, London, W.C.
United States.—1*s.* each, to the Secretary of the Society.
French.—1 fr. 05 c. each, as follows; Patents dated 1902 to 1907 inclusive, Belin et Cie., 56, Rue des Francs Bourgeois, Paris 3e); Patents from 1908 to date, L'Imprimerie Nationale, 87, Rue Vieille du Temple, Paris.
German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

Steam; Formulae connecting the pressure and temperature of saturated ——. S. Godbeer. Engineering, 1912, **94**, 281.

The following formulæ are based on data which have been published during the past few years. For the whole range of temperature from 0° to 374° C. (the critical temperature), the formula is:

$$\log. p = 20{\cdot}21690513 - \frac{7 \times (88{,}730 - 43t)(46{,}526 + 59t)^2}{2{,}488{,}620 \times (10{,}390 - t)(2659 + 10t)},$$

where p is the pressure in mm. of mercury and t is the temperature in degrees Centigrade. For pressures in lb. per sq. in., and temperatures on the Fahrenheit scale, the formula is:

$$\log. p = 18{\cdot}50340887 - \frac{7 \times (161{,}090 - 43t)(409{,}294 + 295t)^2}{22{,}307{,}580 \times (18{,}734 - t)(22{,}331 + 50t)}.$$

For temperatures between 0° and 100° C., the following formula gives specially accurate results (mm. of mercury and degrees Centigrade):

$$\log. p = 8{\cdot}83770304 - \frac{27t}{22{,}391} - \frac{201{,}872{\cdot}95}{24{,}689 + 99t}.$$

—A. S.

Patents.

Evaporation and distillation process. W. Anderson, Helensburgh, J. Meikle, Glasgow, and C. W. Fulton, Paisley. Eng. Pat. 14,285, June 16, 1911.

Liquids containing animal or vegetable matters in solution have a tendency to foam when undergoing evaporation. Advantage is taken of the finely divided condition of the liquid in the foam to promote evaporation. The liquid is heated in a primary evaporator under diminished pressure, and the foam, the production of which is purposely induced, is conducted into a second evaporator, where the concentration of the liquid is carried to the required point, or into a jacketed agitator where the liquid is completely evaporated under diminished pressure.—W. H. C.

Drying, heating or cooling; Apparatus for ——. T. G. Marlow, London, and The Pulsometer Engineering Co., Ltd., Reading. Eng. Pat. 16,299, July 14, 1911.

The material to be dried, heated, cooled, or otherwise treated is placed in a chamber through which air or other gas is circulated alternately in a compressed and rarefied condition. For this purpose, a single fan having a six-way valve chamber attached is employed, the arrangement being such that in different positions of the valve, the fan (1), forces gas into the chamber, (2), circulates the compressed gas through the chamber, (3), sucks gas from the chamber, and (4), circulates the remaining rarefied gas through the chamber.—H. H.

Drying apparatus. C. H. Mower and W. Hessling, London. Eng. Pat. 23,704, Oct. 26, 1911.

In a drying apparatus of the type having a chamber on the ground level into which trucks carrying the material to be dried are run and through which warm and moist air is made to circulate, the air is sucked into the heating flue through an injector nozzle so arranged that a portion of the warm air which has passed through the drying chamber is drawn in with the fresh air supply and again circulates through the apparatus, while the remainder passes away through the chimney. The heated air preferably enters the chamber through openings in the floor at one end, and the portion to be re-circulated is drawn out through similar openings at the other end adjacent to the chimney, the duct connecting the two sets of openings being arranged above ground to lessen the amount of excavation required. —H. H.

Plastic or sticky materials; Process and apparatus for the treatment of —— *at their entry into drying, heating, cooling or storing apparatus.* G. Desaulles. Fr. Pat. 441,715, June 1, 1911.

The plastic material is compressed by screw conveyors in a chamber and is forced through a perforated plate so that it falls into the treating chamber in the form of ribbons or rods, which are subjected to the action of the treating agent before reaching the travelling bands by which they are carried through the apparatus.—W. H. C.

Drying and treating materials; Machine and process for ——. The Mark Process Co. Fr. Pat. 441,990, April 1, 1912.

The materials to be treated are caused to pass by means of a scraper conveyor over a porous floor or bed. Warm air or other desired gaseous treating medium is forced by a fan or other suitable device into a chamber beneath the porous floor and passes through both the floor and the material being moved over the surface of the floor. The floor is enclosed in a chamber provided with a fan or other means of exhausting the moist air or other treating medium.—W. H. C.

Drying fragmentary, pulverulent or other products; Automatic and continuous apparatus for ——. A. Huillard. Fr. Pat. 442,341, April 9, 1912.

The materials to be dried are fed into the upper part of a vertical cylinder through a sector-shaped opening. The interior of the cylinder is divided into a number of superposed compartments by horizontal perforated partitions having sector-shaped openings arranged spirally. From a vertical shaft which passes centrally through the cylinder a number of vertical partitions project into each compartment and divide it into a number of sector shaped divisions. As the shaft rotates, these partitions, which are of the full height of each compartment, sweep round the materials so that they fall from shelf to shelf and are discharged from the bottom. Warm air is introduced into the second compartment from the bottom and, passing upwards, dries the material and is discharged from the top compartment but one.—W. H. C.

Furnace; High temperature ——. A. A. Govan, Bridge-of-Allan, Scotland. Eng. Pat. 19,806, Sept. 6, 1911.

In order to prolong the life of the furnace, that portion of the bed which is exposed to the most intense heat is made in the form of a roller, which can be rotated from without so as continually to expose a fresh surface. An alternative

method is to form that particular part of the bed as a slab, which slides in a groove and can be easily replaced.
—W. H. C.

Furnaces. R. H. Anderson, Newcastle, and R. W. Bulliek, Wingate, Durham. Eng. Pat. 2749, Feb. 2, 1912.

In order to ensure perfect combustion and minimise smoke in Cornish and Lancashire boilers, air is admitted through a horizontal pipe passing along the top of the furnace to a perforated fireclay box arranged in the flue beyond the bridge, where it issues in a highly heated condition and effects complete combustion of any unburnt combustible passing into the flue.—H. H.

Kiln; Continuous ——. R. Daudy. First Addition, dated June 13, 1911, to Fr. Pat. 439,652, April 14, 1911 (this J., 1912, 708).

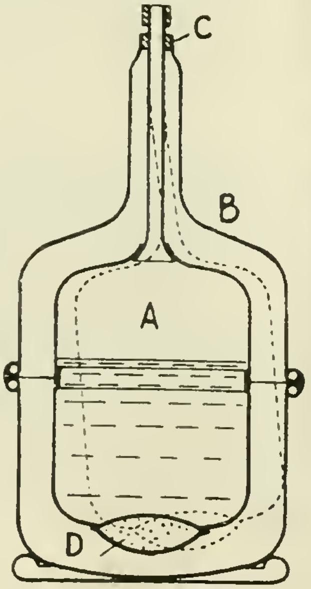
The interior of the kiln has a number of superposed, horizontal hollow shelves, arranged in a zig-zag manner, through which the heating gases circulate. The material is fed on to the top shelf and is pushed from shelf to shelf by rakes, actuated by mechanism from without the kiln. The treated material is discharged from the bottom of the kiln either on to a rotating table or a sliding shelf. The preparation of "mineral blue" in a furnace of this type is claimed, the oxidation being effected by a current of air in the discharge chamber.—W. H. C.

Granulating or agglomerating pulverulent material. G. J. and E. Kemball, London. Eng. Pat. 1492, Jan. 18, 1912.

The powdered material is caused to pass over an inclined heated surface by means of scrapers or other suitable conveying device. The heat causes the material to agglomerate, and the lumps are discharged from the heated surface into a breaking and sifting machine, where granules of the desired dimensions are separated for use, the fine dust being returned to the apparatus.—W. H. C.

Vessel for liquefied gases; Metallic ——. C. W. P. Heylandt, Hamburg, Germany. Eng. Pat. 1663, Jan. 20, 1912.

A metallic vessel, A, having a long, flexible, narrow neck is supported within an outer vessel of similar shape, B, having also a long neck, but one which is wider and stiffer. The two necks are soldered together at C. The gas or air in the space between the two vessels is exhausted and residual gas or leakage is absorbed by magnesium carbonate contained in the perforated box, D. When in the normal upright position, the inner vessel hangs straight down from the neck, a practically equal space being left all round between it and the outer vessel. When, however, it is inclined, the flexible neck bends and the inner vessel occupies the position shown by the dotted lines. Where the two vessels touch, the heat insulation is broken and the heat from the exterior penetrates into the inner vessel, vapourising part of the contained liquid and causing a pressure, which forces the contents out of the vessel very quickly.—W. H. C.



Pumps for withdrawing or forcing gases. Siemens Schuckertwerke, G. m. b. H., Berlin. Eng. Pat. 4700, Feb. 24, 1912. Under Int. Conv., Feb. 24, 1911.

The gas is withdrawn and compressed by a liquid which issues from a ring of fixed jets, and enters a corresponding number of longitudinal passages in a drum. The latter is rotated either by the action of the jets of liquid, or by external means, and the compressed gas and the liquid are discharged through a series of apertures in the cover at the other end of the casing. This cover is adjustable, so that a discharge aperture always presents itself to the discharge end of the longitudinal passages at the moment the desired degree of compression is attained.—W. H. C.

Filtering air or gases; Apparatus for ——. W. F. L. Beth, Lübeck, Germany. Eng. Pat. 8752, Apr. 13, 1912. Under Int. Conv., Aug. 9, 1911.

In a filtering apparatus of the type in which the air or gas to be filtered is sucked through the filter by a fan, a by-pass leading from the delivery side of the fan back to the filter is provided for cleaning the filtering medium by a counter-current of filtered air when desired, the arrangement being such that the counter-current flowing through one filter of a series can be again filtered by other filters which are still at work.—H. H.

Filter-press grating. R. Haag. Ger. Pat. 248,613, Oct. 11, 1911.

The patent relates to gratings prepared from discs of sheet metal by making a series of cuts therein and then bending over the cut portions, so that when the gratings are interposed between the filter-plates and the whole assembled in the press, these projecting portions of metal form channels, by which the liquid to be filtered is distributed over the surface of the filter-plate. According to the present patent, the cut portions are bent in such a manner that they project from only one side of the disc instead of from both sides as hitherto.—A. S.

Pressing materials containing liquid, for example, peat and the like; Process and apparatus for ——. T. Franke. Fr. Pat. 439,503, Dec. 20, 1911.

The material, *e.g.*, wet peat, is compressed in a cylindrical chamber by a number of concentric pistons, the central one being circular and the others annular in shape. The pistons work in compartments formed by a series of cylindrical strainers, each composed of two concentric cylinders of perforated sheet metal with an intermediate core of unperforated sheet metal, preferably corrugated, and with or without sheets of wire gauze between the core and the perforated sheets. The pistons have packing rings of elastic metal wires, preferably of hardened steel, the construction being similar to that of wire brushes. The perforations in the strainers are produced by punching, so as to leave projecting teeth, which tear open the surface of the material being compressed and so facilitate the escape of the expressed liquid. Conical strainers may also be fixed on the upper side of the pistons. The material is fed into the apparatus through a hopper, the bottom of which engages with the tops of the cylindrical strainers, so as to hold the latter in position during the charging. During the charging, layers of wood, paper, or other combustible material (so as not to interfere with the subsequent use of the compressed material as fuel) are inserted in the wet material, these serving to direct the expressed liquid towards the strainers.—A. S.

Pressing materials containing liquid, for example, peat and the like; Process and apparatus for ——. T. Franke, Schöneberg, Germany. Eng. Pat. 24,819, Nov. 7, 1911.

See Fr. Pat. 439,503 of 1911; preceding.—T. F. B.

Pressing liquids from materials containing the same; Machine for ——. T. Franke, Schöneberg, Germany. U.S. Pat. 1,031,543, July 2, 1912.

See Fr. Pat. 439,503 of 1911; preceding.—T. F. B.

Drying apparatus more particularly intended for the drying of sticky or pitchy substances. E. Disdier, Malaga, Spain. Eng. Pat. 25,251, Nov. 13, 1911.

See Fr. Pat. 436,057 of 1911; this J., 1912, 374.—T. F. B.

Impregnating liquids with gases; Apparatus for ——. M. Paschka, Vienna. U.S. Pat. 1,037,517, Sept. 3, 1912.

See Fr. Pat. 410,640 of 1909; this J., 1910, 805.—T. F. B.

Furnace; Regenerative reversing ——. L. L. Knox, Avalon, Assignor to Keystone Furnace Construction Co., Pittsburgh, Pa. U.S. Pat. 1,038,154, Sept. 10, 1912.

See Eng. Pat. 8883 of 1912; this J., 1912, 801.—T. F. B.

Utilisation of the solvent properties of mineral oils with respect to pure anhydrous sulphur dioxide. Fr. Pat. 442,259. *See* VII.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

[*Carbonisation of coal*]. *William Young Memorial Lecture.* H. G. Colman. J. Gas Lighting, 1912, **119**, 683—688.

The author discusses the chemical changes which are brought about in the primary products of coal distillation (evolved at about 450° C.): (1) by contact with the highly heated coke in the retort, and (2) by their passage through empty spaces in the retort where they are subjected to the action of radiant heat; and shows how the kind of retort used, horizontal or vertical, and the method of charging, influence these two actions. It is contended that the assumption that in the case of retorts heavily charged with bituminous coal the distillation gases escape through a central core of coal surrounded by a pasty mass of partly decomposed coal (compare this J., 1912, 114) is incorrect, as experiments have shown (1) that the composition of gas withdrawn from the centre of a vertical retort does not approximate so closely to that of the gas passing through the outlet as does that of the gas withdrawn from the coke near the wall of the retort, (2) that the pressure at the bottom of the retort decreases steadily while the gas is being evolved at a constant rate, during which time the central core is decreasing in cross-section and the outer layer of coke increasing. It is therefore concluded that the pasty mass is mainly impermeable to the gas which is being generated between it and the walls of the retort, and that this gas has to force its way through the interstices of the coke in proximity to the walls of the retort in order to escape. During this passage some of the methane will be broken up into carbon and hydrogen, and avoidance of this action is indicated as one of the lines of improvement necessary in vertical retort practice. It is also suggested that the gas escaping from retorts of this type should be subjected to a further period of "cracking" at moderate temperatures in order to split up the tar vapours, which are more affected by radiant heat than by contact with hot coke, into gas containing more methane, ethylene, and hydrogen, without an undue production of naphthalene and free carbon.—H. H.

Hydrogen and methane in gas mixtures; Determination of ——. W. Hempel. Z. angew. Chem., 1912, **25**, 1841—1845.

In mixtures containing methane and but little hydrogen, neither the Drehschmidt platinum capillary nor the Winkler-Dennis combustion pipette gives concordant results. The author finds the reason to be that the necessary temperature for complete combustion of the methane is not reached by the usual means of heating, namely, an ordinary Bunsen burner. He finds that a capillary tube of transparent quartz, through which passes a platinum wire which almost fills it, is an advantageous substitute for the platinum capillary. It possesses the advantage that explosive mixtures can be heated in it to very high temperatures without fear of propagation of an explosion. An arrangement is figured, showing the quartz capillary connecting the measuring burette and a mercury pipette, and surrounded by a small furnace of non-conducting material, within which is a small gas-blowpipe blown by a hand-bellows. A modification of the Winkler-Dennis pipette has also worked very well. A quartz tube, 13·5 cm. long and 3—4 mm. in bore contains a platinum spiral made from a wire about 18 cm. long and 0·2 mm. in diameter, which is connected with two platinum wires sealed into and passing through quartz capillaries, of the same original outer diameter as the quartz tube, but drawn out at their ends so as to pass into it as far as either end of the spiral. Short rubber tubes make the joints tight, holding the capillary tubes against the wider tube. The ends of the platinum wires, passing through the sides of the capillary tubes, are connected to binding screws so that a suitable current may be sent through the spiral; and the gas is passed back and forth between measuring burette and mercury pipette over the hot spiral. With either of these arrangements, as much as 80 c.c. of the gas to be tested may be used, and there is no danger of oxidation of any nitrogen present, provided the gases travel only slowly through the hot part of the apparatus.

For the determination of hydrogen, the author finds differential combustion over palladium asbestos quite accurate, if the temperature does not exceed 400° C. To secure this, the capillary containing the asbestos is surrounded by a small brass sheath (supported by the Bunsen burner), which also contains a little bulb of mercury, and the burner flame is adjusted so as just to keep the mercury boiling. If 8 minutes be taken to pass 100 c.c. of gas, the hydrogen is completely burnt, usually in one passage, always in three. Absorption of the hydrogen by colloidal palladium was not found quite so satisfactory. The palladium solution should be freshly prepared, and it is best to use half the quantity first, allowing it to absorb all it will, then to return the gas to the burette, empty the pipette, introduce the other portion of the solution, then complete the absorption. The froth which forms may be destroyed by adding a little alcohol; but the solution to which alcohol has been added cannot again be used, and the pipette must be thoroughly cleansed from alcohol before being used again. When water-containing burettes, and pipettes filled with reagents, are used, the solubility of the gases becomes a serious question, especially if gases of widely varying composition succeed one another in the apparatus. This source of error has been almost eliminated by using a cylindrical pipette containing a flattened globular glass float just moving easily within it, and weighted so as to sink about two-thirds in the liquid. As the gas is introduced, the float sinks, and protects the gas and the liquid below it from one another. The gas is exposed only to the liquid on the walls.—J. T. D.

Nitrogen; Determination of —— in ferrocyanides, thiocyanates, and spent oxide. Knublauch. J. Gasbeleucht., 1912, **55**, 713—718, 864—868, 883—890.

It is economically wrong to work the purifiers in gas-works in such a way as to obtain spent oxide with more than 4·75 per cent. of nitrogen, as this results in a diminished yield of Prussian blue and of ammonium sulphate, the nitrogen being bound up as comparatively valueless thiocyanate. Hence the valuation of spent oxide on the basis of "total nitrogen" is only permissible when the spent oxide is "bad," *i.e.*, unworkable for Prussian blue. The total nitrogen of spent oxide, ferrocyanides, thiocyanates, and ammonium salts may be very accurately estimated by heating with soda-lime, receiving the evolved ammonia in standard acid. Before sampling for analysis, "bad" spent oxide should be dried at 50°—60° C. for 5—6 hours, the loss of nitrogen being nil from cyanides, ferrocyanides, and Prussian blue, and less than 0·009 per cent. from ammonium salts. The best agents for decomposing mercury-ammonium compounds formed in Kjeldahl's method of determining nitrogen, so as to allow the liberation of total ammonia by alkali, was found to be "*liver of sulphur*," obtained by fusing potassium carbonate with sulphur. Since spent oxide contains both sulphur and sulphides, it is not necessary to add alkali sulphide before distilling for ammonia, provided that less than 0·05—0·07 grm. of mercury is added for every gram of spent oxide. It is necessary in the case of spent oxide, to add the mercury only after the substance has been heated for some time with sulphuric acid until all the ferrocyanide and thiocyanate have been destroyed—which occurs after a few minutes' heating—since ferrocyanides and thiocyanates do not give accurate results in the presence of mercury. Kjeldahl's method compares very unfavourably with the soda-lime method when the substance to be analysed contains only 1—1·5 per cent. of nitrogen and is difficult to decompose, owing to the small amount of ammonia to be isolated from a large volume of liquid. This difficulty may be got over by using the smallest possible quantity of sulphuric acid and mercury, so that only a little caustic soda and no sodium sulphide are required and the liquid for distillation is thus reduced to small bulk. The analysis of spent oxide is best carried out thus: 1 grm. of spent oxide dried at 50°—60° C. is added to 7—10 c.c. of sulphuric acid (sp. gr. 1·84) in a special 250 c.c. flask, and after standing for 5 minutes and cooling if necessary, the mixture is warmed gently for 15—20 minutes, boiled for 10 minutes, and (a) 0·05—0·10 grm. of copper oxide or (b) not more than 0·05—0·10 grm. of mercury (=0·004—0·005 c.c.), or (c) 0·25 grm. of mercury (=0·02 c.c.) or mercury oxide added. The whole is heated for 40—75 minutes and then, in case of (a) and (b) above, 42—43 c.c. of caustic soda solution (330 grms. per litre) are added, whilst in the case of (c), after making alkaline, sodium sulphide or zinc dust is added. The mixture is now distilled until two-fifths of the liquid have passed over, the ammonia being received in standard acid. A blank experiment is made with the same quantities of reagents and under the same conditions. To ascertain if correction is necessary for loss of nitrogen in drying the sample, 5—10 grms. of the original undried spent oxide are placed in the distilling flask, 100 c.c. of water are added and the mixture distilled. If the distillate requires more than 5—6 c.c. of $N/10$ acid for neutralisation, it will be necessary to make corrections by sucking air over the spent oxide drying at 50°—60° in a closed vessel, passing the air through standard acid and estimating the loss of acidity caused thereby.

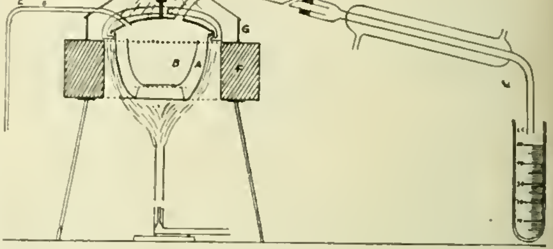
In the case of coal 10—12 c.c. of sulphuric acid and 0·25 grm. of mercury are used; towards the end of the reaction a little potassium chlorate is added. The heating is continued for 2½ hours. It is better, however, to use the soda-lime method for coal, mixing in a little potassium chlorate both with the coal and the soda-lime in the hinder part of the tube.—G. M.

Paraffin and ceresin; Detection and determination of —— in mixtures, and application to the analysis of candles. G. Armani and G. A. Rodano. Ann. Lab. Chim. Centr. delle Gabelle, 1912, 6, 109—118.

The method recommended for the detection and approximate determination of ceresin in admixture with paraffin is based upon the difference in the critical temperatures of solution of the two substances in a mixture of equal volumes of absolute alcohol and benzene. 0·1 grm of the sample is dissolved in 10 c.c. of the solvent and the hot solution is allowed to cool slowly, the temperature at which a turbidity or separation of the dissolved substance is observed being noted. For pure ceresin the critical temperature is 50° C., whilst for mixtures of ceresin and paraffin containing the percentages of ceresin given, the critical temperatures are: 90, 48° C.; 80, 47·5° C.; 70, 47° C.; 60, 44·5° C.; 50, 43° C.; 40, 41·5° C.; 30, 40° C.; 25, 38° C.; 20, 36·5° C.; 10, 30° C.; and 5 per cent. of ceresin, 27° C. With paraffin alone, the critical temperature of solution is usually about 25° C., but may vary in different kinds from 20° to 28° C. In all cases examined, however, of mixtures of paraffin with 10 per cent. of ceresin, the critical temperature was 30° C. In applying the method to candles, 0·1 grm. of the sample is tested as described above: if the critical temperature is below 28° C., the presence of an appreciable quantity of ceresin is excluded. If a higher critical temperature is observed, a portion of the sample is subjected to repeated saponification with an aqueous alcoholic solution of potassium hydroxide (40 grms. dissolved in a mixture of 100 c.c. of water and 200 c.c. of alcohol), and 0·1 grm. of the unsaponifiable matter is tested as described above in order to determine approximately the proportion of ceresin present.—A. S.

Petroleum lubricating oils; Apparatus and method for carbon test and ash residue in ——. P. H. Conradson. Eighth Int. Cong. Appl. Chem., 1912, Sect. I., Orig. Comm., 1, 131—132.

The residue from the carbon test frequently contains mineral impurities due to imperfect refining treatment of the oil. The following method of testing has been adopted by the author with satisfactory results. The apparatus (fig.) consists of an iron crucible or retort, A, of about 200 c.c. capacity, 55 mm. high, 80 mm. in diameter at the top and 45 mm. at the bottom (internal dimensions). Upon a support within the crucible, a glass crystallising dish, B, about 65 mm. in diameter, or preferably a platinum dish of 70—80 c.c. capacity, is placed. The lid of the retort is provided with two tubes, D, and E, the former (7—8 mm. diameter) being an exit pipe to which a condenser is attached, and the latter (2 mm. diameter) for use in blowing out the heavy fumes at the conclusion of the distillation process. 35 grms. of the oil are placed in the weighed dish within the crucible, the cover, C, of the latter is securely clamped down (an asbestos washer being used to make a tight joint) and the apparatus is placed upon an asbestos block, F, resting upon a tripod and covered with an asbestos or sheet-iron hood, G, provided with a clay chimney, H. In order to heat the upper part of the apparatus at the beginning of the test, a large flame is used at the commencement and lowered after a few minutes; the distillation of the oil is conducted at the rate of 1 c.c. per min., and at the end the flame is gradually raised in order to heat the lower part of the apparatus to redness (when heavy oils are being tested), the heavy vapours being finally removed from the interior by displacement with carbon dioxide or other suitable gas. When cold, the dish containing the carbonaceous residue is weighed, the residue is finely powdered and boiled first with water and then with hydrochloric acid (1 : 1), after which it is washed, dried and weighed again; the carbon is finally oxidised by ignition with ammonium nitrate, the residue being weighed and dissolved in hydrochloric acid. The water and acid solutions are examined for mineral impurities such as iron, alumina, lime, soda, sulphuric anhydride and chlorine.—W. E. F. P.



Petroleum illuminating and lubricating oils; Apparatus and method for sulphur determination in ——. P. H. Conradson. Eighth Int. Cong. Appl. Chem., 1912. Sect. I., Orig. Comm., 1, 133—136.

A large proportion of the total sulphur in many inferior, poorly-refined petroleum oils is present as sulphonates or sulphates; these compounds are not included when the sulphur is determined by ordinary "lamp" methods, since they remain in the wick, and although included when direct oxidation methods are employed, no distinction is made between them and the sulphur compounds normally present in the oil. The method employed by the author consists in burning to dryness a weighed quantity of the oil by means of an ordinary kerosene burner and aspirating the products of combustion through two absorption tubes arranged in series and containing a solution of sodium carbonate (6 grms. per litre) previously standardised with $N/10$ acid. 10—20 grms. of illuminating or 5—10 grms. of lubricating oils are usually taken for the determination; the more viscous oils are mixed with an equal volume of highly refined kerosene of known sulphur content, and when the mixture has burned completely, a further 2 c.c. of the kerosene are added and burned to dryness. The sodium carbonate solution (including the rinsings of the apparatus) is either titrated with standard acid or oxidised with bromine and hydrochloric acid and precipitated with barium chloride as usual. The examination of the wick for sulphur compounds is conducted as follows:—When only the total sulphur (sulphonates and sulphates) is required, the wick, cut into small pieces, is digested with 0·2 grm. of sodium carbonate and 5 c.c. of concentrated nitric acid until the fibres are disintegrated, when 2 grms. of magnesium nitrate are added and the temperature is gradually raised until the organic matter is destroyed; the sulphur contained in the residue is then determined by the usual means. When separate determinations are required of the sulphur present as sulphonates and sulphates, the wick is boiled with a solution of barium hydroxide which is then diluted and filtered. The filtrate, containing the sulphonates, is either oxidised with bromine and hydrochloric acid, or evaporated to dryness with nitric acid (the residue being treated with hydrochloric acid and boiling water), to effect the precipitation of the barium sulphate representing the sulphonates originally present. The sulphur in the residue from the barium hydroxide treatment is determined by the method employed for the determination of the total sulphur in the wick.—W. E. F. P.

[Specifications for oil for] oil-mixed concrete. *See* IX.

Chlorides of carbon as solvents. I. Carbon tetrachloride. Baskerville and Riederer. *See* XII.

Patents.

Carbonaceous fuel, stable under varying atmospheric conditions and resisting deformation, and in which the sulphur is rendered innocuous; Manufacture of ——. E. Pollacsek. Fr. Pat. 442,556, April 15, 1912.

Powdered coal is mixed with a thick milk of lime, slightly in excess of the quantity required to combine with the sulphur and with 2 to 4 per cent. of a binder such as starch, glue, or waste sulphite-cellulose lye. The mixture is dried in air, or by heating, and is briquetted. These briquettes are porous, and in order to increase the calorific power they are impregnated with a richer fuel. For this purpose, crude petroleum, containing paraffin and ozokerite, is heated to boiling and mixed with bitumens and phenols (crude phenol or creosote oils) and air is blown through the liquid until the consistence is such that the mixture would solidify at ordinary temperatures. The porous briquettes are dipped in the liquid at about 90° to 100° C.—A. T. L.

Gas retorts; Vertical —— of the continuous type. R. Dempster and Sons, Ltd., and H. J. Toogood, Elland, Yorks. Eng. Pat. 16,471 of 1912; date of appl., July 22, 1911.

The taper of vertical gas retorts of the continuous type is made sharper in the upper than in the lower portion in order to provide for the expansion of the coal when first heated and facilitate the uniform downward progress thereof. In an example of a retort having a height of 25 ft., the cross-sectional diameters are 48 ins. by 10 ins. at the top, 54½ ins. by 14¾ ins. halfway down, and 60 ins. by 19 ins. at the bottom.—H. H.

Coal; Furnace for distillation of ——. A. Boogaerts. Fr. Pat. 442,263, April 6, 1912.

The furnace comprises a closed casing, suitably lined, divided above the grate by a vertical wall into a distillation chamber and a heating chamber for boiler tubes or other apparatus to be heated by the escaping gases. The raw fuel is charged into the upper part of the distillation chamber through a lateral opening provided with air inlets. The gases liberated from the raw fuel, together with the air, pass downwards through a flue in the vertical dividing wall and are delivered so as to burn in contact with the coke on the grate. The grate slopes downwards from the bottom of the distillation chamber, so that the coke formed in this chamber passes on to the grate and is consumed.—A. T. L.

Retort oven. J. G. Völker. Fr. Pat. 442,552, April 15, 1912. Under Int. Conv., April 20, 1911.

The oven comprises a battery of horizontal retorts, a gas producer arranged in the centre of the lower part of the oven, and horizontal flues for the flow of the waste gases and primary and secondary air, built in the lower part of the structure at either side of the producer. To ensure a better transmission of heat to the primary air, the flues for the same are separated from the waste gas flues by a metal wall. In order to obtain a more uniform temperature in the retort chamber, all the conduits admitting secondary air to the retort chamber and primary air beneath the producer grate are provided with dampers.—A. T. L.

Gases; Separating and removing liquid impurities [tar] from ——. S. Carter, Liverpool. Eng. Pat. 20,757, Sept. 20, 1911.

The apparatus is more particularly applicable to the separation and removal of tar from carburetted water-gas, coal gas, producer gas, etc., and comprises a bell or cone fitted at the lower edge with an annular depending ring or flange which is in close proximity to an outer ring carried by a baffle in the form of a cone or bell arranged below the first bell. The apparatus is fitted in the gas main in such a manner that the gas is first "wire-drawn" as it passes between the rings and then impinges on the lower cone or baffle where the liquid impurities become precipitated. The two cones are screwed upon a common spindle, so that the distance between the rings can be adjusted.—H. H.

Coking briquettes; Apparatus for ——. P. Hein, Essen-Ruettenscheid, Assignor to Diamant Brikett-Werke G. m. b. H., Berlin. U.S. Pat. 1,037,479, Sept. 3, 1912.

See Fr. Pat. 425,348 of 1911; this J., 1911, 882.—T. F. B.

Retort; Vertical —— for the carbonisation of coal or the like. A. M. Duckham. U.S. Pat. 1,037,822, Sept. 3, 1912.

See Eng. Pat. 28,388 of 1910; this J., 1911, 481.—T. F. B.

Gas generator. W. Hoeller, Cologne-Ehrenfeld, Germany. U.S. Pat. 1,037,481, Sept. 3, 1912.

See Eng. Pat. 27,547 of 1911; this J., 1912, 676.—T. F. B.

Hydrocarbons [from mineral oils]; Process for producing light ——. C. R. Burke, Pittsburgh, U.S.A. Eng. Pat. 16,931, July 24, 1911.

See Fr. Pat. 432,762 of 1911; this J., 1912, 117.—T. F. B.

Pressing materials containing liquid, for example, peat and the like. Fr. Pat. 439,503. *See* I.

Utilisation of the solvent properties of mineral oils with respect to pure anhydrous sulphur dioxide. Fr. Pat. 442,259. *See* VII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

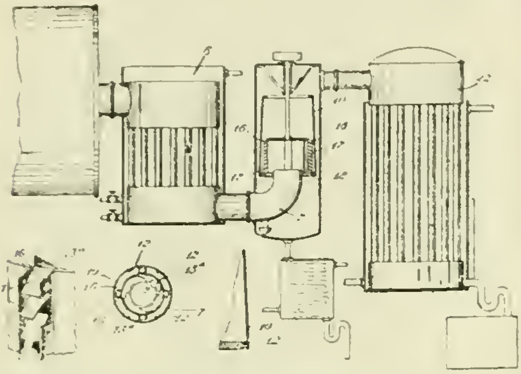
Charcoal having great decolourising power; Process for the production and revivification of ——. O. Molenda and J. Wunsch. Fr. Pat. 442,476, April 12, 1912. Under Int. Conv., April 24, and Oct. 25, 1911.

Carbonaceous substances of animal or vegetable origin are destructively distilled in the presence of chlorine;

or spent decolourising charcoal is revivified in the presence of chlorine, out of contact with the air.—W. H. C.

Acetic acid sufficiently free from tar and oils for industrial purposes ; Process for preparing ——. E. H. French. Ger. Pat. 249,333, Aug. 18, 1911.

A portion of the tar and the oils is separated from the acetic acid vapours by fractional condensation, and the remainder by centrifugal means. The impure vapours are passed through the condenser, 6 (see fig.), and thence through the pipe, 7, into the separator, 10, in which rotates a cylindrical bowl, 12, provided with a series of baffle-plates, 16, 17, through which the tarry and oily matter passes : a number of vertical baffle-plates, 13a, are also provided in the interior of the drum, 12, adjacent to the baffle-plates, 16, 17. The purified acetic acid vapours finally pass into the condenser, 22.—T. F. B.



Electrodes for arc lamps ; Use of metallic tungsten and uranium for the production of ——. [*Sterilisation of water, etc.*] Banque du Radium. Seventh Addition, dated May 26, 1911, to Fr. Pat. 418,280, July 15, 1910 (see this J., 1911, 77, 1305 : 1912, 221, 379, 457).

An arc lamp for sterilising liquids or for use in lighting, comprises a glass or quartz tube with an anode of tungsten, uranium or other pure metal, and a mercury cathode. The ends of the tube are each closed by a tightly fitting quartz stopper, behind which is placed a layer of mercury retained by a stopper of plastic material. The leads pass through the three sections of the closure.—A. T. L.

Filaments for incandescence [electric] lamps ; Manufacture of ductile —— from difficultly fusible metals or alloys. R. Jahoda and Electrische Gluhlampenfabrik "Watt," Scharf, Löti und Latzko. Fr. Pat. 441,914. Mar. 29, 1912. Under Int. Conv., Sept. 30, 1911, and Mar. 1 and 5, 1912.

A tungsten filament prepared from powdered tungsten and a binder and finished in the usual manner is submitted to a further treatment in order to render it ductile and less liable to fracture. This treatment consists in passing the filament through a heated die, preferably in an atmosphere of hydrogen. In one arrangement described, the filament is passed through a tube, and a jet of burning hydrogen at the end of this tube serves to heat the die. The filament itself may be heated by an electric current if desired.
—A. T. L.

Metallic filaments for [electric] incandescence lamps ; Process and apparatus for the automatic manufacture of ——. A. Grammont and J. L. Routin. Fr. Pat. 442,160, June 13, 1911.

Decarbonisation of filaments which have been made from the powdered metal and a binder is effected by the usual process of heating strongly in hydrogen, in a special apparatus which is controlled automatically. The filaments are mounted on terminals in bells containing hydrogen, and one central terminal in each bell, to which all the filaments are connected, is itself connected through an ampere-meter and rheostat with a source of current. The other terminals of the filaments are connected with a number of contacts arranged in pairs beneath a rotating contact arm, and according to the position of this arm, different pairs of filaments are placed in circuit. The current is supplied from a set of four dynamos, which are controlled by the constantly rotating arm of a circular rheostat, in such a way that the current is gradually increased to a maximum and then suddenly interrupted. After the interruption of the current, the rotating arm closes the circuit of an electromagnet, and the armature of this magnet moves an escapement lever allowing a gravity-controlled wheel to turn through one tooth, thereby turning the contact arm so as to cut out the pair of filaments which have been heated and place the next pair in circuit. In this way, the process proceeds automatically until all the filaments have been heated.
—A. T. L.

Incandescence bodies ; Process of manufacturing ——. H. Kuzel, Baden, Austria-Hungary, Assignor to General Electric Co., New York. U.S. Pat. 1,037,268, Sept. 3, 1912.

See Eng. Pat. 8057 of 1906 ; this J., 1906, 841.—T. F. B.

Improvements in articles made of silica glass and requiring leading-in wires combined therewith. Eng. Pat. 21,482. *See* VIII.

Photometer. Fr. Pat. 442,623. *See* XXIII.

III.—TAR AND TAR PRODUCTS.

1 : 5-*Naphthylenediamine* [; *Injury to skin caused by*—.] F. Kunckell and H. Schneider. Chem.-Zeit., 1912, 36, 1021.

The aceto compound yielded by treating this amine with acetic anhydride was found to cause most serious irritation of the skin when handled ; an irritation which spread from the parts which had been actually in contact with the substance to others which had not touched it. The amine itself does not seem to produce this effect, nor do the workers with the aceto-compounds of the 1 : 2-, 1 : 3-, and 1 : 4-naphthylenediamines record any similar experiences.—J. T. D.

Patents.

Anthracene monosulphonic acid ; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 3318, Feb. 9, 1912.

Anthracene-monosulphonic acid is obtained in good yield by sulphonating anthracene in presence of glacial acetic acid. *Example.* 300 parts of anthracene are added to 600 parts of glacial acetic acid, and 200 parts of sulphuric acid chlorhydrin are gradually added to the cooled mixture, with stirring : it is then rapidly heated to 95° C. and kept at that temperature for five hours. The resulting solution is poured into 5000 parts of water and the sulphonic acid is salted out by means of common salt. The precipitate is boiled with 4500 parts of water, and the mixture is cooled to 40° C. and filtered. The residue contains anthracene-β-sulphonic acid, which can be extracted by boiling with a large quantity of water. The filtrate contains the anthracene-α-sulphonic acid, which separates on addition of 120 parts of common salt.
—T. F. B.

Nitroso-derivatives of phenylglycine-ortho-carboxylic acid or ethylene-dianthranilic acid or the esters of these acids ; Process for the preparation of ——. J. D. Riedel Akt.-Ges., Berlin-Britz, Germany. Eng. Pat. 14,341, June 19 1912. Under Int. Conv., June 19, 1911.

Phenylglycine-o-carboxylic acid or ethylene-dianthranilic acid or their esters can be converted into nucleus nitroso derivatives, with good yields, by treating solutions or suspensions of these acids or esters in fuming hydrochloric acid with nitrous acid or nitrites. The nitroso-group enters the position *para* to the substituted amino-group. The products may be used for the preparation of phenazine or phenoxazine dyestuffs and of indigo derivatives.—T. F. B.

Condensation products from cyclic ammonium bases; Process for preparing ——. A. Kaufmann. Ger. Pat. 250,154, Jan. 31, 1911.

Quaternary salts of cyclic ammonium bases (*e.g.*, quinoline) which are not hydrogenated, and which are converted into "cyclaminones" by treatment with alkalis in presence of oxidising agents, such as potassium ferricyanide, are treated with compounds containing reactive methyl or methylene groups in presence of alkaline condensing agents. For example, a quaternary salt of quinoline may be treated with acetoacetic ester, benzyl cyanide, or indoxyl, in presence of alkali. The constitution of the products has not been established.—T. F. B.

Acenaphthene monosulphonic acid; Process for preparing an ——. Kalle und Co. Ger. Pat. 248,994, Nov. 3, 1910.

When acenaphthene is treated with chlorosulphonic acid, preferably in presence of a diluent or solvent, a monosulphonic acid is produced, the sulphonic group having entered a methylene group of the five-membered ring. When acenaphthene is treated with concentrated sulphuric acid, on the other hand, di- and trisulphonic acids are produced, in which the sulphonic groups apparently occupy positions in the naphthalene nucleus.—T. F. B.

p-Mononitro-dihalogenanthraquinones; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 249,721, June 2, 1911.

p-Mononitro derivatives of 1.5- or 1.8-dihalogen-anthraquinones are produced by treating the dihalogen derivatives with a sufficient quantity of a nitrating agent to introduce only one nitro-group, or by using an excess of the nitrating agent and discontinuing the reaction before di-nitration commences. This does not occur in the case of other similarly constituted anthraquinone derivatives, *e.g.*, anthrarutin or diaminoanthraquinones; in these cases, mixtures of the dinitro-compounds with unchanged substance are obtained, and no mononitro-compound is formed.—T. F. B.

Nitro-1-amino-2-hydroxynaphthalene-4-sulphonic acid; Process for preparing ——. Kalle und Co. Ger. Pat. 249,724, March 17, 1911.

Nitro-1-amino-2-naphthol-4-sulphonic acid is obtained by the nitration of 1-amino-2-naphthol-4-sulphonic acid, excluding water from the reaction, and removing the water formed during the process. This may be effected, for example, by nitrating in presence of chlorosulphonic acid, or by using a nitrating acid containing a sufficient amount of fuming sulphuric acid to ensure that all the water formed will be converted into sulphuric acid or monohydrate.—T. F. B.

Hydroxyanthrimides; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 249,938, Nov. 22, 1910.

By heating di- and tri-anthrimides in sulphuric acid solution with nitrous acid or its compounds, in presence of boric acid, hydroxyanthrimides are obtained. The products may be utilised in the manufacture of dyestuffs.
—T. F. B.

β-Anthraquinonylurea chloride; Pure —— and process of making same. A. Schmidt and G. Kranzlein, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,038,003, Sept. 10, 1912.

See Fr. Pat. 415,789 of 1910; this J., 1910, 1294.—T. F. B.

Preparing a caoutchouc-like substance [from tar oils]. Ger. Pat. 218,178. *See* XIV.

IV.—COLOURING MATTERS AND DYES.

Patents.

Indigo-white preparations; Manufacture of stable ——. Meister, Lucius, and Bruning, Ltd., Manchester. From Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 13,673, June 11, 1912. Addition to Eng. Pat. 1647, March 6, 1905.

Preparations of indigo-white, especially suitable for use in the cold fermentation vat, are obtained by mixing indigo white with lactic acid or a lactate, and, if necessary, concentrating or drying the mixture: it is possible to employ smaller quantities of lactic acid or lactates than of the materials described in the principal patent (this J., 1906, 171), and to use less concentrated solutions. For example, when 50 kilos. of indigo white, in the form of a press-cake, are kneaded with 80 kilos. of 50 per cent. lactic acid and the mixture evaporated, if necessary, a thin, syrupy liquid is obtained, which does not ferment or become mouldy, even after long standing.—T. F. B.

Disazo dyestuffs; Manufacture of ——. A. G. Bloxam, London. From Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. Eng. Pat. 13,766, June 12, 1912.

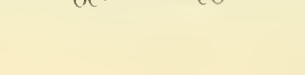
A new series of disazo dyestuffs is produced by combining tetrazo compounds of bases of the diphenyl series with the arylamides of 2.3-hydroxynaphthoic acid. The dyestuffs may be used for the production of pigment colours, which are black to black-blue in colour, and of good fastness to lime and oil. They may also be produced on the fibre by the usual methods, with or without addition of copper salts; the fastness of the greenish-blue shades produced is generally superior to that of the dyeings from the corresponding products from β-naphthol or 2.3-hydroxynaphthoic acid. By printing side by side on a ground prepared with the arylamides of the hydroxynaphthoic acids, the diazo derivative of *p*-nitraniline and a tetrazodiphenyl derivative, red and blue shades, fast to acids, may be obtained. The dyed blue shades may be discharged white by formaldehyde-hydrosulphite in presence of suitable catalytic agents (compare Eng. Pat. 6379 of 1912; this J., 1912, 635).—T. F. B.

Monoazo dyestuffs of the pyrazolone series; Process for producing yellow ——. Société pour l'Industrie Chimique à Bâle. Fr. Pat. 412,590, June 23, 1911.

A series of yellow monoazo dyestuffs, very fast to light and washing, is obtained by combining the diazo derivatives of aromatic sulphonic acids with 1-aryl-3-methyl-5-pyrazolones containing three halogen atoms in the aryl radical. Thus, the dyestuff from *p*-toluidine-*m*-sulphonic acid and tribromophenyl-3-methyl-5-pyrazolone (prepared by condensing acetoacetic ester with tribromophenylhydrazine) dyes wool pure greenish-yellow shades from acid baths. The diazo derivatives of the following are said to be especially suitable:—Aniline-*o*-, *m*-, or *p*-sulphonic acid, toluidinesulphonic acids, the chloroanilinesulphonic acids and chlorotoluidinesulphonic acids, *m*-xylidinesulphonic acid, and the nitranilinesulphonic acids.—T. F. B.

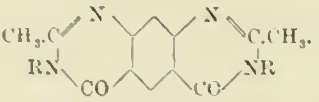
4.6-*Diamino*-1.3-*xylene; Products obtainable from —— and process of making.* M. T. Bogert, New York. U.S. Pat. 1,032,734, July 16, 1912.

When 4.6-diamino-1.3-xylene is acetylated and then oxidised, 4.6-diacetamino-1.3-phthalic acid is produced; this is converted by hydrolysis with hydrochloric acid into the hydrochloride of the diaminophthalic acid, from which free 4.6-diamino-1.3-phthalic acid is produced by treatment with caustic soda and acidifying with acetic acid: this new acid is a colourless powder, which turns pink on standing, and melts at about 235° C. When boiled with acetic anhydride it is converted first into the 4.6-diacetamino-1.3-phthalic acid and then into a new substance, a bisacetanthranil,



$$CH_3.CO.N\!<\!\!\begin{smallmatrix}|\\OC\end{smallmatrix}\!\!>C_6H_2<\!\!\begin{smallmatrix}N.CO.CH_3\\|\\CO\end{smallmatrix}$$

By condensing this with two mols. of a primary monoamine, another new substance, of the 1.3.7.9-naphthotetrazine group, is produced, viz.,



where R is hydrogen or an alkyl or aryl group. Also by condensing the bisacetanthranil with an aromatic diamine, analogous substances are formed, the R being replaced by $R.NH_3$ groups. These can be diazotised and combined with suitable azo components, forming a new series of substantive dyestuffs of good fastness: eighteen such dyestuffs are described, together with the shades which they produce on silk. When they are reduced by stannous chloride, diamino-derivatives of the naphthotetrazine nucleus are produced, which give azo dyestuffs differing from those first obtained, owing probably to reduction products being formed. The first-mentioned azo dyestuffs can also be combined with phthalic anhydride, giving rise to dyestuffs of the Quinoline Yellow type.—T. F. B.

Alizarin: Production of ——. C. Möllenhoff, Leverkusen. Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,036,880, Aug. 27, 1912.

Anthraquinone is converted into alizarin by heating it with a dilute alkali (caustic soda) solution, not stronger than 50 per cent., in presence of an anthraquinonesulphonic acid, and with or without addition of an oxidising agent, such as saltpetre (compare Eng. Pat. 2354 of 1911; this J., 1911, 1246).—T. F. B.

Anthracene dye and process of making same. O. Bally, Mannheim. Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,037,410, Sept. 3, 1910.

See Addition of April 2, 1910, to Fr. Pat. 365,920 of 1906; this J., 1910, 1197.—T. F. B.

Polyazo dyes. Azo dyes. H. Schweitzer and A. Zart, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,038,209 and 1,038,210, Sept. 10, 1912.

See Eng. Pat. 9433 of 1911; this J., 1912, 182.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Fireproofing of cotton goods; Permanent ——. W. H. Perkin. Eighth Int. Cong. Appl. Chem., New York, 1912.

The author gives a description of the series of experiments which have led to the commercial production of permanently fireproofed flannelette. The first process which it was possible to work on a commercial scale consisted in treating the material successively with sodium stannate and with a mixture of sodium tungstate, zinc acetate, and acetic acid: the treated material, however, had a tendency to become damp, the fireproofing was not sufficiently permanent, and the cost of the process was too high. The process finally evolved was as follows: The flannelette is impregnated with a solution of sodium stannate of about 45° Tw., squeezed, dried on heated copper drums, passed through a solution of ammonium sulphate of about 15° Tw., in order to precipitate tin oxide, again squeezed and dried, washed to remove sodium sulphate, dried, and finished in the usual manner. The tin oxide is probably present in actual combination with the fibre, for the fireproofing is not destroyed by repeated washing with hot water and soap. The treated material can be dyed the most delicate shades, has no deleterious action on the skin, and is stated to be stronger and more durable than the untreated material. With tin at £210 per ton, the cost of the process is not more than 1d. per yard. The process is also applicable to the treatment of muslin, lace curtains, etc. (See also Fr. Pat. 321 063 of 1902 and Eng. Pats. 8509 of 1902 and 24,222 of 1903; this J., 1903, 142, 623; 1904, 981).—A. S.

Sulphite-cellulose as a raw material for nitrocellulose. Nitzelnadel. *See* XXII.

Patents.

Silk; New process of production of soluble ——. E. M. S. Galibert. Fr. Pat. 441,606, May 30, 1911.

Silk, either raw or degummed, is treated with a caustic soda lye containing 10—30 per cent. of sodium oxide. After steeping for 2—10 hours, the excess of liquid is removed by pressing or centrifuging, so that a quantity of the lye at least equal to the weight of the silk remains. The product is torn up and exposed to the action of carbon bisulphide for 2—4 hours and is afterwards dissolved in water to form a solution suitable for the manufacture of artificial threads, or films, or for coating yarns, etc.—J. F. B.

Fibres suitable for spinning; Production of artificial textile ——. P. Vindrier. Fr. Pat. 442,015, June 8, 1911.

Artificial filaments are produced from viscous solutions in the ordinary way, in endless form, of a fineness down to 0·5 denier. They are wound off from the jets, parallel and in groups, on drums, bobbins or winders, after which the filaments are cut at one or several places following the axis of the drum so as to produce one or several bunches of threads parallel and equal in length and diameter, suitable for spinning with ordinary spinning machinery into yarn.—J. F. B.

Nitrocellulose; Recovery of volatile solvents employed in the manufacture of plastic masses with a basis of ——. J. Delpech. Fr. Pat. 441,551, Feb. 28, 1912.

Plastic objects of a nitrocellulose basis are placed, whilst still soft, in aqueous solutions of hygroscopic salts, such as calcium, magnesium and zinc chlorides. Such solutions, especially when warm and concentrated, have a great affinity for the volatile solvents, which are thereby absorbed and subsequently recovered by distillation. —J. F. B.

Cellulose esters; Manufacture of ——. L. Lederer. Fr. Pat. 441,864, March 28, 1912.

Gelatinous aqueous solutions of acetylated cellulose are obtained by acetylating cellulose or its modified derivatives by means of acetic anhydride and sulphuric acid, and subjecting the product of the reaction to the action of water for more than a day. Example: 5 parts of cotton are treated with a mixture of 20 parts of acetic anhydride and 20 parts of glacial acetic acid with 1 part by weight of sulphuric acid. Acetylation is effected at a temperature of 20°—25° C. until the cellulose is dissolved. To the syrupy solution are then added, whilst stirring, 20 parts of water, and the mixture is left for a few days, the reaction being brought to a close by the addition of 1·5 part of sodium acetate dissolved in 6 parts of water. —J. F. B.

Cellulose in a filamentous or film form: Process and apparatus for producing ——. A. Pellerin. Fr. Pat. 442,022, Apr. 1, 1912.

The apparatus consists of a truncated conical casing and an internal pipe from which the solution of cellulose may be delivered under pressure through numerous minute orifices into a stream of coagulating liquid continuously passing through the casing at a regulated velocity. The orifices are preferably pierced in sheets of platinum clamped in frames, the angle of which may be adjusted relatively to the direction of flow of the coagulating liquid. The speed of the liquid, being regulated, exerts a pull on the issuing filaments of cellulose and controls their diameter. A mass of filamentous cellulose is thus obtained which is suitable for spinning into yarn. If the orifices are shaped as line slits, strips of cellulose film are similarly produced.—J. F. B.

Cellulose, silk or mixtures; Coating textile yarns with —— by passing through solutions in cupric solvents. E. M. S. Galibert. Fr. Pat. 442,117, June 12, 1911.

When a textile yarn is passed through a sufficiently viscous solution of cellulose, emerging through an orifice very slightly larger than the diameter of the yarn, there is formed, not a continuous coating, but a new filament, wound in spirals about the original thread. The apparatus consists of a four-branched tube with an entrance hole for the textile thread at the top of the vertical branch and a glass spinning orifice for its exit at the bottom. The lateral branches are of equal bore and connected through stopcocks with a supply of the solution of cellulose, silk, etc. When the thread is drawn through the apparatus it emerges with a filament of plastic cellulose surrounding it in spirals, the closeness of which depends on the speed of drawing.—J. F. B.

Cellulose acetates insoluble in acetic acid and chloroform; Process of manufacture of ——. Knoll und Co. Fr. Pat. 442,512, Apr. 13, 1912. Under Int. Conv., Apr. 28, 1911.

The ordinary forms of cellulose acetate may be converted into forms which are insoluble in acetic acid and chloroform by prolonged contact with certain catalysers. For instance, if a catalyser, such as sulphuric acid, sulphoacetic acid, zinc chloride, etc., be added to a solution of cellulose acetate in glacial acetic acid, the mass, at first gelatinous, gradually separates in a solid insoluble form. Alternatively the cellulose acetate may be treated in the solid form, as films, threads, etc., by sprinkling it with a solution of benzene, sulphoacetic acid and acetic anhydride, and continuing the action until the ester has become insoluble.—J. F. B.

Steeping and pressing, particularly for the manufacture of alkali cellulose. Apparatus for the treatment of materials by ——. Soc. La "Soie Artificielle." Fr. Pat. 442,019, Apr. 1, 1912.

In the manufacture of alkali-cellulose for the preparation of "viscose," sheets of wood pulp are steeped in caustic lye and then pressed to remove the excess of liquid. In the apparatus described, the two operations are performed in the same vessel, the steeping vessel being constructed to serve as a cylinder for the hydraulic pressing ram. The vessel is divided into compartments by sliding perforated plates, and each compartment is charged with sheets of pulp packed with loose perforated plates at intervals. After the lye has been admitted and has penetrated the sheets, one end of the chamber, acting as the ram of the press, is moved forward; the plates forming the divisions of the compartments likewise move forward on guides until the whole charge forms a compact mass.—J. F. B.

Resin solutions for use in paper-making; Process for the preparation of ——. G. Sommer. Reval, Russia. Eng. Pat. 20,189, Sept. 12, 1911.

Pulverised resin (1 part) is made into an emulsion with water and mixed with a solution of 0·2 part of calcined sodium carbonate in 20 parts of water at 14° C. When the resulting emulsion is treated with aluminium sulphate in the usual way, aluminium resinate and free resin are precipitated. (Reference is directed to Eng. Pat. 2821 of 1868.)—P. F. C.

Drying and bleaching; Process of ——. J. D. Tompkins. Valatie, N.Y. U.S. Pat. 1,037,370, Sept. 3, 1912.

An electric current is passed through a travelling wet web of fabric, such as paper, which contains a suitable electrolyte. Oxygen is liberated and the fabric is bleached thereby.—P. F. C.

Filling and rendering impermeable fabrics and paper; Process of ——. N. Hornstein and B. Chapiro. Fr. Pat. 441,496, May 26, 1911.

The material is repeatedly impregnated in a size prepared from the flour of "*Colacasia esculadium*" ("*founory*") and agar-agar, then dried and exposed in an autoclave to the vapours from a heated aqueous solution of formalin and potassium bichromate. This last operation may be replaced by a passage through a boiling aqueous solution of sodium carbonate, gelatin, and Glauber's salt, to which calcium carbonate has been added.—P. F. C.

Lycopodium and tannin; Application of powdered —— to impermeable [rubbered] fabrics. G. M. Chotin. Fr. Pat. 441,740, March 26, 1912.

A thin coating of rubber solution is first applied to the fabric, which is then passed under a sprinkling device which covers the whole surface with a mixture of fine lycopodium and tannin powders. The excess of powder is next removed and the surface of the fabric is polished by brushing. Calendering completes the process. Much less rubber solution is required to render the fabric impermeable to water than when lycopodium and tannin are not used.—P. F. C.

Mineral oils; Preparation or treatment of —— for the purpose of rendering their presence on fabrics readily recognisable. H. Lubberger, Tiengen, Germany. Eng. Pat. 5786, March 7, 1912. Under Int. Conv., April 29, 1911.

See Ger. Pat. 248,522 of 1911; this J., 1912, 871.—T. F. B.

Parchment paper; Process for the manufacture of —— and of papers of more or less defined parchment-like character, and waterproof to various degrees. E. Fues, Hanau on Maine, Germany. Eng. Pat. 10,560, May 3, 1912.

See U.S. Pat. 1,033,757 of 1912; this J., 1912, 769.—T.F.B.

Recovery of the volatile products of the hydrolysis of lignocelluloses. Fr. Pat. 441,497. *See* XVIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Dyeing from different solvents. J. Hübner and H. B. Avery. J. Soc. Dyers and Col., 1912, **28**, 280—286.

Dyeings carried out at the ordinary temperature with solutions of Benzopurpurin 10 B. in mixtures of water and alcohol demonstrated that:—(*a*), cotton absorbs less dyestuff from a mixed solvent than from either water or alcohol; (*b*), the point of minimum absorption is reached with a mixture of 45 per cent. of water and 55 per cent. of absolute alcohol by volume; (*c*), cotton absorbs slightly less dyestuff from pure water than from absolute alcohol and more from alcohol containing 5 per cent. of water than from absolute alcohol. It is noteworthy that if silk be used instead of cotton, the minimum absorption is attained with the same proportions of alcohol and water, and these proportions agree with the composition of the known hydrate of alcohol, $C_2H_5{\cdot}OH,3H_2O$ (Varenne and Godefroy, Comptes rend., 1903, **137**, 993—996). Different results were obtained with mercerised cotton, the point of minimum absorption being reached with a mixture of 35 per cent. of water and 65 per cent. of alcohol. Methyl alcohol has practically no effect on the absorption of substantive dyestuffs by ordinary cotton, whilst mercerised cotton absorbs less dyestuff from methyl alcohol than from an aqueous solution. Dyeings from solutions of Benzopurpurin 10 B. in mixtures of water and glycerin showed that the amount of absorption decreases as the proportion of glycerin increases.—P. F. C.

Tannins of nut-galls, divi-divi, myrobalans and sumac; Relative affinities for cotton of the ——. J. P. Srivastava. J. Soc. Dyers and Col., 1912, **28**, 286—294.

A series of experiments proved that:—(1), the absorption of tannic acid by cotton decreases as the temperature rises; (2), the rate of absorption is at first high and rapidly diminishes, 80 per cent. of the maximum absorption being attained after 5 hours; (3), the amount of absorption varies with the concentration of the tannin solution; (4), all traces of tannin can be removed from the fibre by treatment with boiling water; (5), the effect of additions of other substances, such as acetic acid, to the bath depends largely on the conditions of the experiment; if sufficient time is allowed, the maximum absorption of tannin may be attained without making other additions to the bath. Experiments were carried out to determine the relative affinities of various tannins for cotton. The tannins were first analysed by Löwenthal's method and such quantities of the products were used that the initial concentration of gallotannic acid in each bath was the same. Two series of experiments were performed: in one the cotton was immersed for 17 hours in cold tannin solutions, and in the second the cotton was steeped in boiling solutions which were then allowed to cool during the same period. The results are embodied in the following table. Tannic acid Leviss. A and B are specially pure samples.

Name of tannin.	Condition of bath.	Tannin taken per bath. grms.	Amount of tannic acid absorbed as percentage.
Leviss., B	Cold	0·2	39·67
92·32 per cent.	Hot	0·2	46·8
Leviss., A.	Cold	0·228	47·12
80·97 per cent.	Hot	0·228	49·4
Galls.	Cold	0·3208	43·22
57·54 per cent.	Hot.	0·3208	45·67
Sumac	Cold	0·4673	40·42
39·51 per cent.	Hot	0·4673	42·77
Myrobalans ..	Cold	0·4369	36·37
42·26 per cent.	Hot	0·4369	38·24

Fastness tests showed that basic dyestuffs fixed with sumac stand exposure to light better than when fixed by any other tannin.—P. F. C.

Dyeing and finishing chrome kid. Howard. *See* XV.

Patents.

Bleaching by the combined action of chloroethylenes and "decolourising hypochlorites." J. Maisonneuve. Fr. Pat. 442,589, June 23, 1911.

The material is scoured by treating it with a chloroethylene and is afterwards bleached by a mixture of a hypochlorite with magnesium chloride and acetic acid, the magnesium chloride being added in a quantity just sufficient to neutralise the excess of base contained in the hypochlorite. —P. F. C.

Red shades on the textile fibre; Production of ——. P. A. Newton, London. From the Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 2550, Jan. 31, 1912.

The material is dyed with azo dyestuffs obtained from one molecule of a diazotised *o*-anisidine derivative (with the exception of the sulphonic acids) and one molecule of the urea of 2-amino-5 naphthol-7-sulphonic acid. The dyed goods are finally treated in the usual way with diazotised *p*-nitraniline.—P. F. C.

Textile materials; Continuous automatic machine for the regular drainage and recovery of products occurring in —— or their economical, practical treatment by liquids having special properties. G. Malard. Second Addition, dated Mar. 11, 1912, to Fr. Pat. 381,097, Aug. 20, 1907 (see Eng. Pat. 759 of 1908; this J., 1909, 362; also this J., 1910, 558).

This addition describes an improvement in the means for directing the treating liquid on to the material to be extracted.—P. F. C.

Dyeing machine having a circulating dye-bath with means for maintaining the temperature of the dye liquor and reducing the steam consumption to a minimum. L. Derreumaux-Bulteau. First Addition, dated Mar. 20, 1912, to Fr. Pat. 405,290, July 21, 1909 (this J., 1910, 419).

The circulation of the dye-bath is effected by direct steam and the temperature of the dye-bath is maintained by closed steam-chests or coils.—P. F. C.

Dye-bath; Machine having a circulating ——. L. Maselli. Fr. Pat. 441,885, Mar. 23, 1912.

The material to be dyed is packed on the perforated false bottom of an open dye-vat from which dye-liquor can be withdrawn by means of a pump and an injector to be re-delivered into the vat from above. The delivery pipe is fitted with a spraying device which also keeps back any solid matter suspended in the circulating dye-bath. Between the pump and the dye-vat a funnelled pipe branches into the circulation system and by means of it dyestuffs or other substances can be added to the bath. A closed steam-coil is arranged in the bottom of the bath for heating purposes.—P. F. C.

Printing and embossing surfaces; Production of ——. J. W. Aylsworth, East Orange, N.J., U.S.A. Eng. Pat. 12,659, May 25, 1911.

An infusible condensation product of a phenol and formaldehyde, which becomes plastic when heated, is pressed, at a suitable temperature, upon the article which the printing surface is to reproduce. From the matrix thus obtained, a printing or embossing plate is next prepared in a similar manner. The condensation product used for this second operation must, however, become sufficiently plastic at relatively low temperatures.—P. F. C.

Yarn-printing; Machine for ——. O. Hallensleben. Fr. Pat. 442,562, Apr. 15, 1912.

In a machine of the type in which the printing devices are mounted on a carriage which moves along the warps but is arrested during the actual printing operation, the printing devices are actuated by a Jacquard mechanism and are automatically thrown out of action after each separate printing operation.—P. F. C.

Fabrics; Apparatus for removing lye from ——. J. Matter, Laacken, Germany. U.S. Pat. 1,037,280, Sept. 3, 1912.

See Fr. Pat. 392,400 of 1908; this J., 1908, 1201.—T. F. B.

Cleansing, washing, or dyeing woollen, cotton, and other yarns; Apparatus for ——. P. Fineato, Milan, Italy. U.S. Pat. 1,037,461, Sept. 3, 1912.

See Fr. Pat. 420,946 of 1910; this J., 1911, 486.—T. F. B.

Dyeing vegetable fibres with halogenated [indigoid] dyestuffs, Method of ——. R. B. Ransford, London. From L. Cassella und Co., Frankfort on Maine, Germany. Eng. Pat. 24,473, Nov. 3, 1911.

See U.S. Pat. 1,029,066 of 1912; this J., 1912, 638.—T. F. B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Sulphur in pyrites; Determination of ——. A. M. Smoot. Eng. and Min. J., 1912, **94**, 412—414.

Before precipitating with barium sulphate, the heavy metals are removed from the solution of the pyrites electrolytically. The sample is pounded to pass an 80-mesh sieve, 0·5 grm. (or 0·6868 grm. for convenience of calculation) is weighed off, and treated in a 250 c.c. beaker with 12 c.c. of a mixture of 3 parts of nitric acid (sp. gr. 1·42) and 1 part of hydrochloric acid (sp. gr. 1·20), to which four or five drops of bromine have been added.

The covered beaker is allowed to stand at the ordinary temperature for half an hour, then heated in a steam- or water-bath till action has ceased, when the cover is removed and the liquid evaporated to dryness. Then 5 c.c. of hydrochloric acid are added, the cover is replaced till effervescence has ceased, and then removed, rinsed, and the evaporation to dryness repeated. The residue is treated with 25 c.c. of hot water, and rinsed into the electrolytic cell, a conical lipped beaker of about 150 c.c. capacity with a tubulure near the bottom for the platinum wire leading into the mercury cathode. The liquid is made up to about 75 c.c., a flat platinum spiral is introduced as anode, an inverted funnel is made to rest on the wall of the beaker above the liquid, and a current of 0·8 to 1·0 ampère is passed for five or six hours (or a weaker current overnight). The funnel and the beaker sides are now washed down, the liquid decanted into a 300 c.c. beaker as closely as possible, and the beaker and mercury are washed with four successive quantities of 25 c.c. of water. The mercury is then poured out of the side away from the lip, and the empty beaker, especially the lip, is rinsed clean. The liquid is now filtered from the 300 c.c. beaker into an 800 c.c. beaker, the filter washed, the liquid diluted to 450 c.c. (600 c.c. if 0·6868 grm. has been used), heated to boiling, and whilst boiling 25 c.c. (34 c.c.) of ten per cent. solution of barium chloride added slowly. The author uses for this a "precipitation pipette," consisting of a large thistle-funnel, with the stem bent so as to pass under the cover-glass at the lip of the beaker, whilst the funnel is supported by a wire stand on the cover-glass. The end of the stem is so drawn out that 25 c.c. of liquid will be delivered in five minutes. The precipitate is filtered and washed as usual, and the filter burnt off with the precipitate. The resulting error due to the excess of occluded barium chloride over the solubility of barium sulphate amounts to from 0·01 to 0·04 per cent. A number of determinations gave results averaging 0·18 per cent. higher than those obtained with the Lunge method. Lead to the extent of 0·04 grm. in 0·5 grm. does not interfere with the accuracy of the results.—J. T. D.

Sulpher in pyrites ores ; Exact method for the determination of ——. W. S. Allen and H. B. Bishop. Eighth Int. Cong. Appl. Chem., 1912. Sect. 1, Orig. Comm., 1, 33—51.

The essential features of the process are the complete oxidation of a comparatively large sample of the ore by means of a solution of bromine in carbon tetrachloride, followed by nitric acid ; the reduction of the iron by means of aluminium powder ; and the cold precipitation of the barium sulphate in a large volume of liquid by the slow addition of a dilute solution of barium chloride. It is stated that results obtained by this means are generally 0·1—0·15 per cent. higher than those obtained by the usual methods, duplicate determinations agreeing within a few hundredths of one per cent. of sulphur. Having examined the precipitates of barium sulphate obtained by this method in the presence of various added salts, the authors are of opinion that no correction for the presence of occluded salts in the barium sulphate is necessary when the precipitation is conducted as described.

—W. E. F. P.

Ammonia ; Synthesis of —— from its elements. J. Billiter. Nernst Festschrift, 86—89. Chem. Zentr., 1912, 2, 803.

The majority of catalysts which promote the union of nitrogen and hydrogen only work at high temperatures. Cerium hydride and cerium nitride however are quite active at 200°—300° C. (see Lipski, this J., 1909, 423). These catalysts however rapidly become exhausted, although partial recovery takes place on standing. To elucidate these phenomena the author has investigated the catalytic activity of a cerium preparation obtained by heating cerium fluoride with magnesium. It was found that atmospheric moisture played a considerable part in the catalysis, a well-dried mixture of nitrogen and hydrogen giving only traces of ammonia. The presence of moisture in the gas current is not sufficient to bring about the formation of ammonia, the simultaneous presence of hydrogen, air and water vapour being necessary. The contact mass is therefore gradually exhausted by oxidation. The formation of ammonia is probably only a subsidiary reaction. The behaviour of a cerium-iron alloy was similar, but it did not regain its activity on being allowed to stand in perfectly dry gases.—W. H. P.

Nitrogen ; Technical conversion of —— into its compounds. J. A. A. Auzies. Rev. gen. Chim. pur. appl., 1912, **15**, 233—241. Chem. Zentr., 1912, **2**, 766—767.

After a discussion of the known methods of oxidising atmospheric nitrogen, it is deduced from theoretical considerations that the yield is improved 25 per cent. by the use of a gas current of 50 per cent. of nitrogen and 50 per cent. of oxygen. The relation between temperature and yield is illustrated in tables. The oxidation of nitrogen has been successfully attempted by the use of catalysts, apparently owing to the formation of unstable peroxides which yield active oxygen. The catalysts were obtained by calcination of the hydroxides of cobalt, magnesium, chromium, nickel, platinum, palladium, barium, lead, cerium and thorium. The best results are obtained with thorium oxide or mixtures which contain it. The 50 per cent. mixture of gases is obtained by enriching air with oxygen obtained as a by-product in the manufacture of nitrogen (for ammonia manufacture) by fractional distillation of liquid air. The gas current is dried and then passes over plates on which the catalyst is spread in thin layers, and which are heated to a suitable temperature. The further oxidation of nitric oxide to the peroxide takes place in chambers at 150° C. and is hastened under the influence of ultra-violet radiation. The yields are improved when the pressure in the chamber is raised to about 5 atmospheres. The reaction products are passed into a receiver cooled in liquid air which retains the nitrogen peroxide and allows the nitrogen and oxygen to pass back again through the apparatus. For the preparation of ammonia from nitrogen by catalysis with nickel, iron, cobalt, boron, titanium, aluminium, etc., it is essential that the nitrogen and hydrogen should be entirely free from oxygen, and the mixture is therefore first passed through a solution of chromous sulphate. The catalyst is usually prepared by soaking cotton wool in a solution of a salt of the metal, then in ammonia solution and igniting. Only those metals whose oxides are not reducible by hydrogen must be used in the powdered condition. The gas current is passed over the catalyst in tubes which are heated to a red heat in metal baths, the reaction product being quickly cooled below 500° C. As examples of the proportions for mixing the catalysts, the author suggests : 22 parts of boron or 55 parts of aluminium to 168 parts of reduced nickel. The formation of the ammonia is explained by the preliminary production of an unstable boron nitride and the activation of the hydrogen by means of the reduced nickel.—W. H. P.

Metallic nitrides from thiocyanates and cyanides : Formation of ——. A. C. Vournasos. Z. anorg. Chem., 1912, **77**, 191—196.

Elements, such as boron and aluminium, which are able to effect the reduction of cyanides with the formation of nitrides (Bull. Soc. Chim., 1911, **9**, 506), are found similarly to reduce thiocyanates and thiourea. For example, when an intimate and very dry mixture of aluminium (27 parts) and potassium thiocyanate (100 parts), both in a state of fine powder, is heated, at one point, to about 900° C., in a covered crucible, reaction proceeds with great vigour, yielding a mixture of aluminium nitride, potassium sulphide, and carbon, together with some aluminium sulphide ; the main reaction, which is typical, is represented by the equation : $2KSCN + 2Al = Al_2N_2 + K_2S_2 + 2C$. Amorphous boron behaves similarly, and magnesium and calcium readily reduce both cyanides and thiocyanates ; a dry mixture of magnesium and potassium or ammonium thiocyanate kindles as readily as gunpowder. By the action of beryllium on potassium or mercuric cyanide, at 650°—700° C., beryllium nitride, Be_3N_2, is obtained ; this is a white amorphous powder, decomposed by water with the liberation of ammonia.—F. Sodn.

Alkali thiocyanates; Detection of chlorides in presence of ——. H. Cormimboeuf. Ann. Chim. Analyt., 1912. **17**, 329—330.

The method depends on the fact that on adding a cupric salt, in the presence of excess of a reducing agent and in the absence of free mineral acid, to a solution containing an alkali thiocyanate and chloride, the former is completely precipitated, leaving the chloride in solution. It is carried out as follows:—1·5 grms. of the thiocyanate to be examined are dissolved in 20—25 c.c. of water, 30 c.c. of sodium acetate solution (250 grms. of the crystallised salt per litre) are added and, after shaking, 30 c.c. of a solution containing 200 grms. each of crystallised copper sulphate and iron sulphate per litre; the mixture is then filtered, and the blood-red filtrate, which becomes green on adding concentrated nitric acid, is tested with silver nitrate in the usual way.—F. Sodn.

Copper oxide; Melting point of ——. R. E. Slade and F. D. Farrow. Z. Elektrochem., 1912, **18**, 817—818.

Pure cupric oxide does not melt below 1148° C. At this temperature even with a pressure of 2·5 atmospheres of oxygen, decomposition takes place with the production of cuprous oxide, which forms a solution with the cupric oxide solidifying at about 1081° C. At 1 atmosphere the decomposition begins at 1090° C., and the solution (which contains over 50 per cent. of cuprous oxide) solidifies at about 1064° C. This is the value which was given for the true melting point of copper oxide by Wöhler (Z. Elektrochem. 1906. **12**, 781).—W. H. P.

Cuprous iodide [; Determination of iodine in ——]. M. Kohn and A. Klein. Z. anorg. Chem., 1912, **77**, 252—254.

The method of Baubigny and Chavanne for the determination of iodine in organic compounds (this J., 1903, 761) has been successfully applied to the determination of this element in cuprous iodide. A cold solution of ammonium bromide, like potassium bromide solution, dissolves cuprous iodide, 1 litre of the 2*N*, 3*N*, and 4*N* solutions dissolving 1·9068, 3·6540, and 6·0588 grms. respectively, at 20° C.—F. Sodn.

Iodides; Determination of ——. W. Schirmer. Arch. Pharm., 1912. **250**, 448—451.

Iodides can be determined by the following methods: (1). 0·4 grm. of the iodide in 5—20 c.c. of water is mixed with 5 grms. of official *Liquor Ferri sesquichlorati* (Ger. Pharm.) and allowed to stand for an hour. It is diluted with 100—120 c.c. of water and 10 c.c. of official 25 per cent. phosphoric acid added. The iodine that separates is dissolved by the addition of about 0·5 grm. of solid potassium iodide and titrated with thiosulphate. (2.) A solution of not more than 0·5 grm. of the iodide in 50 c.c. of water is treated with 10 c.c. of dilute sulphuric acid and 10 c.c. of a 1 per cent. sodium nitrite solution. After 1—2 minutes 1 grm. of urea is added and the whole vigorously shaken for 5 minutes, the iodine dissolved with 0·5 grm. of potassium iodide and then titrated. (3). 20 c.c. of a 1 per cent. solution of iodic acid, or potassium iodate acidified with 5 c.c. of dilute sulphuric acid, are diluted with 50 c.c. of water, and a solution of 0·4 grm. of the iodide in 5—10 c.c. of water then added. After 1—2 minutes 5 grms. of borax are added, and after a further 5 minutes, 1 grm. of potassium iodide is added to dissolve the iodine, which is titrated with thiosulphate.—F. Shdn.

Platinum [compounds]; Action of dimethylglyoxime on ——. M. Wunder and V. Thuringer. Ann. Chim. Analyt., 1912. **17**, 328—329. (Compare this J., 1912, 663.)

Dimethylglyoxime gives a flocculent precipitate on boiling with a solution of chloroplatinic acid, but the authors have not succeeded in completely precipitating platinum by this reagent.—F. Sodn.

Tungsten; Fusion of some rare earths with alkali carbonates and the separation of —— from iron, beryllium, and aluminium. Wunder and A. Schapiro. Ann. Chim. Analyt., 1912, **17**, 323—327.

Known weights of the oxides of cerium, lanthanum, didymium, erbium, thorium, and tungsten were separately fused with sodium and potassium carbonates respectively, and, after boiling the melts with water (with the addition of 1 grm. of the alkali carbonate to bring about more efficient filtration), the residual oxides were weighed. Cerium, lanthanum, and thorium oxides showed losses of about 0·5—1 per cent., while 10—15 per cent. of the didymium oxide and over 30 per cent. of the erbium oxide passed into the filtrate; with tungstic anhydride the melt was completely soluble. The separation of tungstic anhydride from ferric oxide or beryllium oxide may be effected by fusion with sodium carbonate for 2 hours and extraction with water as above. A mixture of tungstic anhydride and alumina, by similar treatment, gives a solution from which the alumina may be precipitated by adding an excess of ammonium nitrate.—F. Sodn.

Cyanogen and hydrogen cyanide; Detection and determination of ——. F. H. Rhodes. J. Ind. Eng. Chem., 1912, **4**, 652—655.

Wallis (this J., 1906, 427) has shown that a solution of silver nitrate, slightly acidified with nitric acid, rapidly and quantitatively absorbs hydrogen cyanide, whereas cyanogen is not absorbed. The author confirms this and shows that any small quantity of cyanogen dissolved by the acid silver solution can be expelled by a current of air. A quantitative method for the separation and determination of cyanogen and hydrogen cyanide in gaseous mixtures, even when as little as 0·3 c.c. of cyanogen is present and in presence of large volumes of air, has been based on these facts. The gaseous mixture is passed first through an acidified standard solution of silver nitrate and then through potassium hydroxide solution, which latter absorbs the cyanogen with formation of equimolecular proportions of cyanide and cyanate. From the excess of unconsumed silver solution the amount of hydrogen cyanide is calculated, whilst in the potassium hydroxide solution the cyanide is determined and the amount of cyanogen calculated therefrom.—A. S.

Compressed oxygen and hydrogen. The risk of accidents with ——. W. Bramkamp. Z. angew. Chem., 1912, **35**, 536—540.

The author discusses the various possible causes of recent fatal accidents resulting from the explosion of oxygen or hydrogen cylinders. In most cases it is certain that an explosive mixture of hydrogen and oxygen has been introduced into the cylinder. The two most important causes of this are (1) the use of the same compressor alternately for both gases; and (2) unsatisfactory control and attention when the gases are obtained at the same time in the electrolysis of water. Other causes which may contribute but which are unlikely in themselves to account for an explosive mixture in a full cylinder are: (1) the use of an oxygen cylinder as a hydrogen cylinder or *vice versa*, without previously removing all the original gas; and (2) the absorption of hydrogen by finely divided iron inside the cylinder. The various methods by which the explosive mixture when present may be exploded include: (1) ignition of oil or other combustible material in the valve or pressure gauge by the compressed oxygen; (2) local rise in temperature of the gas due to sudden closing of the valve; (3) catalytic action of finely divided iron in causing combination in the mixture and raising its temperature; and (4) pyrophoric oxidation of finely divided iron. The author is of the opinion that with suitable precautions an explosive mixture need never be put into a cylinder, and that all cylinders should be tested by analysis of their contents immediately after filling.—W. H. P.

Arsenic acid; New method of titration of ——. A. W. C. Menzies and P. D. Potter. Eighth Int. Cong. Appl. Chem., 1912. Sect. 1. Orig. Comm., **1**, 367—371.

The process is based upon the fact that arsenic acid acts as a dibasic acid when titrated with sodium hydroxide in the presence of phenolphthalein, the end point of the titration, otherwise indefinite, being rendered sharp by the addition of barium chloride to the solution. In a series of 19 duplicate determinations, very concordant results were obtained by conducting the titrations in the following manner: Sufficient arsenic acid being used to require 30—40 c.c. of $N/1$ alkali, 15 c.c. of a saturated solution of barium chloride are added to the solution, which is then diluted to 250 c.c. and boiled for 15 mins. to remove carbon dioxide, after which it is cooled and titrated. The alkali (preferably containing barium hydroxide to ensure absence of soluble carbonate) is added, with stirring, until the locally-formed precipitate no longer dissolves quickly. The stirring is prolonged (the walls of the vessel being scraped by the rod, if necessary) until the liquid appears lustrous with fine crystals ($BaHAsO_4$) after which the addition of the alkali is continued until the final pink colouration is produced. The value of the alkali employed is calculated from the acidimetric factor or determined by titration with solutions containing known weights of arsenic acid, the latter being prepared either by the oxidation of pure arsenious oxide by nitric acid, or by synthetic methods.—W. E. F. P.

Nitrate of soda; Rational analysis of ——. W. S. Allen. Eighth Int. Cong. Appl. Chem., 1912. Sect. I, Orig. Comm., 1, 19—31.

By means of complete and comparative analyses, the inaccuracy of the "refraction" (difference) method for the estimation of sodium nitrate in the commercial salt is shown. Direct determination of the nitrogen by a modification of Devarda's process is recommended, the distillation being conducted in a modified form of Knorre's apparatus provided with ground glass connections. 1 grm. of the sample is treated with 3 grms. of Devarda's alloy (containing 45 per cent. of aluminium, 50 of copper and 5 of zinc) in the presence of 25 c.c. of a 20 per cent. solution of sodium hydroxide, the ammonia produced being absorbed in standard sulphuric acid. When the violent action caused by the introduction of the alloy has subsided, the distillation is continued in a current of air, the flask being heated by immersion in boiling water; before entering the vessel containing the standard acid, the gaseous products are passed through an upwardly inclined, steam-jacketed scrubber (containing glass wool) to prevent alkali "mist" from being carried over. For the titration, a solution of methyl red is used as indicator: the latter being sensitive to carbon dioxide, all the water employed in the process must be boiled before use. The standardisation of the sulphuric acid, in terms of sodium nitrate, is effected by a procedure identical with that of the assay, pure potassium nitrate being employed for the purpose. Although not so rapid as the nitrometer method, the process is stated to be more easy of manipulation and is believed to be more accurate, the results of duplicate determinations agreeing within 0·15 per cent.—W. E. F. P.

Vanadic acid; Analysis of commercial ——. G. Chesneau. Eighth Int. Cong. Appl. Chem., 1912. Sect. I, Orig. Comm., 1, 123—126.

Commercial vanadic acid usually contains from 15 to 20 per cent. of impurities, the latter consisting mainly of the oxides of sodium and iron. In the method of analysis recommended, moisture and loss on ignition are determined by heating 1 grm. to constant weight at 120° C. and then to redness in a muffle. For the determination of vanadic acid, silica, iron, etc., 1 grm. of the powdered sample is fused with 2—3 grms. of sodium carbonate "mixed with $\frac{1}{10}$ of nitre," and the melt is extracted with boiling water and filtered. The insoluble residue is examined for iron, manganese, calcium and magnesium by the usual methods, but since the residue generally retains a little vanadium, the ferric oxide obtained is fused with sodium carbonate and the melt extracted with water; the resulting solution is added to the filtrate from the magnesium precipitation, the vanadium present in the combined liquids being determined colourimetrically by means of hydrogen peroxide. The aqueous solution from the original fusion, containing the silica and alumina and the bulk of the vanadic acid, is acidified with nitric acid and evaporated to dryness, the residue being taken up with nitric acid and the silica separated by filtration. The filtrate is made slightly ammoniacal and heated, the resulting precipitate of aluminium hydroxide (in which the phosphorus and arsenic and traces of vanadium are included) being filtered off; after being weighed, the ignited precipitate is examined for occluded vanadium by the colourimetric process. To the boiling ammoniacal filtrate a solution of barium nitrate is added, the resulting precipitate being subsequently ignited and weighed as barium vanadate, $2BaO,V_2O_5$, containing 37·24 per cent. of vanadic anhydride; the precipitate not being completely insoluble, the small amount of vanadium remaining in the filtrate is determined colourimetrically. For the determination of soda, the method of Lawrence Smith is employed, 1 grm. of the sample being heated with 8 grms. of calcium carbonate, 1 of ammonium chloride and 3 of barium carbonate; the last-named reagent is employed to ensure the absence of vanadium in the aqueous extract of the heated mixture. For the determination of arsenic and phosphorus, 5 grms. of the sample are fused with 10 grms. of sodium carbonate and the mass is extracted with boiling water; the solution is acidified with hydrochloric acid, reduced with sulphur dioxide, saturated with hydrogen sulphide and filtered; the precipitate is examined for arsenic by any of the usual methods. The filtrate is boiled to expel hydrogen sulphide, and, after the addition of 2—3 c.c. of sulphuric acid, is evaporated until fumes of sulphur trioxide appear. To the liquid (now blue from the presence of hypovanadic acid) an equal volume of ammonium molybdate solution and a few grams of ammonium nitrate are added, and the mixture is maintained for 2 hours at a temperature of 40° C.; the resulting precipitate is stated to be practically free from vanadic acid.—W. E. F. P.

Determination of nitrogen in ferrocyanides, thiocyanates, and spent oxide. Knublauch. *See* IIa.

Patents.

Sulphur or like burning furnaces; Means for regulating the supply of air to ——. D. N. Hunt, Chesham, Bucks. Eng. Pat. 18,895, Aug. 23, 1911.

An auxiliary supply of air is introduced into the upper part of a sulphur-burning furnace, by way of a branch pipe taken from the main air-supply pipe, and enters the chamber at a point near a thermostat, which automatically operates a valve controlling the admission of the auxiliary air. When the thermostat expands, the valve is opened and auxiliary air is gradually admitted, causing vapourised sulphur to burn. Should an excess of air be admitted, it cools the thermostat, which then contracts and reduces the air supply by closing the valve.—O. R.

Sulphuric acid; Process and apparatus for the manufacture of ——. C. Pasques. Fr. Pat. 441,813, Mar. 8, 1912.

The apparatus consists essentially of a series of condensing vessels (in which gases from the pyrites burners, mixed with nitric gases, are made to bubble through a succession of superposed layers of sulphuric acid) and a cooling vessel for the acid produced. It is provided, where necessary, with automatic valves of special construction, which prevent any loss of gases, and among the advantages claimed are the relatively small size of the apparatus and the intensive production of acid which it allows.—F. Sodn.

Sodium carbonate; Process of manufacturing ——. L. P. Basset. Fr. Pat. 441,930, June 6, 1911.

Sodium chloride is fused, in the presence of steam, with a slight excess of silica, in the form of impalpable powder, the mass being well stirred, and dry finely powdered calcium carbonate is then added to the fused mass, so as to convert the sodium silicate, first formed, into sodium carbonate, which is extracted by lixiviation (after carbonating any sodium hydroxide present by means of carbon dioxide or sodium bicarbonate) or by precipitating as bicarbonate with carbon dioxide. The fusion may be effected in a rotary furnace, preferably heated by the injection of powdered fuel, and a little carbon may be added to the fused mass, in order to convert any double silicate which may be formed into calcium silicate and sodium carbonate. The hydrogen chloride liberated in the first stage of the process may be utilised in regenerating the silica or for the preparation of carbon dioxide; or, air may be used instead of steam, in which case chlorine is evolved.—F. Sodn.

Ammonia: Art of oxidising ——. L. C. Jones, D. A. Morton, and C. N. Terziev, Assignors to Semet-Solvay Co., Syracuse, N.Y. U.S. Pat. 1,037,261, Sept. 3, 1912.

Ammonia and an excess of oxygen are passed over a catalytic agent at 700—750° C. with the formation of nitrogen oxides. The catalyst specified consists of the plumbate of a metal, the oxide of which is infusible at 750° C., and has no tendency to revert to its hydroxide or carbonate in the presence of water vapour or carbon dioxide.—O. R.

Lime cartridges for breaking down coal, rock, and other minerals. H. L. Storey and J. Parkinson, Lancaster. Eng. Pat. 10,412, May 2, 1912.

A cartridge for breaking down coal, etc., consists of a hermetically sealed metal tube packed with granules of lime and having an inner perforated tube and non-return valve through which water can be forced into contact with the lime. The tube is made strong enough to withstand a pressure of say 2000 lb. per sq. in., and upon bursting in a bore-hole produces a large shattering effect. —H. H.

Salts [containing free acid]; Process of rendering non-corrosive [neutralising] commercial ——. S. Peacock, Chicago, Ill. U.S. Pat. 1,036,896, Aug. 27, 1912.

Commercial salts composed of non-deliquescent compounds mixed with deliquescent acid impurities, are finely divided, stirred, and exposed to the action of ammonia gas, until all the acid impurities have been converted into ammonium salts.—O. R.

Alumina from felspar; Process for extracting ——. S. Peacock, Chicago, Ill. U.S. Pat. 1,036,897, Aug. 27, 1912.

Alkaline potassium aluminate is prepared from felspar in a suitable manner, a portion of the potash is separated by means of carbon dioxide, and the remainder of the potash is recovered from the aluminate by digesting the latter with amorphous silica.—O. R.

Aluminium sulphate; Process of making ——. P. H. Carter, H. H. Shackleton, and T. E. Grafton, Rome, Ga. U.S. Pat. 1,037,591, Sept. 3, 1912.

Raw halloysite [hydrated aluminium silicate] is powdered and treated with dilute sulphuric acid of such concentration and at such a temperature as to dissolve the aluminous ingredients of the ore and leave the non-aluminous portions undissolved.—O. R.

Effervescent compound [monosodium phosphate]. E. H. Strickler, Assignor to General Chemical Co., New York. U.S. Pat. 1,037,078, Aug. 27, 1912.

Monosodium phosphate, stabilised by means of starch, is claimed as a new acid ingredient for the manufacture of effervescent salt mixtures.—O. R.

Tri-alkali phosphate; Process of making ——. E. H. Strickler, Assignor to General Chemical Co., New York. U.S. Pat. 1,037,837, Sept. 3, 1912.

Phosphate rock is treated with sulphuric acid, the calcium sulphate is removed, and the resulting product is heated in a furnace with sodium sulphate and carbonaceous material, until tri-sodium phosphate is produced.—O. R.

Nitrides; Electric furnace for the manufacture of —— G. Coutagne. Second Addition, dated May 27, 1911, to Fr. Pat. 436,789, Feb. 1, 1911 (this J., 1912, 432, 544).

Further methods of arranging the heating bars are described, bars of agglomerated carbon, of good conductivity, and blocks of feebly conducting material being so disposed that higher temperatures (above 2000° C.) may be maintained.—F. Sodn.

Barium oxide from barium carbonate; Process for the manufacture of ——. Chem. Fabr. Grünau, Landshoff und Meyer A.-G., and W. Kirchner. Fr. Pat. 441,565, Mar. 20, 1912.

Barium carbonate is calcined in vessels made of some form of iron (of high melting point) or other material which will not allow the heating gases to gain access to the charge, so that re-carbonation of the oxide produced, which leads to the formation of a relatively fusible basic carbonate, is prevented, and a porous friable oxide, very suitable for the preparation of barium dioxide, is secured.—F. Sodn.

Nitrous vapours; Process for the absorption of dry and hot —— by a base such as lime. A. T. Schloesing. Fr. Pat. 441,607, May 30, 1911.

The absorption of hot and dry nitrous gases by a base, such as lime, is effected in such a manner that the heat contained in the gases is utilised as completely as possible in the various stages of the nitrate manufacture, thereby rendering external heating unnecessary. For example, gases from an electric furnace fed by a current of dry air are passed, first into a reheater, in which they serve to heat a portion of the gas leaving the absorption apparatus (which in its turn is used in dehydrating the lime employed in absorption), then into a cooling apparatus, where their temperature is reduced to a point suitable for absorption (preferably 350°—400° C.), and finally through a heat-insulated absorption apparatus, in which calcium nitrate, containing a high proportion of nitrogen and practically free from nitrite, is produced. A portion of the gases leaving the absorption apparatus is utilised in re-concentrating the sulphuric acid employed for drying the air admitted to the furnace.—F. Sodn.

Calcium nitrate; Process of granulating ——. Soc. Norvégienne de l'Azote et de Forces Hydro-Electriques. Fr. Pat. 442,514, June 21, 1911.

Commercial calcium nitrate (such as that employed as a fertiliser) is heated for a relatively short time, in a rotating cylinder or in other manner, to a temperature slightly above its fusion point, so that the finer particles melt more or less completely and the coarser particles remain unmelted or are fused superficially only, thus giving, by agglomeration, a granular product. By mixing other finely divided substances, such as calcium cyanamide, with the nitrate, these may be incorporated in the granules. —F. Sodn.

Nitrites; Process for the production of pure —— by means of nitrous gases containing air or oxygen. Elektrochemische Werke, G. m. b. H. Fr. Pat. 441,706, March 25, 1912. Under Int. Conv., May 17, 1911.

The complete absorption by alkalis of nitrous gases (as produced, for instance, by the combustion of air in an electric furnace), with the formation of almost pure nitrite, is effected by dividing the gaseous current into two or more portions, one of which is cooled and allowed to pass slowly to the absorption chamber, whilst the other is kept at a high temperature and passed as directly as possible into this apparatus, the mode of working being such that the currents of gas mix in the absorption chamber, or in each of the absorption chambers, in the proportions required to ensure, in every part, a mixture of nitric oxide and nitrogen peroxide in equal molecular proportions. —F. Sodn.

Hydrogen or gases which contain it; Process for carrying out operations employing ——. Badische Anilin und Soda Fabrik. Fr. Pat. 441,695, March 23, 1912.

Operations in which hydrogen, or gases containing it, are employed under pressure and at a high temperature, such as the synthesis of ammonia from its elements, can be carried out in vessels, provided with special strengthening appliances, although the wall of the interior vessel in which the reaction takes place, is composed of some material (*e.g.*, iron free from carbon, nickel, silver, etc.) which is incapable of offering by itself sufficient mechanical resistance to the conditions imposed by the process, but chemically is as resistant as possible to hydrogen. Means are also provided whereby the hydrogen which diffuses through the wall of the vessel can escape without encountering any great resistance.—W. C. H.

Effervescent [hydrogen] baths ; Process of producing ——. L. Sarason, Berlin. Eng. Pat. 18,772, Aug. 21, 1911.

Effervescent baths, containing hydrogen in the form of extremely minute bubbles, are prepared by mixing with water finely divided metals or alloys, especially aluminium amalgam, preferably in conjunction with an alkaline salt, such as borax or sodium phosphate. A suitable method of preparing a bath consists in adding a dry mixture of 50 grms. of aluminium amalgam and 150 grms. of borax to 2—3 litres of water, and pouring the bubbling mixture into a bath of 250 litres of water, whereupon a uniform evolution of hydrogen will take place for 20—30 minutes.
—O. R.

Oxygen baths ; Impts. relating to ——. R. Wright and W. Armstrong Buxton. Eng. Pat. 18,987, Aug. 24, 1911.

The addition of 2 parts of sodium bicarbonate to a mixture of 10 parts of sodium perborate and 1 part of manganese borate in water at 88°—100° F. (31°—38° C.), is claimed to result in a constant and regular evolution of oxygen, suitable for the preparation of medicinal baths, in which the evolution of the gas begins in 1 minute or less, and lasts for at least 20 minutes.—O. R.

Silicon articles ; Method of making ——. T. B. Allen, Assignor to The Carborundum Co., Niagara Falls, N.Y. U.S. Pat. 1,037,713, Sept. 3, 1912.

An element which has a greater affinity for oxygen and nitrogen than silicon, *i.e.*, whose oxides and nitride have greater heats of formation than silicon oxides and silicon nitride, is added to molten silicon, the products of the reaction of such element with the impurities present in silicon are removed, and the molten silicon is then cast into the desired form.—O. R.

Emery ; Process of manufacture of —— by means of bauxite. Sirubin-Werke Ges. m. b. H. Fr. Pat. 441,984, April 1, 1912.

Bauxite is heated in a furnace with the addition of combustible material, common salt and hydrochloric acid, in two stages, first to about 700° to 800° C. at which point hydrochloric acid is added and a rise of temperature is produced almost to incandescence of the whole mass, which is left exposed to the influence of this high temperature until crystallisation takes place.—W. C. H.

Mineral oils ; Utilisation of the solvent properties of —— with respect to pure anhydrous sulphur dioxide. A. L. C. Guiselin. Fr. Pat. 442,259, April 6, 1912.

The fact that sulphur dioxide dissolves much more readily in mineral oils than in water, giving solutions which have a low vapour pressure at the ordinary temperature and, if the gas be pure and dry, have no action on metals, is taken advantage of (1) in the manufacture of sulphurous acid, and (2) in the working of refrigerating machines, for which purposes oils, especially those of high boiling point, are employed as absorbents in place of water ; it is also utilised (3) in the production of energy, by heating a solution of sulphur dioxide in oil so as to supply compressed gas for driving a motor, and (4) in the storage and transport of the gas, for which oil is used as a vehicle.—F. Sodn.

Ammonia ; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 25,252, Nov. 13, 1911.

See Fr. Pat. 436,472 of 1911 ; this J., 1912, 432.—T. F. B.

Nitrous gases ; Process of absorbing ——. H. Pauling, Assignor to Salpetersaure-Industrie-Ges., Gelsenkirchen, Germany. U.S. Pat. 1,037,977, Sept. 10, 1912.

See Eng. Pat. 14,121 of 1911 ; this J., 1911, 1252.—T.F.B.

Halogen-oxygen compounds ; Method of preparing —— by electrolysis. M. Pier, Schlachtensee, Germany, Assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,038,191, Sept. 10, 1912.

See Fr. Pat. 421,618 of 1910 ; this J., 1911, 422.—T. F. B.

Hydrogen ; Process of manufacturing ——. G. F. Jaubert, Paris. U.S. Pat. 1,037,919, Sept. 10, 1912.

See Fr. Pat. 430,302 of 1910 ; this J., 1911, 1313.—T. F. B.

Preparing acetic acid sufficiently free from tar and oils for industrial purposes. Ger. Pat. 249 333. *See* IIb.

VIII.—GLASS ; CERAMICS.

Silicate and borosilicate glasses ; Surface tension of ——. E. W. Tillotson, jun. J. Ind. Eng. Chem., 1912, **4**, 651—652.

Experiments were made with a number of silicate and borosilicate glasses by the method described previously (this J., 1911, 1161), and curves were plotted showing the variation of the surface tension with the composition of the glass. From the results obtained it is shown that the surface tension (T) of silicate and borosilicate glasses can be calculated with a fair degree of accuracy by means of the formula : $T=a_1p_1+a_2p_2+a_3p_3$, etc., where a_1, a_2, a_3, etc., are factors representing the surface tensions of the several oxides in combination in the glass, and p_1, p_2, p_3, etc., are the respective percentages of these oxides. The following factors are given : silica, 129 ; boric oxide, 45 ; barium oxide, 195 ; lime, 323 ; sodium oxide, 160.—A. S.

Clay ; Plasticity of ——. J. Stewart. Eighth Int. Cong. Appl. Chem., 1912, Sect. VII., Orig. Comm., **15**, 265—271.

It is suggested that the plasticity of clay is due to the presence of an organic aluminium compound, an assumption which is claimed to explain satisfactorily all the established facts concerning the plasticity of clay. It explains for example why only impure clays are plastic, why ignition destroys and levigation fails to restore plasticity, the industrial practice of weathering clay before use, and why plasticity is reduced by bases, since the aluminium organic compound is soluble in alkali.—E. F. A.

Glass manufacture ; Causes of breakage in —— and method of differentiating chemico-heterogeneic strains from cooling strains. R. L. Frink. Eighth Int. Cong. Appl. Chem., 1912, Sect. IIIc., Orig. Comm., **5**, 57—71.

In investigating the causes of the large amount of breakage in the mechanical processes for the production of window glass, the glass was made in a tank furnace from a batch composed of sand 1000 lb., limestone 330 lb., salt cake 380 lb., and ground coal 18 lb. The losses were "breaking off the pipe," "breaking on the horse" and "breaking in the flattening oven," and at first averaged 70 per cent. The breakage was considerably reduced by altering the batch mixture as follows :—Sand 1000 lb., limestone 328 lb., soda ash 240 lb., salt cake 80 lb. In many cases cylinders flew to pieces after a few seconds on the "horse" or at a later stage in the flattening oven. Specimens of such cylinders, about ½ inch wide were examined between crossed Nicols with a petrological microscope and a Wright wedge, and by measurement of the retardation of the light rays it is possible to determine not only whether the specimen is subjected to compressive or tensile strains, but also to measure the amount of these strains. These may arise from chemical heterogeneity of the mass or from physical heterogeneity, viz., introduction into the sheet of a narrow strip or area of "metal" which has been cooled and solidified prior to the solidification of the bulk of the sheet. The extent and character of the lack of uniformity of composition was measured by etching pieces of the cylinders with hydrofluoric acid, and analysing the material dissolved, the total amount of which was given by the difference in weight of the specimen before and after treatment with acid. In this way, supplemented by examination of the etched specimen with a petrological microscope, it was found that certain forms of breakage appeared to accompany certain chemical irregularities, such as an excess of silica. The determination of the refractive index of the glass is also suggested as a rapid method of ascertaining variations in chemical composition and physical condition (strains) of the glass. Thus at a time when the breakage was very heavy, a piece of clear, sound glass had a refractive index of 1·5253, whilst that of a "cord" or thickened string in the sheet was 1·5088. Again, when the soda content was nearly 1 per cent. lower, and the silica 0·6 per cent. higher, the refractive index was 1·524, as compared with 1·52 found for the glass before the composition was altered.—W. C. H.

[Borate] Glasses: The viscosity of molten ——. H. F. Staley. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIc., Orig. Comm., **5**, 127—138.

The relative viscosities of the molten glasses were measured by taking the time required by an immersed body of known volume and effective weight to fall through a certain distance in the melt. The viscosity of the glasses decreases at a slowly decreasing rate with increase of temperature. and the rate is characteristic for each glass. With borates that are very viscous at low temperatures, the rate of decrease is more rapid, so that the viscosities of a series may vary widely at low temperatures but converge rapidly towards what is practically a minimum as the temperature is raised. At any given temperature the viscosity of boric oxide is greater than any mixture of it with the bases baryta, lime, or strontia; magnesia failed to give a homogeneous product, at least with the composition, $0{\cdot}5MgO,1B_2O_3$. In a series of mixtures of boric oxide and baryta, as the latter increases the viscosity continuously decreases, but is not proportional to the percentage or molecular amount of baryta present up to the mixture. $0{\cdot}5BaO,1B_2O_3$, but from that up to the mixture, $2BaO.1B_2O_3$, the decrease in viscosity is slow and nearly proportional to the amount of baryta present. In the melting processes volatilisation of boric oxide only occurred with mixtures containing less than 0·5 of the formula weight of the base to 1 of B_2O_3. At various temperatures the viscosity of a mixture in equal molecular proportions of $0{\cdot}5CaO,B_2O_3$ and $0{\cdot}5BaO,B_2O_3$ is slightly below the calculated added values for the percentage amounts of the two end members of the series. There is no relation between the melting point curve of a series of borates and the lines representing temperatures of equal viscosity. Lines representing temperatures of equal viscosity are straight and roughly parallel in the case of mixtures containing more than $0{\cdot}5BaO$ to $1B_2O_3$, and parabolic and roughly parallel when the baryta is less than 0·5. As the viscosities of mixtures of boric oxide and $0{\cdot}5BaO,B_2O_3$ are below the added values of the viscosities of the constituents of the mixture, it may be assumed that considerable dissociation takes place in one or both end members of the series, and that boric oxide itself is a polymerised substance which is broken down into simpler molecules in the presence of the base.—W. C. H.

Clay; Colouring power of iron compounds in burned ——. C. F. Binns and C. H. Makeley. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIc., Orig. Comm., **5**, 7—15.

The effect of the most common sources of iron and the influence of silica and alumina were studied by firing test pieces to 1200° C. and 1270° C. Forty per cent. of the mixtures used for the test pieces consisted of English ball clay and the iron compound, which was added to give 2·5, 5·0 and 10·0 per cent. of ferric oxide; the remaining 60 per cent. was ground quartz in the first member of each series and pure alumina in the last, the intermediate members containing 40 and 20 per cent. of quartz and 20 and 40 of alumina respectively. Commercial ferric oxide was used in the first series; in the second, ferrous sulphate solution was added to the clay, and the hydroxide (which was rapidly oxidised by the atmosphere during drying) was produced *in situ* by the addition of ammonia; siderite, $FeCO_3$, and pyrites were added in the third and fourth series respectively, making a total of 96 test pieces in all. It does not appear to be possible to produce red colours in burned clay by the addition of finely ground minerals containing iron, and added alumina tends to tone the colour down towards buff, especially at the higher firing temperature. Red colours are produced when the iron compound is precipitated in a colloidal condition in the clay mass. The colloidal precipitate is apparently derived from ferrous sulphate, itself an oxidation product of pyrites in clays, either by oxidation with separation of limonite, or by combination with carbon dioxide, and consequent precipitation of ferrous carbonate. In the form of siderite, even when finely ground, ferrous carbonate does not produce red colours. In the tests with added pyrites, red colours were produced in the portions which had dried relatively slowly, but on the edges which dried rapidly, and where oxidation could not take place, the iron appeared as the anhydrous oxide, and produced no red colours.—W. C. H.

Patents.

Silica glass; Impts. in articles made of —— and requiring leading-in wires combined therewith. H. A. Kent, Bound's Green, Middlesex, H. G. Lacell, Finchley, and The Silica Syndicate, Ltd., London. Eng. Pat. 24,482, Nov. 3, 1911.

The use of molybdenum for the manufacture of leading-in wires in connection with silica articles, is claimed to furnish the only suitable material of small sectional area, which can carry a large current and withstand the high temperature employed in the manufacture of silica glass. —O. R.

Stannic oxide [for frits, enamels, etc.]. J. Hubers, London. From T. Goldschmidt, Essen on Ruhr, Germany. Eng. Pat. 29,114, Dec. 27, 1911.

See Fr. Pat. 439,609 of 1912: this J., 1912, 723. A product containing about 10 per cent. of water and 3 to 5 per cent. of alkali is claimed.—T. F. B.

Manufacture of laboratory utensils and apparatus. Fr. Pat. 442,094. *See* XXIII.

IX.—BUILDING MATERIALS.

Portland cements; Rapid methods of testing the volume-constancy of ——. M. Gary. Tonind.-Zeit., 1912, **36**, 1483—1485.

The author enumerates the various methods proposed for testing the volume-constancy of Portland cements, including the Le Chatelier test and Hentschel's modification of Michaëlis's boiling test (this J., 1911, 749). Reference is made to the adoption of the Le Chatelier test at the International Congress at Copenhagen in 1909, and to the opposition to it, headed by Butler, which was brought forward at a meeting of the Concrete Institute in 1910. Finally, mention is made of Strebel's investigations (this J., 1911, 1314), which bear out Butler's objections, and lead the author to propose that the Le Chatelier test be rejected as untrustworthy, and that the question of a rapid test for volume-constancy be referred to a fresh commission.—O. R.

Portland cement; Sulphuric anhydride content of ——. Verein Deutscher Portlandzement-Fabrikanten in Kalkberge (Mark). Tonind.-Zeit., 1912, **36**, 1485—1487.

On the island of Sylt in the North Sea two cements, the one containing 1·19 per cent. and the other 0·57 per cent.

of sulphuric anhydride, were subjected, first in their original state and secondly after increasing their SO_3-content to 2·5 per cent. by the addition of raw gypsum, to the following tests: (1) Cement-sand mortars, 1 : 2 and 1 : 4, were exposed to the action of salt water, fresh water, and air, and their crushing strengths tested after 28 days, 1 year, 5 years, and 10 years. (2) Blocks of about $\frac{3}{4}$ cb.m. volume were made from a mixture of 1 cement : 2 sand : 3 stone rubble, and sunk in the sand in a place where they were subjected to the full force of the waves. (3) Plates, 50 by 50 by 8 cm., of cement-sand mixtures, 1 : 2 and 1 : 4, were fixed on to a breakwater, where they were exposed to the tidal action twice daily and to weathering in the interim. The following conclusions were arrived at: (1) The crushing strengths showed that a SO_3-content of 2·5 per cent. was perfectly harmless in Portland cement hardened under sea water; (2) the state of the concrete blocks showed that cement containing 1·19 per cent. of sulphuric anhydride, and the same cement enriched up to 2·5 per cent. of sulphuric anhydride, withstood the action of sea water better than cement containing only 0·57 per cent. of sulphuric anhydride, whereas the last-named cement, enriched up to 2·5 per cent. of sulphuric anhydride actually stood better than the original cement; (3) the analysis of the plates showed that the cement with lower SO_3 content suffered greater chemical decomposition than the cement with the higher proportion of sulphuric anhydride. The increase of the SO_3-content up to 2·5 per cent. in the case of the SO_3-poorer cement, as in the previous instance, improved the resisting qualities of the cement. It is therefore suggested that the maximum allowable sulphuric anhydride content be fixed at 2·5 per cent.—O. R.

Concrete: [Specifications for oil for] oil-mixed ——. Bull. 46, Office of Public Roads, U.S.A. J. Gas Lighting, 1912, **119**, 760.

The following specifications are given for residual oils intended for waterproofing concrete according to the method of L. W. Page (this J., 1911, 1213): (1) The oil shall have a specific gravity of 0·930—0·940 at 25° C. (2) It shall be soluble in carbon bisulphide at the ordinary temperature to at least 99·9 per cent. (3) It shall contain 1·5—2·5 per cent. of bitumen insoluble in paraffin naphtha of 86° B. (4) It shall yield 2·5—4 per cent. of residual coke. (5) When 240 c.c. of the material are heated in an Engler viscosimeter to 50° C., and maintained at this temperature for at least six minutes, the first 100 c.c. which flow out shall show a viscosity of 40—45 c.c. (6) When 20 grms. of the material are heated at 163° C. for five hours in a cylindrical tin dish, $2\frac{1}{2}$ inches in diameter by 1 inch high, the loss in weight shall not exceed 2 per cent.—O. R.

Portland cement; Magnesia in ——. A. A. Klein and A. J. Phillips. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIc., Orig. Comm., **5**, 73—81.

Although the allowable amount of magnesia in Portland cement is often limited to 3 per cent., many cements in which the amount exceeded 7 per cent. passed the physical tests satisfactorily. A number of cements with increasing amounts of magnesia were analysed and also examined petrologically. The chief crystal constituents were: β-2CaO,SiO_2 and 3CaO,Al_2O_3, while 3CaO,SiO_2, and 5CaO, $3Al_2O_3$ were present only in small quantities. Artificial mixtures, in which the lime was replaced by magnesia in molecular proportions and also in definite percentages, were burned and examined. It was found that as much as 7·5 per cent. of magnesia may be present in Portland cements, as mixed calcium-magnesium orthosilicate or mixed tri-calcium-magnesium aluminate, without any being present in the form of either free magnesia or MgO,Al_2O_3. The lime in the crystals β 2CaO,SiO_2 may be replaced by magnesia up to 6 per cent. of the latter without disturbing the homogeneity of the crystals: beyond that amount a mixture of the β-orthosilicate and the compound CaO.MgO.SiO_2 (the properties of which closely agree with those of the mineral monticellite of the olivine series) is formed. In the 3—1 aluminate series, lime may be replaced by magnesia up to 10 per cent. of the latter, and still yield homogeneous compounds; when the magnesia exceeds 10 per cent. of the total constituents, a mixture of 3—1 calcium aluminate MgO,Al_2O_3 and free lime is formed. Acting as a flux, magnesia assists in the formation of β 2CaO,SiO_2 and 3CaO,SiO_2.—W. C. H.

Portland cement; The use of the higher phenols in testing for free lime in ——. D. C. McFarland and H. F. Hadley. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIc., Orig. Comm., **5**, 83—90.

The calcium salts of phenol and its homologues are very difficultly soluble in any of the common solvents, and many of the salts hydrolyse very easily. The rapidity with which the substances react with free lime varies considerably: *p*-cresol apparently reacts at once, β-naphthol and phenol rather slowly, and the remaining homologues which were tried reacted only slightly. When the total quantity of free lime present is small, it can be extracted to a roughly quantitative extent by a properly proportioned mixture of *p*-cresol, absolute alcohol and a trace of water. The test is more rapid and more delicate than White's (this J., 1909, 23), and is almost too delicate for practical use. Three grams of cement are shaken for an hour or more with 21 c.c. of absolute alcohol, 30 drops of *p*-cresol and 0·5 c.c. of water; the cement is filtered off and washed with water till the washings are no longer coloured red, and the filtrate is evaporated in a porcelain dish and the residue ignited and weighed as calcium oxide. It was also found that a cement that had been exposed to the air for some months, and by this test showed very little free lime, gave a considerable amount of lime after being re-ground in a mortar. Consequently ageing a cement for some time does not necessarily destroy all the free lime which it contains.—W. C. H.

Patents.

Wood-preserving compound. E. L. Powell, New Orleans, La. U.S. Pat. 1,036,706, Aug. 27, 1912.

A mixture of 1 part of creosote oil and from 1 to 3 parts of a material containing the "still bottoms" of asphaltic petroleum.—O. R.

Wood; Preserved ——. H. M. Newton, St. Louis, Mo., Assignor to The Kettle River Co. U.S. Pats. 1,037,831 and 1,037,832, Sept. 3, 1912.

(1) Wood is impregnated with the residuum hydrocarbon oil obtained in the manufacture of oil- and water-gas, by the use of petroleum oil having an asphaltum base. The hydrocarbon oil has a sp. gr. of about 1·13 at 15° C., begins to distil at about 150° C., is fluid at the ordinary temperature, substantially non-volatile, practically free from matter in suspension, and is antiseptic to the organisms which attack wood. (2) The hydrocarbon oil described above is mixed with creosote oil before use.—B. N.

"Wood-stone," linoleum, artificial cork and other similar products; Process of manufacture of ——. J. von Vass. Fr. Pat. 442,075, March 6, 1912.

The raw materials used for the manufacture of the products mentioned in the title are brought by some suitable means into a mixing nozzle, from which they are forced by pressure, *e.g.*, by compressed air, in the form of a jet of powder, on to a mould or on to a surface to be coated. Either before or after the materials leave the mixing pipe colouring materials, glue, etc., may be added to them. By this process the materials produced can be formed into articles or coverings of any description.—W. C. H.

Cementitious products; Process for producing ——. S. W. Ramsey, Kent, Ohio. U.S. Pat. 1,036,712. Aug. 27, 1912.

A mixture of 90 parts of ground blast furnace slag, 2 of sodium bicarbonate, 5 of lime, 1 of "iron oxide," 1 of chrome alum, and 1 part of silica sand, is thoroughly agitated until all the ingredients are thoroughly commingled, and exposed to the action of steam at a pressure of 150 lb. per sq. in. for five hours. —O. R.

Cement mortar and concrete; Method of rendering —— waterproof. R. A. Plumb, Assignor to Trussed Concrete Steel Co., Detroit, Mich. U.S. Pat. 1,036,898, Aug. 27, 1912.

A "WATER-REPELLENT and insoluble soap" is mixed with a small proportion of ammonia, whereby it is rendered readily miscible with water, and the emulsified product is added to the cement or concrete, whereby it is claimed that these materials are rendered waterproof.—O. R.

Kilns for drying timber. F. D. Willey, Chicago. Eng. Pat. 21,902, Oct. 4, 1911. Under Int. Conv., Feb. 11, 1911.

SEE U.S. Pat. 996,442 of 1911; this J., 1911, 942.—T. F. B.

Concrete; Process of producing ——. H. J. Harms, Orange, and G. E. Small, West Orange, Assignors to Monogram Construction Co., Arizona. U.S. Pat. 1,038,125, Sept. 10, 1912.

SEE Fr. Pat. 417,652 of 1910; this J., 1911, 29.—T. F. B

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron oxide; Reduction of ——. M. Levin. Nernst Festschrift, 252—257. Chem. Zentr., 1912, 2, 807—808.

THE equilibrium concentration of carbon monoxide in the system: FeO, Fe, C, CO, CO_2, is found to increase in a linear manner with rising temperature. This confirms the results of Schenck and others (this J., 1905, 803 and 1907, 692), no evidence being obtainable of the minimum previously observed by Baur and Glässner (this J., 1903, 699). The equilibrium concentration of carbon monoxide in the system: Fe_3O_4, FeO, C, CO, CO_2, shows a maximum according to Baur and Glässner at 580° C. These results are confirmed by the present author, although he obtains somewhat higher carbon monoxide concentrations at lower temperatures. Comparing the two systems it is found that the carbon monoxide concentration for the system: FeO, Fe, C, CO, CO_2, is much greater at temperatures above 500° C. than that for the system: Fe_3O_4, FeO, C, CO, CO_2. To reduce ferrous oxide to iron therefore by a mixture of carbon dioxide and monoxide, the latter must contain a much greater percentage of carbon monoxide than is required to reduce triferric tetroxide to ferrous oxide. Below 500° C., the curves representing the two systems lie much closer together and the reduction of triferric tetroxide to metallic iron may take place almost directly, since a mixture of carbon dioxide and monoxide containing only a little more carbon monoxide than is necessary for the reduction of triferric tetroxide to ferrous oxide will also reduce the latter to metallic iron. The work of Levin and Niedt (this J., 1911, 1214) has shown that the concentration of carbon monoxide in blast-furnace gases is much greater than the equilibrium concentration for either of the above systems. The author finally compares the carbon monoxide content of blast-furnace gases at varying temperatures, with that of the system: CO_2, CO, C. Up to 900° C. the concentration of carbon monoxide in the blast-furnace gases is much the greater, as the curves do not approach each other till between 900° and 1000° C. —W. H. P.

Iron and manganese; Electrolytic separation of ——. Analysis of ferromanganese. R. Belasio. Ann. Lab. Chim. Centr. delle Gabelle, 1912, **6**, 207—216.

FROM a solution containing ammonium oxalate and a small quantity of hydrazine sulphate, iron can be separated electrolytically from manganese, without any deposition of manganese dioxide at the anode. As applied to ferromanganese, spiegeleisen, etc., the method is as follows:—1·5 grm. of the finely powdered alloy is dissolved in 30 c.c. of nitric acid of sp. gr. 1·2, to which a few drops of hydrochloric acid have been added, and the solution is treated with 1—2 grms. of ammonium nitrate, evaporated, and the residue heated to redness. After cooling, the mass is dissolved in 4—5 c.c. of concentrated hydrochloric acid, the solution cooled, and then evaporated with 10 c.c. of 50 per cent. sulphuric acid. The residue is dissolved in water, the solution filtered, and the residue washed with water acidulated with sulphuric acid. The solution is diluted to 250 c.c. and 50 c.c. (=0·3 grm. of alloy) are treated with ammonia until a precipitate begins to form; this is dissolved by sulphuric acid, added drop by drop, and the solution is added to a boiling concentrated solution of 6—7 grms. of ammonium oxalate. The whole is diluted to 200 c.c., cooled, 5 c.c. of a solution of hydrazine sulphate (1 grm. in 50 c.c. of water) are added, and the iron is deposited by electrolysing for 2—3 hours with a current of 0·7 ampère at 4—4·5 volts; during the electrolysis a further 45 c.c. of the hydrazine sulphate solution is added to the electrolyte, near the anode, at the rate of 8—10 drops per minute. After the complete deposition of the iron, the solution is concentrated to 70—80 c.c., treated with 1·5 grms. of chrome alum and 10 grms. of ammonium acetate, filtered, treated with 3 c.c. of 50 per cent. ammonia solution, and the manganese deposited as dioxide by electrolysing for about 2 hours at 70°—80° C. with a current of 0·5—0·6 ampère at 2—3 volts. The deposited dioxide is heated to redness and weighed as Mn_3O_4: it should then be washed with water and again ignited and weighed. If manganese is present in the alloy in preponderating quantity, the solution remaining after deposition of the iron should be concentrated, diluted to 200 c.c., and 100 c.c. used for the determination of the manganese.—A. S.

Ferrosilicon; Analysis of——. S. Camilla and C. Pertusi. Ann. Lab. Chim. Centr. delle Gabelle, 1912, **6**, 627—630.

THE authors have found that ferrosilicon containing from 40—50 per cent. of silicon is readily dissolved by hydrofluoric acid containing a small quantity of concentrated nitric acid. A gas is evolved, which is not silicon fluoride, but probably hydrogen silicide, although this has not yet been definitely proved. Since ferrosilicon with a high content of silicon, almost invariably contains less than 2 per cent. of total impurities, its composition can be approximately determined by treating 0·4—0·5 grm., finely powdered, with 20—30 c.c. of concentrated hydrofluoric acid to which a few drops of nitric acid have been added. When solution is complete, a few c.c. of dilute sulphuric acid is added, the liquid evaporated to dryness, and the residue ignited in a muffle and weighed as ferric oxide. From the weight obtained, the percentage of iron is calculated and the silicon taken by difference.—A. S.

Copper-zinc β-constituent; Structural resolution of the pure —— into $\alpha+\gamma$. H. C. H. Carpenter. Inst. of Metals, Sept. 1912. [Advance proof.]

THE position reached in the authors' previous researches (this J., 1911, 133. 1912, 133) was that an alloy consisting of pure apparent β-constituent, composed of 52·12 per cent. of copper and 47·88 per cent. of zinc, after six weeks annealing at 445° C., showed no signs of resolution into α and γ. Continuation of the annealing for four months did not produce inversion and therefore the pure eutectoid in the absence of free α or γ may be considered absolutely stable. Repeated quenchings in liquid air produce structures characteristic of a two-phase system. The structures, however, are of a transitory nature, and the conditions of their appearance are obscure. They do not correspond to a segregation of α and γ in a coarse crystalline form. Between 460° C. and the ordinary temperature the alloy shows no inversion which can be detected on the cooling curve. The resolution of the pure β-structure into $\alpha + \gamma$ was ultimately achieved by the "nucleus" action of an alloy containing 0·95 per cent. of vanadium which contains its $\alpha + \gamma$ in a coarse crystalline form immediately after being cast. By infecting the pure apparent β-alloy with this substance for as hort period at 420° C., followed by prolonged annealing, coarse segregations of α and γ were observed. A lamellar resolution was never obtained.—W. H. P.

Copper-zinc alloys; Effect of other metals on the structure of the β-constituent in ——. H. C. H. Carpenter. Inst. of Metals, Sept., 1912. [Advance proof.] (See preceding abstract.)

Metals insoluble in copper or zinc. The effect of these metals, viz., bismuth, lead, chromium, is very slight. Only in one alloy containing 2·9 per cent. of bismuth did the α + γ complex separate at 470° C. in such coarse crystals as to produce any brittleness in the alloy. *Metals of limited solubility:* iron, antimony, tin, aluminium, silicon and vanadium With the exception of iron all these metals are stated to aid the precipitation of α + γ from apparent β. They displace the alloy from eutectoid composition to the γ side, and consequently γ-crystallites are obtained in a matrix of α. Iron is much slower in its action, being without effect up to 2 per cent. *Metals of great solubility:* nickel and manganese. Nickel is somewhat irregular in its action, but seems to behave on the whole like the preceding class, while manganese appears to be almost without action of this kind. The problem of lowering the transformation temperature so as to make β the stable phase at ordinary temperature appears to be theoretically insoluble. In practice, however, the structural stability is kept at its maximum by keeping the amount of impurities as small as possible and avoiding heating in use.—W. H. P.

Tin in alloys of lead, tin, and antimony, coated with tin; Electrolytic determination of ——. R. Belasio. Ann. Lab. Chim. Centr. delle Gabelle, 1912, **6**, 231—237.

An alloy of lead with small quantities of tin and antimony, coated with tin, is now extensively used in place of pure tin for the manufacture of collapsible tubes for oils, perfumes, etc., and for other purposes. When it is desired to determine separately the tin coating and the tin content of the lead alloy, the author recommends treatment with a 10 per cent. solution of sodium hydroxide containing a small quantity of hydrogen peroxide. With this reagent, the tin coating can be readily dissolved, without any appreciable action on the lead alloy. The same reagent is useful for the removal of the tin coating from tin-plate. Full details of the separation of tin from the lead alloy preparatory to its electrolytic determination are given.—A. S.

Tungsten; The production of ductile ——. O. Ruff. Z. angew. Chem., 1912, **25**, 1889—1897.

The author gives detailed descriptions of the processes employed in producing fine tungsten wires for metallic filament lamps, and other purposes (see this J., 1907, 972 and 1132; 1908, 15 and 496; 1910, 825; 1911, 291 and 945). In order that brittle tungsten shall be easily worked into a ductile state, it is necessary that it be entirely free from oxide, from iron and nickel, and practically free from non-metallic impurities such as sulphur, phosphorus, etc. It should not contain more than about 0·1 per cent. of carbon. It is desirable that the massive metal should be as dense as possible, *i.e.*, it should be sintered almost to melting point before working, and the actual swaging and drawing should be carried out as gradually as possible, avoiding undue exposure to air. In order to get a pure metal, it is desirable to purify the initial trioxide, which is done by reducing it to the dioxide, volatilising the latter as oxychloride, and treating this with hydrochloric acid. In this way silica and phosphoric acid are left behind in the non-volatile residue, while arsenic and antimony pass into solution in the hydrochloric acid. The pure trioxide is reduced in a rapid current of hydrogen at a temperature of 1250° C., so as to produce the metal in a sufficiently coarse state of subdivision and relatively free from oxide. After this has been pressed into rods, the latter are hardened by heating in hydrogen to about 1300° C., and sintered by heating in a special furnace to about 2650° C. In the case of very pure tungsten, it may be necessary to add a little (about 0·05 per cent.) carbon to lower the melting point. It is found that the pure metal melts at about 2900° C., whereas in the presence of carbon the melting point may be as low as 2730° C. There is a diminution in volume on sintering, of about 14 per cent.—W. H. P.

Mercury; Oozing of —— through tinned copper. A. Tscherniawsky. Arch. Sci. phys. nat. Genève, 1912, **34**, 32—55. Chem. Zentr., 1912, **2**, 699—700.

Two vessels containing mercury standing at different levels were connected by a tinned copper wire, with a thin rubber sheath, to conduct an electric current. It is stated that mercury passed from the upper to the lower vessel as through a syphon. The rubber insulation played no part in the process beyond preventing oxidation of the tin. The flow of the mercury is independent of the difference in level of the two vessels up to at least 650 mm. The phenomenon therefore appears to be due to amalgamation of the surface of the metal by the mercury, which rises owing to capillary action. The amalgamation is confined to a very small surface layer, since there was no difference noted when a tinned iron wire was used instead of tinned copper.—W. H. P.

Pig iron: Methods of the United States Steel Corporation for the commercial sampling and analysis of ——. Chemists' Committee of the U.S. Steel Corporation. Eighth Int. Cong. Appl. Chem., 1912. Sect. I., Orig. Comm., **1**, 91—122.

Sampling. A portion of the molten metal from each ladle used in the cast is poured either upon an iron plate (pat test) or into a thick-walled iron mould (chilled mould test), the analysis being made upon a mixture of equal parts of these samples; the test-pieces are either drilled or crushed, only that portion passing through an 80-mesh sieve being used for analysis in the latter case. The use of the water shot sample is condemned.

Silicon. The well-known methods of Drown (treatment with nitric and sulphuric acids) and Ford (treatment with hydrochloric acid) are employed; the silica obtained is weighed as such, no subsequent treatment with hydrofluoric acid being given.

Sulphur. It is pointed out that, although extremely useful, methods depending upon the evolution of hydrogen sulphide are of comparative value only; the gravimetric method must be employed for the determination of the total sulphur. In the evolution method recommended, the absorbent employed is an ammoniacal solution of cadmium chloride or zinc sulphate, or a solution of alkali hydroxide; the contents of the absorption vessel are subsequently acidified and titrated with standard iodine solution. In the gravimetric process, the sample is dissolved in nitric acid, the latter being subsequently eliminated by evaporation and the residue dissolved in hydrochloric acid. After the separation of the silica, etc., in the usual manner, the precipitation of the barium sulphate is effected by the addition of barium chloride to the cold hydrochloric acid solution. The sulphur remaining in the carbonaceous, silicious residue from the hydrochloric acid treatment is extracted by fusion with sodium carbonate and nitre and added to the main quantity.

Phosphorus. For the volumetric determination, 1—2 grms. of the sample are dissolved in 40 c.c. of nitric acid (sp. gr. 1·13), the combined carbon is oxidised by the addition of 1 grm. of ammonium persulphate, followed by boiling, the liquid is filtered and the residue washed with dilute nitric acid (2 per cent.) and hot water. To the boiling filtrate a slight excess of potassium permanganate solution (25 grms. per litre) is added, and the boiling is continued until the excess is decomposed, the resulting precipitate of manganese dioxide being reduced and ultimately dissolved by the addition of a saturated solution of sugar or of a 5 per cent. solution of ammonium bisulphite, ferrous sulphate, or potassium nitrite to the liquid which is then boiled until the excess of reducing agent is decomposed. The solution being at 80° C., 40—60 c.c. of ammonium molybdate solution are added and the mixture is shaken for 5 mins.; the resulting precipitate is collected on a small filter, washed with dilute nitric acid (2 per cent.) until free from iron, and finally with a 1 per cent. solution of potassium nitrate until free from acid. The precipitate is then either (1) dissolved in sodium hydroxide and titrated with nitric acid, or (2) reduced with zinc and sulphuric acid and titrated with permanganate, the solutions employed being standardised against the known phosphorus content of a standard steel. In the gravimetric determination, 1—5 grms. of the sample are dissolved in 25—60 c.c. of nitric acid (sp. gr. 1·13), the solution being evaporated to dryness and the residue ignited; the latter is taken up with 30 c.c. of hydrochloric acid and the solution concentrated until the chlorides begin to separate out, when 10 c.c. of strong nitric acid are added, the liquid heated and then diluted to 60 c.c. with cold water. After separation of the silica, 25 c.c. of strong ammonia solution are added to the liquid (about 150 c.c.) which is then rendered clear by the addition of 25 c.c. of strong nitric acid. With the solution at a temperature of 80° C., 50—75 c.c. of ammonium molybdate solution are added and the mixture is agitated for about 5 mins., after which the precipitate is filtered off and washed with dilute nitric acid (2 per cent.). The precipitate is either weighed direct or dissolved in a hot solution of ammonium citrate and reprecipitated with magnesia mixture in the usual manner.

Manganese. The methods employed are (1) the colour comparison process devised by Walters (solution of the metal in nitric acid, oxidation of the combined carbon with ammonium persulphate, separation of the silica by filtration, oxidation of the manganese in the filtrate by means of silver nitrate and ammonium persulphate, and comparison of the resulting pink colouration with that obtained by the similar treatment of a suitable standard iron); (2) titration of the permanganic acid obtained in the preceding process with standard sodium arsenite; (3) the gravimetric process devised by Ford, in which the manganese is precipitated from the nitric acid solution by means of potassium chlorate, the precipitate of manganese dioxide being subsequently dissolved in a solution of ammonium bisulphite; excess of the latter is then decomposed by boiling with nitric acid, the iron present in the solution is twice precipitated as basic acetate, and the manganese in the combined filtrates is finally precipitated in acetic acid solution with sodium or ammonium phosphate.

Total carbon. The methods recommended are (1) direct combustion, preferably in a tube of fused quartz, the temperature being maintained at about 1000° C., and in any case not falling below 960° C.; (2) solution of the metal in copper-ammonium or copper-potassium chloride, and combustion of the carbonaceous residue in the usual manner. In either process the carbon dioxide produced by the combustion is (a) absorbed as usual and weighed direct, (b) absorbed in standard alkali and titrated with standard acid, or (c) absorbed in barium hydroxide; in the last case the barium carbonate produced is either weighed after ignition or the excess of hydroxide remaining in the solution is titrated with standard acid.

Graphitic carbon. One grm. of the sample is dissolved in 40 c.c. of nitric acid (sp. gr. 1·13), the insoluble residue being filtered off, washed, and treated with potassium hydroxide to remove the silica; if preferred a little hydrofluoric acid may be added to the acid solution to dissolve the silica and thus expedite the filtration. The carbon in the graphitic residue is determined either by combustion or by drying the filter and contents to constant weight at 110° C., removing the carbon by ignition and weighing again.

Combined carbon. The colourimetric process (Eggertz) is employed, care being taken to select a suitable standard for comparison.

Titanium. Five grms. of the sample are digested with hydrochloric acid until completely decomposed; the amount of titanium dissolved by the acid is usually quite negligible, practically the whole remaining in the insoluble residue. The latter is treated with hydrofluoric acid for the volatilisation of silica, and after ignition to expel the last traces of hydrofluoric acid, the residue is fused with 4 grms. of sodium carbonate, the melt being disintegrated by boiling with water. The insoluble sodium titanate is dissolved in hot dilute sulphuric acid, the titanium being subsequently determined by the hydrogen peroxide colourimetric method.

Copper. The metal is dissolved in nitric acid and evaporated with sulphuric acid until fumes of sulphur trioxide appear; the residue is heated with dilute sulphuric acid and the solution filtered. The iron in the filtrate being reduced by boiling with excess of ammonium bisulphite, the copper is precipitated by the addition of sodium thiosulphate to the boiling solution. After filtration of the liquid, the separated copper sulphide is either ignited and weighed as oxide (the latter being corrected for contained iron if necessary) or the ignited precipitate is dissolved in nitric acid and titrated with standard thiosulphate in the usual manner.—W. E. F. P.

Gold bullion; Sampling of ——. F. P. Dewey. Eighth Int. Cong. Appl. Chem., 1912. Sect. I., Orig. Comm., **1**, 155—181. (See also this J., 1910, 215; 1912, 437).

The investigation was made to ascertain the effect upon the assay results of variations in the sampling of gold bullion of different grades; dip (granulated), chip and drill samples were taken from bars varying in weight from 300 to 1200 oz. and in composition from almost pure gold to bullions containing upwards of 40 per cent. of base metals. In the case of the simpler bullions (*e.g.* standard gold) of fineness 900 and upwards, the method of sampling was found to be practically without effect upon the assay results, but serious discrepancies in the latter occurred with the more complex alloys. Referring generally to the sampling of miscellaneous gold bullion when in bars weighing over 300 oz. each, it is stated that although in cases where the metal is known to be of suitable composition a chip or drill sample may be regarded as satisfactory, none but a properly prepared dip sample should be accepted in the case of an unknown bullion; in many instances—particularly with cyanide bullion—the composition of the metal is such that the actual assay process is interfered with, a preliminary refining of the bullion being necessary before the gold can be determined with accuracy.
—W. E. F. P.

Platinum; Action of boiling sulphuric acid on ——. Le R. W. McCay. Eighth Int. Cong. Appl. Chem., 1912. Sect. I., Orig. Comm., **1**, 351—359.

An investigation made in connection with the analysis of tin-antimony alloys by a method involving the use of hydrofluoric and sulphuric acids. It was found that, as previously noted by other workers, platinum is dissolved to a considerable extent by boiling concentrated sulphuric acid, 0·0038 grm. of the metal being dissolved in 1 hour by 10 c.c. of the acid. Solution of the metal was not retarded when the boiling was conducted in an atmosphere of nitrogen or carbon dioxide; but the solvent action of the acid was practically inhibited by sulphur dioxide when the latter was introduced through a tube into the boiling acid or generated within the vessel by the introduction of sulphur or carbon into the acid. The metal was not appreciably attacked when the acid contained sufficient arsenious oxide, and antimonious oxide was also found to exert a decidedly protective action. The theory is advanced that at the temperature of attack an appreciable dissociation of sulphur trioxide into the dioxide and oxygen occurs, the latter being responsible for the solution of the platinum; that the function of the added sulphur dioxide consists in repressing, by its high concentration, the dissociation of the sulphur trioxide; and that arsenious and antimonious oxides act by absorbing the liberated oxygen as fast as the latter is set free.—W. E. F. P.

[*Zinc.*] *Spelter analysis: New technical method of* ——. E. J. Ericson. Eighth Int. Cong. Appl. Chem., 1912. Sect. I, Orig. Comm., **1**, 183—186.

The separation and determination of the lead contained in spelter are based upon the following reactions:—

$$(1)\ Pb(NO_3)_2+4NH_4OH+(NH_4)_2S_2O_8 \\ =PbO_2+2NH_4NO_3+2(NH_4)_2SO_4+2H_2O;$$

$$(2)\ PbO_2+H_2O_2+2HNO_3=Pb(NO_3)_2+2H_2O+O_2;$$

$$(3)\ 5H_2O_2+2KMnO_4+6HNO_3 \\ =2KNO_3+2Mn(NO_3)_2+8H_2O+5O_2;$$

2 molecules of the permanganate are thus equivalent to 5 of lead, but since low results are obtained when the theoretical value of the permanganate ($\frac{5\,Pb}{10Fe}=1{\cdot}851$) is employed, the empirical factor 1·92 is used in cases where a preliminary separation of the lead is unnecessary, this

being increased to 1·95 for ores in which such separation is essential. The necessity for a higher factor than that required by theory is believed to be due to a slight hydration of the lead peroxide molecule. The analysis is conducted as follows:—19·2 grms. of the spelter are placed in a mixture of 200 c.c. of water and 44 c.c. of strong hydrochloric acid [or of 100 c.c. of water and 50 c.c. of sulphuric acid (1 : 3)] and allowed to stand overnight if cadmium is to be determined, but for a few hours only if lead alone is required. The metallic residue (lead, cadmium and undissolved zinc) is filtered off, washed, and boiled with 10 c.c. of strong nitric acid to the complete expulsion of brown fumes, the solution being diluted and filtered if traces of tin or antimony are indicated. 30 c.c. of strong ammonia solution and 5—10 grms. of ammonium persulphate are then added, half of the latter being added before the ammonia if the proportion of lead present exceeds 1 per cent. After boiling for 5 mins. and allowing to stand for 10 mins., the liquid is filtered, the precipitate being subsequently washed 4 times with hot ammonia solution (10 per cent.) and 5 times with hot water. The filter and contents are then treated with 25 c.c. of hydrogen peroxide solution (10 to 50 c.c. of a 3 per cent. or 10 volume solution per litre plus 50 c.c. of strong nitric acid), and when solution of the precipitate is complete, a mixture of 15 c.c. of nitric acid (sp. gr. 1·20) and 75—100 c.c. of water is added, the excess of hydrogen peroxide being titrated with potassium permanganate solution (0·568 grm. per litre) of which 1 c.c. corresponds to 0·01 per cent. of lead when 19·2 grms. of the spelter are taken for assay. The hydrogen peroxide solution being standardised against the permanganate, the percentage of lead in the sample is ascertained by simple calculation. The results obtained by this process are stated to be in excellent agreement with those obtained by the gravimetric (chromate) process. For the determination of cadmium, the ammoniacal filtrate from the lead peroxide precipitate is boiled until nearly neutral (when a white precipitate appears): 40 c.c. of sulphuric acid (1 : 3) are then added and the boiling is continued for about 10 minutes, after which the liquid is diluted to about 200 c.c. and saturated with hydrogen sulphide. The mixture being passed through double filters, the precipitate (cadmium sulphide contaminated with zinc and copper sulphides) is washed with water and treated on the filter with a minimum quantity of warm dilute hydrochloric acid, the insoluble residue of copper sulphide being washed, ignited and weighed as copper oxide. The filtrate containing the chlorides of cadmium and zinc is nearly neutralised with dilute ammonia, 8 grms. of trichloracetic acid (dissolved in water) are added, and the volume being diluted to about 200 c.c., the solution is saturated with hydrogen sulphide: the precipitated sulphide is filtered off and the cadmium determined preferably as sulphate or phosphate. Iron is determined by dissolving 10 grms. of the spelter in dilute sulphuric acid (a few drops of platinum chloride being added at the end of the operation to effect complete solution) and titrating the solution with the same permanganate as used for the lead; on a 10 grm. basis, 1 c.c. of this solution corresponds to 0·01 per cent. of iron. The percentage of zinc is taken by difference.—W. E. F. P.

Determination of sulphur in pyrites. Smoot. *See* VII.

Determination of sulphur in pyrites ores. Allen and Bishop. *See* VII.

Melting point of copper oxide. Slade and Farrow. *See* VII.

Acceleration of rusting by paint films. Liebrich. *See* XIII.

PATENTS.

[Iron] Oxides; Process for the economic reduction of —— by carbon and carbon monoxide. Soc. Electro-Métallurgique Française. Third Addition, dated June 8, 1911, to Fr. Pat. 432,721, Oct. 10, 1910 (this J., 1912, 135, 541 and 730).

THE proportion stated in the original patent, viz., two equivalents of carbon monoxide to one equivalent of carbon dioxide, in the gas leaving the reduction zone, is not invariable. The temperature conditions in the rotary furnace are different from those in the blast-furnace, and the reduction of ore by carbon monoxide may proceed until the proportion of this gas is less than originally indicated. The system as originally described tends however to accommodate itself automatically to the variations of carbon monoxide.—T. ST.

Iron; Method of refining ——. F. Heberlein. Fr. Pat. 442,292, April 6, 1912.

THE agglomerate formed by blowing air through a mixture of iron-ore powder and a combustible material, is very suitable for adding to the steel bath in the Martin and similar processes. It is claimed that the refining action of such agglomerates is quicker and more complete than that of the lumps of ore generally added.—T. ST.

Steel castings; Process for hardening ——. J. W. Gebhard, Muncie, Ind., Assignor to Armor Steel and Foundry Co., Chicago, Ill. U.S. Pat. 1,036,995, Aug. 27, 1912.

MOULDS for steel castings are treated with a paste prepared by incorporating with a suitable oil a mixture of manganese and vanadium or a mixture of manganese, vanadium, and tungsten, all finely ground.—A. S.

Steel; Treatment of molten ——. J. W. Richards, South Bethlehem, Pa. U.S. Pat. 1,037,536, Sept. 3, 1912.

FINISHED molten steel is transferred to an acid-lined induction electric furnace, in which it is maintained for some time in a molten state before casting. Alloying metal may be added to the steel in the electric furnace. —A. S.

Metals and alloys, particularly steel and its alloys; Preparation of ——. Westdeutsche Thomasphosphat-Werke G. m. b. H. Fr. Pat. 442,413, April 10, 1912. Under Int. Conv., April 10, 1911.

THE invention relates to the method of adding a material to a metal or alloy, as, for instance, ferromanganese to steel. The material to be added is kept melted in a separate furnace, as far as possible out of contact with air. This condition, together with the covering of slag which forms, make it possible to keep the mass molten for a considerable time without loss. The material to be added, heated to a temperature considerably above its melting point, can thus be drawn off as required. Owing to its high temperature and freedom from dross, it is stated that it diffuses rapidly and completely through the metal to which it is added.—T. ST.

Steel; Process for alloying molten —— with other metals. Elektrostahl Ges. m. b. H. Ger. Pat. 248,698, July 23, 1910.

BRIQUETTES of iron, charcoal, and an ore or oxide of the alloying metal, containing a slight excess of charcoal, are added to the molten steel. The briquettes are so heavy that they fall through the fused slag into the molten steel beneath, and reduction of the ore or oxide of the alloying metal takes place gradually. It is stated that the temperature required for the reduction of the alloying metal is much lower by this method than by other processes. —A. S.

Armour plates; Manufacture of ——. Soc. Anon. Italiana G. A. Armstrong & Co. Fr. Pat. 442,299, April 6, 1912. Under Int. Conv., May 3, 1911.

AN ingot of steel is manufactured, at as low a temperature as possible, and of the following composition:—Carbon 0·50 to 0·70, silicon 0·100 to 0·150, sulphur and phosphorus below 0·035, manganese 0·25 to 0·40, chromium 1·80 to 2·50, and nickel 3·50 to 4·50 per cent. The ingot is kept at 450° C. for a period depending on its size, and is then heated gradually to about 1200° C., when it is rolled or forged. It is next heated to about 600° C., quenched in oil or warm water, heated to 750°—780° C., and after flattening out bends, allowed to cool to about 200° C. in oil or boiling water, after which it is heated to about 630° C., flattened carefully, and allowed to cool in air. The face to be cemented is preferably planed at this stage. Cementation is then carried out at 960°—1000° C. for about 60 hours, using preferably carbon monoxide. The carbon content of the face of the plate is thus brought to about 1 per cent. Following cementation, the plate is allowed to cool to 780°—800° C., quenched in oil till the temperature has fallen to 300°—400° C., heated gradually and uniformly to 625°—640° C., and quenched in water. It is now heated to 750°—780° C., bent to the desired shape, again heated to 750°—780° C., quenched in oil, heated carefully to about 635° C., and quenched in water. If the fracture at this stage is not fibrous, the heating to 635° C. and quenching in water must be repeated. The final tempering is made with great care, the face being heated to 850° C. and the back to about 600° C.—T. St.

Alloys for ships' propellers. A. K. Huntington and F. G. P. Preston, London. Eng. Pat. 14,314, June 16, 1911.

CLAIM is made for copper-zinc alloys belonging to a series in which the elongation increases with increasing percentages of zinc, such series containing 34 to 42 per cent. of zinc, and 4 to 1·75 per cent. of aluminium. The content of iron and manganese should be as low as practicable above the amount which can be kept in solution. The upper limit of manganese is about 2 per cent., but the amount in most cases is less than this. The amount of iron should be not more than 1 per cent., and preferably less. Tin and nickel cause diminution of elongation and are preferably absent. Lead may be used in quantity up to 0·75 per cent., but less is preferable.—T. St.

Copper alloy, and process for manufacturing the same. E. J. S. Pickering, Newcastle-on-Tyne. Eng. Pat. 24,298, Nov. 1, 1911.

THE alloy consists for ordinary purposes approximately of copper 75, ferromanganese 10, and iron pyrites 15 per cent. The ferromanganese is first melted, next the copper is added, and the two melted together, and then the iron pyrites is added and melted with the others. When well melted, borax or other suitable flux is added, and the whole well stirred. After a few minutes, the mixture is run into ingots or direct into moulds. The alloy can be hardened, and tempered, and rolled either in a hot or cold state.—T. St.

Alloy suitable for the manufacture of tubes, and other flexible metal articles. L. Eslous. Fr. Pat. 442,268, April 6, 1912.

THE alloy is composed of copper 80 per cent., and nickel 20 per cent. It may be made into tubes so flexible that they will replace rubber tubes. Such tubes are especially suitable, in view of their strength and durability, for the conveyance of gas under pressure, etc.—T. St.

Alloys; Process for the electrolytic production of —— H. Sprengel. Ger. Pat. 249,778, Nov. 12, 1911.

EXTREMELY thin layers of the individual components of the alloy are deposited electrolytically one upon another until the desired thickness is attained. The cathode is formed of a rotating piece, or of wire, band, etc., which during its travel passes through the different electrolytic baths for the deposition of the several components of the alloy, and pressing, smoothing, and washing devices may be disposed between the different baths. The composite deposit may afterwards be heated to a suitable temperature to effect a more intimate alloying of the several component metals.—A. S.

Ores; Separation of ——. Murex Magnetic Co., Ltd., and A. A. Lockwood, London. Eng. Pat. 18,189, Aug. 11, 1911.

ORES the metallic constituents of which consist wholly or partially of oxides or carbonates, are agitated with water, magnetite, and an oily liquid such as Texas residuum, etc., and at some stage of the operation a small quantity of alkali silicate or carbonate is added. The magnetite attaches itself selectively to the metallic oxides, etc., to the exclusion of the gangue, and separation is then effected by passing the mixture through a wet magnetic separator. The magnetite may first be mixed into a paint with the oil, or it may be added to the mixture separately, wetted with water, in the presence of an alkali silicate or carbonate. Examples of the treatment of specific ores are given.—T. St.

Ores; Magnetic preparation or oiling of —— *and apparatus therefor.* Murex Magnetic Co., Ltd., and A. A. Lockwood, London. Eng. Pat. 25,369, Nov. 14, 1911.

THE ore pulp, water, and the magnetic paint, are agitated in a horizontal rotating tube with shot, or other easily coated substances, and clean pebbles, or other substances not easily coated with oil. The shot serve to transfer the paint to the metalliferous contents of the ore, and the function of the pebbles is to prevent the shot from sticking together, and the formation of agglomerations. When desired, the shot may be of such a size as simultaneously to have a grinding action. The discharge orifices, which may be screened as desired, are preferably near to, or at, the periphery of the tube.—T. St.

Ores; Magnetic separation of ——. I. S. Dalgleish, London. Eng. Pat. 19,678, Sept. 4, 1911.

THE ground ore is passed between the poles of a magnet energised by a pulsating or intermittent current. The poles of the magnet are inclined to the vertical and a series of steps is provided by spacing the laminae, the pole pieces corresponding to the lower steps being further apart than those of the higher steps. The inside surfaces of the pole pieces are covered with glass or other suitable non-magnetic material. Magnetic particles thus follow a step-like path, passing, as it were, through magnetic strata of diminishing strength, the lowest one being sufficiently weak to allow of the particles dropping into a suitable receptacle. The pulsating magnetic field allows the magnetic particles to drop slowly through the magnetic strata and at the same time subjects them to a series of shocks which help to detach any adhering non-magnetic particles. The separation of particles of different permeability is also assisted by an arrangement of baffle-wires.
—T. St.

Ores; Treatment of ——, N. H. M. Dekker, Paris. Eng. Pat. 18,488, Aug. 16, 1911.

ONE or more metallic sulphates are dissolved in concentrated sulphuric acid and the product is used as the reagent for treating metallic ores. A mixture of one molecular proportion of zinc sulphate and one of magnesium sulphate dissolved in four molecular proportions of sulphuric acid has been found to be the most generally useful reagent. The reagent is placed in a closed tank and heated to about 80° C. The ore to be treated is then added in the dry state though a hopper provided with an air-tight sliding door, and the resulting mixture is stirred by vanes attached to a rotating horizontal shaft. Reaction takes place gradually with the development of a considerable amount of heat, and the metals present are converted into sulphates. Carbon dioxide escapes from carbonates, and in the case of sulphide ores, the whole of the sulphur is said to be released in the state of sulphur vapour, and is brought through a conduit into a suitable tank, where it collects as flowers of sulphur When the action has stopped, water is added, and all the soluble portion removed. The metals desired are obtained by electrolysis or precipitation, and after concentration the reagent is again ready for use. Precious metals are allowed to accumulate until present in an amount suitable for treatment. The methods for the treatment of galena, blende, copper pyrites, auriferous pyrites and smaltine are described in detail.—T. St.

Ores; Treatment of —— *by the cyanide process.* H. M. Leslie, Glasgow. Eng. Pat. 27,879, Dec. 12, 1911.

ALL the tanks, vats, extractor boxes, etc., where cyanogen compounds are present are covered over in order to prevent the loss of cyanogen compounds by diffusion into the atmosphere. The air with the contained gases is led from the extractors, etc., to gasometers and is then compressed. This compressed air is then utilised for agitating or aerating the ore pulp under treatment, and for lifting the same from vessel to vessel. A typical plant for working the process is described in detail.—T. St.

Ores; Manufacture of briquettes of ——. Rheinische Stahlwerke. Fr. Pat. 411,806, Feb. 23, 1912.

Ores, metalliferous dust, etc., are mixed with from 8 to 10 per cent. of finely ground calcined calcium phosphate, with the addition of a suitable quantity of water. Quicklime may also be added if desired. The mixture is left until hydration is complete, and is then pressed into briquettes. These harden very quickly, and after 48 hours will retain their compactness even on being placed in water.—T. St.

Ores; Method of agglomerating oxide —— *by fritting.* F. Cochlovius. Fr. Pat. 412,517, June 21, 1911.

Iron ores, burnt pyrites, manganese ores, blast-furnace dust, and other similar substances are agglomerated by mixing with sulphur, or metallic sulphides such as pyrites, and, after setting the sulphur alight, blowing air through the mass until the sulphur is burnt away. By mixing the material to be agglomerated with partially roasted pyrites, taken direct from the furnace, the expense of heating the mass to ignite the sulphur is avoided. The resulting sulphur dioxide is utilised in any desired manner. —T. St.

Ore-briquettes, especially those of iron ore prepared without binding agents: Process for consolidating —— *by heating.* Maschinenbau-Anstalt Humboldt. Ger. Pat. 249,085, June 9, 1911.

The briquettes are placed, spaced apart, in a tunnel-kiln, the intermediate spaces being filled with fuel, which is burned by means of an air blast.—A. S.

Graphite-containing ores; Process for the treatment of finely-ground —— *by the oil flotation process.* Maschinenfabr. u. Mühlenbauanstalt G. Luther A.-G. Ger. Pat. 250,039, Aug. 3, 1911.

The coating of the graphite particles with oil is effected by causing the ore, in a loose finely-divided condition, to fall through a spray of petroleum.—A. S.

Zinc-bearing ores or compounds; Separation of metals from —— *and apparatus therefor.* E. A. Ashcroft, London. Eng. Pat. 19,257, Aug. 28, 1911.

A crude solution of zinc chloride having been obtained by treating the roasted ore with hydrochloric acid, or by "chlorine smelting," ammonia is added in excess. The resulting solution contains zinc, lead, and manganese. The latter is separated by means of a slow stream of chlorine. The zinc is then precipitated as hydroxide by driving off the excess of ammonia by heat, or by neutralising the solution with a further proportion of zinc chloride in purified neutral solution, or by the addition of an acid with formation of ammonium salts (preferably chloride). The separated moist zinc hydroxide is mixed with an excess of ammonium chloride and slowly heated to about 300° C. The ammonia is recovered. At the end of the reaction the temperature is raised to 500° C., when the excess of ammonium chloride is driven off. Whilst still at this temperature it is preferable to pass a slow stream of chlorine through the fused mass for some hours, and it is also convenient to produce a partial vacuum over the charge. The resulting zinc chloride may contain lead, but this in no way interferes with the final treatment, which consists in subjecting the fused mass to electrolysis. This is carried out in a long trough lined at the sides with fireclay, and furnished with a number of parallel graphite anodes. The cathode consists of a bath of molten lead, and is heated from below. The anodes are so disposed that there is only a thin layer of the fused chloride between them and the cathode. A current density of about 3 amps. per sq. cm. of exposed anode surface may be used, and 2·5 volts per vat will suffice under these conditions. The temperature is best kept at 450° C. An inverted bell is placed over each anode in order to recover the chlorine undiluted with air, each bell being connected by a pipe with the chlorine main. A current efficiency of 85 per cent. may be readily obtained. The production of zinc is given as 2·5 tons, and of lead 10·0 tons per electric horse power year.—T. St.

Zinc vapours; Condensers for ——. A. L. J. Queneau, Philadelphia, U.S.A. Eng. Pat. 2669 of 1912; date of appl., Aug. 29, 1911.

The cylindrical condenser is fastened to the exit end of a rotary reducing furnace, with which it revolves. It is lined with graphite compounded with clay, and is furnished with a number of transverse baffle-plates provided with apertures. At the furnace end of the condenser are magnesite or chromite brick courses which flare outwardly into the condenser. A suitable quantity of molten zinc is always left in the condenser, so that, as it slowly revolves, the baffle-plates become cooled by contact with the molten zinc. The temperature of the condenser is kept under control by means of a tempering pipe having a refractory outer covering and a hollow interior, through which a stream of water or air of suitable temperature is made to circulate. Combustible gases, such as carbon monoxide, together with any uncondensed zinc vapours, escape through a prolong. Molten zinc is tapped off at intervals through a suitable opening, but is never completely run off.—T. St.

Zinc; Method of extracting —— *from its ores.* Soc. Anon. Métallurgique Proc. de Laval. Fr. Pat. 411,697, March 23, 1912. Under Int. Conv., March 30, 1911.

The charge, containing excess of carbon, is fed from the sides into an electric furnace of the resistance type, the electrodes, and the outlet for the gases formed, being in the centre of the furnace. The gases thus escape from the hottest part of the furnace. Baffle-walls serve to keep the charge thinner in the centre than at the sides. The carbon dioxide first formed in the cooler parts of the furnace reacts with the excess carbon, with the result that it is all converted into carbon monoxide before leaving the furnace. Oxidation of the reduced zinc by interaction with carbon dioxide is thus avoided.—T. St.

Ores; Method and means of desulphurising sulphide ——, *and of reducing them to metal, and of forming zinc sulphate from complex sulphide ores, such as pyrites, chalcopyrite, galena and blende, even when intimately mixed.* G. Fusina. Fr. Pat. 442,280, April 6, 1912.

The finely ground ore is set alight, and air is drawn through the mass. When the portion of the charge which the air first reaches begins to show signs of cooling, the direction of the air is reversed. The operation is repeated until the sulphur is all burnt away. When zinc is present, the formation of the sulphate is encouraged by the supply of steam. The zinc sulphate is extracted by water, and the insoluble residue is smelted in a blast-furnace for lead. When the amount of zinc is very small, the charge may be treated in the primary ignition with reducing gases in order to cause considerable reduction to metallic lead. Two forms of plant for carrying out the process are described. In the first, fire-bars are arranged on endless chains like the tiles of a roof. Ground ore is fed on to them as they pass beneath a hopper and is at once ignited. By an arrangement of bells or chambers situated alternately below and above the travelling hearth and connected with a common aspirator, air is drawn through the charge alternately from above and from below. The air is made to go through the charge by allowing the extremities of the fire-bars to dip into troughs of water. Finally the bars and ignited ore fall into a reservoir of water. In the second form, the charge is built up in layers on a grid in a cylindrical furnace provided with a removable conical cover. When in place, the cover rests in a circular trough of water and thus seals the furnace. At the apex of the cone, and connected with the space below the grid are pipes connected in turn respectively with the open air and a chimney. Air is thus drawn through the mass alternately from below and from above.—T. St.

Copper; Process of refining ——. W. S. Rockey and H. Eldridge. New York. Assignors to Metallurgical Research Co. U.S. Pat. 1,037,538, Sept. 3, 1912.

THE copper is melted by exposing it to the heat of a furnace and its gases, and the molten metal is removed from the furnace, brought into intimate contact with carbon in order to purify it, and then caused to pass through and under a protective flux containing anhydrous boric oxide and carbon, on its way to the ladle or mould.—A. S.

Copper by electrolysis, Process and apparatus for the production of ——. M. Perreur-Lloyd. Fr. Pat. 441,644, March 22, 1912.

COPPER is obtained electrolytically from impure solutions derived from copper ores, charged with sulphurous acid, by employing a rotating cathode, and a cylindrical anode of perforated lead, carbon, or other insoluble material. The anode and cathode are maintained absolutely parallel, the fixed anode enveloping the cathode completely. The composition of the bath is also kept uniform by the rotation of the cathode, and the decomposition of water and the formation of black sulphide of copper are thus avoided. The undesirable action of the ferric salts in the solution is prevented by increasing the speed of formation of the deposit, so that the quantity of copper dissolved by the ferric salts is negligible in comparison with the amount deposited. This result is attained by employing a current of high intensity, viz., 400 to 500 ampères per sq. m. (0·26—0·32 amp. per sq. in.). The anode is provided at its upper part with an opening closed by a movable plug, which permits inspection of the cathode, and removal of the sheet of deposited copper without displacing the anode.—B. N.

Metals or alloys; Casting of —— *and device for use with same.* R. H. Carpmael. Kenilworth. Eng. Pat. 25,711, Nov. 17, 1911.

IN order to ascertain the temperature of metals or alloys prior to casting, one or more vessels, conveniently made of porcelain, platinum, etc., and containing respectively substances of known (but slightly different) melting points, are floated on the surface of the molten metal preferably after the metal has been removed from the furnace.—T. St.

Alkali metals; Process for the production of the ——. H. Mehner. Berlin. Eng. Pat. 26,025, Nov. 21, 1911.

SEE U.S. Pat. 1,016,758 of 1912; this J., 1912, 288. The molten cast iron is periodically recharged with carbon and again used for the reaction.—T. F. B.

Cupolas. S. Barnes. Montreal, Canada. Eng. Pat. 282, Jan. 3, 1912.

THE molten metal is run off from the cupola through a T-shaped covered conduit to the spout, the head of the T being approximately in the centre of the disc-like bottom of the cupola, and open at the two ends. Outside the cupola, the spout is provided with a trap or depression, above which is a firebrick transverse bridge which retains any dross, slag, etc. The slag then runs away through side openings in the top edge of the sides of the spout. By this arrangement melting and pouring may be carried on continuously, the slag also being carried away continuously during the pouring operation.—T. St.

[*Metallurgical*] *Electric induction furnace.* A. E. Greene. Chicago, Ill., Assignor to American Electric Smelting and Engineering Co., St. Louis, Mo. U.S. Pat. 1,036,996, Aug. 27, 1912.

THE three-phase induction furnace comprises two separate magnetic cores surrounded by channels of refractory material, which form single turn secondary circuits; the channels open into a main central chamber. Each core is provided with a primary winding consisting of two coils in series, of which one is located adjacent to each channel. Means are provided for connecting a variable number of turns of one winding between two of the wires of a three-phase supply system and for connecting a corresponding number of turns of the other winding with the centre of the first winding and with the third wire of the three-phase system, in order that approximately equal voltages may be developed in all the secondary circuits.—A. S.

Furnace; Electric —— *with electrodes.* L. Gonnet. Fr. Pat. 441,588, March 15, 1912.

THE base of the furnace consists of a grating pierced with holes, placed immediately below the horizontal electrodes. The base is movable and may be dismounted.—B. N.

Furnaces; Electric arc ——. Patents Purchasing Co. Fr. Pat. 442,548, April 15, 1912.

THE furnace is provided with a lower non-metallic vertical electrode, connected with one source of the current, passing through the base of the furnace, and two metallic electrodes, which may be regulated, passing through the furnace walls at an angle of about 45°. The three electrodes form a kind of hopper or support for receiving the material to be treated, which descends from another hopper through a vertical tube provided with an oscillating arrangement for regulating the delivery. The metallic electrodes are formed of the metals to be extracted, and serve also as a flux and as a vehicle for removing the metallic portions of the mineral. The strength of the current is such that the arc is not produced along the whole length of the electrodes, but is disposed alternately from one side electrode to the other. The hearth of the furnace is hollow, and provided with channels on each side of the lower electrode for receiving the molten material. —B. N.

Furnace for melting metals and alloys, and for other metallurgical operations, heated by combustible liquids. A. Étienne, L. Cauet and L. and H. Mercier. Fr. Pat. 441,951, March 30, 1912.

THE combustible liquid (tar oil, mineral oil, etc.), is fed into shallow trays which are placed in channels in the upper part of the furnace. Air is then drawn over the surface of the oil in such quantity that incomplete combustion takes place. The products formed are led down conduits in the walls of the furnace and are met by ascending currents of hot air. The mixed gases then find their way by suitable ports to the furnace proper where the final combustion takes place. The burnt gases are passed through regenerators which serve in the usual way for heating the air supplied to the furnace. By suitably regulating the air supply, a reducing or oxidising atmosphere may be obtained. This method of heating may be used with either crucible or reverberatory furnaces, but with the latter the ports are inclined downwards towards the bed of the furnace.—T. St.

Furnace for roasting ores. Helsingborgs Kopparverks Aktiebolag. Fr. Pat. 442,472, April 12, 1912. Under Int. Conv., April 13, 1911.

THE invention relates to roasting furnaces which are provided with a vertical rotating shaft, to which are attached rabbles for stirring the ore, and transporting it from one compartment to another. Claim is made for constructing such furnaces so that the interior has the usual cylindrical form, whilst the outside is rectangular or nearly so. The masonry is thus thickest at the corners, and at these parts, vertical conduits are constructed for the passage of gases, and communicating as desired with the various compartments. Two furnaces designed on this principle, one for the chloridising roasting of ores, and the other for roasting low-grade pyrites, are described in detail.—T. St.

Atomising metals, etc.; Process of and apparatus for ——. J. M. Neil, Toronto, Canada. U.S. Pat. 1,036,689, Aug. 27, 1912.

THE metal is melted and then caused to issue in an upward direction through a suitable aperture in a "head" with a flat surface. A powerful jet of suitable atomising fluid, superheated to approximately the melting point of the metal, is directed against the molten metal as it issues from the aperture, so as first to flatten it out into the form of a film on the "head" and then to remove it from the latter in a finely divided state.—A. S.

Calcium; Process and means of refining ——. Soc. d'Electro-Chimie. First Addition, dated Mar. 21, 1912, to Fr. Pat. 438 772, Mar. 22, 1911 (this J., 1912, 647.)

Crude calcium is placed in a cylindrical vessel made of thin sheet-iron, and the latter is placed mouth downwards in a strong iron dish, and secured in position. The whole system is then slowly immersed in fused calcium chloride. The crude calcium melts and floats on the top of the calcium chloride, which enters the containing vessel from below. The impurities in the calcium pass into the calcium chloride beneath, and after a suitable time the system is removed from the calcium chloride bath, allowed to cool, and the sheet-iron cylinder cut open to obtain the purified metal.—T. St.

Gases; Method and means of filtering —— *discharged from metallurgical works or plant, and of recovering the contained metalliferous dust.* I. B. Fiechter. Fr. Pat. 442,180, April 4, 1912. Under Int. Conv., April 5, 1911.

The filter consists of a vertical annular column of granular material, maintained in position by two concentric partitions made up of circular or polygonal rings, arranged one above the other like the slats of a Venetian blind. The rings comprising the outer partition are inclined downwards towards the centre, those of the inner partition towards the outside. The whole is enclosed in a cylindrical sheet-iron casing. The gas to be filtered is fed into the annular space between the casing and the filter, and is drawn off from the centre, the gas thus traversing the filter laterally. The granular filtering medium is fed in at the top through a hopper, and is distributed evenly by means of a cone. At the bottom is a funnel through which it is drawn off. The action may be continuous or intermittent. The metallic particles are conveniently recovered by sending the drawn-off filtering medium through a rotating cylindrical screen of suitable mesh.—T. St.

Electroplating of non conducting objects. A. Frei. Fr. Pat. 442,258, April 6, 1912.

A conducting layer is produced by the application of metal foil on a foundation saturated with drying substances, such as oils, which are insoluble in water and unaffected on heating.—B. N.

Nickel ores or metallurgical products containing iron and copper; Process for the treatment of sulphide ——. W. Borchers and H. Pedersen. Ger. Pat. 248,802, Dec. 30, 1911. Addition to Ger. Pat. 245,198, March 23, 1911.

The method described in the chief patent (this J., 1912, 497) is modified as follows:—The acid sulphate solution is treated with hydrogen sulphide to precipitate the copper as sulphide, which is afterwards converted into metallic copper or copper sulphate. After removal of the copper sulphide, the solution is concentrated and treated for the recovery of nickel sulphate, which is subsequently dehydrated, and roasted so as to yield nickelous oxide, sulphuric acid and sulphur trioxide; the gases are introduced into the matte-roasting furnace or into a sulphuric acid plant connected therewith. The nickelous oxide is smelted to nickel.—A. S.

Ore-reduction and smelting process, with regeneration of the furnace gases and use of the electric current. H. Hinden. Ger. Pat. 249,188, Feb. 26, 1910.

The plant comprises an ore-reduction furnace, an electric smelting furnace, and a generator for the reduction of the furnace gases. The coal to be used for the reduction of the furnace gases is heated in a retort built inside the generator, and the "air-gas" produced together with carbon monoxide, is utilised to preheat the carbon dioxide (furnace gases) to be reduced or to diminish the loss of heat of the apparatus by external heating.—A. S.

Manganese; Process for obtaining metallic —— *by means of carbonaceous reducing agents.* Isabellen-Hutte Ges. m. b. H. Ger. Pat. 250,035, April 8, 1911.

A mixture of natural pyrolusite with pyrolusite which has been calcined at a red heat is reduced by means of carbonaceous reducing agents as described by Tamm (Chem. News, 1872, 37, 111). It is stated that the yield of manganese is considerably increased by calcining a portion of the pyrolusite before reduction.—A. S.

Metallurgical gas furnaces. D. Tschernoff, St. Petersburg, and M. Sendzikowsky, Moscow. Eng. Pat. 19,281, Aug. 29, 1911.

See Fr. Pat. 433,738 of 1911; this J., 1912, 237.—T. F. B.

Copper and nickel; Process for the extraction of —— *particularly from low-grade ores and products.* W. Borchers, Aachen, Germany, and H. Pedersen, Trondhjem, Norway. Eng. Pat. 227, Jan. 3, 1912. Under Int. Conv., March 22, 1911.

See Ger. Pat. 245,198 of 1911; this J., 1912, 497.—T. F. B.

Electroplating non-conducting articles; Process for ——. A. Frei, Zurich, Switzerland. Eng. Pat. 3366, Feb. 10, 1912.

See Fr. Pat. 442,258 of 1912; preceding.—T. F. B.

Metallic surfaces; Means for protecting —— *from corrosion.* W. E. Lake, London. From The New Jersey Zinc Co., New York. Eng. Pat. 3626, Feb. 13, 1912.

See U.S. Pat. 1,031,377 of 1912; this J., 1912, 784.—T. F. B.

Annealing metallic articles; Apparatus for ——. A. Kreidler, Stuttgart, Germany. Eng. Pat. 4188, Feb. 19, 1912.

See Ger. Pat. 245,355 of 1911; this J., 1912, 543.—T. F. B.

Vanadium from ores; Processes for extracting ——. B. D. Saklatwalla, Pittsburgh, U.S.A. Eng. Pat. 6119, March 11, 1912.

See U.S. Pat. 1,020,312 of 1912; this J., 1912, 394.—T. F. B.

Preparation of rust-preventing paints from chromates. Ger. Pat. 248,292. *See* XIII.

XI.—ELECTRO-CHEMISTRY.

Rapid electro-analysis under reduced pressure. Fischer and Stecher. *See* XXIII.

Patents.

Storage battery plates; Electric ——. A. Ricks, Gross-Lichterfelde-Ost, Germany. Eng. Pat. 4843, Feb. 27, 1912. Under Int. Conv., June 13, 1911.

Lead, deposited electrolytically in the form of thin sheets of a scaly or flaky form on lead plates from lead acetate or nitrate solutions, is mixed in small quantity with other lead preparations or oxides, and to the active material thus produced is added glass wool, in a disintegrated condition or in the form of short fibrous particles, and two specific kinds of binding agents. One of these, such as an albuminous substance, is for the purpose of cementing the material mechanically, and the other, *e.g.*, phenol, pyridine, or the like, acts as a hardening agent, in the presence of lead oxides forming conductive compounds with the material.—B. N.

Electrolytic cell. F. H. Briggs, Elyria, Ohio. U.S. Pat. 1,036,554 Aug. 27, 1912.

The electrodes and connections, means for heating the electrolyte, and a cover for the cell are carried by a fixed support. The containing vessel for the electrolyte is mounted on a platform, which can be moved up and down, so as to bring the container into and out of position, without disturbing the electrodes, etc.—A. S.

[Electrical] Ozoniser. R. M. Leggett, Assignor to M. J. Fritz, F. I. Cornwell, and T. F. Hutzel, Ann Arbor, Mich. U.S. Pat. 1,037,500, Sept. 3, 1912.

The ozoniser comprises an air-tight tank, with a number of dielectric tubes, open at the ends, supported therein, so that air may circulate about and through them. One electrode is arranged on the outside, and another, with open ends, within each dielectric tube, the inner electrode being so spaced with respect to the tube that air is free to travel through the inner electrode, and between the latter and the dielectric tube. A dam is placed across the air-tight tank, dividing it into two compartments having communication only through the dielectric tubes, and air is supplied under pressure to one of the compartments, the air on the outside of the electrodes and dielectrics acting as a cooling agent.—B. N.

Silicon; Apparatus and detached pieces of electrical apparatus in —— and process for the moulding of these pieces. G. Gualtierotti. Fr. Pat. 441,591, March 21, 1912. Under Int. Conv., March 22, 1911.

The casting is made in a mould which permits the free and sudden contraction of the object at the moment of solidification. For this purpose, one part of the mould is made in two pieces, one, a wedge-like piece, being movable, so that it may be displaced according to the amount of contraction. The bodies produced may be employed as electric resistances in heating apparatus, the resistance of the substance diminishing as the temperature rises.—B. N.

Electrolysis of liquids. J. Billiter, Vienna. U.S Pat. 1,037,585, Sept. 3. 1912.

See Eng. Pat. 11,093 of 1910; this J., 1911, 905.—T. F. B.

Electrode [for electric furnaces for gas reactions]. O. Schönherr and J. Hessberger, Fiskaa, Assignors to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Christiania. U.S. Pat. 1,038,208, Sept. 10, 1912.

See Fr. Pat. 357,358 of 1905; this J., 1906, 79.—T. F. B.

Electric furnace for the manufacture of nitrides. Addition to Fr. Pat. 436,789. *See* VII.

Impts. in articles made of silica glass and requiring leading-in wires combined therewith. Eng. Pat. 24,482. *See* VIII.

XII.—FATS; OILS; WAXES.

Chlorides of carbon as solvents. I. Carbon tetrachloride. C. Baskerville and H. S. Riederer. J. Ind. Eng. Chem., 1912, 4, 645—651.

The carbon tetrachloride used was a commercial product of 99·7 per cent. purity and the experiments were made, unless otherwise stated, at the ordinary temperature (20°—21° C.). *Asphaltums, bitumens, etc.* Gilsonite, oil asphaltum, refined bitumen, and wiedgerite ("mineral liver") are almost completely soluble, grahamite contains from 55—80·6 per cent. insoluble, albertite and impsonite are partly soluble, and wurtzilite (elaterite, tabbyite, aconite, aegerite) is slightly soluble in carbon tetrachloride (compare also Richardson and Forrest, this J., 1905, 310; Andés, this J., 1905, 807). *Cellulose acetates and nitrates.* Cellulose nitratea (11·32 and 12·63 per cent. of nitrogen) and acetates (three kinds) and celluloid are all insoluble in carbon tetrachloride; camphor is soluble (125 grms. in 100 grms. of carbon tetrachloride at 20° C.). *Alcohol-soluble gums.* Accroides is insoluble, sandarac is partly soluble, and mastic is completely soluble in carbon tetrachloride; on evaporating the viscous mastic solution at 60° C., a residue of constant weight cannot be obtained even after 390 hours, although mastic alone is unaffected under similar conditions. *Copal gums.* These are all partly soluble in carbon tetrachloride at 20° C.; heating does not assist solution, the gums partly melting and decomposing. *Dammar gum* is completely soluble in carbon tetrachloride, giving a turbid solution which can be cleared by addition of 95 per cent. alcohol, or by warming; 100 grms. of carbon tetrachloride dissolve 7·13 grms. of Batavia dammar at 20° C. *Kauri gum.* This is dissolved to some extent but not uniformly by carbon tetrachloride (compare Coffignier, this J., 1909, 430). *Water-soluble gums.* Aleppo, Turkey, and Persian gum tragacanth, Indian gum, gum senegal, and gum arabic are all insoluble in carbon tetrachloride. *Shellac.* The results of Andés (*loc. cit.*) are confirmed. *Rosin* and carbon tetrachloride are mutually soluble; a residue of constant weight cannot be obained from the solutions even after heating for over 350 hours at 60° C. The depth of colour of a solution of rosin in carbon tetrachloride could probably be used to determine the quality of the rosin. *Pine oil* is miscible in all proportions with carbon tetrachloride, but the solution is turbid owing to the presence of water in the oil. *Waxes.* "Flora" and "No. 3 ceara" carnaüba wax, Japan wax, pure ozokerite, candelilla wax, montan wax, yellow Cuban beeswax, bayberry wax, shellac wax (m. pt. 75° C.), and refined paraffin wax (m. pt. 120° C.) are all partly soluble in cold and completely soluble in boiling carbon tetrachloride: the melted waxes are miscible in all proportions with carbon tetrachloride. *Butter* when heated with carbon tetrachloride yields an emulsion, which separates into three layers, the middle one probably consisting of casein, which is insoluble in both carbon tetrachloride and water. *Fats and fatty oils* are soluble in all proportions in carbon tetrachloride. When 10 grms. of oil were mixed with 25 c.c. of carbon tetrachloride and the mixture heated at 60° C. for from 5½ to 10 hours in order to evaporate the solvent, the following results were obtained:—Menhaden oil gained less than 1 per cent. in 6 hours. Boiled linseed oil gained 1·25 per cent. in 5 hrs. 40 min., and raw linseed oil gained 1 per cent. in 5 hrs. 20 mins; a thin skin formed on the surface of the oils. Chinese wood oil gained 2·30 per cent. in 5 hrs. 15 mins., and a skin formed on the surface. Whale oil gained 0·6 per cent. in 6 hrs., maize (corn) oil 0·04 per cent. in 8 hrs., and soya bean oil 0·5 per cent. in 7 hrs., and 1 per cent. in 10½ hrs. *Sulphur.* 100 grms. of carbon tetrachloride dissolve 0·717 grm. of sulphur at 20° C. The authors give also four tables in which data published by other workers are collected, viz., (1) solubility of various inorganic substances in carbon tetrachloride; (2) solubility of naphthalene in carbon tetrachloride; (3) solubility of carbon tetrachloride in water; (4) solubility of various medicinal preparations in carbon tetrachloride.—A. S.

Cottonseed oil; Halphen's reaction for ——. E. Gastaldi. Giorn. Farm. Chim., 1912, **61**, 289—297. Chem. Zentr., 1912, 2, 758.

The actual producer of the Halphen colour reaction is not the amyl alcohol, but its impurities. Pyridine, quinoline, aniline, potassium and sodium hydroxides and ammonia will all produce the colouration. The author therefore suggests the following improved method for conducting the test. To 5 c.c. of oil are added 1 drop of pyridine and about 4 c.c. of carbon bisulphide containing 1 per cent. of dissolved sulphur, and the mixture warmed for half an-hour on the water-bath. In this way, it is stated, 0·25 per cent. of cottonseed oil may be detected with certainty.—W.H.P.

Strychnos nux vomica; The oil of the seeds of ——. A. Heiduschka and R. Wallenreuter. Arch. Pharm., 1912, **250**, 398—402.

The unsaponifiable portion of the oil of the seeds of *Strychnos nux vomica* has been examined (see this J., 1905, 718). Several crystalline substances resembling phytosterols have been isolated by treating the unsaponifiable matter with acetic anhydride and hydrolysing the acetyl compounds produced. The first acetyl compound isolated melted at 121° C. and had the composition, $C_{40}H_{70}O_2$. It lost one acetyl group on hydrolysis and then melted at 99° C. The second acetyl compound obtained melted at 221° C., and had the composition, $C_{32}H_{54}O_2$. After hydrolysis it melted at 186° C. The unsaponifiable portion of the original oil was extracted with 80 per cent. alcohol, and a crystalline substance, m pt. 165° C., was obtained giving the phytosterol reactions. —F. Shdn.

Sorindeia oleosa; Fat of the seeds of ——. A. Hébert. Les Matières Grasses, 1912, 5, 2814—2815.

The kernels of the seeds of the Soudan tree *Sorindeia oleosa*, contain a fat which is used in the manufacture of soap. A sample of the dried kernels yielded 25 per cent. of a solid brownish fat with the following characteristics:—Sp. gr. at 17° C., 0·889; m.pt., 16° to 17° C.; solidif. pt., 16° to 17° C.; acid value 4·9; saponification value, 185·0; Reichert value, 7·92; Hehner value, 91·75; and iodine value, 132·0. The fatty acids melted at about 39° or 40° C., and were separated incompletely by the lead-ether method into 24 per cent. of liquid acids and 76 per cent. of solid acids melting at 44° to 45° C., and apparently consisting of some of the lower fatty acids. The fat does not appear to be edible, and the low m.pt. of the fatty acids renders it unsuitable for the manufacture of candles. —C. A. M.

Fatty oils of the seeds of Illicium verum and I. religiosum; Composition of ——. J. Bulir. Z. Unters. Nahr. Genussm., 1912, 24, 309—312.

The fruit of the Chinese anise, *Illicium verum* (Hook), is frequently adulterated with 10 to 90 per cent. of the fruit of the poisonous Japanese anise, *I. religiosum* (Sieb.). The seeds of the former yielded 20 per cent., and those of the latter 12·5 per cent. of non-drying oil, with the following characters:—

Oil.	Sp. gr. at 15° C.	Saponification value.	Hehner value.	Reichert-Meissl value.	Iodine value (Hübl).	M.pt. of saturated acids. °C.	Mol. weight of total fatty acids.
I. verum	0·9264	193·8	95·2	1·4	93·1	59·0	279·7
I. religiosum .	0·9295	193·4	95·0	1·5	90·6	59·0	279·0

The fatty acids of *I. verum* consisted approximately of 45 per cent. of oleic acid, 23·9 of linolic acid, 23·2 of palmitic acid and 2·6 per cent. of stearic acid; whilst the fatty acids of *I. religiosum* were composed of 60·2 per cent. of oleic acid, 9·8 of linolic acid, 22·5 of palmitic acid, and 2·5 per cent. of stearic acid.—C. A. M.

Wool grease oleines; Detection of mineral oils in ——. L. Settimj. Ann. Lab. Chim. Centr. delle Gabelle, 1912, 6, 197—201.

For the detection of mineral oil in wool grease oleines by a solubility test, the author finds that as a solvent a mixture of 1 part of amyl alcohol and 2 parts of 96 per cent. ethyl alcohol is much superior to the mixture of methyl and ethyl alcohols recommended by Winterfeld and Mecklenburg (this J., 1910, 1396). Ten c.c. of the sample are shaken with 40 c.c. of the mixture of amyl and ethyl alcohols; pure wool grease oleine dissolves to a clear solution, but if even 5 per cent. of mineral oil be present, an oily layer separates, the volume of which corresponds approximately with the quantity of mineral oil contained in the sample. —A. S.

Wool grease stearine. E. Coen. Ann. Lab. Chim. Centr. delle Gabelle, 1912, 6, 567—579.

Six samples of the stearines (solidif. p's. ranging from 56·8° to 59° C.) obtained by pressing distilled wool grease were found to contain from 20 to 30 per cent. of solid unsaponifiable matter. The saponification values of the saponifiable matter ranged from 157·9 to 168·5, mean 163. A second pressing of the wool grease stearine caused an increase in the solidifying point and content of fatty acids and a decrease in the iodine value, the content of unsaponifiable matter, and the rotatory power of the hydrocarbons. In four other samples of wool grease stearine with solidifying points ranging from 41·5° to 43·5 C., the amount of unsaponifiable matter varied from 9 to 15 per cent., and the saponification value of the saponifiable matter from 192·2 to 209·1. (See also this J., 1911, 755.)—A. S.

Saponin; Preparation of —— from the sapindus. Rousset. Les Matières Grasses, 1912, 5, 2824—2825.

The tropical tree *sapindus*, which, even in Algeria, can only grow on the lowest parts of the coast, yields fruit which is much richer in saponin than that exported from India. After the eighth year the tree produces from 40 to 90 kilos. of fruit, the nuts of which fetch up to 1000 francs per ton. The pericarp of the fruit (about 68·5 cent.) could with advantage be used in place of quillaia bark, and owing to the presence of certain gums it has also a sizing effect upon fabrics. For the preparation of baths similar to those made from quillaia bark, the fruit may be air-dried and freed from its seeds; but to obtain a sufficient detergent effect the soaking must be prolonged, since the gums retard the solution of the saponin. The best results are obtained by first roasting the fruit for 3 or 4 hours at 130° to 140° C., which renders it friable and readily soluble. The loss in weight is about 10 per cent., and the resulting powder not being hygroscopic may be exported in sacks. A suitable bath is obtained by the use of 10 to 15 grms. of the powder per litre, and the only precaution required is thoroughly to rinse the fabrics to eliminate a slight yellow tint due to certain products formed in the roasting.—C. A. M.

Herring oil. A. Lusskin. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve, Orig. Comm. 12, 155—158.

The following analytical constants were obtained in the course of an investigation made to compare the behaviour and adaptability for paint purposes of two samples of herring oil with other fish oils:—

Description.		Colour.	Odour.	Sp. gr. at 15° C.	Acid value.	Iodine value.
Herring oil No. 1		very pale	good	0·9240	2·4	137·9
Herring oil No. 2		dark brown	bad	0·9210	41·9	136·1
Ditto	blown	deep red	almost none	0·9654	25·7	89·94
Ditto	winter-pressed. Refined	extremely pale	fair	0·920	39·4	136·1

Attempts to "dry" the samples of herring oil were unsuccessful, even when very powerful driers were used; under similar conditions porpoise body and menhaden oils dried satisfactorily. The author is of opinion that the blown herring oil could be used for smoke-stack paints and for paints intended to resist the "chalking" action of sea air. (See also this J., 1911, 1170.)—W. E. F. P.

Detection and determination of paraffin and ceresin in mixtures, and application to the analysis of candles. Armani and Rodano. *See* IIa.

Decomposition of linseed oil during drying. Olsen and Ratner. *See* XIII.

The rarer paint oils. Gardner. See XIII.

Patents.

Fat: Apparatus for extracting —— by means of non-inflammable solvents, and the products obtained with such apparatus. R. A. G. Fabre. Fr. Pat. 442,002. April 1, 1912. Under Int. Conv., Nov. 3, 1911.

The extraction vessels are all arranged at the same level and are shallow and of wide diameter.—C. A. M.

Wax; Apparatus for the extraction of ——. E. C. Smith and A. Waterhouse, Pearl City, Hawaii. U.S. Pat. 1,036,738, Aug. 27, 1912.

The apparatus comprises a container, with means for heating the same, and an independent receiver or separator. The lower parts of the container, into which the material to be treated is introduced, and of the separator are connected by a pipe. From the top of the container rises a pipe, which is open to the atmosphere at its upper end, and at an intermediate point is provided with a branch pipe leading to the upper part of the separator.—A. S.

Soap. T. Anyon, Manchester. Eng. Pat. 24,304, Nov. 2, 1911.

A soap is made by saponifying in the usual way a mixture of distillers' or brewers' yeast (say 5 to 85 per cent.) with fatty or oily matter, with or without the addition of scents, colouring matters, etc.—C. A. M.

Soap: Process and apparatus for the manufacture of a durable and frothing ——. Z. Mayerfi. Fr. Pat. 442,000. April 1, 1912. Under Int. Conv., Oct. 4, 1911.

The tablets are composed of at least two layers of different kinds of soap, one of which froths readily whilst the other is of a hard character. The apparatus claimed is characterised by having an angular tube, composed of endless bands in which the different liquid soaps are conducted by various tubes in proportions previously fixed.—C. A. M.

Soaps; Manufacture of hard ——. J. Leimdörfer. Fr. Pat. 442,248, April 5, 1912. Under Int. Conv., April 6, and Aug. 11, 1911.

Hard soaps, from *e.g.* bone fat, olive or sesamé oils, are obtained in liquid, semi-solid or paste-like form by adding to such fats, or their fatty acids, a suitable proportion of polymerised fats, fatty acids or their derivatives, or mixtures thereof, containing halogenated or acid radicals (*e.g.*, Turkey-red oil), and saponifying the mixture as completely as possible. For example, a hard soap paste is obtained by saponifying the ordinary fats or fatty acids with strong alkali, after the addition of the other fats and sufficient alkali to form their neutral soaps. Or, a paste with a high percentage of fatty acids, corresponding to a liquid soap, is obtained by saponifying the ordinary fatty acids with alkali carbonate, and adding a sufficient quantity of the other fatty bodies and then alkali to complete the saponification of the latter.—C. A. M.

Saponin: Preparations of solutions containing —— and not imparting any tint to white articles washed therein. R. Mandelbaum and Dr. A. Kauffmann und Co. Fr. Pat. 442,294, April 6, 1912. Under Int. Conv., July 1, 1911.

Preparations or liquid extracts of substances containing saponin are treated with an acid and a reducing agent (*e.g.*, sodium sulphite) or solutions thereof.—C. A. M.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Shellac; Microscopical method for the determination [detection] of arsenic, as orpiment, in ——. R. Schwarz. J. Ind. Eng. Chem., 1912, 4, 660—661.

The shellac is dissolved in methyl alcohol, the insoluble matter is separated, and washed with methyl alcohol, in a centrifugal machine, and portions of it are examined under the microscope, the orpiment appearing as transparent to translucent granular masses and imperfect crystals of a characteristic yellow-greenish colour.—A. S.

Rusting: Acceleration of —— by paint films. E. Liebreich. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve, Orig. Comm., 12, 143—154. (See also this J., 1912, 190.)

The structure of a paint film is such that there is always the possibility of an electrolyte being in contact with iron and pigment in the pores of the paint film. There is thus the possibility of increased corrosion if potential differences are set up in the right direction, and if the resistance of the circuit is not too great. There is no potential difference between linseed oil and iron, but many of the common colouring matters, when pressed into rods, exhibit differences of potential against metallic iron, being less electropositive by about 0·1 volt. The particles of pigment are not entirely surrounded by the linseed oil in the paint film, as the same differences of potential can be observed with paint films on glass. The resistance of the film is not likely to be sufficient to prevent a current from flowing with such differences of potential. The choice of material for the pigment is therefore very important. The use of powdered zinc or aluminium as a protective ingredient of the paint leads to the formation of pin-holes. The addition of chromium salts is expensive and affects the drying properties of the oil. It is more satisfactory to use a paint which contains substances like the amides of the alkali metals which yield an alkali in the presence of water. Such pigments are efficacious as rust preventers, but they are apt to saponify, so that the problem is not completely solved.—W. H. P.

White lead: Sublimed ——. J. A. Schaeffer. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **12**, 175—179.

Sublimed white lead (basic lead sulphate) is made by the oxidation of galena in water-jacketed blast furnaces of special form and employing hard, compact coke as fuel. A mixture of galena, limestone and metallic iron, to which varying amounts of "blue fume" (a by-product of the ordinary smelting of lead ores, containing about 35 per cent. of lead oxide and 50 of lead sulphate) are frequently added, is charged upon the bed of incandescent fuel. The oxidation occurs with great violence, a certain amount of metallic lead being produced, which is periodically withdrawn with the slag; the volatilised products are first drawn through a cooling system and finally driven by means of a powerful fan into the bag-room. The suction is so adjusted that the coarser and less satisfactory portions of the product are deposited in that part of the cooling system preceding the fan, only the finest fume being collected in the bag-room. As removed from the latter the product is white and contains approximately 78 per cent. of lead sulphate, 16 of lead oxide and 5·5 of zinc oxide; the presence of the last constituent is due to the association of blende with the galena employed and, it is claimed, enhances the value of the product. The pigment is chemically inert when used in coloured paints containing chemically reactive tinting materials and is stated practically to inhibit the corrosion of iron and steel even after long exposures; it is also largely employed in the manufacture of the finer grades of rubber goods.—W. E. F. P.

Lamp black and carbon black. G. L. Cabot. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **12**, 13—31.

An outline of the history and development of the industry is given, together with particulars of some of the more important factories in the United States. Although the distinction is not universally recognised, in the American trade the term "carbon black" is applied to the product obtained by contact of a flame with a cooled surface, "lamp black" being restricted to the soot deposited during the burning of oil, resin, etc., in a limited supply of air. The uses of the two products are quite sharply defined, carbon black being mainly employed for printers' ink, stove polish and vulcanised rubber, whereas lamp black is used for colouring oilcloth, leather and unvulcanised rubber and usually for paints also. In the manufacture of lamp black the raw material employed is usually "dead" tar oil which yields 15—35 per cent. of its weight of the black; the furnaces are of such construction that the product is practically calcined at the time it is deposited. The chief source of carbon black is natural gas which is burnt in rotating burners beneath cooled, stationary plates; a detailed description is given of a factory producing about 10,000 lb. per day of this material. With a few exceptions, the attempts made to utilise petroleum in the manufacture of carbon black have proved commercially unsuccessful. The specific gravity of carbon black is about 1·7, but the product as scraped from the plates contains 95 per cent. of its volume of "air" and still retains 88 per cent. when compressed to one-third of its original bulk.—W. E. F. P.

Paint oils: The rarer ——. H. A. Gardner. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **12**, 33—40. (See also this J., 1911, 223.)

As showing the behaviour of the less common paint oils under practical (atmospheric) conditions, the results are given of tests in which wooden panels were coated with paints containing various proportions of these oils and exposed for twelve months. The pigment employed contained 20 per cent. of basic carbonate white lead, 30 of basic sulphate white lead, 35 of zinc oxide, 10 of magnesium silicate and 5 of barytes; the oils used are indicated in the following table in which the results of the exposures are also shown:—

No.	Vehicle.	Chalking.	Checking.	General condition.	Remarks.
1	Pure raw linseed oil	very slight	none	excellent	very white
2	,, soya bean oil	very slight	little	very good	slightly darker than No. 1
3	,, menhaden oil	very slight	none	very good	very dark
4	Raw and blown linseed oils	considerable	little	good	very white; excellent gloss
5	Raw linseed and soya bean oils	medium	very slight	good	
6	,, ,, menhaden oils	medium	none	very good	slightly dark
7	,, ,, perilla oils	considerable	none	very good	very white
8	,, ,, treated Chinese wood oils	very slight	considerable	good	high gloss; very white
9	,, ,, corn (maize) oils	medium	none	very good	fairly dark
10	,, ,, cottonseed oils	medium	little	good	very dark
11	,, ,, rosin oils	Paint very white. Cracking and large scales coming off in places.			
12	,, ,, whale oils	very heavy	slight	fairly good	very dark
13	Blown linseed and soya bean oils	very slight	very slight	very good	very white and glossy
14	Raw linseed oil, 50% Soya bean oil, 25% Treated Chinese wood oil, 25%	In similar condition to No. 13			

Note.—In Nos. 4 to 13 the oils were mixed in equal proportions.

W. E. F. P.

Linseed oil; Decomposition of ——, *during drying.* J. C. Olsen and A. E. Ratner. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve, Orig. Comm., **12**, 165—173.

5·336 grms. of linseed oil—absorbed in sufficient glass-wool to expose the whole of the oil in a thin film—were exposed to the action of dry air free from carbon dioxide; after contact with the oil the air was passed through apparatus for the absorption of the water and carbon dioxide produced. The purified air being passed through the apparatus at the rate of 15 litres per day, it was found that after 74 days the weight of the oil had increased by 18·05 per cent.; the water and carbon dioxide generated amounted respectively to 14·55 and 5·21 per cent. of the original weight of the oil, but the latter figures include unknown (small) quantities of volatile organic matter emitted from the oil. Neglecting the error due to this cause, the total "oxygen" absorbed by the oil amounted to 37·80 per cent., the linseed oil (carbon 76, hydrogen 11, and oxygen 13 per cent.), thus having lost 1·87 per cent. of its carbon and 14·73 per cent. of its hydrogen.

—W. E. F. P.

Oil varnish; Examination and criticism of the method of McIlhiney for the analysis of ——. G. Bochand and P. Gillet. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **12**, 7—12.

As the result of examining varnish of known composition by the method of McIlhiney (this J., 1908, 866), the authors conclude that the constituents of varnish cannot be determined with sufficient precision by this means. It is pointed out, for example, that the degree of insolubility in petroleum ether of the hard gums after "running" varies with the temperature employed in the latter operation, those treated at the higher temperatures being dissolved to a considerable extent by this solvent; and that the method also fails in not revealing the nature of the gums or of the oils and volatile solvents present.

—W. E. F. P.

Wood turpentines; Analysis, refining, composition and properties of ——. L. F. Hawley. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **12**, 41—100.

As the result of an investigation made for the purpose of improving the conditions governing the production and utilisation of wood turpentine in the United States, an improved method of examination by distillation was developed; various samples of crude wood turpentine produced by different commercial processes were successfully refined; the influence of the methods of production, refining and storage upon the composition of wood turpentine was determined; and the compositions of wood- and "gum-" turpentines were compared. The method of examination adopted is a modification of that recommended in Circular 152 of the U.S. Forest Service; 500 grms. of the turpentine are placed in a round-bottomed flask, of about 1000 c.c. capacity, connected with a condenser by means of a Hempel column; the total height of the latter is 20 in., the middle portion (¾ in. in diameter) being filled with perforated glass beads for a length of 12 in.; the bulb of the thermometer extends to within 1 in. of the beads; a flat coil of wire is placed in the bottom of the flask to prevent "bumping"; the distillation is conducted at a maximum rate of 2 drops per second, the various fractions of the distillate being collected in weighed flasks. With the temperature of the distillation changing slowly and regularly, the fractions may be as large as 10 or 12 per cent. of the total weight, but should not exceed 4 or 5 per cent. if the temperature is changing rapidly; it is usually unnecessary to continue the distillation above 180° C. The weight and physical properties of each fraction being noted, the percentage weights of the combined fractions are calculated and plotted against the corresponding boiling points, specific gravities and refractive indices respectively, and the three curves are considered together in interpreting the results of the distillation. The refining of five different samples of crude wood turpentine was conducted in a specially designed apparatus of the continuous type. In the refining of crude wood turpentines produced at temperatures below 200° C., it was found that fractional distillation without chemical treatment was sufficient for the production of good grades of turpentine and pine oil; that the separation of light oils of lower boiling point than the turpentine was unnecessary; and that better separation of the turpentine from the pine oil was obtained in a column still than in an ordinary pot still. In the refining of crude wood turpentines produced at temperatures above 200° C., chemical treatment (with caustic soda) was necessary, before distillation, in order to produce a good grade of refined turpentine; the colour and odour of the latter product were much improved by the preliminary separation of the "light oils." Wood turpentines were found to differ from "gum" turpentines in containing notable amounts of dipentene and heavy oils; it was found that the proportions of these constituents (especially the former) increased with the temperatures of production of the crude wood turpentines, the amounts of dipentene contained in samples produced at 148° C., 195° C. and two successively higher temperatures being about 10, 15, 25 and 40 per cent. respectively. Specifications for gum turpentine based on the physical properties not being applicable to all classes of wood turpentine, owing to the presence of dipentene in the latter, the author states that some method of examination is necessary which will differentiate (1) between high boiling points due to dipentene and those due to heavy oils; (2) between low specific gravity due to dipentene and that due to adulteration; (3) between low boiling points due to incomplete separation of light oils and those due to the addition of substances not normally present in the crude material. The paper is accompanied by six illustrations, 48 sets of "analyses" and other curves, and an appendix, in which latter are given the reports received from manufacturers and others to whom samples of the wood turpentines were submitted for practical testing in paint and varnish making. (See also this J., 1911, 559.)—W. E. F. P.

Oleoresins: Examination of the ——, from several species of pine native to the Western States. A. W. Schorger. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **12**, 181—183.

(1) *Western yellow pine* (*P. ponderosa*) *from California.* The oleoresin (sp. gr. 1·0290 at 15° C.) contained 18·5 per cent. of volatile oil, 79·5 of rosin, 0·8 of "trash" and 1·2 of water. The volatile oil had the following properties: sp. gr. (15° C.) 0·8625; refractive index (15° C.) 1·4772; optical rotation $[\alpha]_D$ = —41·34°; about 70 per cent. distilled between 168° and 172° C. and consisted largely of β-pinene; α-pinene was isolated from the first fraction and limonene from the fraction boiling between 174° and 178·6° C. The rosin had the following properties: sp. gr. (15° C.) 1·068; acid value 148·8; saponification value 161·3; it distilled between 245° and 265° C. at 22 mm. pressure, and contained about 90 per cent. of abietic acid.

(2) *Western yellow pine* (*P. ponderosa scopulorum*) *from Arizona.* The oleoresin contained 19·6 per cent. of volatile oil, 75·0 of rosin, 3·8 of "trash," and 1·6 of water. The volatile oil had: sp. gr. (15° C.) 0·8639—0·8672; refractive index (15° C.) 1·4723—1·4729; optical rotation $[\alpha]_D$ = +36·96° to +37·44°; it contained 60—70 per cent. of α-pinene, about 5 of β-pinene and 20—25 of limonene. The rosin (optical rotation —88·93°) contained about 90 per cent. of abietic acid.

(3) *Digger pine* (*P. sabiniana*). The oleoresin contained 11·4 per cent. of volatile oil, 83·5 of rosin, 3·3 of "trash" and 1·8 of water; the sp. gr. (15° C.) was 1·0265. The volatile oil had: sp. gr. (15° C.) 0·6971; refractive index (15° C.) 1·3903; b.p. 96·1°—98·8° C. for the first 95 per cent.; the oil consisted almost entirely of normal heptane. The rosin had: sp. gr. (15° C.) 1·073; acid value 156·7; saponification value 176·5.

(4) *Sugar pine* (*P. lambertiana*). The oleoresin (sp. gr. 1·0420 at 15° C.) contained 16·4 per cent. of volatile oil, 75·3 of rosin, 3·4 of "trash" and 4·9 of water. The volatile oil had: sp. gr. (15° C.) 0·8658—0·8663; refractive index (15° C.) 1·4727—1·4728; optical rotation $[\alpha]_D$ = +29·93°; the oil boiled largely below 165° C. and contained approximately 70—75 per cent. of α-pinene, 5 of β-pinene, 2—3 of a terpene (apparently phellandrene), 2—3 of (apparently) an aliphatic hydrocarbon and 10—12 of a sesquiterpene agreeing closely with aromadendrene. The rosin had: sp. gr. (15° C.) 1·078; acid value 142·7; saponification value 152·6.

(5) *Lodgepole pine* (*P. contorta*). The oleoresin (sp. gr. 1·0210 at 15° C.) contained 14·7 per cent. of volatile oil, 77·7 of rosin, 2·5 of "trash" and 5·1 of water. The volatile oil had: sp. gr. (15° C.) 0·8518—0·8549; refractive index (15° C.) 1·4860—1·4862; optical rotation $[\alpha]_D$ = —57·81°; the oil consisted almost entirely of β-phellandrene. The rosin had: sp. gr. (15° C.) 1·061; acid value 131·2; saponification value 139·6; it contained about 80 per cent. of abietic acid.

(6) *Pinon pine* (*P. edulis*). The oleoresin (sp. gr. 1·0238 at 15° C.) contained 20·0 per cent. of volatile oil, 76·5 of rosin, 0·9 of "trash" and 2·6 of water. The volatile oil had: sp. gr. (15° C.) 0·8680; refractive index (15° C.) 1·4707; optical rotation $[\alpha]_D$ = +55·35°; it contained approximately 70—75 per cent. of α-pinene, 5 of β-pinene and 15—20 of *d*-cadinene. The rosin had: sp. gr. (15° C.) 1·060; acid value 155·2; saponification value 164·1; it distilled between 240° and 255° C. at 10 mm. pressure.—W. E. F. P.

Shellac analysis and the detection of small amounts of colophony in shellac. E. F. Hicks. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **12**, 115—121.

REFERRING to the Wijs-Langmuir iodine method for the determination of rosin in shellac (this J., 1905, 12), the author states that although by observing the precautions indicated by Langmuir and White (this J., 1911, 786) concordant results can be readily obtained, the latter are likely to be low and the method is also open to the objections that any other substance of high iodine value is counted as rosin and that the latter is not actually separated from the mixture. The process devised by McIlhiney (this J., 1908, 579) is recommended as being free from these objections, but since, in the author's experience, the petroleum ether employed in this process always dissolves about 1 (and sometimes as much as 2) per cent. of the resinous matter of pure shellac, the mere obtaining of a weighable residue at this stage is not absolute proof of the presence of rosin in the sample under examination. It is stated that by applying the Halphen colour reaction—in the manner already described by the author (this J., 1911, 373)—to the residue of the ethereal extract of the precipitated resin acids obtained in the McIlhiney process, it is possible to detect as little as 0·1 per cent. of rosin in a sample of shellac when 2 grms. of the latter are used for the analysis.—W. E. F. P.

Cobalt driers. V. P. Krauss. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **12**, 127—131.

THE compounds of cobalt employed for driers include the following:—*Resinate.* Prepared by saponifying rosin with sodium hydroxide or carbonate and precipitating with a solution of cobalt sulphate or chloride. The washed, pressed and dried precipitate is either ground or fused. *Oleate or linoleate.* The basis is generally linseed oil, although walnut, perilla, soya and other oils may be used. The oil is saponified and then precipitated with a salt of cobalt. When fused with varnish gums and dissolved in volatile oils, true linoleate of cobalt forms an excellent drier. *Tungate.* Prepared from tung oil in the same manner as the linoleate. Since this product oxidises very rapidly and the oxidised material is useless, great care is required in the preparation of this material. *Oleoresinate and resino-tungate.* Prepared by fusing together the precipitated resinate and linoleate or the resinate and tungate, sometimes with the addition of fused fossil gum resins. The above cobalt compounds are generally incorporated in oils, the latter being heated to between 300° and 500° F. with from "1—2 to 5 per cent." of the material. Liquid driers are obtained by melting the paste or solid driers alone or with gum resins and/or bodied linseed oil, and thinning the product with volatile oils. In all cases the cobalt should be present in the trivalent condition, the conversion from the cobaltous to the cobaltic state being effected in practice by blowing atmospheric or ozonised air through the hot drier stock, or by introducing liquid or solid oxidising agents into the latter. It is stated that the value of cobalt driers is not so much dependent upon their power to dry linseed oil as upon their ability to make the cheaper, semi-drying oils behave like linseed oil. Although the ultimate effect upon paint films has not yet been definitely ascertained.

the author is of opinion that the use of cobalt driers is not attended by the harmful, progressive, oxidising action exerted by some of the usual manganese-lead compounds.
—W. E. F. P.

Varnish manufacture; The technology of ——, *with notes on an improved scientific process.* J. C. Smith and G. de Pierres. Eighth Int. Cong. Appl. Chem., 1912. Sect. Ve., Orig. Comm., **12**, 185—191.

The authors have found that all the ordinary hard resins of commerce can be satisfactorily and economically treated by the method devised by Terrisse [heating with naphthalene under pressure (this J., 1904, 552)] to replace the process of "gum-running" by which the depolymerisation of the resins is usually effected, and have also investigated the composition of copal oil, the volatile product of gum-running. When distilled at normal pressure, copal oil yielded between 90° and 175° C., about 7·5 per cent. by volume of distillates of an acid character in which acetic acid predominated; between 175° and 250° C. about 20 per cent. by volume of a brownish-yellow oil of acid reaction and penetrating odour was obtained; from 250° C. the temperature rose rapidly to about 310° C. when about 20—25 per cent. by volume of a dark olive-green oil was produced; on standing, the latter separated into two layers, the upper consisting of a mixture of naphthalene or hydronaphthalene and polyterpenes, the lower being an aqueous solution of acetic acid. The undistilled residue (48—53 per cent. by volume) consisted of a fused, resinous mass. All the samples of copal oil examined yielded similar results, the only variation being in the proportion of undistilled residue obtained. It is pointed out that in the process of gum-running, not only is a part of the depolymerised (soluble) product lost by destructive distillation, but a further portion of this material is carried over by the terpene vapours during the process. In the manufacture of varnish by the autoclave process, it has been found advantageous to employ, instead of pure naphthalene, a mixture of the latter and the green oil above referred to; this oil acts as a powerful aid in bringing the hard resins into a soluble form, and is subsequently eliminated by the volatilisation of the naphthalene. The authors claim that the process of gum-running is not only unnecessary but indefensible, since the "acid," which the process is supposed to separate, is to a large extent produced by the destructive distillation of the resin itself; and since the depolymerisation of the hard gum (upon the completeness of which the solubility of the product depends) can be effected with greater precision and economy by means of the autoclave process.
—W. E. F. P.

Chlorides of carbon as solvents. I. Carbon tetrachloride. Baskerville and Riederer. *See* XII.

Herring oil. Lusskin. *See* XII.

Patents.

White lead; Method and apparatus for the manufacture of ——. F. H. Sharpe, Liverpool. Eng. Pat. 21,292, Sept. 27, 1911.

A sludge of lead oxide, basic acetate of lead and water is introduced into the first of a series of connected vessels preferably made in the form of inverted cones. A current of carbon dioxide is admitted into the bottom of this vessel and, after converting part of the lead oxide into white lead, passes through an outlet near the top into the second vessel. At the same time a large quantity of the sludge, containing the bulk of the white lead, is also carried over, and the process of conversion of the lead oxide in this sludge is continued in the second and succeeding vessels, the white lead being continually separated by levigation, until the final product is sufficiently pure to be saleable. The liquor from the white lead in the last vessel contains lead acetate, which is used again in the formation of fresh sludge. The flow of liquid through the apparatus and the pressure of the carbon dioxide are controlled by means of an adjustable valve.
—C. A. M.

Rust preventing paints; Process for the preparation of —— *from chromates.* H. Friedmann. Ger. Pat. 248,292, Dec. 11, 1910.

A chromate is heated with a drying oil, and the product is thinned by the addition of a further quantity of the drying oil, or oil of turpentine, etc., and mixed with other substances, such as tar or asphaltum, which also have a rust-preventing action.—A. S.

Varnish. L. H. Baekeland, Yonkers, Assignor to General Bakelite Co., New York. U.S. Pat. 1,037,719, Sept. 3, 1912.

The varnish consists of a condensation product of phenols and formaldehyde, which can be transformed by heat into an infusible body, and of a solvent containing a liquid oxygen compound of the aliphatic series (*e.g.*, acetone) and a cyclic hydrocarbon (*e.g.*, of the benzene series), with or without another soluble or miscible organic body.
—C. A. M.

Lead compounds [red lead], Process for the manufacture from metallic lead of ——. G. Jansen, Düsseldorf, Germany. Eng. Pat. 3728, Feb. 14, 1912. Under Int. Conv., March 4, 1911.

See Fr. Pat. 439,287 of 1912; this J., 1912, 732.—T. F. B.

Continuous kiln [for manufacture of mineral blue]. Addition to Fr. Pat. 439,652. *See* I.

Manufacture of "wood-stone," linoleum, artificial cork, etc. Fr. Pat. 442,075. *See* IX.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Patents.

Caoutchouc-like substance [from tar oils]; Process for preparing a ——. Ges. f. Teerverwertung m. b. H. Ger. Pat. 248,178, Nov. 21, 1911.

The most volatile fractions of the light oils obtained from coal tar and the corresponding fractions of coke-oven tar, boiling up to about 25° C., contain butadiene, cyclopentadiene, and hydrocarbons with triple linkages, as well as saturated hydrocarbons. These products, separated from the tar distillates by strongly cooling, *e.g.*, to —10° C., are converted into caoutchouc-like substances by treating them, after removal of the carbon bisulphide in the known manner, with a quantity of sodium more than sufficient to convert the acetylenic hydrocarbons into their sodium derivatives. *Example.* 100 parts of the distillate are allowed to stand in contact with two parts of sodium at the ordinary temperature; the sodium compound of the acetylenic hydrocarbons separates in the form of a solid precipitate, whilst the other hydrocarbons are polymerised, forming a gelatinous mass, from which the caoutchouc susbstance is isolated. The presence of a small quantity of ammonia is advantageous.—T. F. B.

Caoutchouc-masses obtained from solutions; Process for improving the properties of ——. P. Alexander. Ger. Pat. 249,802, Dec. 25, 1909.

In the recovery of caoutchouc from old or waste rubber, the product is obtained in the form of a solution or emulsion; by evaporating these to remove the solvent or emulsifying agent, with or without the aid of steam, the caoutchouc is obtained in a strongly depolymerised form, and is devoid of "nerve." In order to produce marketable rubber from the recovered product, it may be heated under pressure; similar products are obtained by heating the solutions or emulsions of the recovered rubber for a considerably longer time than is necessary for the removal of the greater portion of the solvent or emulsifying agent; this heating may also be carried out under pressure.—T. F. B.

Application of powdered lycopodium and tannin to impermeable [rubbered] fabrics. Fr. Pat. 441,740. *See* V.

Manufacture of beta-gamma dimethylerythren. Eng. Pat. 1557. *See* XX.

Process of producing erythrene. U.S. Pat. 1,038,359. *See* XX.

Making αγ-butadiene and its derivatives. Fr. Pat. 441,619. *See* XX.

XV.—LEATHER; BONE; HORN; GLUE.

Chrome kid; Dyeing and finishing ——. C. J. Howard. Leather World, 1912, 4, 682—683.

After chroming, shaving and sorting, the skins are neutralised by drumming in 12—15 gallons of water at 60° C., in which 1½ lb. of borax are dissolved for each 100 lb. of leather. After ½ hour the skins should be neutral to litmus paper. They are then washed for 20 minutes in warm water and mordanted with 1½ pints of sumac extract in 10—12 gallons of water at 60° C. for each 100 lb. of leather. The mordanting solution is run through the feed-pipe of the drum and the latter rotated for 20—30 minutes. The leather is then fat-liquored with either of the two following mixtures. (1) 1½ lb. of Castile soap, 1½ pints of neatsfoot oil, and ½ lb. of egg-yolk. The soap is dissolved in hot water, the oil and egg-yolk are added and well mixed and the whole made up to 12 gallons with water and boiled. (2) 1 lb. of olive oil soap, 1½ pints of castor oil, and ½ lb. of egg-yolk dissolved in the same way as (1). Each of the above is sufficient for 100 lb. of leather. After fat-liquoring, the skins are dyed, acid dyes being used for light shades and basic or acid dyes for dark shades. If basic dyes are used, the leather must be dyed immediately after mordanting, and then fat-liquored after dyeing. The proper weight of dyestuff for 100 lb. of leather is dissolved and made up to 12 gallons. When the drum is running, the dye solution is run in at 140° F. (60° C.). After running for 20—25 minutes, ¼ lb. of sodium bisulphate is dissolved and run in. After 10 minutes the skins are well washed in warm water, "horsed up" to drain, struck out and treated with glycerin (1 part to 6 parts of water), "sammed," lightly set out and dried. Skins for black should be treated in the mordanting solution with ½ lb. of hæmatin per 100 lb. of leather, and more common oils such as cod or sperm oil may be used in the fat-liquoring. A suitable mixture of dyes for producing a black consists of Nerazine G 4½ oz. and Chrome Leather Black 4 oz. per 100 lb. of leather. The skins are allowed to lie 4 or 5 days after drying and then damped back in sawdust and staked, aired off in the stove and staked again. They are then seasoned with 2 oz. of egg albumin, 1 oz. of blood albumin, 1½ oz. of orange shellac, 2 oz. of methylated spirit and ½ oz. of borax in 2 gallons of water. The albumin is dissolved in warm water, the shellac and borax in boiling water to which the methylated spirit is added and about 2 oz. of glycerin and a little of the dye with which the skins were dyed. The skins are lightly cleared with lactic or oxalic acid before seasoning and glazed after seasoning; they are then seasoned again and glazed. For blacks, defibrinated dry blood may be used in place of albumin, and a little green is added if necessary to the dye used in the mordanting.—D. J. L.

Patents.

Tanning drums and the like. Herrenschmidt und Co., Strassburg, Germany. Eng. Pat. 12,867, May 31, 1912. Under Int. Conv., June 6, 1911.

The free ends of the arms of the crosses fixed on the ends of the drum, and to which are attached the pivots on which it revolves, catch over the edges of the body of the drum and thereby secure the same.—D. J. L.

Skins; Treatment of ——. R. Ribot, Paris. Eng. Pat. 5214, March 1, 1912. Addition to Eng. Pat. 5117 of 1912, dated March 4, 1911.

See Fr. Pat. 442,062 of 1912; this J., 1912, 890.—T. F. B.

XVI.—SOILS; FERTILISERS.

Soils; Acidity of ——. A. Grégoire, J. Hendrick, E. Carpiaux, and E. Germain. Bull. Soc. Chim. Belg., 1912, **26**, 336—342, 362—375, 386—409.

Emphasis is laid on the great importance of lime in the soil and the manner in which it acts, both indirectly in keeping the colloidal constituents in a state of flocculation and preserving the texture of the soil, and directly in keeping the soil alkaline, so that micro-organisms may flourish in it. A summary is given of the agricultural chemical methods of determining lime and free acid in soils. There does not appear to be any relation between the utilisation of lime by plants and the quantity of this element extracted by the various solvents used in agricultural analysis. A new method of determining the acidity of soils is based on Kjeldahl's iodometric method of titrating weak organic acids with a solution of potassium iodide and potassium iodate. The solution used contains 55·3 grms. of potassium iodide, 14·3 grms. of potassium iodate, and 99·2 grms. of sodium thiosulphate per litre. Ten grms. of soil are digested with 15 c.c. of this solution for 24 hours and the absorption of iodine measured. Certain mineral constituents of the soil also react with this solution as well as the organic acids, thus ammonium iron sulphate, aluminium sulphate and chloride, and potash alum are all indicated as acid. To determine organic carbon in soils, the method adopted consists in burning the substance in a stream of oxygen, absorbing the carbon dioxide in barium hydroxide, collecting the barium carbonate on a filter, and determining the carbon dioxide in it gasometrically. The application of these methods to a number of soils is described, determinations being made of the reaction to litmus, the lime soluble in 10 per cent. ammonium chloride solution, the amount of carbon dioxide, the organic carbon, and the acidity. There is in general a relation between the reaction of the soil and the other factors measured, but there are in all cases many exceptions. The closest correlation is that between the reaction and the acidity as measured by Kjeldahl's solution.—E. F. A.

Soils; Chemistry of steam heated ——. O. Schreiner and E. C. Lathrop. J. Amer. Chem. Soc., 1912, **34**, 1242—1259.

The changes which take place when soils are heated by steam under pressure as in the process of sterilisation may be summarised as follows: The water-soluble constituents increase, as also does the acidity, even though ammonia and amines are formed at the same time. There is an increase in nearly all the organic compounds which have been isolated from unheated soil with the exception of nucleic acid. A number of compounds beneficial to plant growth are formed by the decomposition of nucleic acid and protein material, viz., xanthine, hypoxanthine, guanine, cytosine, and arginine. Harmful substances such as dihydroxystearic acid are produced during the heating. Cultural tests both in the soils and their extracts showed that the heated soils gave a poorer plant growth, indicating that the harmful compounds formed have the greater effect: until these are eliminated the full beneficial effects of heating cannot be shown. Soil fertility on the other hand is the resultant of the balance of beneficial and harmful factors: it may be influenced by cultural treatment, etc.—E. F. A.

Soil; Guanine from a heated ——. E. C. Lathrop. J. Amer. Chem. Soc., 1912, **34**, 1260—1263.

Guanine was not present in the unheated soil, but after heating for 3 hours in an autoclave at 30 lb. steam pressure, guanine could be identified. It probably arises in the heated soil from the breaking down of higher forms of nitrogenous material, probably nucleic acids. Guanine is rapidly changed by micro-organisms and enzymes into xanthine, etc., and therefore does not remain in the soil long.—E. F. A.

Manganese in soils ; Determination of total ——. R. A. Gortner and C. O. Rost. J. Ind. Eng. Chem., 1912, **4**, 522—524.

The method proposed by Walters (Chem. News, 1901, **84**, 239) for the determination of manganese in steel, etc., by oxidation to permanganic acid with ammonium persulphate, has been adopted by Hillebrand (U.S. Geolog. Survey, Bull. 422, 116) for the determination of manganese in rocks. The author finds that when applied to soils, the method does not give concordant results (compare Brinton, this J., 1911, 574), the manganese being incompletely extracted by the mixture of hydrofluoric and sulphuric acids used, unless three or sometimes four successive extractions are made. The following method, in which the oxidation of the manganese is effected with sodium bismuthate, is recommended. One gram of the soil is fused in a platinum crucible with 4 grms. of dry sodium carbonate, and the melt is treated with 100 c.c. of water in a large platinum or porcelain dish. The mixture is acidified with 130 c.c. of 35 per cent. (by weight) sulphuric acid, and diluted to 250 c.c. After filtering, if necessary, 100 c.c. of the solution are treated with from 0·25 to 1 grm. of sodium bismuthate (according to the quantity of manganese present), heated to boiling, and boiled until the characteristic permanganate colour is properly developed. The solution is then cooled and the colour compared with that of a standard prepared by reducing a solution of potassium permanganate in 20 per cent. sulphuric acid by addition of sulphurous acid, and then re-oxidising with bismuthate: the standard should contain about 0·2 mgrm. of manganese oxide (MnO) per 10 c.c.—A. S.

Soil phosphates ; Effect of ignition on the solubility of ——. C. B. Lipman. J. Ind. Eng. Chem., 1912, **4**, 663—664.

Fraps (this J., 1911, 700) has shown that by igniting phosphate minerals, such as wavellite, dufrenite, and variscite, for 10 minutes at a low red heat, the solubility of the phosphoric acid contained in them in $N/5$ nitric acid was increased about ten times, whilst it was rendered almost completely soluble in 12 per cent. hydrochloric acid. The author points out, however, that deductions from the results of laboratory tests with pure minerals, solutions, etc., cannot be applied directly to soils, and he describes experiments with soils of widely varying characters showing that when they are ignited, the solubility of the phosphates contained therein is appreciably diminished.—A. S.

Thomas-slag ; Determination of the citric-acid-soluble phosphoric acid in ——. W. Fuchs and P. Wagner. Chem.-Zeit., 1912, **36**, 1037—1039.

Five grms. of the slag are shaken for 30 minutes with 500 c.c. of a 2 per cent. solution of citric acid in an apparatus making 30 to 40 revolutions per minute. To 50 c.c. of the solution are added 10 c.c. of a 0·3 per cent. solution of hydrogen peroxide and 25 c.c. of a specially prepared ammonium citrate solution. The solution is then stirred mechanically, the temperature being maintained at 15° to 18° C., and 25 c.c. of magnesia-mixture are added. After being stirred for 30 minutes the solution is ready to be filtered. *Preparation of the ammonium citrate solution.* 2 kilos. of citric acid, and 100 c.c. of a solution of ferric chloride containing 12 grms. of iron, are placed in a 10-litre flask, and about 8 litres of 20 per cent. ammonia solution carefully and slowly added. When solution is complete and the liquid has cooled, the bulk is made up to 10 litres with the ammonia solution. *Preparation of the magnesia mixture.* 110 grms. of pure crystallised magnesium chloride and 140 grms. of ammonium chloride are dissolved in 1300 c.c. of water, and then 700 c.c. of an 8 per cent. ammonia solution are added. The solution is filtered after standing several days. The presence of the iron in the ammonium citrate solution makes it possible to make the "direct" determination with slags rich in silica, which, in the absence of the iron, would yield impure precipitates. The results agree very closely with those obtained by methods in which silica is separated. Several methods are discussed, and the results of a considerable number of comparative determinations are given.—T. St.

Soils ; Experiments with re-inoculation of steamed ——. T. L. Lyon and J. A. Bizzell. Eighth Int. Cong. Appl. Chem., 1912. Sect. VII., Orig. Comm., **15**, 159—178.

Soils, sterilised by means of steam under pressure, were inoculated with fresh soil and with heated soil, and the mixtures and also the uninoculated steamed soil allowed to stand for different periods before analysis. In all cases the water-soluble matter decreased on standing. At first the decrease was most rapid in the soil inoculated with fresh soil, but after six months this sample contained most soluble matter. Nitrate-reducing organisms are apparently an important factor in determining the quantities of nitrates formed. Inoculation does not apparently introduce organisms which lessen ammonia formation. Plants grown on these soils made a better growth at first on the soil inoculated with fresh soil, but did not continue at the same rate. The luxuriance of growth is apparently a function of the rate of disappearance of the soluble matter in the soil. The experiments show considerable variation when repeated with different soils. The difference in productiveness is not a matter of available nutrients, but depends on the nature of the toxic matter formed in the soils when steamed. The condition of the organic matter before steaming influences the toxicity of the steamed soil. The rapidity of oxidation in the soil does not always indicate the rate at which toxicity disappears, although aeration of the steamed soil and the growth of plants in it both cause a decrease in toxicity.—E. F. A.

Soil solution ; Concentration of the ——. F. K. Cameron. Eighth Int. Cong. Appl. Chem., 1912. Sect. VII., Orig. Comm., **15**, 43—48. (See this J., 1910, 774.)

A re-statement of the fundamental principles involved in solubility as applied to soil solutions. The composition of the soil solution is determined by the nature of the solids and the gas with which it is in contact and by the temperature. The moisture is all in the form of film moisture, thus introducing the complication of surface effects. The amount of dissolved carbon dioxide, a factor which is continually changing, is very potent in modifying the solvent action of the soil water. The solubility of a solid component of the soil is affected by the presence of other substances; the state of division of the solid also affects the solubility. Solid solutions and surface absorption also introduce complications. However, under any given climatic conditions, the concentration of the soil solution with respect to those constituents derived from the soil minerals varies within narrow limits. Marked differences are occasioned by differences in climate.—E. F. A.

Cyanamide ; Increase of the fertilising action of —— *by the addition of iron oxide.* A. Stutzer. Eighth Int. Cong. Appl. Chem., 1912. Sect. VII., Orig. Comm., **15**, 301—304. (Compare this J., 1911, 638.)

Plants can only make use of cyanamide after it is converted into ammonia; urea is an intermediate product of this reaction. The addition of molasses to the powdered calcium cyanamide (this J., 1910, 1263) favours the assimilation of the available nitrogen. The reaction is still more favoured by the addition of iron oxide, powdered bog ore being the cheapest material to use. Practical trials are quoted showing the increased yields resulting from the admixture of 50 kilos. of bog ore with the quantity of calcium cyanamide (*e.g.* 200 kilos.) intended for 1 hectare (about 2½ acres).—E. F. A.

Fertilisers ; Use of ground rocks and ground minerals as ——. W. O. Robinson and W. H. Fry. Eighth Int. Cong. Appl. Chem., 1912. Sect. VII., Orig. Comm., **15**, 215—216.

FIELD and pot experiments show that ground orthoclase and potash mica are not efficient potash fertilisers. American soils already contain much more of these materials than can be added economically. It is concluded that ground minerals can have no value as commercial fertilisers.—E. F. A.

Phosphates ; Conservation of —— in the urine. P. E. Browning. Eighth Int. Cong. Appl. Chem., 1912. Sect. VII., Orig. Comm., **15**, 41.

WHEN urine is brought in contact with calcium hydroxide, the phosphates present unite readily with it to form calcium phosphate. This is rapidly effected by agitating urine with lime or filtering it through a layer of lime. This reaction is suggested as a possible future source of phosphatic fertiliser.—E. F. A.

Zinc ; Use of —— as a catalytic fertiliser. M. M. Javillier. Eighth Int. Cong. Appl. Chem., 1912. Sect. VII., Orig. Comm., **15**, 145—146.

THE addition of zinc sulphate to the soil as a fertiliser under practical conditions has given very variable results. Uniformly positive results were obtained with maize ; with other crops indefinite or even adverse results were obtained. It is evident that the amount of zinc added must be very small and that the effect produced varies according to the nature of the plant grown, the composition of the soil, and the character of the other fertilisers used. Under laboratory conditions (see this J., 1912, 247) in the case of *Aspergillus niger*, zinc is shown to have a considerable effect on the formation of enzymes and on the utilisation by the mould of carbohydrate, nitrogenous and mineral nutrients, as well as on its elementary composition. The effect is still traceable in a dilution of 1 in 500,000. It is thus important to determine the effect of zinc as a complementary manure.—E. F. A.

Rational analysis of sodium nitrate. Allen. *See* VII.

PATENTS.

Phosphorites or phosphate rock ; Treatment of —— to render the same suitable for fertilising purposes. H. V. Dunham, Bainbridge, N.Y., U.S.A. Eng. Pat. 19,044, Aug. 24, 1911.

FINELY ground phosphate rock is mixed with a "converting salt," such as sodium carbonate or sodium sulphate, a "non-flux," such as alumina prepared from bauxite or clay, and a considerable amount of water, the mixture being then calcined at a white heat, cooled, and ground to a fine powder. The object of the alumina is to enable a higher temperature to be used without danger of fusing, and with consequent increased conversion of natural phosphate into the "soluble" condition.—O. R.

Fertilisers ; Process of making ——. L. Saarbach, New York. U.S. Pat. 1,036,909, Aug. 27, 1912.

MINERALS containing calcium phosphate and calcium carbonate are treated with "nitrogen oxide" in the presence of moisture.—O. R.

Ammonium superphosphate ; New process of manufacture of ——. H. Lemaire and G. de Geyter. Fr. Pat. 442,092, March 20, 1912.

THE mixture of calcium superphosphate and ammonium sulphate, used for the manufacture of ammonium superphosphate, is ground in a powerful mill and then immediately compressed into solid blocks which preserve their individuality without adhering together in a mass. This grinding and compression accelerate the desired reactions and reduce the time required for them from about six months to three or four days. Blocks or briquettes obtained by this process of powerful compression immediately following grinding possess the economic advantage of being fit for pulverisation without risk of partial re-setting to a mass.—W. C. H.

Fertiliser ; Artificial ——. P. Hirschberger. Fr. Pat. 441,542, Jan. 31, 1912.

PHONOLITE, felspar, leucite, micaceous rocks, or mixtures of these minerals, are mixed with calcareous materials in varying proportions, and the potash extracted by electrical or other means.—W. C. H.

Superphosphate chamber. H. P. C. Freudenthal, Hamburg, Germany. U.S. Pat. 1,037,464, Sept. 3, 1912.

SEE Fr. Pat. 422,875 of 1910 ; this J., 1911, 701.—T. F. B.

Process of granulating calcium nitrate. Fr. Pat. 442,514. *See* VII.

XVII.—SUGARS ; STARCHES ; GUMS.

Purity ; Apparent and true —— [of beet sugar factory products]. J. Weisberg. Bull. Assoc. Chim. Sucr., 1912, **30**, 33—36.

IN order to ascertain the true quotient of purity of beet sugar factory products more rapidly than by the usual method involving the determination of the dry substance by desiccation, the author has proposed the use of a table of factors by which the apparent quotient of purity, found from the determination of the dry substance by the Brix reading, is multiplied. He now draws attention to some results given in three recent papers, in which the accuracy of his factor is confirmed. Saillard and Wehrung's values (Circ. hebd. Syndic. Fabr. Sucre, France, No. 1215) for the true quotient of purity of second jet massecuites, centrifugal syrups, and molasses especially demonstrate this, some of the figures for (*a*) the true purity actually found by desiccation and polarisation, and (*b*) the true quotient calculated by the author's factors, being as follows : Second jet massecuites, (*a*) 76·6, (*b*) 76·9 ; (*a*) 73·3, (*b*) 73·6 ; (*a*) 69·3, (*b*) 69·5. Centrifugal syrups, (*a*) 71·1, (*b*) 71·4 ; (*a*) 66·9, (*b*) 67·0. Molasses, (*a*) 63·1, (*b*) 63·7 ; (*a*) 63·8, (*b*) 64·1. Provided that clarification during manufacture has been well conducted, and the instructions given by the author for determining the apparent quotient of purity (Bull. Assoc. Chim. Sucr., 1910, **28**, 1145) are followed, the table of factors can always be advantageously applied, either directly, or after making a slight alteration occasioned by local conditions, after verification by means of carefully executed desiccation determinations.—J. P. O.

Sodium hydrosulphite ; Experiments on the use of —— in the sugar refinery. L. Nowakowski. Deutsche Zuckerind., 1912, **37**, 752—753. (Cf. also this J., 1911, 823 and 1465.)

EXPERIMENTS were made by the author in a Russian refinery using 0·006 per cent. of sodium hydrosulphite, this being added to the pan just before graining. On comparing the treated and untreated massecuite, sugar, and centrifugal syrup, no increase whatever in the reducing sugar content could be detected, showing clearly that sodium hydrosulphite under the conditions employed does not cause any inversion. In spite of the decolourisation of the massecuite by the hydrosulphite, the greatest economy that could be effected in the use of the covering liquor during machining was only 3·45 per cent. According to the author, the effect of sodium hydrosulphite at its best is shown in the case of the green syrups, which, it is stated, may consequently be directly worked to massecuite without the customary repeated filtration over animal charcoal.—J. P. O.

Iron ; Remarks on the determination of traces of —— in sugar factory products. H. Pellet. Intern. Sugar J., 1912, **14**, 525—527. (See this J., 1912, 831.)

IN the case of dark liquors the author uses a modification of Weil's volumetric stannous chloride process. After dissolving the ash in hydrochloric acid, the resulting solution is oxidised with potassium chlorate, and a slight excess of ammonia added. If the liquid contains no copper, as indicated by the absence of any bluish or bluish-green colour, it is acidified with hydrochloric acid, concentrated, and the yellow liquid contained in a test-tube titrated with a standard solution of stannous chloride, the addition being continued until exact decolourisation takes place. When the ammoniacal liquid is bluish, and copper is therefore present, the silica, iron and alumina, etc., are filtered off through a 2 cm. paper, re-dissolved in hydrochloric acid, concentrated, and titrated with standard stannous chloride solution. It is pointed out that it is of importance to consider the condition, whether soluble or insoluble, in which iron occurs in the different products; and that the iron in sugars may originate, not only from the rust of the tanks and pipes, but also from soil adhering to the canes, and from the action of very acid juices upon the metal of the mill rollers.—J. P. O.

Maltose; Hydrolysis of —— by dilute acids. W. Kopaczewski. Bull. Soc. Chim., 1912, **11**, 850—853. (See also this J., 1912, 893.)

The relative hydrolytic acid action of hydrochloric, sulphuric, and nitric acids on maltose is dependent on their electrolytic dissociation; at a temperature of 40° C., hydrolysis commences to proceed rapidly when the concentration of the acid is $N/4$, and upwards. The hydrolysis is also proportional to the temperature, about twice as much of the sugar being hydrolysed at 80° C. as at 40° C. Further, the concentration of the maltose solution influences the rate of hydrolysis, the greater the concentration the more rapid the hydrolysis; for instance, hydrochloric acid ($N/10$) in 14 hours hydrolysed a 2 per cent. maltose solution to the extent of 12·2 per cent. of the quantity of sugar present and under the same conditions a 50 per cent. maltose solution was hydrolysed to the extent of 24·7 per cent. The influence of the concentration of the maltose solution is particularly marked in the case of hydrolysis with sulphuric acid. The following percentage quantities of maltose were hydrolysed by the different acids under conditions most favourable to the hydrolysis (maltose solution, 50 per cent.; strength of acid, $N/2$; temperature, 80° C.; time, 14 hours): hydrochloric acid, 85·6; sulphuric acid, 72·3; nitric acid, 68·5.—W. P. S.

Honey; Examination of some important methods for the analysis of ——. J. Fiehe and P. Stegmüller. Arbb. Kais. Gesundh.-Amt, 1912, **40**, 305—356. Chem. Zentr., 1912, **2**, 959—960.

For the exact determination of the dried residue of honey, the gravimetric method alone should be used, the temperature being kept below 100° C. A special apparatus is described in the original paper, by means of which samples can be dried at 65°—70° C. in a current of air in a partial vacuum. Indirect determinations from the density of solutions of honey, with the help of Windisch's sucrose table, give approximate results, but the table of Halenke and Möslinger is not to be recommended. In determining the free acids, sensitive blue-violet litmus paper should be used, and the results are best expressed in c.c. of $N/1$ alkali required, since the presence of formic acid in honey has not been proved beyond doubt. With the determination of the alkalinity of the ash can conveniently be coupled a simple acidimetric titration of the phosphates present, which appears useful in forming a judgment respecting samples of honey. It is recommended that the "alkalinity of the ash" should indicate the quantity of alkali found by titration in presence of methyl orange, after the pyrophosphates have been hydrolysed by heating on a water-bath with dilute hydrochloric acid in a covered flask. After cooling, the titration is carried out with $N/10$ alkali until a neutral tint is shown by methyl orange. The liquid is then treated with 2 c.c. of a neutral 10 per cent. solution of calcium chloride and 4—5 drops of phenolphthalein, and is further titrated until a permanent red colour begins to appear. Sucrose in honey should be determined gravimetrically, since the polarimetric method gives only approximate results. Ley's test for added invert sugar is untrustworthy (see this J., 1910, 1072; 1911, 43). Fiehe's resorcinol reaction (see this J., 1908, 1127; 1912, 598), coupled wth a test for enzymes, has been found very useful, a positive result with both of these indicating the presence of added invert sugar. A positive resorcinol test and a negative enzyme test indicates either that invert sugar has been added, or that the honey has been over-heated and spoiled; in the latter case the appearance of the sample affords confirmation. Fiehe's test for added starch syrup and starch sugar (this J., 1910, 106) is simple and trustworthy. The enzyme test indicates with certainty whether a sample has been heated above 85° C. For this test freshly prepared solutions of the sample are treated with soluble starch, kept for 5 mins. at 40° C., and then tested with iodine. The determination of precipitable proteins by Lund's method (see this J., 1911, 565) possesses no significance as a means of judging samples of honey.—J. H. L.

Sugar cane juice; Objectionable nitrogenous compounds in ——. F. Zerban. Eighth Int. Cong. Appl. Chem., 1912. Sect. Va, Orig. Comm., **8**, 103—111.

Recently the question of the so-called "objectionable nitrogenous compounds" of the sugar beet has attracted much attention (cf. this J., 1905, 808; 1906, 673; 1910, 1122; and 1911, 701); but in the case of the sugar cane very little work has been done on the nature of these constituents and the extent to which they are present. Juice from mature cane was neutralised with sodium hydroxide, defecated with a slight excess of normal lead acetate, filtered, and treated with mercuric nitrate or acetate. The precipitate thus obtained was washed, the mercury separated from it by treatment with hydrogen sulphide, the resulting liquid neutralised with ammonia, and concentrated *in vacuo* to crystallising point. In order to purify the crystals, they were washed with 50 per cent. alcohol, re-crystallised three times from water, and finally washed with 95 per cent. alcohol and ether. Elementary analysis of the crystalline substance, and other suitable tests, showed it to be asparagine. On concentrating the mother-liquor, a further crop of crystals was obtained, these consisting of needles interspersed with prisms. These prisms were separated mechanically, and found to consist entirely of asparagine; while the needles after purification were identified as a mixture of glutamine and tyrosine. In the opinion of the author these amino-acids and acid amides should undoubtedly be classed as "objectionable nitrogenous compounds," and as molasses-formers in the light of Prinsen Geerligs' theory of molasses production.—J. P. O.

Sugar juices; Incomplete precipitation of the combined lime of —— by sodium carbonate. I. de Grobert. Eighth Int. Cong. Appl. Chem., 1912. Sect. Va, Orig. Comm., **8**, 21—24.

To eliminate the calcium salts from sugar juices and syrups, sodium carbonate is sometimes added, the resulting sodium salts remaining in solution being less unfavourable to crystallisation. When this is done, it has been noticed by the author that the sodium carbonate added does not precipitate its equivalent amount of lime, a considerable quantity remaining in solution unchanged. This sodium carbonate remaining in solution is not in the free state (since the alkalinity is not increased in proportion to the amount added), but has been used to decompose part of the organic non-sugars, notably the amides, that are capable of yielding acid products by the action of alkali carbonates. Experiments now made indicate that when sodium carbonate is added to a syrup (a) in the theoretical amount necessary to precipitate the total lime in solution, and (b) in twice the theoretical amount, it is accounted for in the following way: that used in precipitating the lime (a) 52, (b) 40; that remaining free, (a) 18, (b) 38; and that used in neutralising the organic non-sugars, (a) 30, (b) 22 per cent. These experiments prove that in practice sodium carbonate must be added to the syrups with care, and that the theoretical amount to precipitate all the lime present is the quantity giving the best results.—J. P. O.

Sucrose; Inversion of —— by means of ammonium chloride [in the double polarisation method]. F. Strohmer and O. Fallada. Eighth Int. Cong. Appl. Chem., 1912. Sect. Va, Orig. Comm., 8. 85—92.

It has been pointed out that in the double polarisation method of determining sucrose, an error is introduced by taking the direct reading in an alkaline or neutral solution and the inversion reading in an acid solution, owing to the difference in the rotation of the optically-active non-sugar substances (cf. this J., 1911, 62; and 1912, 244). Attempts to effect inversion by means of ammonium chloride proved unsatisfactory, but some preliminary experiments indicate that it may be possible to take the direct reading in a solution containing ammonium chloride, to invert with hydrochloric acid in the usual way, and finally to neutralise with ammonia, both readings being made under the same conditions of ammonium chloride concentration.—J. P. O.

Sugar solutions; Action of disinfectants on ——. G. P. Meade. Eighth Int. Cong. Appl. Chem., 1912. Sect. Va. Orig. Comm., 8. 33—45.

With the object of determining the relative value of different substances for preserving sugar juices and syrups in the factory, laboratory experiments were made with ammonium fluoride, chloride of lime, formalin, and a cresol preparation. Satisfactory results were obtained only in the case of ammonium fluoride, using 1 part to 1000 parts of a 30 per cent. solution of sucrose containing peptone. No change whatever occurred in the polarisation until after 3 days' incubation at 38° C. With chloride of lime, formalin, and the cresol preservative, in proportions varying from 1 : 200 to 1 : 100,000 of sugar solution, at 30°—33° C., the results were unsatisfactory, these substances apparently increasing the rate of decomposition. In fact, it was shown in other experiments that in the case of pure cultures of yeast and gum-forming bacteria, chloride of lime stimulates the growth of the organism.—J. P. O.

Composition of fusel oil from beet molasses. Boswell and Gooderham. *See* XVIII.

Patents.

Clarification [of sugar cane juice]; System of ——. C. Rumpf, Napoleonville, La. U.S. Pat. 1,037,798, Sept. 3, 1912.

The apparatus consists of a series of drums with "staggered" connecting pieces. The ends of the drums are closed by diaphragms, through which pass tubes for the passage of the juice; the tubes of adjacent drums are connected by curved pieces, funnel-shaped at the ends. A steam pipe opens into the shell of the first drum, whilst the shell of the last drum of the series has a pipe for the discharge of condensed water.—A. S.

Starch and starch materials; Art of treating ——, and product. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,829, Aug. 20, 1912.

The material, consisting entirely or mainly of starch, in the form of powder or small lumps, and containing some moisture, is heated in a closed vessel to such a temperature that partial gelatinisation occurs, and is subjected to a continuous tumbling motion, until the gelatinised particles have gathered up the loose material into pebble-like lumps.—J. H. L.

Starch materials, flours and flour product; Art of treating ——. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,830, Aug. 20, 1912.

The process described in the preceding abstract is applied to moistened starch-containing flour, containing about 20—40 per cent. of moisture.—J. H. L.

Starch pellets, pebbles or nodules and process of making same. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,831, Aug. 20, 1912.

Finely divided starch, containing about 35—40 per cent. of moisture, is heated and tumbled in a closed vessel until gelatinised particles are formed which gather up the loose material into lumps, and the heating and tumbling are continued until practically complete gelatinisation has occurred. The pressure is afterwards slowly released and the product reduced to a substantially air-dry state. —J. H. L.

Starch; Art of treating and drying ——. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,832, Aug. 20, 1912.

Wet starch is heated and tumbled as described in the preceding abstract, and afterwards reduced to an air-dry state by continuing the heating and reducing the pressure in the vessel to less than 1 atm.—J. H. L.

Starch-pebbles; Art of making ——. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,833, Aug. 20, 1912.

Wet starch is heated in a partial vacuum, at a temperature below that of gelatinisation, until dried to the desired extent. After cleaning, if necessary, it is heated and tumbled in a closed vessel, at a temperature sufficiently high to gelatinise it slightly, until it has practically all formed into pebble-like lumps. The pressure within the vessel is then slowly reduced.—J. H. L.

Starch; Art of treating ——. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,834, Aug. 20, 1912.

Starch containing about 40 per cent. of moisture is converted into practically completely gelatinised pebble-like lumps, by heating and tumbling in a closed vessel. The pressure within the vessel is afterwards reduced to bring the lumps to an air-dry condition, and they are then suddenly heated (*e.g.*, to 200°—400° C.) whereby they become puffed.—J. H. L.

Starch materials; Art of treating ——. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,835, Aug. 20, 1912.

Lumps or grains of starch or starchy material (cereal grains) are puffed by confining them in a closed vessel, injecting steam under pressure into the vessel so as to produce an internal pressure within the lumps or grains, and then suddenly reducing the pressure.—J. H. L.

Starch-containing flours; Art of puffing ——. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,836, Aug. 20, 1912.

The moist material is converted into pebbles by heating and tumbling in a closed receptacle. Superheated steam is then injected into the vessel to increase the pressure within the pebbles, and afterwards the steam pressure is suddenly reduced.—J. H. L.

Starch; Art of treating ——, and product. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,837, Aug. 20, 1912.

The finely divided material, containing about 15—25 per cent. of moisture, is converted into pebbles by heating and tumbling in a closed receptacle. The pressure within the receptacle (which may amount to 30—50 lb. per sq. in.) is afterwards slowly reduced, superheated steam is admitted until the pressure has again risen to about 130 lb. per sq. in., and then the starch-pebbles are puffed by suddenly reducing the pressure.—J. H. L.

Cereal grains; Art of treating ——, and a product thereby obtained. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,838, Aug. 20, 1912.

Air-dry cereal grains (*e.g.*, rice) are enclosed and agitated in an air-tight receptacle, the interior of which is heated sufficiently to drive out moisture from the grains and convert it into steam. The temperature within the receptacle being higher than that of the grains, the steam condenses on the latter, and gelatinises the peripheral layers of starch. The horny layer thus formed may be thickened by injecting superheated steam into the receptacle and afterwards reducing the pressure. In this way cereal grains of substantially natural size are produced, having an artificially gelatinised outer layer resistant to the escape of fluid under pressure from the interior of the grain.—J. H. L.

Cereal grains ; Art of treating and drying ——. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,839, Aug. 20, 1912.

Cereal grains, approximately saturated with moisture, are kept in motion in an air-tight heated receptacle, until a pressure (*e.g.*, of 10—55 lb. per sq. in.) develops owing to the steam produced from the moisture of the grain. The grains are then dried to any desired extent by reducing the pressure.—J. H. L.

Starch-containing material ; Apparatus for puffing ——. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,840, Aug. 20, 1912.

The apparatus comprises a movable drum, mounted on a support, and provided with a lid which can be tightly clamped to the drum and suddenly opened when the drum is in a certain position.—J. H. L.

Starch materials ; Apparatus for the treatment of ——. A. P. Anderson, Chicago, Ill. U.S. Pat. 1,035,842, Aug. 20, 1912.

A drum, mounted for rotation, contains two sets of projections inside by which large masses of material are broken up. One set of projections is movable with the drum, whilst the other can be kept stationary or moved from outside, independently of the motion of the drum. —J. H. L.

Sugar ; Process of manufacturing ——. Guanica Centrale. Fr. Pat. 441,912, Mar. 29, 1912. Under Int. Conv., May 15, 1911.

From 50 to 60 per cent. of the juice is extracted from sugar canes, the residue of the canes is then dried, treated with formaldehyde or other preservative, and the residual sugar is extracted subsequently. (See also this J., 1912, 740.)—W. P. S.

Starch ; Apparatus for the continuous conversion of —— into glucose and other derivatives. S. M. Lillie, Philadelphia, Pa. U.S. Pat. 1,038,397, Sept. 10, 1912.

A float is disposed in the liquor in the converting vessel and carries two perforated plates, one just below and the other just above the surface of the liquor. The fresh starch liquor is introduced into the upper part of the converting vessel, and, falling on the upper perforated plate, is distributed over the whole surface of the liquor in the vessel.—A. S.

Betaine hydrochloride from vinasse, molasses, or other by-product in the manufacture of sugar ; Process for the manufacture of ——. H. Stoltzenberg, Berlin. Eng. Pat. 11,354, May 13, 1912. Under Int. Conv., May 16, 1911.

See Ger. Pat. 243,332 of 1911 ; this J., 1912, 353.—T. F. B.

Nitration of sugars, and explosives. Eng. Pat. 17,221. See XXII.

XVIII.—FERMENTATION INDUSTRIES.

Yeast ; New glucolytic ferment of ——. V. Birckner. J. Amer. Chem. Soc., 1912, 34, 1213—1229.

An enzyme has been found in the yeast from Californian beer, which under certain conditions accelerates the decomposition of dextrose at an elevated temperature. This enzyme is not identical with zymase ; it is very active at 70° C., causes no gas formation and yields no alcohol. The dextrose solution darkens, becomes strongly acid, acquires an odour like caramel and forms a carbon-like solid deposit. The enzyme may be obtained from a yeast powder prepared by treating the cells with ethyl alcohol : it may be purified in the usual manner by precipitation of the aqueous extract with ethyl alcohol, but this weakens it considerably. It is very stable in sterile aqueous solution at the ordinary temperature and is not destroyed by boiling. It is active in neutral or acid solution towards dextrose, polyphenols and lactates. It does not contain tyrosinase nor act as a peroxydase towards dextrose. The solution gives a strong pyrrol reaction. The enzyme shows some relationship to the oxydases, but it is best classed together with zymase amongst the "fermenting enzymes" of Euler. The products obtained from dextrose and the new enzyme are mainly acids, none of which has as yet been identified. Pentose and formaldehyde are also present among the cleavage products.—E. F. A.

Micro-organisms ; Action of uranium on certain ——. H. Agulhon and R. Sazerac. Bull. Soc. Chim., 1912, 11, 868—872.

Whilst alcoholic fermentation by yeasts is retarded, or even inhibited, by the presence of small quantities of uranium salts (1 part in 50,000 parts), acetic fermentation proceeds in solutions containing 1 part of uranium salt per 1000 parts of the solution. A similar concentration of the uranium salt does not prevent the growth of the mould *Aspergillus niger*. In the case of acetic fermentation, small quantities of uranium salts even accelerate the rate of formation of the acetic acid. Different uranium salts, however, do not have the same effect ; the acetate, in concentrations varying from 1 in 1000 to 1 in 10,000 greatly accelerates the production of acetic acid, but the nitrate, when present in these quantities, shows an inhibiting action, acceleration being observed, however, when the concentration is reduced to 1 in 50,000 parts.—W. P. S.

Methyl alcohol ; Determination of —— in admixture with ethyl alcohol, especially in potable spirits. W. Koenig. Chem.-Zeit., 1912, 36, 1025—1027.

The author tried different methods which have been proposed for this determination and found that the bichromate process when modified gave the best results. A specially cleaned flask containing some pieces of pumice is fitted with a two-holed stopper, through one hole of which passes the stem of a dropping funnel reaching to the bottom of the flask, and through the other hole the end of a reflux condenser. The dropping funnel is closed with a soda-lime tube. The upper end of the condenser is bent down and connected with a series of U-tubes, the first of which is a Peligot tube containing sulphuric acid, and the second is a plain tube containing granulated calcium chloride which has been exposed to carbon dioxide to remove any alkalinity. The third and fourth tubes are the absorption tubes proper, the third containing soda-lime, and the fourth soda-lime in one limb and calcium chloride in the other. The fifth tube is a protection tube from the atmosphere. After a current of air free from carbon dioxide has been drawn through the apparatus, the weighed absorption tubes are placed in position. Then the alcohol mixture to be examined is admitted to the flask through the dropping funnel and washed in with water, followed by a mixture of 30 grms. of potassium bichromate and 50 c.c. of sulphuric acid in 500 c.c. of water previously cooled to 5° C. After closing the tap of the dropping funnel, the contents of the flask are well mixed by shaking and allowed to stand for at least 4 hrs. The mixture is then boiled slowly for an hour, when the heat is removed and a current of air free from carbon dioxide aspirated through for three-quarters of an hour. The absorption tubes are then re-weighed and the increase multiplied by 0·728 gives the weight of methyl alcohol in the mixture examined. The sample taken for the determination should contain not more than about 3 grms. of total alcohol nor more than about 1 grm. of methyl alcohol. With pure methyl alcohol the process estimates about 99 per cent. of the weight taken. The effect of ethyl alcohol on the process was investigated, and it was found that some carbon dioxide was obtained, corresponding to about 0·5 per cent. of methyl alcohol. Mixtures of ethyl and methyl alcohols gave results closely agreeing with the quantities taken. Tables are given showing the results obtained with the distillates from various alcoholic liquors. When the percentage of methyl alcohol is small, correction should be made for the amount yielded by the ethyl alcohol present. The process can be used also for the estimation of the methyl alcohol content of tinctures, perfumes, etc. —J. H. J.

Fusel oil from beet molasses; Composition of ——. M. C. Boswell and J. L. Gooderham. J. Ind. Eng. Chem., 1912, **4**, 667—669.

THE fusel oil examined had the sp. gr. 0·8370 at 15° C., and was amber in colour: the colouring matter was soluble in dilute caustic soda solution. The proportions of the several alcohols present were determined by fractional distillation of the alcohols and of their acetic esters. The composition of the fusel oil is given as follows:—ethyl alcohol, 1; isopropyl alcohol, 4; isobutyl alcohol, 6; *n*-butyl alcohol, 6; methyl-*n*-propylcarbinol, 8; active amyl alcohol, 42; isoamyl alcohol, 26; fatty acids (as caproic acid), 0·5; fatty acid esters (as amyl caproate), 2·46; hexyl alcohols, etc., traces; and water, 4 per cent. Small quantities of pyridine and other bases were also present, but furfural could not be detected.—A. S.

Koji-diastase; Saccharification of starch by —— *in presence of acids and salts.* F. Ando. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIB, Orig. Comm., **14**, 13—24.

THE experiments described were carried out at 50° C., with 100 c.c. of a 2 per cent. solution of potato-starch, containing 0·01 grm. of koji-diastase. The salts and acids investigated (29 in all) were present in concentrations ranging from 0·1 to 1 per cent. The reducing power of the solutions after 1 hour at 50° C. was taken as a measure of saccharification. Sodium and potassium carbonates and acid calcium phosphate were found to arrest the diastatic action completely. Neutral and acid salts (except acid calcium phosphate) accelerated saccharification, but this favourable influence diminished with increase in the concentration of the salts, except in the cases of manganese sulphate and chloride. The alkaline salts, with the exception of potassium phosphate, retarded saccharification. All acids, mineral or organic, exercised a retarding influence, except hydrochloric and nitric acids at the lowest concentrations used (0·1 and 0·2 per cent.). In presence of only 0·1 per cent. of lactic and succinic acids the diastatic action was reduced by about one-half, and tartaric, malic, and citric acids showed a still greater inhibitive action. Diastatic action was not arrested by the presence of 30 per cent. of alcohol.—J. H. L.

Yeasts; Red ——. K. Ando. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIB., Orig. Comm., **14**, 7—12.

THE author has investigated two kinds (A and B) of red yeasts obtained from the air of a fermentation laboratory in Tokyo. When cultivated on nutrient gelatin, both give at first light red, round colonies; on further development the colour deepens and the colonies assume somewhat different forms in the two cases. In koji-extract they produce at first the so-called yeast ring, which develops later into a red film; the latter gradually wrinkles and begins to settle as a red precipitate. The film produced by A is thin, easily broken, and on shaking renders the liquid turbid, whilst that formed by B is thicker, breaks into comparatively large flakes when shaken and produces no turbidity. Both forms develop moderately well in solutions of sugars (but not of starch) without, however, causing fermentation. The presence of 6 per cent. of sodium chloride or 0·5 per cent. of acetic acid completely arrests their growth, but they develop in solutions of alcohol of less than 6 per cent. concentration. The quantity of acid produced by them is very small. They invert sucrose readily, and liquefy gelatin if the temperature of growth is not too low. Observed under the microscope, young cultures in koji-extract are found to consist of apparently colourless, oval cells much smaller than those of ordinary yeasts. The cells of A are rather larger than those of B, and amongst them are more circular forms. In older cultures the cells of B show little change, but in the case of A there is an increase in the number of large, and of circular cells, many of the latter having tube-shaped buds. The coral-red colour of these yeasts appears to be a characteristic independent of the nature of the nutrient medium, or the presence of light. If, however, a disinfectant, such as formalin, is added to a colony, the red colour is bleached completely within 24 hours. The colouring matter is insoluble in water, but can be extracted by warm alcohol, producing a red solution which retains its colour permanently in a closed tube, and which dyes silk a light red colour moderately fast after washing with water. These red yeasts do not sporulate on gypsum, and the author considers that they are rightly classed among the torulæ. The quantity of alcohol and acid in saké would prevent their development in this beverage.—J. H. L.

Wort and beer; Sources of error in the determination of the acidity of ——. F. Stuhlmann. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIB., Orig. Comm., **14**, 151—154.

THE author urges the desirability of substituting, in place of the present method of determining total acidity, a method which will differentiate between acidity caused by free acid and that caused by acid phosphates. Experiments are cited to show that such a differentiation is possible. Solutions were prepared containing respectively 0·108, 0·027, and 0·000 per cent. of lactic acid and also 0·000, 0·108 and 0·144 per cent. of monosodium phosphate. On titrating 100 c.c. of these solutions, using neutral litmus paper as indicator, practically the same quantity of *N*/10 alkali (12 c.c.) was required in each case; but when red litmus paper was employed the volumes of alkali required in the respective cases were 12·0, 4·3 and 2·1 c.c. These volumes show some correspondence with the quantities of lactic acid present, although they are clearly influenced to some extent by the phosphate. The author considers that on the basis of these experiments a method could be devised which would give at least some information as to the nature of the total acidity of worts and beers. —J. H. L.

Alcoholic fermentation; Influence of pressure on ——. L. Lindet and L. Ammann. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIB., Orig. Comm., **14**, 107—110.

FROM experiments described, the authors conclude that yeast develops and ferments normally under pressures up to 3 atm. (the maximum employed). If the pressure is supplied only by the carbon dioxide produced, fermentation is considerably retarded, but this is owing to lack of air.—J. H. L.

Clarifying liquids [beer, wine, etc.]; Inorganic colloids [silicic acid] for ——. F. P. Siebel. Eighth Int. Cong. Appl. Chem., 1912. Sect. VIB., Orig. Comm., **14**, 149—150.

COLLOIDAL silicic acid possesses several advantages over aluminium hydroxide as a clarifying agent for certain liquids. Its tastelessness and indifference towards acids render it suitable for the clarification of beers and wines. It may be added in the form of a pure dialysed solution, or may be produced within the beer or wine by adding a solution of a suitable silicate from which the acids present liberate silicic acid in the colloidal form. The former method is probably to be preferred, since it avoids the introduction of other matters (*e.g.*, sodium or potassium salts) into the beer or wine.—J. H. L.

Hydrolysis of maltose by dilute acids. Kopaczewski. *See* XVII.

Determination of tartaric acid in presence of metals capable of forming emetics. Kling and Florentin. *See* XX.

Application of the racemate method of determining tartaric acid to solutions of tartaric esters. Kling and Gelin. *See* XX.

Enzyme action. XVI. Prunase, the correlate of prunasin. XVII. Distribution of β-enzymes in plants. Armstrong and others. *See* XXIV.

Enzyme action. XVIII. Linase and other enzymes in Linaceae. Armstrong and Eyre. *See* XIXA.

PATENTS.

Beer and other liquors; Apparatus for raising or forcing —— and for improving the condition thereof. J. St. P. Macardle, Dundalk, Ireland. Eng. Pats. 20,953, Sept. 22, 1911, and 21,391, Sept. 28, 1911.

The compressed carbon dioxide employed for raising beer is heated before introduction into the barrel, and clogging of the tap of the gas cylinder from which it issues is prevented by directing the flue gases from the heating apparatus upon it.—H. H.

Lignocelluloses; Recovery of the volatile products of the hydrolysis of ——. E. and A. Lederer. Fr. Pat. 441,497, May 26, 1911.

The volatile products formed in the hydrolysis of wood by Classen's process are passed through a solution of lime so as to absorb the volatile organic acids, whilst the neutral products, methyl alcohol and terpenes, are passed forward and condensed. According to an alternative method, the volatile acids contained in the product of hydrolysis are esterified by a limited and constant quantity of ethyl or methyl alcohol and are distilled as esters, whilst the terpenes are subsequently expelled as such by distillation with steam. After the volatile products have been removed, the residual hexose sugars are fermented by yeast acclimatised to the presence of tannin, and the alcohol produced is recovered by distillation. The pentoses in the spent wash are then fermented, preferably in presence of an inert atmosphere, by means of bacteria which convert them into ethyl alcohol and higher alcohols; the final residue contains the glycerol.—J. F. B.

Yeast; Process for the manufacture of dried ——. E. C. R. Marks, London. From S. Oppenheimer, Düsseldorf, Germany. Eng. Pat. 3407, Feb. 10, 1912.

See U.S. Pat. 1,033,807 of 1912; this J., 1912, 834.—T.F.B.

Alcohol; Recovery of —— in fermenting processes. Maschinenbau Akt.-Ges. Golzern-Grimma, Saxony, and A. Zeckendorf, Cincinnati, U.S.A. Eng. Pat. 22,411, Oct. 11, 1911. Under Int. Conv., Nov. 4, 1910.

See Fr. Pat. 434,949 of 1911; this J., 1912, 354.—T. F. B.

XIXa.—FOODS.

Enzyme action. XVIII. Enzymes of the emulsin type (III.) Linase and other enzymes in Linaceæ. H. E. Armstrong and J. V. Eyre. Roy. Soc. Proc., 1912, **85b**, 370—378. (Compare this J., 1910, 711.)

By means of Guignard's picrate paper test it is easy to detect hydrogen cyanide, produced from the glucoside linamarin, even in a single flax seed. Ripe seeds are free from cyanide but this is always present in unripe seeds. Flax, which flowers during a considerable period, always carries a mixture of ripe and unripe seed when harvested: in consequence cyanide is always present in the commercial cake. Its presence is usually regarded as harmful, but the authors consider that it may well be of positive condimental value and that the peculiar value of linseed cake as a cattle food is at least in part due to the liberation of minute proportions of such a substance. All species of *Linum*, resembling ordinary flax in habit of growth, carrying white, blue or red flowers contain more or less hydrogen cyanide, but in no case could hydrogen cyanide be obtained from the yellow flowered species. The amount is subject to variation throughout the period of growth. The enzymic activity of the *Linaceæ* is correlated with the presence of the glucoside. The yellow flowered species have practically no action on glucosides: incidentally these species are all slow in germinating and slow in growth. Those species which contain cyanide are all able to hydrolyse linamarin, prunasin, and salicin. Prunase accompanies linase in both *Phaseolus lunatus* and in many *Linaceæ*: it has not yet been possible to find linase without prunase.—E. F. A.

PATENTS.

Margarine; Manufacture of ——. A. R. Wilson, Hornchurch. Eng. Pat. 19,535, Sept. 1, 1911.

Soured separated milk is passed through a centrifugal machine, or strained, or filtered, in order to separate the curd, and the liquid portion or whey is then used for churning with the fat. The margarine resulting from this process is stated to be less liable to putrefaction than ordinary margarine.—J. H. J.

Butter; Process for the manufacture and preservation of ——. J. M. W. Kitchen and O. von Bernuth. Fr. Pat. 442,281, April 6, 1912.

Cream is separated from milk, cooled to a low temperature, then churned, and the butter obtained is immediately cooled to a temperature of about —18° C.—W. P. S.

Milk; Process for the desiccation of —— and for other purposes. W. B. McLaughlin. Fr. Pat. 441,742, Mar. 26, 1912. Under Int. Conv., April 3, 1911.

The milk is introduced in the form of a fine spray into the upper portion of a vertical cylinder and a current of air at a temperature of about 148° C. is passed into the top of the cylinder. As the spray falls down the cylinder, the moisture is removed and a current of cooler air, introduced near the bottom, reduces the temperature of the powder before the latter leaves the lower open end of the cylinder. The moist air leaving the cylinder passes through a surrounding gauze jacket and escapes from the top of a casing which encloses the whole apparatus. —W. P. S.

Milk powder; Process for the manufacture of dry ——. V. de Brugada Vila and L. E. Dotesio. Fr. Pat. 442,353, Mar. 9, 1912.

The milk is introduced in the form of a fine spray into the top of a cylinder which is heated by means of a steam-jacket to 45°—50° C. A low pressure and an atmosphere of carbon dioxide is maintained in the cylinder. The partially dried milk falls on to a small rotating drum fitted at the lower part of the cylinder and on which the drying process is completed. The small drum is provided with blades for breaking up the particles of dried milk, and is heated internally. Liquids other than milk may be dried in the apparatus.—W. P. S.

Vegetable base for use in preparing hot beverages; Manufacture of products having a ——. H. Schmidt, Meudon, France. Eng. Pat. 25,151, Nov. 11, 1911.

Two equal quantities of the plant, the extract of which is desired, are taken, and one portion is treated with hot water for 10—15 min., the mixture filtered, and the filtrate evaporated *in vacuo* at a low temperature to a soft paste. To remove the mucilaginous substances, the paste is treated with alcohol at 15° C., and after filtration, the alcoholic solution is evaporated *in vacuo*. If it is desired to make use of the mucilaginous substances, the portion insoluble in alcohol is washed with alcohol, treated with boiling water, the solution filtered, and the filtrate evaporated *in vacuo*. The mucilaginous extract thus obtained is then mixed with the soft extract from the alcohol. The other portion of the plant is submitted to steam distillation to extract the essential oil, no neutral solvent being used. The soft extract, with or without the mucilaginous extract, is then mixed with powdered sugar in a mortar and the essential oil incorporated. The mass is made into pellets which are dried and coated with sugar. These pellets when dissolved in boiling water give an infusion of the plant.—J. H. J.

Condensing milk and mixtures of milk with cocoa, coffee, and the like; Process of and apparatus for ——. M. Vouga, Neuchatel, Switzerland. Eng. Pat. 7151, March 23, 1912. Under Int. Conv., June 12, 1911.

See Fr. Pat. 441,489 of 1912; this J., 1912, 835.—T. F. B.

Drying condensed milk and mixtures of condensed milk with cocoa, coffee, and the like ; Process of and apparatus for ——. M. Vouga, Neuchatel, Switzerland. Eng. Pat. 7152, March 23, 1912. Under Int. Conv., June 12, 1911.

See Fr. Pat. 441,490 of 1912 ; this J., 1912, 836.—T. F. B.

Pasty materials, such as chocolate ; Apparatus for treating ——. E. L. A. Savy, Paris. U.S. Pat. 1,037,545. Sept. 3, 1912.

See Fr. Pat. 422,275 of 1910 ; this J., 1911, 526.—T. F. B.

Meat : Apparatus for curing ——. J. C. Lincoln, East Cleveland, Assignor to The Electric Meat Curing Co., Cleveland, Ohio. U.S. Pat. 1,037,941, Sept. 10, 1912.

See Eng. Pat. 23,183 of 1908 ; this J., 1909, 670.—T. F. B.

Various ways of treating starch and starch products. U.S. Pats. 1,035,829 to 1,035,840 and 1,035,842. *See* XVII.

XIXB.—WATER PURIFICATION ; SANITATION.

Bacteria ; Electrical conductivity of —— *and the rate of sterilisation of bacteria by electric currents.* W. M. Thornton. Roy. Soc. Proc., 1912, **85B**, 331—344.

The electrical conductivity of bacteria can be measured by observing their orientation when an electric current is passed through a liquid containing them : experiments are made in a series of solutions of sodium chloride of gradually increasing or decreasing concentration and when it is observed that no orientation of the bacteria suspended therein takes place, it is accepted that the conductivities of the solution and of the bacteria are identical. The values found vary from 35 to 350 ohms per centimetre cube, depending upon the nature and state of the culture medium. The conductivity of the bacteria increases in subcultures, reaching a steady value at about the fourth sub-culture on agar. Water containing *B. coli communis* is completely sterilised by either direct or alternating currents in several hours at 0·3 ampère per sq. cm. density. The cell used must be of such a shape that a thin film of liquid, which can be readily cooled, is exposed to the current. Milk is curdled by direct current at the positive pole and thinned at the negative pole ; it can be sterilised without the formation of a "skin" by the passage of alternating current through it. It is suggested that the cause of the bactericidal action of light is syntony between it and the frequency of electronic movement in the protoplasm. The use of an ozone spray is to be preferred to direct electrical action for the rapid sterilisation of liquids in bulk. In order to obtain marked bactericidal effect by the passage of alternating or direct electric currents, it is requisite to employ such high currrent densities that external cooling is necessary.—E. F. A.

1·5-*Naphthylenediamine* [; *Injury to skin caused by* ——]. Kunckell and Schneider. *See* III.

Patents.

Water purification plant. F. C. York, Leamington. Eng. Pat. 17,215, July 27, 1911.

The tank containing the chemical reagent to be added to the water consists of a main compartment fed with the chemical solution through a valve controlled by a float, and two small delivery compartments each fitted with a discharge pipe ; the solution from the main compartment is raised in one or other of a pair of small buckets suspended from levers on one of the trunnions of the tipping buckets, which deliver the water to the mixing tank, and is delivered into the small delivery compartments. The mixing tank is of circular form and contains in its upper part an inverted cone into which the water and the chemical solution are delivered ; its lower part is of the form of a truncated cone, the outlet being in the smaller diameter just below the point of the upper cone. From the mixing tank the water passes through a series of settling tanks.—J. H. J.

Water ; Apparatus for the sterilisation of —— *by means of quartz mercury-vapour lamps immersed in the water.* P. G. Triquet. First Addition, dated May 26, 1912, to Fr. Pat. 434,069, Nov. 14, 1910 (this J., 1912, 253).

In order that the lamps employed in the apparatus (*loc. cit.*) may be removed rapidly when necessary, they are mounted at one end in a cup-shaped device attached to a screw plate which makes a water-tight joint with the side of the apparatus. The lamps are so arranged in the apparatus that the maximum of light is obtained from them and the water is directed into close contact with the lamps.—W. P. S.

Liquids ; Apparatus for the sterilisation of —— *by rays of short wave-length.* R. Renoncé. Fr. Pat. 441,968, June 7, 1911.

The liquid is passed through a chamber containing a quartz mercury-vapour lamp, partition plates in the chamber causing the liquid to come into close contact with the lamp. The liquid is admitted through a device in electrical connection with the lamp and which interrupts the supply of liquid should the lamp fail to act ; this device consists of a small chamber the top of which is closed by a diaphragm. The pressure of the liquid moves this diaphragm and operates a lever attached to it, the lever in turn making an electrical connection which starts the lamp working and at the same time opens a valve which allows the water to flow into the sterilising chamber. In another form of the apparatus, the supply of water is regulated by a ball-float.—W. P. S.

"*Allophanoids*" *for the purification of water ; Use of* —— *and their preparation from natural rocks.* Deutsche Filtercompagnie G. m. b. H. Fr. Pat. 440,351, Feb. 19, 1912.

"Allophanoids" (the silicious, non-crystallisable portion of volcanic rocks) may be employed in place of zeolites in the purification of water (removal of calcium and magnesium salts), and can be obtained by subjecting the powdered rocks to successive elutriations with water, the "allophanoids" being lighter than the crystalline portions of the rocks.—W. P. S.

Water ; Process for the removal of carbon dioxide, oxygen, and other gases from ——. J. D. Riedel Akt.-Ges. Fr. Pat. 441,567, March 20, 1912.

A current of air is passed through the water while the latter is maintained under low pressure ; the quantity of air admitted is such that only traces of oxygen pass into solution, and valves operated by floats regulate the proportions of air and water. An air-pump is provided for removing the expelled gases from the space above the surface of the water.—W. P. S.

Water ; Process for the sterilisation of ——. M. Duyk. Fr. Pat. 441,618, March 21, 1912. Under Int. Conv., Feb. 12, 1912.

Air is passed through a solution containing a hypochlorite and an acid or salt, such as ferric chloride, and the air thus charged with oxides of chlorine is bubbled through the water to be treated. A convenient method of treating the water with the gas consists in passing the water into the top of a Glover's tower while the gas is introduced at the bottom. Any excess of chlorine, etc., is removed from the water by passing the latter through a filter composed of manganese oxide obtained by heating manganese dioxide with carbon.—W. P. S.

Diaphragm for sterilising towers. M. P. Otto. Fr. Pat. 441,642, March 22, 1912.

A series of cement bars are placed horizontally across the tower, a similar set of transverse bars being fitted below these. The lower bars are supported on a flange provided on the wall of the tower, and the bars are separated from one another by a distance of a few centimetres. A layer of gravel or coarse sand is placed above the upper bars, the object of the apparatus being to ensure the equal distribution of bubbles of ozonised air in the water under treatment.—W. P. S.

Water; Process for the removal of colloidal substances from —— particularly applicable for the removal of clay and colloidal oxide of iron from potable and other waters. M. Morel. Fr. Pat. 441,941, March 30, 1912.

The water is treated with a definite quantity of potassium permanganate and then agitated thoroughly, or it may be heated. Colloidal substances present in the water are entrained in the precipitate of manganese dioxide which is formed, and, after the addition of a further quantity of permanganate, the water is filtered through a layer of iron turnings, coke, or the like, and sand. In place of filtration, the treated water may receive the addition of hydrogen peroxide, or a mixture of barium dioxide and sodium sulphate, and then be allowed to settle.—W. P. S.

Sewage water; Clearing tank for ——. R. Körner. Aue in Erzgebirge, Germany. Eng. Pat. 14,644, June 22, 1912. Under Int. Conv., June 22, 1911.

The liquid enters a small cylinder forming the top of a truncated cone, the lower edge of which is slightly turned up. The liquid flows from the cylinder down the side of the cone and over the lower edge, and drops on to the inside of a wider and inverted cone surrounding the other. The lower portion of this cone is truncated and its edge turned up inwards. The liquid flows over this edge into the funnel-shaped bottom portion of the tank, where the solids settle and can be drawn off by pipes when desired. The cleared liquid rises upwards and passes away by a circular channel in the upper portion of the tank at a slightly lower level than the tops of the cones.—J. H. J.

Sterilising water by ozone; Process for ——. E. C. R. Marks, London. From Siemens und Halske Akt.-Ges., Berlin. Eng. Pat. 19,838, Sept. 6, 1911.

See Fr. Pat. 431,402 of 1911; this J., 1911, 1404.—T. F. B.

Use of metallic tungsten and uranium for the production of electrodes for arc lamps. [Sterilisation of water, etc.]. Addition to Fr. Pat. 418,280. *See* IIb.

Preparing nucleus-substituted mercury derivatives of benzoic acid. Ger. Pat. 249,332. *See* XX.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Alkaloids in basic solvents; Solubility of ——. M. Scholtz. Arch. Pharm., 1912, **250**, 418—423.

The solubility of strychnine and cinchonine in water is increased by ammonia, which however decreases the solubility of the bases in alcohol. The following table gives the parts by weight of different alkaloids soluble in 100 parts by weight of the respective liquids at 20° C.:—

Base.	Aniline.	Pyridine.	Piperidine.	Diethylamine.
Quinine	14·5	101	119	57
Cinchonine	1·6	1·4	3·5	1·3
Strychnine	20	1·5	0·7	1·7
Brucine	12	28	1	1·6
Morphine	6·5	19	66	8
Narcotine	25	2·3	1·7	0·4
Papaverine	29	8	1	0·4
Thebaine	30	9	2	0·7
Veratrine	37	175	83	271
Cocaine	76	80	56	36
Atropine	34	73	114	67

—F. Shdn.

β-Benzylglucoside; New synthesis of a glucoside of alcohol by means of emulsin. E. Bourquelot and M. Bridel. Comptes rend., 1912, **155**, 523—524. (See this J., 1912, 739.)

A mixture of 50 c.c. of benzyl alcohol and 2 grms. of dextrose was treated with 0·2 grm. of emulsin, and allowed to stand at the room temperature for about 50 days. The mixture was shaken with water and β-benzylglucoside was thereby extracted. The glucoside can be crystallised from a mixture of ethyl acetate and ether, and forms needles melting at 106° C. It has $[\alpha]_D = -49·78°$ in aqueous solution. It possesses a bitter taste and is not hygroscopic.—F. Shdn.

Epinephrine [adrenaline, suprarenine] from the whale. E. R. Weidlein. J. Ind. Eng. Chem., 1912, **4**, 636—645.

The author succeeded in isolating epinephrine from the suprarenal glands of the whale after these had been preserved for 6—9 months in chloroform: the highest yield was 0·2 per cent. of the moist glands or about 1·2 grms. from each gland. The depressant action following the increase of blood pressure observed when commercial epinephrine is used, is due to impurities extracted with the epinephrine from the glands and to oxidation products formed in aqueous solutions of the substance: it is not observed when properly purified epinephrine is used. The epinephrine of the whale was isolated and purified in the following way:—1000 grms. of the finely disintegrated glands were treated with a mixture of 500 c.c. of absolute alcohol, 50 c.c. of chloroform, and 25 c.c. of acetic acid, added gradually, with constant shaking, and after standing over night, the liquid was pressed from the glands, made distinctly acid with an additional 25 c.c. of 50 per cent. acetic acid, and heated to boiling on the water-bath. The coagulated protein was filtered off, and the clear yellowish filtrate concentrated under diminished pressure to 60 c.c., filtered, and made distinctly alkaline with strong aqueous ammonia solution. The precipitated epinephrine was filtered off, and washed. It was purified by dissolving in a 25 per cent. solution of acetic acid containing a small quantity of sodium sulphite and re-precipitating with ammonia. After standing for about 1 hour, the precipitated epinephrine was collected on a filter under pressure, washed thoroughly with water, absolute alcohol, and ether, and dried in a vacuum over sulphuric acid. A further small quantity of epinephrine was obtained from the residual glands by treating them with a mixture of 500 c.c. of 70 per cent. methyl alcohol, 100 c.c. of chloroform, and 25 c.c. of acetic acid, and then proceeding as before. The purified epinephrine melted at 212° C. and had $[\alpha]_D^{25} = -52·00°$.—A. S.

Vanillin; Difficulties in the colourimetric determination of ——. W. S. Hubbard. J. Ind. Eng. Chem., 1912, **4**, 669—670.

In the official method of the U.S. Bureau of Chemistry for the colourimetric determination of vanillin, which is a modification of that of Moerk (this J., 1892, 637), the vanilla extract is decolourised by means of lead hydroxide. It is shown that this treatment renders the method unreliable, as lead hydroxide combines with vanillin to form a compound of the composition, $(C_8H_7O_3)_2Pb$. Some experiments with a standard vanillin solution showed that by addition of phosphoric acid or malic acid before treating with lead hydroxide, solutions could be obtained, which on subsequent treatment with bromine and ferrous sulphate gave colourations matching those obtained with vanillin solutions not treated with lead hydroxide.—A. S.

Vanillin in flavouring extracts; New colourimetric method for the determination of ——. O. Folin and W. Denis. J. Ind. Eng. Chem., 1912, **4**, 670—672.

Five c.c. of the extract are mixed with 75 c.c. of water and 4 c.c. of a solution containing 5 per cent. each of basic and normal lead acetate, and made up to 100 c.c. with water. The mixture is rapidly filtered, and 5 c.c. of the filtrate are transferred to a 50 c.c. flask, 5 c.c. of a standard solution of vanillin (1 mgrm. in 10 c.c.) being placed in another similar flask. Five c.c. of a phosphotungstic-phosphomolybdic acid reagent are added to each flask, and after shaking and allowing to stand for 5 mins., the solutions are made up to 50 c.c. with a saturated solution of sodium carbonate, and well mixed. After standing for 10 mins., the solutions are filtered, and the colours of the filtrates compared in a Dubosc colourimeter. The phosphotungstic-phosphomolybdic acid reagent is prepared by boiling 100 grms. of pure sodium tungstate and 20 grms. of phosphomolybdic acid (free from nitrates and ammonium salts) with 100 grms. of syrupy (85 per cent.) phosphoric acid and 700 c.c. of water for 1½—2 hours, cooling, filtering if necessary, and diluting to 1 litre. Other mono-, di-, and tri-hydric phenol compounds, besides vanillin give a blue colour with this reagent on addition of sodium carbonate, but coumarin, extract of tonka beans, and acetanilide do not give any colouration, and sugar, caramel, and glycerin do not interfere with the test. With the dilute solutions employed, it is stated that no vanillin is precipitated by the lead acetate. The method has been tested on a large number of genuine vanilla extracts and found to give accurate results. —A. S.

Erysolin, a sulphone-mustard oil from Erysimum perowskianum. W. Schneider and H. Kaufmann. Annalen, 1912, **392**, 1—15.

By the same process as was used by one of the authors for the extraction of cheirolin from wallflower seeds (this J., 1910, 1131), a new mustard oil, *erysolin*, has been obtained from the seeds of *Erysimum perowskianum* in a yield of, however, only 0·05 per cent. The formula is $C_6H_{11}O_2NS_2$ and differs from that of cheirolin only by CH_2. The suspicion that it consisted of a higher homologue of cheirolin was confirmed by a study of its reactions and especially by its synthesis by means similar to those used for the synthesis of cheirolin. The new mustard oil is, therefore, δ-thiocarbimidobutylmethylsulphone,

$$CH_3.SO_2.CH_2.CH_2.CH_2.CH_2.NCS.$$

Citronella oil; Valuation of Java ——. J. C. Umney and C. T. Bennett. Perfum. and Essent. Oil Rec., 1912, **3**, 250—251.

Owing to the variations produced in the apparent amount of citronellal found by acetylating methods where different proportions of acetic anhydride and sodium acetate are used, the following is proposed as the process yielding the most uniform results:—10 c.c. of the oil are boiled gently under a reflux apparatus with 20 c.c. of acetic anhydride and 2 grms. of anhydrous sodium acetate. The oil is washed with brine containing 1 per cent. of potassium hydroxide. The washing is continued till the brine remains alkaline to phenolphthalein. The neutral oil is dried by means of potassium sulphate and 2—3 grms. are saponified with $N/2$ alcoholic potassium hydroxide for one hour in the usual way.—F. Shdn.

Petitgrain oil; Adulterated ——. J. C. Umney and E. J Parry. Perfum. and Essent. Oil Rec., 1912, **3**, 240—241.

A suspected specimen of petitgrain oil had the following characters: sp. gr. 0·8965 at 15·5° C.; optical rotation, +1° 10′ in 100 mm. tube; refractive index, 1·4650 at 20° C. By fractionating large amounts at reduced pressure, the presence of terpinyl acetate was established, but it is not possible to separate this substance from small amounts of the oil. Indications of this impurity can be obtained as follows: 2—3 grms. of the oil are saponified (1) with 20 c.c. of $N/2$ potassium hydroxide for 2 hours; (2) the same amount of oil is used, but only 10 c.c. of $N/2$ potassium hydroxide diluted with 25 c.c. of alcohol, and the saponification allowed to proceed for one hour. Under these circumstances terpinyl acetate will show a difference of 90 in the saponification values.—F. Shdn.

Ascaridol. O. Wallach. Nachr. K. Ges. Wiss. Göttingen. 1912, 422—430. Chem. Zentr., 1912, **2**, 921—922.

Ascaridol, $C_{10}H_{16}O_2$, which occurs, together with cymene, in the oil of *Chenopodium ambrosioides L.*, var. *anthelminticum* (cp. Nelson, this J., 1911, 1279), very readily takes up four atoms of hydrogen in presence of palladium. The chief product is an optically inactive solid, $C_{10}H_{20}O_2$, which crystallises from dilute methyl alcohol in large colourless prisms melting at 116°—117° C., soluble in hot water, chloroform, ethyl acetate, and methyl alcohol, and slightly soluble in cold water and in ether. This substance yields 1,4-cineol (terpinene-cineol, boiling at 170° C., see this J., 1907, 1160) as main product on warming with oxalic acid, and is probably a stereo-isomeride of the known terpin (terpinene-terpin, see this J., 1907, 221, 1160) which melts at 137° C.—J. H. L.

Aromatic sulphuric acid; Improved method of assay for ——. L. A. Brown. J. Ind. Eng. Chem., 1912, **4**, 512—514.

The U.S.P. method for the assay of aromatic sulphuric acid (a mixture of concentrated sulphuric acid, alcohol, tincture of ginger, and oil of cinnamon), which is based on the supposition that ethylsulphuric acid is completely hydrolysed on boiling with water, is inaccurate, for the hydrolysis is not complete even after boiling for 8 hours. The method used by the author is as follows: 10 grms. of the sample are diluted to 100 c.c., and in 10 c.c. the total acidity (sulphuric acid and ethylsulphuric acid) is determined by titration with $N/10$ potassium hydroxide, using phenolphthalein as indicator. The neutralised solution is then diluted to 100 c.c., heated quickly to boiling, 2 c.c. of hydrochloric acid added and an excess of barium chloride solution, and after boiling for 1 or 2 minutes, and heating on the water-bath for 1 hour, the barium sulphate is filtered off, washed, ignited, and weighed: from the weight thus obtained the quantity of free sulphuric acid in the sample is calculated. Experiments showed that barium ethylsulphate is not hydrolysed to any appreciable extent on heating in slightly acid, dilute, aqueous solution. When aromatic sulphuric acid is kept for several months, a small quantity of diethyl sulphate is formed: this is not determined either by the U.S.P. method or the author's process, but the amount formed in 5 months corresponds only to about 0·4 per cent. of sulphuric acid.—A. S.

Aldehydes; Study of some methods for the determination of ——. B. G. Feinberg. Eighth Int. Cong. Appl. Chem., 1912. Sect. I., Orig. Comm., **1**, 187—203.

An investigation made to ascertain the applicability of the general methods of examination to the quantitative determination of various typical aldehydes. The best results for benzaldehyde were obtained under the following conditions:—25 c.c. of a 1 per cent. solution of the aldehyde in 12 per cent. acetic acid were diluted with 50 c.c. of water, and 30 c.c. of 30 per cent. acetic acid containing about twice as much *p*-nitrophenylhydrazine as required by theory were added. After standing for 5 hours, the precipitate was filtered off (Gooch crucible), washed with 10 per cent. acetic acid until the washings no longer gave a strong colour with dilute alkali, dried at 105°—110° C. and weighed, the weight being multiplied by 0·4400 for calculation to benzaldehyde. When the benzoic acid present was separately determined (by titration with alkali) and subtracted from the calculated aldehyde, results showing an accuracy of about 99 per cent. were obtained. For salicylic aldehyde the conditions were essentially the same as for benzaldehyde, but the precipitate was allowed to stand for 1 hour only; the factor employed for calculating the precipitate to aldehyde was 0·4747, but the results, although concordant, were only about 95·5 per cent. of the theoretical. Under the above conditions, resulta 100, 101·5 and 102 per cent. of the theoretical were obtained for anisaldehyde, *p*-hydroxybenzaldehyde and vanillin, respectively, the factors used for the conversion of the hydrazones into the corresponding aldehydes being 0·50188, 0·4747 and 0·5353 respectively; the author is of opinion that co-precipitation would be minimised by employing the *p*-nitrophenylhydrazine in dilute hydrochloric acid solution (about $2N$) and adding the reagent drop by drop to the warm, diluted aldehyde solution with vigorous stirring. The hydrazones obtained by precipitation with *p*-nitrophenylhydrazine were less soluble and of better physical form than those produced by the *p*-bromo-compound. In the following table the results (percentage of the theoretical) obtained in the determination of formaldehyde, benzaldehyde and vanillin by various processes are compared :—

—	Iodine.	Bisulphite.	Neutral sulphite.	*p*-Bromo-phenyl-hydrazine.	*p*-Nitro-phenyl-hydrazine.	Alkali-metric.
Formaldehyde	33·86	33·34	33·32	—	about 26	99·06
Benzaldehyde	—	93—95	98·52	about 93	98·70	—
Vanillin	about 95·5	about 95·5	—	99·03	about 100	—

—W. E. F. P.

Determination of methyl alcohol in admixture with ethyl alcohol, especially in potable spirits. Koenig. *See* XVIII.

Tartaric acid; General method for the determination of ——, *in presence of metals capable of forming emetics.* A. Kling and D. Florentin. Eighth Int. Cong. Appl. Chem., 1912. Sect. I. Orig. Comm., 1, 237—249.

By a modification of the original process (this J., 1910, 451) it was found possible to determine, with considerable accuracy, tartaric acid contained in metallic salts, tartars, lees, and fermented liquors. The solutions required are :—(A) A solution of bi-ammonium citrate, containing 50 grms. of the salt per litre; (B) a solution containing 20 grms. of pure *l*-ammonium tartrate (free from the *d*-compound), and 5 or 6 c.c. of formaldehyde (as preservative) per litre; (C) a solution prepared by dissolving 16 grms. of chemically pure calcium carbonate in 120 c.c. of glacial acetic acid, and diluting to 1 litre; (D) dilute hydrochloric acid containing 40 grms. of the 22° Bé. acid per litre; (E) a solution prepared by dissolving 5 grms. of calcium carbonate in 20 grms. of acetic acid, adding 100 grms. of sodium acetate and diluting to 1 litre; (F) a solution of potassium permanganate containing 16 grms. per litre. The permanganate is standardised against a solution of tartaric acid of known titre determined with *N*/10 potassium hydroxide. In the determination of tartaric acid, in the presence of interfering metals or not, the solution is diluted to a volume of 150 c.c., 10—15 c.c. of solution A are added, and then successively 25 c.c. of solution B and 20 c.c. of solution C. The mixture is agitated and allowed to stand for several hours (12 hours if appreciable quantities of interfering metals are present). After being filtered off and washed with cold water, the precipitated racemate (*loc. cit.*) is dissolved in 20 c.c. of the dilute hydrochloric acid (solution D), the solution is diluted to 150 c.c., 40—50 c.c. of solution E are added, the mixture is heated to about 80° C. and then allowed to cool for several hours. The resulting precipitate is filtered off, washed, redissolved in hot, dilute sulphuric acid (10 per cent. by volume) and titrated at the boiling point with the permanganate solution.—W. E. F. P.

Tartaric esters; Application of the racemate method of determining tartaric acid to solutions of ——. A. Kling and E. Gelin. Eighth Int. Cong. Appl. Chem., 1912. Sect. I., Orig. Comm., 1. 251—256. (See also this J., 1910, 451; 1911, 706.)

The solutions examined (prepared by heating alcoholic solutions of tartaric acid in sealed tubes) contained known amounts of tartaric acid, the latter being present in the free state and in the form of acid and neutral ethyl tartrates. The amount of tartaric acid corresponding to the total acidity being found by titration with *N*/10 potassium hydroxide, the free acid present was determined by the racemate method in a second portion of the liquid. A third portion was saponified with alkali in very dilute solution, the racemate process being then applied for the determination of the total (free and combined) acid in the liquid. The results thus obtained were concordant and corresponded to the amounts of tartaric acid known to be present. The process is stated to be applicable to wines and other fermented liquors.—W. E. F. P.

Oil of Strychnos nux vomica seeds. Heiduschka and Wallenreuter. *See* XII.

Patents.

Beta-gamma-dimethylerythrene; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 1557, Jan. 19, 1912. Addition to Eng. Pat. 13,677, June 6, 1910 (see this J., 1911, 307).

Pinacone can be converted into $\beta\gamma$-dimethylerythrene by distilling it with normal sulphates the solutions of which have an acid reaction, *e.g.*, alum, iron alum, chrome alum, copper sulphate, or aluminium sulphate. In the example given, a mixture of 1000 parts of pinacone with 100 parts of alum is heated to 140°—150° C.—T. F. B.

Erythrene; Process of producing ——. C. Harries, Kiel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,038,359, Sept. 10, 1912.

Butylene halogenides (*e.g.*, butylene bromide) are treated with hydroxy-compounds of metals of metallobasic character (*e.g.*, soda-lime), and the erythrene is separated from the gaseous reaction product.—T. F. B.

$\alpha\gamma$-Butadiene and its derivatives; Process for making ——. Badische Anilin und Soda Fabrik. Fr. Pat. 441,619, March 21, 1912. Under Int. Conv., May 22, 1911.

The hydrobenzenic hydrocarbons which have at least one double linkage, and also the cyclopentenes of analogous composition, can be decomposed by heat, forming $\alpha\gamma$-butadiene and its homologues: if one of the carbon atoms joined by the double linkage, is replaced by a methyl group, isoprene is produced, *e.g.*, in the case of Δ^1-tetrahydrotoluene. In place of using the hydrocarbons themselves, compounds may be employed which are susceptible of being converted into the hydrocarbons: for instance, hexahydro-*o*-cresol, when treated with dehydrating agents, is converted into Δ^1-tetrahydrotoluene. The compounds may be heated to high temperatures, alone or mixed with indifferent gases, under atmospheric or reduced pressure. The products desired should not be allowed to remain long in the heated zone, and it is advisable to avoid contact with iron, nickel, and similar metals; the portions of the apparatus subjected to high temperatures should be made of platinum, quartz, or analogous substances. When 1-methyl-Δ^2-cyclopentene is heated in the above manner, a butadiene is obtained which appears to be identical with the piperylene of Thiele.—T. F. B.

Barbituric acids; Manufacture of derivatives of ——. Farbenfabr. vorm. F. Bayer und Co., and H. Hoerlein, Elberfeld, Germany. Eng. Pat. 15,452, Jan. 3, 1912.

Phenylpropyl- and *p*-methoxyphenylethylbarbituric acids and their salts are obtained by converting, in the usual manner, the corresponding alkylarylmalonic acids or alkylarylcyanoacetic acids into barbituric acids: or suitable arylmalonic acids or arylcyanoacetic acids are converted into the arylbarbituric acids or intermediate products, and these are alkylated and converted, if necessary, into the arylalkylbarbituric acids. The products are said to be of value as hypnotics when used by subcutaneous injection, being more than twice as efficient in this respect as diethylbarbituric acid (compare Ger. Pat. 247,952 of 1911: this J., 1912, 795).—T. F. B.

Quinine and dialkylbarbituric acids; Process for preparing compounds of ——. E. Merck. Ger. Pat. 249,908, Oct. 19, 1911.

Compounds of quinine with dialkylbarbituric acids are obtained either by melting together for a short time equimolecular proportions of the two components and extracting the cooled mass with a suitable solvent, or by allowing the components or their salts to interact for a long time in presence of a solvent. The products have more powerful hypnotic effects than those of the corresponding dialkylbarbituric acids.—T. F. B

Esters of meta-cresol and derivatives of the same with lower fatty acids. N. Sulzberger, New York. U.S. Pat. 1,031,971, July 9, 1912.

The esters of *m*-cresol with fatty acids containing not more than three atoms of carbon, while possessing the antiseptic properties of *m*-cresol, do not possess its irritant action: esters of derivatives of *m*-cresol possess analogous properties. All are insoluble in water and volatile with steam; when their solutions in glacial acetic acid are treated with one mol. of bromine, the solutions remain colourless, bromo-derivatives being produced. The acetate of *m*-cresol is especially claimed as a liquid of b. pt. 214° C., forming a crystalline bromine derivative of m. pt. 83° C.—T. F. B.

meta-Cresol; Derivatives [*esters*] *of* —— *with organic acids.* N. Sulzberger, New York. U.S. Pat. 1,033,841, July 30, 1912.

The esters of *m*-cresol with saturated fatty acids containing more than three atoms of carbon, are found to possess powerful antiseptic and disinfectant properties, as well as a marked analgesic action, rendering them suitable for pharmaceutical and other purposes. They may be prepared by any of the usual methods of esterification. They are all insoluble in water, and may be utilised as solvents, *e.g.*, for iodine. Besides the esters themselves (*e.g.*, the butyrate and *iso*-valerate), substitution products of the esters are also claimed, derived both from substituted *m*-cresol and from substituted fatty acids.
—T. F. B.

Creatinine; Process for the manufacture of ——. A. Viquerat. Fr. Pat. 441,681, Dec. 30, 1911. Under Int. Conv., Nov. 18, 1911.

Urine which has been allowed to stand for one or two days, and is consequently alkaline, is evaporated to one-half or one-third of its volume, until no more evolution of gas occurs, as indicated by frothing; calcium chloride is then added in sufficient quantity to precipitate the phosphates, the solution is filtered and rendered slightly alkaline by addition of sodium carbonate, and a concentrated, syrupy solution of zinc chloride, which has been acidified, is added; in about two hours the whole of the creatinine will have been precipitated in the form of a greyish mass of the double chloride of zinc and creatinine. The mixture of precipitate and solution is boiled for a few minutes, and the precipitate filtered off, mixed with a milk of lead hydroxide, and boiled for a short time; the zinc is thus precipitated whilst the creatinine dissolves. The filtered solution is now concentrated to a syrupy consistency, decolourised by means of animal charcoal, acidified by dilute acetic acid, and boiled to convert the creatine into creatinine: after standing, the mixture is filtered and the solution concentrated until crystallisation of the creatinine commences; the crystals are finally removed, washed with water, and dried. It is stated that the above process can be completed in about four hours.
—T. F. B.

3.4-*Dihydroxyphenylalkylamines; Process for preparing* ——. K. W. Rosenmund, C. Mannich and W. Jacobsohn. Ger. Pat. 247,906, Nov. 11, 1909. Addition to Ger. Pat. 243,546, Oct. 21, 1909 (see this J., 1912, 358).

3.4-Dihydroxyphenylalkylamines of the general formula, $(HO)_2.C_6H_3.CH_2.CHR.NH_2$, where R represents alkyl or hydrogen, are obtained by reducing the oximes of the general formula,

$$(R'O)^4(R''O)^3.C_6H_3.CH_2.CHR : NOH,$$

where R′ and R″ represent alkyl radicals, and then saponifying the 3.4-dialkyloxyphenylalkylamines by means of mineral acids, such as hydriodic acid. The preparation and properties of *β*-dimethoxy- and *β*-dihydroxy-3.4-phenyl-*i*-propylamine and of *β*-dimethoxy- and *β*-dihydroxy-3.4-phenylethylamine are described in the specification.—T. F. B.

p-Hydroxyphenylethyldimethylamine (hordenine); Process for preparing ——. A. Voswinkel. Ger. Pat. 248,385, Feb. 16, 1911.

The aminoketone, $CH_3O.C_6H_4.CO.CH_2.N(CH_3)_2$, obtained by the action of alcoholic solutions of dimethylamine on chloromethyl-*p*-anisyl ketone, is converted into the free phenolic compound by heating with hydriodic acid of sp. gr. 1·7, and the resulting *p*-hydroxyphenylethanone-dimethylamine is heated under pressure with hydriodic acid of sp. gr. 1·96 and phosphorus to convert the ketonic group into a CH_2-group, whereby hordenine, $HO.C_6H_4.CH_2.CH_2.N(CH_3)_2$, is produced. The yield is stated to amount to about 10 per cent. of the calculated yield.—T. F. B.

Guaiacol-m-sulphonic acid, together with small quantities of guaiacol-p-sulphonic acid, catecholsulphonic acid, and veratrolsulphonic acid; Process for preparing mixtures containing high percentages of ——. C. Gentsch. Ger. Pat. 248,155, Dec. 5, 1909.

When catechol-*p*-sulphonic acid or a salt thereof is treated with a methylating agent, a mixture is produced, containing a high percentage of guaiacol-*m*-sulphonic acid, and only a very small proportion of guaiacol-*p*-sulphonic acid.—T.F.B.

Guaiacol; Process for preparing —— *from guaiacolsulphonic acids or their salts.* F. Hoffmann-La Roche und Co. Ger. Pat. 250,380, Aug. 23, 1910.

Guaiacolsulphonic acids or their salts are converted into guaiacol by heating at 130°—140° C. in acid solutions, the guaiacol being removed from the solution by steam distillation. Guaiacol is also obtained by distilling solutions of free guaiacolsulphonic acid with superheated steam at 130°—140° C., or by distilling acid solutions of salts of guaiacolsulphonic acids with superheated steam at temperatures above 130° C.—T. F. B.

Allophanic acid esters; Process for preparing ——. E. Merck. Ger. Pat. 248,164, Aug. 11, 1911.

Esters of allophanic acid are obtained by heating cyanaminoformic esters (see this J., 1912, 796) with concentrated acids at the ordinary or at slightly increased temperatures. The esters are crystalline, tasteless, and odourless, and are readily decomposed in the organism. In the specification the ethyl, guaiacol, hydroxycamphor, menthol, and salicylicmethylester esters of allophanic acid are described.—T. F. B.

Hydroxides of the platinum metals in colloidal form; Process for producing preparations containing ——. Kalle und Co. Ger. Pat. 248,525, May 2, 1911.

The solutions of organic acid salts of metals of the platinum group, obtained by the interaction of aqueous solutions of inorganic salts of platinum metals with alkali salts of organic acids, are treated with aqueous solutions of "fixed" alkali carbonates in presence of the alkali salts of the decomposition products of albuminoids or other suitable colloids, whereby colloidal solutions of the hydroxides of platinum metals are produced: these are purified by dialysis and converted into solid stable condition by evaporation. The resulting solid "sols" dissolve in water, even after keeping, giving colloidal solutions. The sodium salt of protalbinic acid is the most effective colloid to use for this process, but the alkali salts of lysalbinic acid and of the high-molecular albumoses, and also dextrin, tannin, and gum arabic, give satisfactory results. In the case of dextrin, tannin, and gum arabic, only colloidal solutions can be produced, the products obtained on evaporation being insoluble.—T. F. B.

a-Arylated acids; Process for preparing derivatives of ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 248,777, May 1, 1910.

Derivatives of a-arylated acids (with the exception of phenyl- and *p*-tolyl-*iso*-butyric acids), of the general formula, Aryl.CR_1R_2.COOH, where R_1 and R_2 represent alkyl groups, are obtained by converting the above acids or their derivatives into amides or ureides by the usual methods. The products are said to have powerful sedative, hypnotic, and antipyretic properties, and to be practically tasteless.—T. F. B.

Condensation product from a-methyliminazole and chloral; Process for preparing a ——. O. Gerngross. Ger. Pat. 248,885, June 15, 1911.

One mol. of a-methyliminazole is heated with two mols. of chloral for about 28 hours at 70°—90° C.; when cool, the product is dissolved in a neutral solvent and the new condensation product precipitated by an acid from this solution in the form of a salt. The product serves for the preparation of medicinal compounds.—T. F. B.

Yeast containing ferric iodide; Process for preparing a ——. Chem. Fabr. Grünau, Landshoff und Meyer A.-G., and R. May. Ger. Pat. 248,886, Feb. 26, 1911.

Preparations of yeast containing ferric iodide are obtained (1) by treating yeast with a solution of iodine in acetone, in presence of an iron salt, at the ordinary temperature; (2) by the action of an acetone solution of iodine on compounds of iron and yeast, in presence of a small quantity of water; (3) by allowing dextrose to ferment in presence of an iron salt and an iodine compound of yeast. The products are intended for use as substitutes for *Sirupus ferri iodati* and *Ferrum iodatum saccharatum*. —T. F. B.

Chloroform: Process for preparing ——. E. Koelitz. Ger. Pat. 249,331, June 25, 1910.

Suitably fermented mashes or worts, preferably containing lactic acid, are submitted, without distillation, to treatment with chloride of lime: the vapours evolved are submitted to further heating with a solution of chloride of lime. It is stated that 3·4 litres of a wort fermented by yeast (containing 77 Tralles alcohol per 100 c.c., *i.e.*, 2 per cent.), produced by this process 17·5 c.c. of chloroform of b. pt. 61·2° C., *i.e.*, a yield of 24·7 per cent. of the alcohol present.—T. F. B.

Iron salts of higher unsaturated halogen-fatty acids; Process for preparing ——. F. Hoffmann-La Roche und Co. Ger. Pat. 249,720, July 15, 1911.

Iron salts of halogen derivatives of higher unsaturated fatty acids are obtained by precipitating solutions of alkali salts of these halogen-acids with aqueous solutions of ferrous salts; when the green syrupy masses are purified they are obtained in the form of reddish-brown syrups, the iron content of which corresponds to that of the normal ferric salts of the acids. They are easily soluble in ether, carbon tetrachloride, and benzene, but soluble with difficulty in alcohol.—T. F. B.

Organic phosphoric acid compounds; Process for preparing ——. K. Langheld. Ger. Pat. 248,956, June 22, 1910.

Compounds suitable for therapeutic use are obtained by heating esters of metaphosphoric acid with compounds containing alcoholic hydroxyl groups or with organic derivatives of ammonia.—T. F. B.

Mercury derivatives of benzoic acid; Process for preparing nucleus-substituted ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 249,332, April 4, 1911. Addition to Ger. Pat. 234,914, March 22, 1910.

In place of the alkyl-, halogen-, or alkylhalogen-benzoic acids used in the process described in the principal patent (see Eng. Pat. 28,019 of 1910; this J., 1911, 572), other derivatives of benzoic acid may be employed (with the exception of the hydroxybenzoic-sulphonic acids) containing two or more similar or different substituents in the nucleus. The products are said to possess more powerful disinfectant properties than the products described in the chief patent or those from hydroxybenzoic-sulphonic acids.—T. F. B.

Mercury derivatives of aminobenzoic acids and their salts; Process for preparing nucleus-substituted ——. Verein. Chemische Werke A.-G. Ger. Pat. 249,725, Dec. 4, 1910.

Mercury derivatives of nitrobenzoic acids or their salts, in which the mercury is united only with the aromatic nucleus, are converted into the corresponding derivatives of aminobenzoic acids by treatment with neutral or alkaline reducing agents. The mercury derivatives of *o*-, *m*-, and *p*-aminobenzoic acid are described. They are applicable to medicine.—T. F. B.

Silver-albumose compounds soluble in water; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pats. 249,679 and 249,764, Feb. 9 and 16, 1911.

(1) Compounds of silver and albumose, soluble in water, are obtained by treating insoluble silver-albumose solutions with salts of aminocarboxylic acids, or by treating silver salts of aminocarboxylic acids with albumoses, or by allowing salts of aminocarboxylic acids to act on organic or inorganic silver compounds in presence of albumoses. Products obtained in this way give solutions lighter in colour than those produced by other methods, and containing up to 16 per cent. of silver. They differ from the neutral silver-gelatose compounds in that they are less irritant in their action. (2) Aminocarboxylic acids may be used in the above process, which contain more than one amino- or imino-group or substituted amino- or imino-group. Solutions of the products in water are alkaline, and are not acted on by alkalis; addition of dilute mineral acids precipitates the silver compound, which, however, dissolves again in excess of the acid.—T. F. B.

Dihydro-isoquinoline derivatives; Process for preparing ——. H. Decker. Ger. Pat. 249,723, July 26, 1911. Addition to Ger. Pat. 234,850, May 11, 1910 (see this J., 1911, 923).

Salts of the homologues of hydrastinine are obtained by treating 6.7-methylenedioxy-3.4-dihydroisoquinoline with alkylating (other than methylating) or aralkylating agents. The physiological action of the products resembles that of the salts of hydrastinine itself, but it is more intense (see also Ger Pat. 245,095; this J., 1912, 483). —T. F. B.

2.3-Diphenylquinoline-4-carboxylic acids; Process for preparing substituted ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 249,765, Aug. 27, 1911.

Derivatives of 2.3-diphenylquinoline-4-carboxylic acid, containing one or more substituents (alkyl, aryl, alkoxy, carboxyl, halogen) in one or more of the benzene nuclei, are obtained by condensing isatin with substituted desoxybenzoins, or by condensing substituted isatins with desoxybenzoin or with substituted desoxybenzoins. The therapeutic properties of the products resemble those of unsubstituted 2.3-diphenylquinoline-4-carboxylic acid, but are more marked.—T. F. B.

2-Phenylquinoline-4-carboxylic acid, Process for the manufacture of ——. Chem. Fabr. auf Actien, vorm. E. Schering, Berlin. Eng. Pat. 15,684, July 4, 1912. Under Int. Conv., July 5, 1911.

A yield of 2-phenylquinoline-4-carboxylic acid, amounting to about 140 per cent. of the weight of pyroracemic acid employed, is obtained by adding pyroracemic acid (44 parts) to a boiling solution of benzylidene-aniline (90 parts) in "strong" alcohol; the solution is further heated for one to two hours and allowed to crystallise, and the product is purified by known means. The yields are stated to be very considerably higher than those obtained when aniline dissolved in alcohol is added to a solution in absolute alcohol of pyroracemic acid and benzaldehyde, and boiling, or when an alcoholic solution of benzylideneaniline and pyroracemic acid is boiled under a reflux condenser.—T. F. B.

2-Phenylquinoline-4-carboxylic acid or its homologues with glycocoll; Process for preparing compounds of ——. Chem. Fabr. auf Actien, vorm. E. Schering. Ger. Pat. 249,766, Sept. 29, 1911.

The compounds obtained by the action of the alkyl esters of glycocoll on 2-phenylquinoline-4-carboxylic acid or its homologues, are soluble in water, and possess diuretic properties, in addition to those associated with the phenylquinolinecarboxylic acid itself.—T. F. B.

Essential oils from citrus fruits; Machine for extracting ——. W. A. D. Allport and T. J. W. C. Davenport, Roseau, Dominica. Eng. Pat. 28,402, Dec. 16, 1911. Under Int. Conv., Dec. 17, 1910.

See U.S. Pat. 1,002,020 of 1911; this J., 1911, 1138.—T.F.B.

4.4′-Di[hydr]oxy-3.3′-diamino-arsenobenzene; Manufacture of derivatives of ——. Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 5797, March 7, 1912. Under Int. Conv., March 17, 1911.

See Fr. Pat. 441,392 of 1912; this J., 1912, 844.—T. F. B.

Casein derivatives and process for the manufacture of the same. R. Tambach, Assignor to Knoll und Co., Ludwigshafen on Rhine, Germany. U.S. Pat. 1,037,685, Sept. 3, 1912.

See Eng. Pat. 5087 of 1908; this J., 1908, 1128.—T. F. B.

Tuberculosis; Process of producing a remedy for ——. W. Ruppel, Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,037,997, Sept. 10, 1912.

See Ger. Pat. 223,758 of 1909; this J., 1910, 1228.—T. F. B.

Hydroquinine; Manufacture of ——. H. Thron, Assignor to Verein. Chininfabriken Zimmer und Co., G. m. b. H., Frankfort on Maine, Germany. U.S. Pat. 1,038,027, Sept. 10, 1912.

See Eng. Pat. 3948 of 1912; this J., 1912, 604.—T. F. B.

2-Alkoxy-5-disubstituted barbituric acids. 2-Alkoxy-5-monosubstituted barbituric acids. M. Engelmann, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,038,101 and 1,038,102, Sept. 10, 1912.

See Eng. Pat. 27,112 of 1911; this J., 1912, 843.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Patent.

Photometer. Fr. Pat. 442,623. *See* XXIII.

XXII.—EXPLOSIVES; MATCHES.

Nitrocellulose manufacture; Sulphite-cellulose as a raw material for ——. K. A. Nitzelnadel. Wochenbl. Papierfabr., 1912, 43, 3488—3489.

The author has prepared nitrocellulose from various samples of sulphite wood pulp, bleached and unbleached, also from straw cellulose. These materials contain higher proportions of non-cellulose impurities than the cotton ordinarily employed in the nitrocellulose industry; straw pulp also possesses the disadvantage of not being readily wetted by liquids. The nitration experiments showed that sulphite wood pulp yields products containing at least as much nitrogen as those prepared from cotton; the products from straw cellulose were generally rather poorer in nitrogen. The solubility in ether-alcohol of the nitrocellulose prepared from these celluloses was generally over 40 per cent.; in one case only was it as low as 13 per cent. The films obtained on evaporating the solutions were inferior to those from solutions of nitrated cotton. The stability tests, performed according to Will's method, showed that these nitrocelluloses were sufficiently stable to satisfy official specifications; the products from straw cellulose showed the lowest stability. The ignition temperature, according to Kast's test, was in general somewhat lower than for nitrated cotton, but all the nitrocelluloses prepared from wood fibre showed temperatures of ignition well above the specified minimum limit of 180° C.; the products from straw cellulose tended to fall below this limit. The yields of nitrocellulose from sulphite wood pulp were lower than those obtained from cotton; straw cellulose gave the lowest yields. The author's conclusions are in favour of the use of wood cellulose as a raw material in the nitrocellulose industries, but he considers straw cellulose unsuitable. The disadvantages of wood cellulose, as compared with cotton, are the lower yields, the lower ignition temperature of the products, and the greater solubility in ether-alcohol. Commenting on the above, Klemm points out that one of the chief difficulties in preparing nitrated derivatives from wood cellulose lies in the different structure of the cells of the spring and autumn growths, and it is possible that woods grown in tropical regions would afford more uniform results under chemical treatments.—J. F. B.

Patents.

Explosives; Impts. in the nitration of sugars, and ——. A. T. Cocking and Kynoch, Ltd., Birmingham. Eng. Pat. 17,221, July 27, 1911.

When glycerin and sugar are nitrated together, the product is a powerful explosive which can be used alone or in admixture with nitrates, carbohydrates, etc. The sugar should be in a fine state of division, and may be partially dissolved in the glycerin, and partially in suspension. With the sugar forming up to 25 per cent. of the mixture of sugar and glycerin, the product is adaptable for replacing nitroglycerin in the manufacture of explosives. Higher proportions of sugar yield more viscous products which may be used like nitro-cotton as a stiffening medium in certain kinds of explosives. When the product is a thin liquid, it is conveniently purified by washing first with water, and then with dilute sodium carbonate solution, at about 40° C. When the product is viscous, it is best purified by repeatedly precipitating it from its solution in acetone by water. Purification is continued until a product is obtained which is stable under the heat test.—T. St.

Explosive; Granular —— especially suitable for the preparation of pressed pieces, and method of making the same. O. Reuter, Schlebusch-Manfort, Germany, Assignor to E.I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,036,906, Aug. 27, 1912.

A mass of a fused aromatic nitro-compound is formed into layers, which are solidified by chilling and then broken up so as to produce a mass of fine flakes. The latter, with or without admixture of a crystalline explosive, are subjected to pressure to produce pressed pieces.—A. S.

Explosives. J. F. O'Brien, Chicago, Ill. U.S. Pats. 1,037,300, Sept. 3, 1912, and 1,038,187 and 1,038,188, Sept. 10, 1912.

(1) The explosive consists of an alkali chlorate, *e.g.*, potassium chlorate (75 lb.), a solid carbohydrate, such as starch (12½ lb.), a carbohydrate in solution, *e.g.*, molasses (25 lb.), and a silico-aluminous substance, *e.g.*, Portland cement (less than 40 lb.). (2) A mixture of an alkali chlorate and a carbohydrate in the proportions of about 3 : 1, and a comparatively inert substance containing silico-aluminous material, *e.g.*, finely divided, burned clay. (3) A mixture of an alkali chlorate, *e.g.*, potassium chlorate (2 parts), molasses (1 part), and a silico-aluminous material, such as finely divided, burned clay (1 part).—A.S.

xplosive. H. P. Bostaph, Windsor, Ontario. U.S. Pat. 1,038,275, Sept. 10, 1912.

NE part of rosin is mixed with 8 parts of wood meal, d the mixture is incorporated with 37 parts of ammonium rchlorate, 11 parts of dinitrobenzene, and 43 parts of dium nitrate. All the materials must be in a finely vided condition, the rosin so as to pass a 40-mesh reen, the wood meal and dinitrobenzene, a 60-mesh, e ammonium perchlorate, a 100-mesh; and the sodium trate, an 80-mesh screen.—A. S.

yroxylins ; Method of separating pure colloidal —— from their solutions for explosives. J. Delpech. Fr. Pat. 441,555, March 11, 1912.

HE collodion is treated with a liquid (*e.g.*, water or chloro- rm) which coagulates the pyroxylins and enables them be separated rapidly and economically.—C. A. M.

itroglycerin ; Process for accelerating the separation of ——in nitroglycerin manufacture. Westfälisch-Anhalt Sprengstoff-A.-G. Ger. Pat. 249,573, Dec. 3, 1911.

MALL quantities of silicates of the earth or alkaline-earth etals, especially talc or kaolin, are added either to the ycerin or to the nitrating acid, before, during, or after tration.—A. S.

xplosive ; Safety ——. N. Ceipek, Vienna. U.S. Pat. 1,038,292, Sept. 10, 1912.

EE Eng. Pat. 9743 of 1911 ; this J., 1911, 926.—T. F. B.

ecovery of volatile solvents employed in the manufacture of plastic masses with a basis of nitrocellulose. Fr. Pat. 441,551. *See* V.

ime cartridges for breaking down coal, rock, etc. Eng. Pat. 10,442. *See* VII.

XXIII.—ANALYTICAL PROCESSES.

lectro-analysis ; Rapid —— under reduced pressure. F. Fischer and E. Stecher. Z. Elektrochem., 1912, 18, 809—816.

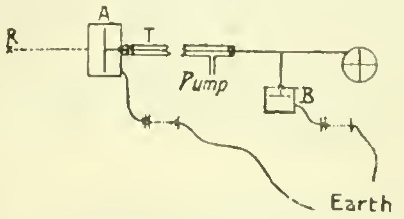
HE authors have extended the application of their ethod of rapid electro-analysis (this J., 1911, 1282) to etals other than copper. Nickel is readily separated uantitatively in the cold from nickel ammonium sulphate. t is necessary to have a sufficient excess of ammonium ulphate, and to start tho electrolysis under ordinary ressure. This is done to prevent the bubbles of ammonia, hich come off at first, from becoming too large and ausing loss of electrolyte. After about 3 minutes the uction is applied and the electrolysis concluded in 12 to 5 minutes. Lead is not so easily determined. It is ifficult to avoid the deposition of lead on the cathode, ith conditions which give an adherent deposit of lead ioxide at the anode. Zinc is readily deposited from lkaline solutions, but it must be washed and dried rapidly o prevent oxidation. The separation of copper from inc is accomplished in 10 minutes at 90° C. in nitric acid olution. Copper is separated from nickel in sulphuric cid solution at about 90° C. in about 13 minutes. After ashing the cathode, and replacing it by a new one, the ickel can be deposited from the now larger volume of iquid at ordinary pressure in about 20 minutes. For the nalysis of silver copper alloys the apparatus is used in onjunction with an Edison accumulator as a source of urrent. The wire anode is replaced by a gauze electrode o diminish the cell resistance, and 3 grms. of sulphuric cid are added to each 100 c.c. of electrolyte. In this way ·1 grm. of silver can be deposited at 90° C. in 15 minutes. he end of the deposition is marked by the attainment of constant minimum current which is measured by a illiammeter. Larger quantities of silver can be deposited without difficulty if vigorous agitation of the lectrolyte is ensured in the earlier stages of the deposition. he authors describe an appliance for washing the sides f the vessel without removing the stopper.—W. H. P.

Zinc ; Electrolytic determination of —— in presence of ammonium salts. R. Belasio. Ann. Lab. Chim. Centr. delle Gabelle, 1912, 6, 239—244.

IN presence of ammonium salts, none of the usual methods for the electrolytic determination of zinc is applicable, dark spongy deposits being obtained. Good results can, however, be obtained if the zinc be converted into oxalate and electrolysed in presence of lactic acid and sodium or potassium lactate. The solution containing 0·1 to 0·3 grm. of zinc as sulphate, and which may also contain ammonium sulphate and ammonia, is rendered distinctly acid with lactic acid, then neutralised with potassium hydroxide, a further 5 c.c. of lactic acid added, the solution diluted to 200 c.c., and after dissolving 3 grms. of ammonium oxalate and 5 grms. of potassium sulphate therein, the zinc is deposited by electrolysing for 2—3 hours with a current of 0·4—0·5 ampère at 3—3·5 volta, then adding 2 c.c. of lactic acid, and electrolysing for about 1 hour with a current of 1 ampère.—A. S.

Radium : Compensation method for the comparison of quantities of —— and some applications of the method. C. Rutherford and G. Chadwick. Le Radium, 1912, 9, 195—200. Chem. Zentr., 1912, 2, 751—752.

THE usual method of comparing a specimen of unknown radium content with a standard preparation is by comparing tho amounts of γ-radiation from the two specimens.



It is necessary that the preparation to be tested shall be free from mesothorium or radiothorium. The method only yields good results when the preparations are of the same order of activity; when the activities are very different it is not easy to achieve complete saturation of the ionisation current in the electroscope for both specimens. To overcome this difficulty the authors work as follows. The γ-radiation from the radium preparation at R (see fig.) passes into the ionisation chamber, A. The saturation current produced is compensated by an equal and opposite current from a comparison preparation of uranium oxide in B. Exact compensation is achieved by the use of a Dolezalek electrometer, the current from B being kept constant while the preparation at R is moved to the position of compensation. This is done with both the unknown and standard radium preparations, and the relative activities calculated from the inverse squares of the distances. For exact measurements it is necessary to correct for the absorption of γ-radiation by air and by glass. Further corrections are necessary for the determination of radium emanation. The application of the method in determining the γ-radiation from a large quantity of radium emanation gave an exponential fall with a period of 3·854 days. It was further determined that the γ-activity of a tube filled with radium emanation reaches its maximum after 255 minutes. Finally it was established that the emission of γ-rays is not affected when the emanation is placed between the poles of a powerful electromagnet.—W. H. P.

Titanium ; Volumetric determination of ——. P. W. and E. B. Shimer. Eighth Int. Cong. Appl. Chem., 1912. Sect. I., Orig. Comm., 1. 445—451.

THE process is based upon the reduction of titanium dioxide (to Ti_2O_3) by means of zinc and sulphuric acid, and the subsequent oxidation of the lower oxide by titration with potassium permanganate if iron is also to be determined or with a solution of ferric ammonium sulphate (employing thiocyanate as indicator) if titanium alone is required. The reductor employed consists of a glass tube, 36 in. long, filled with amalgamated zinc and provided with a receiving flask at the lower end. The grains of zinc are of such size as to pass through a 10-mesh, but remain upon a 20-mesh, sieve, and the metal is heated by the passage of hot dilute sulphuric acid through the tube before the reduction proper is commenced. The hot sulphuric acid solution of titanium and iron is then passed slowly through the reductor, the receiving flask being filled with carbon dioxide before and after the operation. The usual time required for complete reduction is stated to be about 15 minutes. In the analysis of rutile, the latter was fused with potassium bisulphate, the melt extracted with dilute sulphuric acid and the insoluble matter filtered off. The solution was saturated with hydrogen sulphide to effect the reduction of the iron, which was determined by titration with permanganate after the removal of the excess of hydrogen sulphide by boiling. The titrated solution was then heated almost to boiling and passed through the preheated reductor, into the receiving flask. 5 c.c. of a saturated solution of potassium thiocyanate being added to the reduced liquid, the latter was titrated with the ferric solution until the assay retained a brownish colour for at least a minute. The value of the ferric solution in terms of titanium dioxide was ascertained by calculation from the iron value as determined by titration with permanganate. The process was also employed with excellent results in the analysis of ferro-titanium, titaniferous iron ores, titanium carbide, steel and pig iron, some of these materials being obtained from the U.S. Bureau of Standards. It was found necessary in the presence of a large excess of iron (as in the determination of titanium in steel, etc.), to pass the hot, sulphuric acid solution twice through the reductor. High results were obtained in the presence of vanadium, the removal of which was found to be necessary before the reduction of the solution was effected.—W. E. F. P.

Titanium; New colourimetric method for ——. V. Lenher and W. G. Crawford. Eighth Int. Cong. Appl. Chem., 1912. Sect. I, Orig. Comm., 285—293.

THE method is based upon the red colouration produced by the addition of thymol to titanium, both being in solution in concentrated sulphuric acid. The intensity of the colouration is stated to be at least 25 times as great as that produced by hydrogen peroxide; the colour fades on heating the solution, but is completely restored by cooling unless the temperature exceeds 90° C., when a permanent change occurs. The reagent is best prepared by dissolving the thymol in a little acetic acid (or acetic acid containing 10 per cent. of alcohol) and adding concentrated sulphuric acid; the solution darkens in a few hours upon exposure to bright light. The titaniferous material is most conveniently brought into solution by fusing with potassium bisulphate and extracting the melt with concentrated sulphuric acid. The titanium solution is cooled to room temperature before the thymol is added; the ratio of thymol to titanium may vary greatly, but it has been found best to have at least 0·006 grm. of the former present to every 0·0001 of titanium dioxide.—W. E. F. P.

Aluminium and beryllium; Detection and separation of ——, by the action of amyl alcohol on the nitrates. P. E. Browning and S. B. Kuzirian. Eighth Int. Cong. Appl. Chem., 1912. Sect. I., Orig. Comm., 1, 87—90.

THE separation is based upon the fact that, in concentrated solutions, aluminium nitrate is rendered insoluble (dehydrated) by boiling with amyl alcohol, whereas beryllium nitrate remains in the liquid, from which it may be obtained in aqueous solution by agitation with water; the presence of beryllium in the aqueous solution is indicated by the production of a white precipitate on the addition of ammonia. 5 c.c. of a saturated solution of beryllium nitrate in amyl alcohol were found to contain from 0·10 to 0·13 grm. of beryllium oxide. As a qualitative method the results were entirely satisfactory and the process is recommended for the preparation of beryllium salts free from aluminium. Difficulty was experienced in the quantitative separation, a little beryllium being included in the aluminium precipitate even after two treatments; but the authors consider the results sufficiently promising to warrant a further investigation of the process.—W. E. F. P.

Boron; Detection of infinitesimal traces of ——, by means of tincture of mimosa flowers. L. Robin. Eighth Int. Cong. Appl. Chem., 1912. Sect. I., Orig. Comm., 1, 429—432.

IN the preparation of the tincture, 5 grms. of mimosa flowers are heated on a water-bath for 10 mins. with 50 c.c. of pure ethyl alcohol (95 per cent.); when cold, the solution is filtered, the residue is washed with a further 40 c.c. of alcohol, and finally pressed with a spatula; the filtrate and washings are mixed and stored preferably in the dark. The test is applied in the following manner:—To a few drops of the aqueous solution under examination (slightly acidified with hydrochloric acid), 2 drops of the tincture are added and the mixture is evaporated just to dryness upon a water-bath. The residue (which is lemon yellow or yellow brown in colour according as boric acid is absent or present) is treated with dilute ammonia, when a colouration varying from rose pink to blood red, according to the quantity of boric acid present, is developed in the liquid. The test is stated to be so sensitive as to render a blank experiment necessary; working with solutions containing only boric acid, the author has detected as little as 0·000071 mgrm. of boron by the above means, and 0·000048 mgrm. by allowing the solution to evaporate spontaneously in a desiccator instead of employing the water-bath. The colour produced by 0·00012 mgrm. of boron was found not to be affected by the presence of potassium nitrate, chloride, bromide or iodide, or calcium sulphate, but was less pronounced when sodium phosphate was present, and was not formed at all in the presence of organic acids. The latter, however, are easily removed by calcination, the test being then applied to the aqueous extract of the ash, as in the case of milk and other organic substances.—W. E. F. P.

Refractometry. H. C. Lythgoe. Eighth Int. Cong. Appl. Chem., 1912. Sect. I., Orig. Comm., 1, 295—331.

A GENERAL account of the application of the principles of refractometry to analytical purposes, both qualitative and quantitative. The various formulæ in use for calculating "specific refraction" (*i.e.*, refractive index independent of temperature) are discussed, special reference being made to that of Lorenz and Lorentz, $\frac{n^2-1}{n^2+2}\cdot\frac{1}{d}=k$, where n is the refractive index, d the specific gravity, and k a constant; in this connection tables are given showing the values of $\frac{n_2-1}{n_2+2}$ for values of n from 1·30 to 1·879 and for each scale division of the immersion butyro- and milk-fat refractometers. A comprehensive and classified bibliography of the subject is also appended.
—W. E. F. P.

Determination of hydrogen and methane in gas mixtures. Hempel. *See* IIA.

Determination of nitrogen in ferrocyanides, thiocyanates and spent oxide. Knublauch. *See* IIA.

Apparatus and method for (1) carbon test and residue an (2) sulphur determination in petroleum lubricating oils. Conradson. *See* IIA.

Detection and determination of paraffin and ceresin i mixtures, and application to the analysis of candle Armani and Rodano. *See* IIA.

Determination of sulphur in pyrites. Smoot. *See* VII

Determination of sulphur in pyrites ores. Allen and Bisho *See* VII.

New method of titration of arsenic acid. Menzies an Potter. *See* VII.

Analysis of commercial vanadic acid. Chesneau. *See* VII.

Rational analysis of sodium nitrate. Allen. *See* VII.

Detection of chlorides in presence of alkali thiocyanates. Cormimbœuf. *See* VII.

[*Determination of iodine in*] *cuprous iodide.* Kohn and Klein. *See* VII.

Determination of iodides. Schirmer. *See* VII.

Fusion of some rare earths with alkali carbonates and separation of tungsten from iron, beryllium, and aluminium. Wunder and Schapiro. *See* VII.

Detection and determination of cyanogen and hydrogen cyanide. Rhodes. *See* VII.

Use of the higher phenols in testing for free lime in Portland cement. McFarland and Hadley. *See* IX.

Methods of U.S. Steel Corporation for sampling and analysis of pig iron. *See* X.

Electrolytic separation of iron and manganese. Analysis of ferromanganese. Belasio. *See* X.

Analysis of ferrosilicon. Camilla and Pertusi. *See* X.

Sampling of gold bullion. Dewey. *See* X.

Action of boiling sulphuric acid on platinum. McCay. *See* X.

Technical method of spelter [*zinc*] *analysis.* Ericson. *See* X.

Electrolytic determination of tin in alloys of lead, tin, and antimony, coated with tin. Belasio. *See* X.

Halphen's reaction for cottonseed oil. Gastaldi. *See* XII.

Detection of mineral oils in wool grease oleines. Settimj. *See* XII.

Examination and criticism of the method of McIlhiney for the analysis of oil varnish. Bochand and Gillet. *See* XIII.

Shellac analysis and the detection of small amounts of colophony in shellac. Hicks. *See* XIII.

Microscopical determination [*detection*] *of arsenic, as orpiment, in shellac.* Schwarz. *See* XIII.

Acidity of soils. Grégoire. *See* XVI.

Determination of total manganese in soils. Gortner and Rost. *See* XVI.

Determination of citric acid-soluble phosphoric acid in Thomas slag. Fuchs and Wagner. *See* XVI.

Inversion of sucrose by means of ammonium chloride [*in the double polarisation method*]. Strohmer and Fallada. *See* XVII.

Determination of traces of iron in sugar factory products. Pellet. *See* XVII.

Examination of some important methods for the analysis of honey. Fiehe and Stegmüller. *See* XVII.

Sources of error in the determination of the acidity of wort and beer. Stuhlmann. *See* XVIII.

Determination of methyl alcohol in admixture with ethyl alcohol, especially in potable spirits. Koenig. *See* XVIII.

Difficulties in the colorimetric determination of vanillin. Hubbard. *See* XX.

Colorimetric method for the determination of vanillin in flavouring extracts. Folin and Denis. *See* XX.

Valuation of Java citronella oil. Umney and Bennett. *See* XX.

Determination of aldehydes. Feinberg. *See* XX.

Determination of tartaric acid in presence of metals capable of forming emetics. Kling and Florentin. *See* XX.

Application of the racemate method of determining tartaric acid to solutions of tartaric esters. Kling and Gelin. *See* XX.

Assay of aromatic sulphuric acid. Brown. *See* XX.

PATENTS.

Laboratory utensils and apparatus; Product for the manufacture of ——. H. Kunz-Krause. Fr. Pat. 442,094, March 29, 1912. Under Int. Conv., April 12, 1911.

LABORATORY utensils made from clay are impregnated either before or after firing with finely-divided metals. This is done by impregnating the clay article with a solution or suspension of a metal or metallic compound, whereby the article when finished is so uniformly impregnated with the metallic particles that its stability and heat conductivity are similar to objects formed entirely of the precious metals.—W. H. C.

Photometer. J. Macé. Fr. Pat. 442,623, April 17, 1912.

THE apparatus is of the type in which a photographic plate is exposed to the source of light for a definite time, developed under definite conditions, and then compared with a set of standard plates, which may have been prepared similarly from a standard source of light. The apparatus comprises a plate carrier and a developing machine. The plates are stored in a magazine and are pressed upwards by a spring so as to enter one by one a recess in a slide carried in the base board. The plate is carried from the magazine by moving the slide to its central position, a tube directed towards the source of light is then brought over the plate, and the exposure is made. The slide is then moved again so as to deliver the plate into the developing machine. This is a separate piece of apparatus having a receiving tube to fit over the discharging tube of the plate-carrier. The exposed plate is received in a recessed slide and carried by it to the developing tank which is of the same shape as the magazine. The developer is stored in a reservoir connected with the developing tank and the liquid is transferred from one vessel to the other for developing and washing the plate, by means of a pressure bulb.—A. T. L.

XXIV.—MISCELLANEOUS ABSTRACTS.

Hydrocarbons; Action of ultra-violet light upon gaseous ——. D. Berthelot and H. Gaudechon. Comptes rend., 1912, **155**, 521—522.

UNDER the influence of ultra-violet light, acetylene can be made to yield a solid yellowish polymerised product. Ethylene polymerises to a thick liquid boiling above 100° C., and bearing some resemblance to caprylene. Allylene gives rise to a whitish solid. Methane shows no tendency to polymerise, but in the presence of oxygen it loses hydrogen and forms higher homologues of the paraffin series.—F. Sodn.

Combustion in an atmosphere of carbon tetrachloride. E. van Melckebeke. Bull. Soc. Chim. Belg., 1912, **26**, 384—386.

WHEN a jet burning hydrogen is introduced into a vessel containing carbon tetrachloride vapour, the flame becomes more and more smoky; the dense black smoke settles on the walls of the vessel. When the flame reaches a zone where the air is completely displaced by carbon tetrachloride vapour, it is extinguished. Extraction of the deposits on the walls of the vessel with light petroleum gave a brown liquid which deposited colourless prismatic needles which polarised light. These had the properties of a mixture of hexachlorobenzene and hexachloroethane formed thus:—$6CCl_4+18H=C_6Cl_6+18HCl$

$$2CCl_4+2H=C_2Cl_6+2HCl.$$

These chlorides are then decomposed by hydrogen at the temperature of the combustion, with the formation of carbon. An acetylene flame is immediately extinguished when introduced into carbon tetrachloride vapour.
—E. F. A.

Green plants; Constituents of ——. IV. Further volatile aldehydes in hornbeam leaves. V. Volatile alcohols in hornbeam leaves. T. Curtius and H. Franzen. Sitzungsber. d. Heidelberger Akad., 1912, Abtheil. A., [8] [9]. Chem. Zentr., 1912, 2. 722. (See this J., 1912, 706.)

The authors have found in hornbeam leaves: formaldehyde, acetaldehyde, *n*-butylaldehyde, valeraldehyde, *αβ*-hexylenealdehyde and higher homologues of the last-named. The hexylenealdehyde is present in much the greatest proportion, acetaldehyde and butylaldehyde are fairly plentiful, while the others are found only in small quantity. Butylaldehyde has not previously been identified in plants. The alcohols present are butylene, pentylene, and hexylene alcohols, an alcohol of the formula $C_6H_{14}O$, and higher homologues. The authors proceed to discuss the function of the various acids, aldehydes and alcohols identified in hornbeam leaves.—W. H. P.

Enzyme action. XVI. Enzymes of the emulsin type. I. Prunase, the correlate of prunasin. H. E. Armstrong, E. F. Armstrong, and E. Horton. Roy. Soc. Proc., 1912, **85b**, 359—362.

The resolution of amygdalin by almond emulsin is effected in two stages: the enzyme amygdalase hydrolyses it to glucose and prunasin (mandelonitrile glucoside), whilst the enzyme prunase (*β*-glucase) converts prunasin into glucose, benzaldehyde and hydrogen cyanide. The leaves of the cherry laurel *Prunus laurocerasus* have now been found to contain prunase without amygdalase, whereas the fruit, like that of the almond, contains both enzymes. Almond emulsin and indeed most natural products consist of a mixture of enzymes. The evidence that enzymes are strictly specific agents is regarded as overwhelming.
—E. F. A.

Enzyme action. XVII. Enzymes of the emulsin type (II.) The distribution of β-enzymes in plants. H. E. Armstrong, E. F. Armstrong and E. Horton. Roy. Soc. Proc., 1912, **85b**, 363—369. (Compare this J., 1907, 885; 1908, 823; 1910, 711.)

In examining plants for enzymes the following method is used. The material after collection is placed in a bottle with toluene or chloroform until it can be dealt with; it is then cut up in a mincing machine and dried, either directly or after thorough washing to deprive it of soluble matter. Washing usually diminishes the activity but it has the advantage that no correction for reducing substances has to be applied subsequently in the course of the analytical process. The dried material is finally ground to a very fine powder which retains its activity over long periods. By means of the four glucosides, linamarin (phaseolunatin), amygdalin, prunasin and salicin, the distribution of the four enzymes linase, amygdalase, prunase and salicase has been determined in a number of plants. Amygdalase is but sparsely distributed and almost confined to seeds in which amygdalin is present. Prunase is widely distributed. A distinct enzyme salicase exists, which is possibly only capable of acting on salicin, but the two enzymes, prunase and a salicase, occur together in many cases. A number of cases are quoted in which the amount of glucoside or enzyme has been observed to vary either in the same species in different localities or between different species of a group. These afford evidence as to the possibility of differentiating botanical species by chemical means.—E. F. A.

Books Received.

Modern Research in Organic Chemistry. By F. G. Pope, B.Sc. (Lond.). Methuen and Co., Ltd., 36, Essex Street, London, W.C. Price 7s. 6d.

Crown 8vo containing 315 pages of subject matter arranged under the following headings:—I. The polymethylenes. II. The terpenes and camphors. III. The uric acid or purine group. IV. The alkaloids. V. Relation between the colour and constitution of chemical compounds. VI. Salt-formation, pseudo-acids and bases. VII. The pyrones. VIII. Ketens, ozonides, triphenylmethyl. IX. The Grignard reaction. There are also indexes of authors' names and of subjects and a bibliography.

A Second-Year Course of Organic Chemistry for Technical Institutes. The Carbocyclic Compounds. By F. B. Thole, B.Sc. (Lond.). Methuen and Co., Ltd., 36, Essex Street, London, W.C. 1912. Price 2s. 6d.

This crown 8vo volume contains 139 pages of subject matter, appendices occupying 40 pages, and an alphabetical index. It includes chapters on the Grignard reaction and on steric (or spatial) hindrance, sections on important synthetical reactions, etc., and qualitative practical organic chemistry; and tables of specific gravities and melting and boiling points.

Transactions of the American Institute of Chemical Engineers. Vol. IV. 1911. D. Van Nostrand Co., New York. E. and F. N. Spon, Ltd., London. 1912. Price 30s. net.

Large 8vo volume containing 505 pages of subject matter, with 15 illustrations, and an alphabetical index. 86 pages are devoted to official matter connected with the Institute and the remaining 419 pages to addresses and papers read before the Institute. These include a number of technical papers, abstracts of some which have already appeared in the Journal, and two series of papers on "Chemical Engineering Education" and "The U.S. Patent System" respectively.

Einführung in die Mathematik für Biologen und Chemiker. Von Prof. Dr. L. Michaelis. Verlag von J. Springer, Berlin. 1912. Price M. 7; bound, M. 7.80.

8vo volume containing 250 pages of subject matter, with 96 illustrations (curve diagrams, etc.), and an alphabetical index. The text is arranged under the following headings:—I. Recapitulation of elementary mathematics. II. The law of functions. III. Differential calculus. IV. Integral calculus. V. MacLaurin's and Taylor's series. VI. Differential equations. An introduction to the mathematical representation of a function is given in an appendix.

Annali del Laboratorio Chimico Centrale delle Gabelle, Diretti dal Dr. V. Villavecchia. Vol. VI. Tipografia Co-operativa Sociale, Via de' Barbieri 6, Roma. 1912.

This is the sixth volume of the reports of the work done in the Italian Central Customs Laboratory, which was instituted in 1886. Previous volumes were published in 1891, 1893, 1897, 1900, and 1904 respectively. The present 8vo volume contains 699 pages of subject matter and an alphabetical index. After a description of the work of the laboratory since its installation, a detailed tabular statement of the analyses executed therein is given. The rest of the volume is occupied by original papers (abstracts of some of which appear in the present number of the Journal) containing descriptions of investigations made in the laboratory, and abstracts of similar papers published elsewhere.

* New Books.

[The Roman numerals in thick type refer to the similar classification of abstracts under "Journal and Patent Literature" and in the "List of Patent Applications."]

I. *Bikoff*, N., u. G. v. *Doepp*, Proff.: Die internationale Ausstellung v. Verbrennungsmotoren in St. Petersburg. [Aus: "Die Gasmotorentechnik."] (52 S. m. Fig. u. 1 Taf.) 31,5×23,5 cm. Berlin, Boll & Pickardt. 1912. M. 3.

Diesel, Rud.: Ueberblick üb. den heutigen Stand des Baues v. Dieselmotoren u. dessen Bedeutung f. die Weltindustrie im allgemeinen u. die englische Industrie im besonderen. [Aus: "Der Oelmotor."] (11 S. m. 2 Abbildgn.) Lex. 8°. Berlin, Verlag f. Fachliteratur. 1912. M. 1.

Graefe, Dr. E.: Ueber den Einfluss des Schwefels in flüssigen Brennstoffen beim Motorenbetrieb. [Aus: "Der Oelmotor."] (3 S.) Lex. 8°. Berlin, Verlag f. Fachliteratur. 1912. M. 1.

Kirschke, A.: Gas and oil engines; a concise account of the most important types; tr. from the German and applied to English practice by C. Salter; with 55 illustrations. N.Y., Van Nostrand. 8+159 p. tabs. D. (Broadway ser. of engineering handbooks.) 1912. $1.25.

Rimmer, E. J.: Boiler Explosions. Collapses and Mishaps. 8vo, pp. 152. Constable. London. 1912. Net 4s. 6d.

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PRESENTATION OF THE SOCIETY'S MEDAL TO SIR WILLIAM CROOKES, O.M., F.R.S.

The medal of the Society was presented to Sir William Crookes, O.M., F.R.S., at a dinner held at the Criterion Restaurant, London, on Wednesday, October 23rd, 1912, at which nearly 150 members and guests were present. The chair was occupied by the retiring President, Dr. Rudolph Messel, F.R.S.

The toast of H.M. the King having been duly honoured,

THE MEDAL.

The Chairman said their gathering that night might be looked upon as the final function of their Annual General Meeting, which had been held in New York, and at which the Medal had been unanimously awarded to Sir William Crookes. It had not been possible for Sir William personally to receive the Medal in New York; he had shrunk from the great fatigue which the voyage to and attendance in New York would entail. However, that had the advantage that they could that night celebrate the event and hand the medal to him in London. He was particularly delighted that they had such a representative gathering of the Society, and he felt greatly indebted to the Chairmen and the Secretaries of their Sections in England who had come to do honour to Sir William Crookes; and, likewise, that so many Scientific Societies were represented. He especially appreciated the honour that, for the first time, they had amongst them the President of the Royal Society. They all knew that was only reflected glory on them, and that it was all to the honour of Sir William Crookes; but all the same they most sincerely appreciated it. Sir William had excused himself for not going to New York on account of his advanced age; but he thought Sir William's 80 years sat very lightly on his shoulders. Looking back to the time when Sir William Crookes started working more than half-a-century ago,—he founded the "Chemical News" in 1859 and discovered thallium in 1861—seeing him now daily at work—serious, honest hard work, partly new and partly filling up gaps in work started more than half-a-century ago, they could only marvel, and hope they might look forward to many years of active work by Sir William Crookes.

He had received many letters from past Presidents and Presidents of kindred societies; the letters were invariably in the same laudatory strain, expressing admiration for this remarkable man and regret for not being able to do honour to Sir William Crookes that night. Their new President, Professor Marston T. Bogert, wrote expressing sincere regret for not being able to be present, and offered his humble tribute to and his high appreciation of the long, distinguished, and fruitful career which had made Sir William Crookes' name a household word wherever chemistry was taught and a natural leader amongst his colleagues in all lands, which meant so much for the scientific progress of the world; the Society was adding one more famous name to the brilliant roll of its medallists, and was honouring itself in honouring Sir William Crookes; and he expressed the hope that Sir William would long be spared in health and happiness to continue his splendid work and to enjoy the well-won fruits of his life; and that if, in the distant future, old age should descend upon Sir William it would be found that

> "Age is opportunity no less
> Than youth itself, though in another dress;
> And as the twilight fades away,
> The sky is filled with stars invisible by day."

The sentiment expressed in this letter was that which really moved them all. In his (Dr. Messel's) address at the presentation of the medal in New York (see this J., Sept. 30, 1912, p. 857), he mentioned some of the work done by Sir William, but the world knew the work he had done and it was not necessary to say anything further in that connection. Among the many acknowledgments which Sir William had received were the award of the Order of Merit and a Knighthood, as well as the Albert Medal, the Royal Society's Medals, and the Gold Medal of the French Academy, and many others—some thirty in all—and now, this Society offered its Medal to Sir William Crookes. To their Society it was a great honour to be allowed to enrol his illustrious name amongst their medallists, and they wished to show how sincerely they appreciated his services; but to him what can it mean? They hoped that he would look upon it as a proof not only that they so greatly appreciated his services, but also that they wished to hold him up as a model to future generations, that they valued pure science foremost, and that they would always regard it as the true foundation of progress and industry. As far as Sir William was concerned, he hoped he would look upon it as an appreciation of his services to science and as a mark of the high esteem in which he was held by 4,000 or 5,000 brother chemists—the members of our Society.

The Chairman then handed the Society's Medal to Sir William Crookes, with the remark that it was his proud privilege to present the Medal, which was the best the Society had to give.

Sir William Crookes, O.M., F.R.S., in acknowledging the receipt of the Medal, spoke as follows: The first thing I must do is to crave your indulgence. Adequately to express my feelings on this occasion is beyond me. The kind things said about me, the cordial manner in which reference to works of mine has been received, and the flattering presence of this distinguished company of men eminent in the Society, give me vivid pleasure. I am no speech maker; all my life I have been grappling with mysteries only to be tracked by incessant work in the laboratory. But pray do not suppose I am indifferent to your friendliness. Sympathy is no less dear to workers in science than to those engaged in more popular pursuits. Indeed it is more dear, since our work appeals to the few, not to the many.

To every student, to every investigator seeking to acquire deeper and clearer insight into the appalling wonders of what we call nature, recognition of success, especially from a distinguished scientific Society, naturally leads to further endeavour. That I should have been counted worthy to receive the Medal of the Society of Chemical Industry, a Society which numbers in its roll of former Medallists some of the brightest names in every department of applied chemistry, is an honour I keenly appreciate—an honour I shall never forget. If there be any element of truth in the old proverb, "*Nolo laudari nisi a laudato,*" surely the highest aim of ambition must be to receive the praises of those who themselves are the most praised and the most praiseworthy.

Working as I have been for half-a-century with problems of radiant energy and radiant matter, there is a peculiar appropriateness in the design of my beautiful Medal. In the centre is Phœbus Apollo, the Divinity of radiance and light (associated by Euripides with the Sun-god Helios), and the rays darting from him represent the atoms of helium, the discovery of which has aided the revival of the alchemists' dreams of the middle ages.

Chemical engineering and my own special lines of research lie at opposite ends of the science. You deal with enormous weights of raw material, with gigantic engine power, and with vast combinations of matter, labour, and machinery; I, on the contrary, have been absorbed in the mechanism of electrons, atoms, and molecules—millions of which unite to build up even one mote dancing in the sun-beam. You handle hundreds of tons of matter and thousands of horse power; I deal with forces and dimensions compared with which the millionth of an atmosphere of pressure, the millionth of a grain of weight, and the millionth of a millimetre of length are large quantities. But here, as in other cases, extremes meet, and the infinitely great and the infinitely small are each governed by the same chemical and mechanical laws.

Industrial chemistry as we now know it is essentially a product of the Victorian age. What in my early days was a curiosity of the few, has now become the useful servant of the many. Supreme in the arts of peace as of war, industrial chemistry is indispensable in every department of life, and without it civilisation would soon come to an end and be non-existent.

In our overwhelming present we are apt to forget our past—to forget those who helped to make it for us. My first stock of thallium in quantities of over an ounce was extracted from flue-dust from Peter Spence's sulphuric acid works at Manchester, and quantities of crude thallium chloride were presented by him to me to be worked up in my private laboratory. Subsequently—nearly 50 years ago—I was under great obligations to Messrs. Hopkin and Williams for working up some flue-dust for thallium. Ten tons of dust, generously presented to me by Messrs. Allhusen, of Newcastle, yielded me more than a hundredweight of the pure metal. In more recent times I have been under great obligations to my good friend Mr. Tyrer, who worked up a considerable quantity of gadolinite for yttria and other rare earths, and later the same benefactor broke up half-a-ton of pitchblende and sent me all the different products for me to extract the radium from the most suitable specimen. My gratitude to this friend is not unmixed with a lively sense of favours to come, for in my laboratory I have a considerable quantity of crude scandium material which I hope to induce him to take in hand.

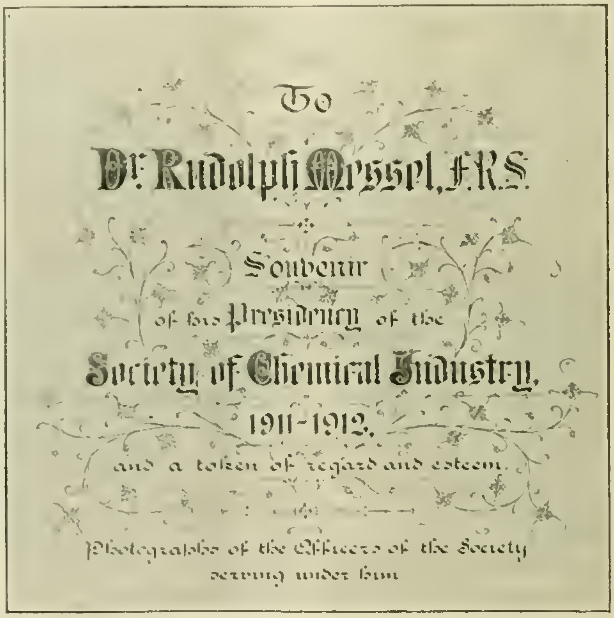
During my long life I have striven loyally with all my might for the truth. No one can be more fully conscious than I am how little I have won compared with what remains to be solved and achieved. Those of us who have attempted to penetrate from the known to the unknown, from the vague to the definite, are surprised not so much by the extent of our knowledge as by the depth of our ignorance. As I have proceeded in my investigations I have discerned new and unexplored regions opening out to the right and to the left. To some of these mysterious tracks I may return and endeavour to capture them and to bring them within the domain of science. Who shall dare to say what new treasures of truth and even of practical utility may there await the patient enquirer? I hope and believe I shall still be able to do good work in my research laboratory, and this notwithstanding the ominous assurances of friends that I grow younger every year!

It is a matter of great regret that I was unable to attend the meeting of the Society in New York. Our new President is a citizen of the United States, and I trust he will be able to come among us and preside at some of our meetings. I hope the most cordial relations, and the most friendly rivalry may ever prevail between the men of science of that great Republic and the researchers of the little Mother Isle. May we labour harmoniously side by side in our great life-task—the interpretation of the chemical secrets of the universe!

In proposing the toast of "Kindred Societies," Mr. **David Howard** (Past President) said that a great honour had been laid upon him and a very great responsibility, because how could he do justice to this toast, which meant so very much to the industrial chemist? "Kindred Societies" was a very generic term, but it was a special honour and pleasure to include, first of all, the parent society, the Royal Society, the oldest society in England and also the youngest, because truth was ever young and there was no time in the Royal Society; it was as young as ever and had all the common knowledge which was the foundation of all our applied knowledge. It was well to remember that science was not kept in water-tight compartments, for to think it was a fatal danger. No doubt it was one's duty to know, not science but the little tiny branches of science that one had to do with as well as one could; that meant knowing one's own ignorance. Applied science was but a little corner of the great field of science, which was the very foundation of them all. It had been the noble work of the Royal Society to link together all sciences, for they were all one, though so different; and to keep before their minds the great principle that they did not know everything. They welcomed most heartily the President of the Royal Society. There were other kindred societies represented there, including the Institute of Chemistry, the Society of Public Analysts, the Institute of Brewing, the Royal Photographic Society, and the Pharmaceutical Society; and they welcomed them all. Science was a tremendous subject, and, in order to achieve success in their own tiny compartments they should recognise the influence of others upon their own, and to appreciate the nobleness and magnificence of truth for its own sake; and then they would realise what it meant to meet there, as they did, the representatives of pure science and applied sciences, all working for one common object. All the progress of science of which this twentieth century was so proud was but a tiny little bit of the great truth; and if a little imperfect appreciation of truth meant so much, what must be truth itself? They were all applying to practical uses the central truths which it was the honour and glory of the Royal Society to teach. How much of their practical work was the result of the theoretical work of the pure scientist? Their success in applied science made them humble enough to appreciate the glories of science for its own sake. He urged them not to think that useful knowledge was the only thing they had to study. They had to study science for its own sake, and it might be that they might make it useful, but they should, first of all, remember that all applied science sprung from science for its own sake; and, secondly, that all branches of applied science were akin to one another, linked to one another, one family who ought to love one another.

Sir **Archibald Geikie**, K.C.B., F.R.S. (President of the Royal Society), said it was an honour of which the President of the Royal Society was always very conscious when he was asked to respond for the "Kindred Societies." Two hundred years ago, there was only one Scientific Society, but the number had increased till every branch of science had, not only its own Society devoted to the cultivation of pure science, but had also its Society of Applied Science. The Chairman had said that he thought he had been mainly induced to come to the dinner to do honour to Sir Wm. Crookes, and he admitted that was one object he had, and he was glad to add his humble word of praise of that great chemist and dear personal friend. It had been a great pleasure to him during the past four years to have served with Sir Wm. Crookes on the Council of the Royal Society; but Sir William's term of office was almost ended, and he looked forward with great regret to the termination of a long personal intimacy. But that was not his only object in wishing to be present at that dinner; to a man who had devoted himself mostly to pure science it was always a great pleasure to come into contact with those who had spent their lives in turning science to practical use. He admired and wondered when he knew of the tons of material employed and of the intense heat in the electric furnace and the vast complications of processes they carried through. It was a great advantage and also a great pleasure to meet men engaged in a totally different sphere from one's own, for in that way one obtained many new ideas. He thanked them for the pleasure that dinner had given him; and he wished long success and happiness to the Society of Chemical Industry with its splendid *clientèle* of members. With such a brilliant past, they undoubtedly had a great future before them; and nobody would rejoice more in that than the Fellows of the Royal Society. He thanked them for the way this Toast had been proposed and received.

In proposing the toast of the "Society of Chemical Industry," Professor Sir **James Dewar**, F.R.S. (Past President) said that it so happened that the toast which had been placed in his hands he had had the honour of proposing 24 years ago, when he presided over a meeting at Glasgow, at the time that he was the Society's seventh President. He was now about to propose their own healths and to congratulate themselves upon their thirtieth President. During that time the Society had increased with most extraordinary velocity from what was considered to be unexampled success, by the promoters of that great movement, in the year 1888, when the membership at the time of the meeting at Glasgow was a little over 2000, while now their numbers exceeded double that. That result had been achieved by a most judicious mode of advance in co-ordination and co-operation which would not have been possible but by the association of men of intellect in both abstract and applied science; it was the special design and object of the founders of the Society that it should be not only beneficial to industry but also to science itself; because the co-operation of those two groups was essential for the future benefit of the human race. The men who carried this out in the early days were men not only of great originality but of unselfish power and devotion to their object. They laboured with joy at the foundation and at the success of the Society; and it was their initiative which had permeated and maintained the fruitful and spontaneous blood-stream of life which permeated it at this moment as vigorously as it did at the beginning. Such men, like Mond and many other Presidents and Secretaries, were those who had assisted in making this extraordinary success of the Society which was world-wide, with its 12 Sections extending not only throughout Great Britain but including one in Canada, two in the United States, and one in Australia. Verily they were now in contact with the whole of the intellectual and practical world. They had created in reality a great memorial body of applied chemical science, an imperial body in the highest and most important sense of the term. There was still so much to be done in other fields where what one might call Governmental forces were utilising, and necessarily utilising, science more and more. They could only wish that the educational system of this country did something more to educate those who were responsible for the management of the great Departments of the State. If that were done, it would be not only a benefit to themselves but a great benefit to the nation and it would enable them to see, as sooner or later they must see, that a training in science was absolutely essential to the management of such great undertakings. An individual mind responsible for great efforts ought to possess and could only possess the necessary power by early training and by the advice of other men. The Universities were moving rapidly, and he had seen at one of the oldest Universities what advances and enlightenment had taken place in the acknowledgment of science and its claims. At the present time, in the Cambridge Laboratories extensions in every department would be found in physiology and geology; and large extensions on behalf of agricultural science, not to mention botanical science. They required to produce men who were really competent to aid in the practical application of science. He did not doubt that this Society would be able to influence more and more even the older Universities, as well as the newer ones, in the extension of the great domain of science. He then came to the acknowledgment of the services of their present President, Dr. Rudolph Messel, who was a worthy successor of any previous President. They were all proud when the Royal Society recognised the President's originality and merits as a great inventor and how his modest but determined, careful, and laborious life had accomplished great things which were now being imitated and applied in many ways; the catalytic process and its applications would always be associated with the name of Dr. Messel as one of the great applications of Science in our time: and he asked the Society to thank Dr. Messel for the admirable manner in which he had conducted the business of the Society. They wished him long life and good health and every possible success, and they congratulated him on his work and labour for the Society. Before asking the meeting to drink the health of the Society, he asked the Treasurer, Mr. Tyrer, to address the meeting.


To

Dr. Rudolph Messel, F.R.S.

Souvenir

of his Presidency of the

Society of Chemical Industry,

1911-1912,

and a token of regard and esteem.

Photographs of the Officers of the Society

serving under him

Mr. Tyrer (Hon. Treasurer) said he had a very pleasing duty to perform, namely, to ask Dr. Messel to receive, on behalf of the Society, a token of their regard in the form of an album, containing photographs of the officers of the Sections and of the Society, who had served under Dr. Messel during his presidency, together with portraits of Sir William Crookes and of the new President, Professor Bogert. Emblazoned on the cover of the album were the Arms of the British Empire, the United States, Canada, and Australia, together with the Stars of America and the Fleurs de Lis, but no stripes—for brotherhood required none. In addition to being responsible for the design of the memento, he also had the honour to be the medium of handing to the Chairman this token of regard, and he hoped Dr. Messel's life would last as long as the Album was intended to do.

The Chairman said it was impossible to find words adequate to express to them his appreciation of their great kindness to him. How could he express it sufficiently? He knew that all they had said about him was prompted by their kind feelings and good fellowship; and he also knew how little worthy he was of much of what had been said. On one point, however, he would not give way, and that was that during the long time he had been in connection with the Society he had always tried to do his best and his level best in its interests. His year of office had nominally closed; but, because Professor Bogert would be unable to come to England for some time, he had been requested to undertake the duties of President during his year of office. The Council had by an unanimous vote begged him to accept, and therefore he should carry out the duties some little time longer. In Great Britain he had visited all the Sections; he had also visited New York, Boston, Toronto, and Montreal; in fact he had visited all their Sections, with the exception of New South Wales; and he was prevented from going there by the great distance. He had been most cordially received wherever he went, and he had found that the Society and its work were very greatly appreciated. There had been some fear that the membership of the Society might suffer owing to the activity in the Scientific Societies and in scientific literature in America; but, after making careful enquiries, he had come to the conclusion that they were not threatened in that way so long as they realised what was required of them and, above all, so long as they kept their Journal in a state of efficiency. It was of particular advantage to them to have Professor Bogert as his successor, because Professor Bogert, in addition to being a most accomplished scientist, was certainly a *personâ gratâ* in the United States, and he was a most active member of the American Chemical Society. There need be no antagonism between the Societies, and, so far as he knew, there was none. It gave him very great pleasure indeed to thank them for all the kindness they had shown him during his year of office; and he thanked them most sincerely for the way in which they had received him that night. He also most heartily thanked them for the delightful album, which he should treasure all his life as a memento of their kindness to him.

Sydney Section.

Meeting held at Sydney, on Wednesday, July 24th, 1912.

MR. LOXLEY MEGGITT IN THE CHAIR.

CHEMICAL AND BACTERIOLOGICAL STUDY OF FRESH AND FROZEN NEW ZEALAND LAMB AND MUTTON.

BY A. M. WRIGHT.

The influence of the length of time during which meats are held in cold storage is important, and when we consider that from the time the animals are killed in New Zealand until the carcases reach the consumer in Great Britain at least 50 days must elapse, it is of economic value to know definitely the character of the changes which take place. The object of the present investigation was to study the changes in lamb and mutton when exposed to temperatures of 2° to 19° F. for varying periods up to 160 days. Little has hitherto been published on these particular meats, although there have been investigations in relation to beef and poultry.

Bibliography.—Summaries of articles which have appeared have been given by Emmett and Grindley (J. Ind. Eng. Chem., 1910, 2, 413—416) and by Houghton (J. Ind. Eng. Chem., 1911, 3, 497—499), but the following is a more complete bibliography:—

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Experimental.—Carcases weighing respectively 34 and 48 lb., selected immediately after slaughter, were split, and from one half of each portions of the flesh were taken, the excessive fat trimmed off and all bone removed; the resulting lean meat was finely minced to obtain a uniform sample, and then analysed. The other half of the carcase was held in cold storage.

The methods followed for the estimation of moisture, ash, fat, and total nitrogen were those of the Association of Official Agricultural Chemists (U.S. Dept. of Agric., Bureau of Chem., Bull. 107 Revised). The coagulable, proteose, peptone, meat-base, and ammoniacal nitrogen were determined by the methods used by the author in Meat Extract Analysis (this J., 1912, **31**, 176). Acidity was found by titration with $N/10$ potassium hydroxide and phenolphthalein, and expressed as lactic acid.

For the latter determination, as well as those of nitrogen, all of which were done in duplicate, 50 grms. of the minced meat were digested for 2 hours with about 250 c.c. water, filtered through cheese-cloth and wrung out, the residue being again treated with successive portions of water at half-hourly intervals, until 1000 c.c. of extract was obtained. This was filtered and preserved by the addition of a little chloroform, and 100 c.c. used for each of the various determinations.

For the purpose of showing more clearly the changes taking place in the nitrogenous constituents, the various proportions of nitrogen are expressed in relation to the total nitrogen of the meat; while on account of unavoidable variations in the moisture and fat contents of the samples, and in order that the results obtained might be readily comparable, the figures for organic extractives were calculated to a moisture, ash, and fat-free basis.

(1) *Changes due to putrefaction.*—To determine these changes, portions of the finely minced lamb and mutton were placed in flasks with water and inoculated with infusions from putrefying meat. The contents of the flasks were examined at the end of 2, 4, 7, and 14 days. Table I. shows the proximate analyses of the original meats and Table II. the results of the putrefactive changes. The initial stages of putrefaction are characterised by the transformation of the insoluble into soluble proteids and the conversion of coagulable proteids into proteoses, peptones, meat-bases, and ammonia, while the later stages of the process are marked by the formation of simpler compounds such as ammonia, carbonic acid, and water.

There was found to be a progressive increase in the amount of soluble matter, the total soluble nitrogen rising from 21·7 per 100 of that in the fresh lamb, to 75·5 per cent. after 14 days, the results for mutton being similar. The changes in the proportions of the various constituent bodies, as indicated by their nitrogen, can be readily seen.

The most striking evidence of putrefactive change is given by the figures for ammoniacal nitrogen, which, in the lamb rose from 0·8 to 53·4 per cent. of the total nitrogen present, the results obtained with mutton being in close agreement.

The figures opposite the term "Organic extractives" in Tables II. to V. are the percentages of the total fat-free organic matter soluble in water.

Table I.

Original meat.

	Lamb.	Mutton.
	per cent.	per cent.
Moisture	73·68	71·49
Ash	1·08	1·04
Fat	5·29	7·00
Other solids	19·95	20·47
	100·00	100·00
Total nitrogen	3·27	3·20
Acidity as lactic acid	0·54	0·61

(2) *Changes due to ripening.*—Experiments were carried out to determine the changes occurring during seven days when meat was held in flasks at laboratory temperatures of 60° to 70° F., the material being examined at the end of 1, 2, 3, 5, and 7 days. The results are shown in Table III.

It will be seen that certain progressive changes took place up till the third day, and then, owing to the increase of bacteria, incipient decomposition set in, this being evidenced by the marked increase of ammoniacal nitrogen, and the decrease of meat-base nitrogen.

(3) *Changes due to ripening in the absence of bacterial interference.*—To permit of ripening taking place without bacterial growth, portions of minced meat were mixed with thymol and chloroform and kept in flasks. The results, which are detailed in Table IV., show that under these conditions changes involving the increase of organic extractives, total soluble nitrogen, meat-base nitrogen, proteose and peptone nitrogen, took place up to between the third and fifth days, and then further changes either ceased or proceeded extremely slowly. It is probable that these changes were due to enzyme action.

(4) *Changes during cold storage* (2° *to* 19° *F.*).—These were only slight and of the same general nature as those taking place during ripening in absence of bacterial interference, and like them were probably due to enzyme action, for not only was the interior of the meat found to be sterile, but any bacteria lodged on the surface were also

TABLE II.

Showing changes due to putrefaction.

	Soluble nitrogen, per 100 in original meat.									
	Lamb.					Mutton.				
After days	0	2	4	7	14	0	2	4	7	14
Coagulable nitrogen	10·9	13·1	17·2	14·8	13·9	12·0	13·8	18·8	19·1	17·6
Proteose do.	1·3	1·7	3·1	3·4	3·3	1·8	1·9	3·9	3·1	3·6
Peptone do.	0·4	1·1	1·5	0·7	1·2	0·4	0·8	1·6	1·2	1·3
Meat base do.	8·3	9·9	5·0	3·9	3·7	8·1	9·8	1·5	3·9	3·8
Ammoniacal do.	0·8	2·6	7·5	43·5	53·4	0·9	2·8	8·5	42·2	52·7
Total do.	21·7	28·4	34·3	66·3	75·5	23·2	29·1	34·3	69·5	79·0
Organic extractives	21·4	24·7	30·5	37·7	40·0	21·3	24·1	29·0	36·5	40·9

TABLE III.

Showing changes due to ripening.

	Soluble nitrogen, per 100 in original meat.											
	Lamb.						Mutton.					
After days	0	1	2	3	5	7	0	1	2	3	5	7
Coagulable nitrogen	10·9	10·5	9·3	8·6	9·9	12·0	12·0	11·9	10·5	8·8	11·5	13·3
Proteose do.	1·3	1·5	1·7	1·7	2·0	2·6	1·8	1·7	1·9	1·9	1·7	2·0
Peptone do.	0·4	0·5	1·2	1·1	1·3	0·7	0·4	0·7	1·2	1·5	1·8	1·6
Meat base do.	8·3	8·4	9·3	10·9	10·1	9·9	8·1	8·7	9·6	12·1	11·4	9·4
Ammoniacal do.	0·8	0·9	0·8	0·8	1·2	1·9	0·9	0·9	0·9	0·8	1·3	2·6
Total do.	21·7	21·8	22·3	23·1	24·5	27·1	23·2	23·9	24·1	25·1	27·7	28·9
Organic extractives	21·4	21·8	22·6	23·1	24·2	26·2	21·3	21·9	22·2	23·9	24·7	26·2

TABLE IV.

Showing changes due to ripening in absence of bacteria.

	Soluble nitrogen, per 100 in original meat.											
	Lamb.						Mutton.					
After days	0	1	2	3	5	7	0	1	2	3	5	7
Coagulable nitrogen	10·9	10·4	9·8	8·9	8·8	8·9	12·0	12·2	10·1	8·6	—	8·8
Proteose do.	1·3	1·6	1·8	1·7	1·8	1·9	1·8	1·6	1·8	2·0	—	1·8
Peptone do.	0·4	0·7	1·1	1·2	1·2	1·0	0·4	0·9	1·3	1·0	—	1·2
Meat base do.	8·3	8·3	8·7	10·7	10·9	10·7	8·1	7·9	10·2	12·8	—	12·5
Ammoniacal do.	0·8	0·9	0·8	1·0	0·9	1·0	0·9	0·8	1·0	0·9	—	0·9
Total do.	21·7	21·9	22·2	23·5	23·6	23·5	23·2	23·4	24·4	25·3	—	25·2
Organic extractives	21·4	21·7	22·8	23·4	23·1	23·5	21·3	21·7	22·1	23·9	—	23·8

found to be unable to grow at the temperature of storage. In the case of lamb the maximum change was reached in about 60 days, while with mutton it was not attained until between the 90th and 120th days. The results are set out in Table V.

Table V.

Showing changes occurring during cold storage.

	Soluble nitrogen, per 100 in original meat.													
	Lamb.							Mutton.						
After days	0	14	28	60	90	120	160	0	14	28	60	90	120	160
Coagulable nitrogen	10·9	9·5	9·0	8·6	8·4	8·5	8·5	12·0	10·1	9·5	9·3	8·7	8·4	9·2
Proteose do.	1·3	1·6	1·7	1·7	1·7	1·7	1·7	1·8	1·9	1·9	2·1	2·2	2·2	2·1
Peptone do.	0·4	0·8	1·1	1·3	1·4	1·3	1·5	0·4	0·8	1·0	1·1	1·4	1·4	1·3
Meat base do.	8·3	9·2	10·2	11·1	11·2	11·4	11·1	8·1	9·3	9·8	10·6	11·5	11·8	11·7
Ammoniacal do.	0·8	0·8	0·8	0·8	0·7	0·8	0·8	0·9	0·8	0·9	0·8	0·7	0·8	0·8
Total do.	21·7	21·9	23·1	23·5	23·4	23·7	23·6	23·2	22·9	23·1	23·9	24·5	24·6	25·1
Organic extractives	21·4	21·9	22·5	23·4	22·9	23·0	23·6	21·3	21·7	21·9	22·5	23·4	23·5	23·5
Acidity	2·7	2·9	2·8	2·9	2·9	2·9	2·8	3·0	3·0	2·9	2·8	2·9	3·0	2·9
Fat-acidity	0·22	0·24	0·24	0·24	0·28	0·26	0·28	0·26	0·26	0·28	0·26	0·28	0·28	0·30

Acidity.—The figures for acidity, in Table V., which are in terms of lactic acid, show that no change occurred during the term of cold storage.

Moisture.—In both lamb and mutton there was a progressive decrease in the moisture contents, in the former of 3·6 per cent. and in the latter of 2·4 per cent., which is contrary to the results with beef recorded by Richardson and Scherubel, who found neither gain nor loss of moisture. Emmett and Grindley, on the other hand, reported losses up to 1·3 per cent. during a 37-day experiment on beef. In this connection, however, it should be noted that the change in moisture must largely depend upon the humidity of the air of the chamber in which the meats are stored.

Histological.—It is a matter of general observation, that, when meats are frozen and thawed out rapidly, a certain amount of distortion and rupture of the tissues takes place, but where the freezing and subsequent thawing are slowly conducted, little or no alteration of the structure of the tissues will be found. This fact has been overlooked by some observers, and the distortion and rupture noticed have in some cases been wrongly attributed to putrefactive causes.

Free fatty acidity.—The development of acidity in fat is a delicate indication of decomposition, but as will be seen from the figures in Table V., no material change occurred during the period of cold storage.

Separation and detection of enzymes.—Dr. Rideal, in a paper read before the First Refrigeration Congress, suggests that the tenderness and maturing of cold storage meats are due to the gradual and limited work of natural enzymes such as pepsin and trypsin present in flesh, which cause a certain amount of predigestion similar to that occurring when fresh meats are kept or "hung." In the present case the enzymes detected were peroxydase, catalase, and an enzyme similar to trypsin (a protease), which were found in both lamb and mutton throughout the whole period of cold storage, and were also present in the material preserved for seven days with thymol and chloroform. Negative results were obtained in testing for invertase, lipase, and diastase. The methods used for the separation and detection of the enzymes were those described by Houghton (J. Ind. Eng. Chem., 1911, 3, 504). Importance is attached to these results, for while enzyme activity goes on slowly at low temperatures, yet the action is not stopped, and the changes found in cold storage meats are evidently due in a large measure to these bodies, especially to the trypsin-like protease.

Bacteriological examination. In health, the flesh of animals is free from bacteria, but when death ensues it becomes a suitable medium for bacterial growth.

In carrying out the following observations, the method of procedure was to remove portions of meat from the surface and from the interior, with necessary aseptic precautions. The samples were placed in flasks of sterilised bouillon and incubated at 70° F. for fourteen days. In the event of no growth occurring, the contents of the flasks were then inoculated, to prove their suitability for bacterial growth, and in no case did this fail.

Experiments were made to determine the time necessary for the penetration of the surface bacteria to the interior of the meat. It was found that in five days for lamb, and seven days for mutton, bacteria could invade the interior, the meat being kept at 60°—70° F. Further experiments were carried out for the purpose of verifying the sterility of the meat which had been treated with thymol and chloroform and used for the experiments recorded in Table IV. In no case was there any evidence of the presence of living bacteria.

Finally experiments were carried out to ascertain whether bacterial growth and invasion of the interior of the meat could proceed during cold storage. In every case it was found that the surface of the meat, even after 160 days, was infected with bacteria, just as in the case of fresh meat, but that the interior was sterile. Certainly in two cases bacteria developed in the culture flasks, but this was shown by the other tests to have been due to accidental contamination.

General conclusions as to frozen meat. Consideration of the data given above, shows that in the case of lamb and mutton held in cold storage for a period of 160 days at 2° to 19° F. :—

1. There was a loss of moisture amounting to from 2½ to 3½ per cent.

2. There was an increase in the amounts of proteose, peptone, and meat-base nitrogen, and a decrease in coagulable nitrogen, while ammoniacal nitrogen remains unchanged. These changes were similar to those occurring during the ripening of meat in absence of bacterial interference, the maximum change taking place in the lamb about the 60th day and in the mutton between the 90th and 120th days.

3. The free acidity of the fat remained practically unchanged.

4. The changes in chemical composition were probably due to enzyme action.

5. The meats remained in the same condition bacterially as when freshly killed.

6. When the freezing and subsequent thawing were carried out slowly there was no rupture or alteration of the structure of the tissues.

7. The nutritive values of lamb and mutton were unaltered.

For permission to publish these results the author desires to express his thanks to the Christchurch Meat Company, Ltd., in whose chemical laboratory most of the work in connection with this investigation was carried out.

Yorkshire Section.

Meeting held at Queen's Hotel, Leeds, on Monday, March 25th, 1912.

MR. GEORGE WARD IN THE CHAIR.

AZO-SALICYLIC ACID AND AZO-HYDROXY-NAPHTHOIC ACID DYES.

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In a previous paper (Watson, Sircar, and Dutta, this J., Jan. 16th, 1911, p. 6), we showed that benzene-azo-salicylic acid, when dyed with a chrome-mordant, possessed all-round fastness, *viz.*, towards light, alkali, and acid, far superior to that of any other simple monoazo dye. We wished, therefore, to try to prepare other dyestuffs, derivatives, as it were, of benzene-azo-salicylic acid, which would possess the same all-round fastness but with the colour deepened to red, violet, blue or black.

The first method to suggest itself for the preparation of such dyes was to increase the weight of the hydrocarbon radicle A, if we write the formula $A{\cdot}N{:}N{\cdot}C_5H_3(OH)COOH$. Naphthalene-azo salicylic acid is, however, still yellow (Frankland, Chem. Soc. Trans., 1880, **37**, 747). Anthracene-azo-salicylic acid suggested itself, but it was found that dihydro-anthraminesulphonic acid had been diazotised and coupled with resorcinol (Ber., **15**, 854) to yield only an orange dye. So there did not seem much prospect of anthracene-azo-salicylic acid having any colour deeper than orange. It was thought possible that the introduction of monovalent hydrocarbon radicles into the original benzene nucleus, A, might be more effective than replacing it by more condensed nuclei. Xylene-azo-salicylic acid, $(CH_3)_2C_6H_3.N:N.C_6H_3(OH)COOH$, is, however, still yellow. [*p*-Ethoxy-benzene-azo-salicylic acid has been described by Grandmougin and Guisan (J.C.S. abs., 1908, **94**, i., 927) as green, but judging from the colour of *p*-ethoxy-benzene-azo-hydroxynaphthoic acid, which we have prepared, the green colour of their substance was probably due to impurity]. We thought, also, of replacing A by the group, $(C_6H_5)_2{:}CH.C_6H_4$, as being one of the heaviest hydrocarbon groups which would be fairly easy to prepare. We were, however, deterred from this by learning that $HO.C_6H_4.C(C_6H_4N:N.C_6H_3(OH)COOH)_2$, a much more complicated group, possessing, moreover, in itself chromophores and auxochromes, in replacing A does not raise the colour of the dye above yellow (Alizarine Yellow, F.S.; see Green's Survey of Organic Colouring Matters).

Since it seemed impossible to deepen the colour of the dye by simply replacing A by a heavier hydrocarbon group we turned our attention to the possibility of attaining the object by replacing A by groups containing chromophores.

Benzene-azo-benzene-azo salicylic acid,

$$C_6H_5N:N.C_6H_4N:N.C_6H_3(OH)COOH,$$

although it dissolves in caustic alkali with a claret colour, dyes wool only to a yellow shade, or orange-yellow if chrome mordanted. It dissolves in strong sulphuric acid with a deep violet colour. Much time was spent in trying to prepare naphthalene-azo-naphthalene-azo-salicylic acid. There can be no doubt that naphthalene-azo-naphthylamine can be diazotised, for it has yielded azo-naphthalene by diazotisation and boiling with alcohol (Nietzki and Goll, Ber., **18**, 297). But many attempts to couple the diazo-compound with salicylic acid failed to give us any product with dyeing properties. Many attempts to diazotise benzene-azo-naphthylamine and couple the diazo-compound with salicylic acid to obtain benzene-azo-naphthalene-azo-salicylic acid also failed. It was thought, perhaps, that the difficulty in each case might be simply due to the great insolubility of the intermediate diazo-compounds which have high molecular weights and do not contain any sulphonic acid or other group which would cause them to come into solution. *Di-sulpho-naphthalene-azo-naphthalene-azo-salicylic acid,*

$$(SO_3H)_2C_{10}H_5\,N:N.C_{10}H_6.N:N.C_6H_3(OH).COOH,$$

was therefore prepared and found to dye wool a reddish-brown shade, which, however, is changed to brown if the wool is chrome-mordanted. It dissolves in caustic alkalis with a reddish-brown colour and in strong sulphuric acid with a blue-black colouration. In our previous paper (Watson, Sircar, and Dutta, *loc. cit.*) we had pointed out that the presence of sulphonic acid groups was so detrimental to fastness towards alkalis that good fastness towards this agency could not be expected in dyes containing the sulphonic acid group. It is claimed, however, that some dyes of this series, derivatives of naphthalene-azo-naphthalene-azo-benzene, containing sulphonic acid groups, *e.g.* Anthracite Black B. (Cassella).

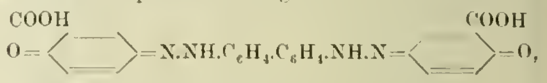
$$(SO_3H)_2.C_{10}H_5N:N.C_{10}H_6N:N.C_6H_3(NHC_6H_5)_2,$$

are fast to milling when after-chromed (see Cassella's "Wool Dyeing," in which Anthracite Black B is given fastness IV. to milling), and it was thought that perhaps the prejudicial effect of the sulphonic acid groups would scarcely be felt on account of the heaviness of the molecule.

From the point of view of the quinonoid theory of colour, the greatest chance of obtaining azo-salicylic acid dyes of deep colour would lie in constructing dye molecules containing not only more than one chromophore but also more than one auxochrome, so that a di-quinonoid arrangement would be possible. Several dyes answering these requirements are known, but the colours are not deeper than yellow or brown, *e.g. Chrysamine G.* which has the formula,

$$HOCO(OH)C_6H_3.N:N.C_6H_4.C_6H_4.N:N.C_6H_3(OH).COOH$$

and might be expected to owe its colour to its ability to assume the di-quinonoid arrangement,

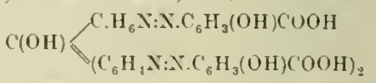


is only yellow.

Anthracite yellow S., which has the formula,

$$COOH(OH).C_6H_3N\;\;N.C_6H_4{\cdot}S{\cdot}C_6H_4N{:}N.C_6H_3(OH).COOH,$$

and might be expected to owe its colour to its ability to assume a similar di-quinonoid arrangement is only a yellow dye; *Alizarine Yellow, F.S.*, which has the formula,



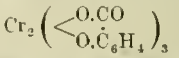
$$C(OH)\begin{cases} C.H_6N{:}N.C_6H_3(OH)COOH \\ (C_6H_4N{:}N.C_6H_3(OH)COOH)_2 \end{cases}$$

and might be assumed to be capable of a tri-quinonoid arrangement, is still only yellow; the dye having the formula,

$$HO.CO(OH)C_6H_3.N:N.C_{10}H_6.N:N.C_6H_3(OH).COOH$$

is described as giving brown shades (see Eng. Pat. 8299, 1889, and Ger. Pat. 51,504, 1889).

It may be argued that on chrome mordant the hydroxyl group of the salicylic acid is engaged in forming the group,



$$Cr_2\left(<\begin{matrix}O.CO\\ O.C_6H_4\end{matrix}\right)_3$$

and is therefore not capable of taking part in any quinonoid arrangement. Hewitt and Mitchell (J. Chem. Soc., 1907, **19**, 1251) have used this argument to explain the fact that *p*-nitrobenzene-azo-hydroxynaphthoic acid gives only a brown precipitate with lead salts, although it dissolves in alkalis to a blue solution. It explains to some extent the fact that disulphonaphthalene-azo-naphthalene-azo-salicylic acid dissolves in caustic soda with a reddish-brown colour and dyes unmordanted wool to this shade, whilst it only dyes chrome-mordanted wool brown. The fact that benzene-azo-benzene-azo-salicylic acid dissolves in caustic soda with a claret colour but only dyes wool to a yellow or orange-yellow shade, whether mordanted or unmordanted, can scarcely be explained, as on unmordanted wool there seems no reason why the claret shade should not be obtained. Finally, no explanation seems possible of the fact that Alizarine Yellow, F.S. not only dyes yellow but dissolves in caustic soda solution with no deeper colour than orange-yellow.

From the foregoing experiments and observations it seemed as though it were impossible to get red, violet, blue, or black shades in azo-dyes unless the auxochrome or auxochromes were contained in naphthalene nuclei; and the ready production of such shades in many cases where this condition is fulfilled made it seem probable that if the salicylic acid group were replaced by the hydroxynaphthoic acid group such shades might be obtained.

It was only, however, with reluctance that it was decided to try the preparation of such dyes in which the salicylic acid is replaced by hydroxynaphthoic, for it cannot be hoped that such dyes will possess the same fastness to light as the salicylic acid derivatives, since it has already been noted that dyes with the auxochromes contained in naphthalene nuclei are much less fast than the corresponding dyes with the auxochromes carried by benzene nuclei (Watson. The Relation between the Chemical Constitution of Mon-azo-dyes and their Fastness to Light, Calcutta, 1909; J. Soc. Dyers and Colourists, 1910, 237). This, however, seemed the only remaining chance of obtaining red, violet, or blue dyes of this type.

The mono-azo dyes, benzene-azo-*a*-hydroxynaphthoic acid and naphthalene-azo-α-hydroxynaphthoic acid, had already been prepared and described (Ber., **20**, 1275; **23**, 1910). Although the latter gives a deep-red neutral sodium or potassium salt it dyes wool only to a fiery orange colour. *m-Xylene-azo-a-hydroxynaphthoic acid*, $(CH_3)_2.C_6H_3.N:N.C_{10}H_5(OH).COOH$, dissolves in strong sulphuric acid with a deep violet colour and in caustic soda with a red colour, but only dyes orange-yellow shades on wool. *p-Ethoxybenzene-azo-a-hydroxynaphthoic acid*, $C_2H_5O.C_6H_4.N:N.C_{10}H_5(OH).COOH$, also dissolves in strong sulphuric acid with a deep violet and in caustic soda with a red colour, dyes unmordanted wool yellow and chrome-mordanted wool brownish-yellow. [These observations make it extremely improbable that the simpler substance, *p*-ethoxybenzene-azo-salicylic acid, should be green as described by Grandmougin and Guisan (*loc. cit.*). The green colour observed by them must have been due to impurity. The crude substance, *p*-ethoxybenzene-azo-*a*-hydroxynaphthoic acid was also green, but this was due to impurities which could be removed by recrystallisation].

Benzene-azo-benzene-azo-a-hydroxynaphthoic acid,

$C_6H_5N:N.C_6H_4.N:N.C_{10}H_5(OH).COOH$, and *di-sulpho-naphthalene-azo-naphthalene-azo-a-hydroxynaphthoic acid*, $(SO_3H)_2.C_{10}H_5.N:N.C_{10}H_6.N:N.C_{10}H_5(OH).COOH$, have been prepared. The former dissolves in strong sulphuric acid with a brilliant green, in caustic soda with a maroon colour, dyes wool reddish-orange when unmordanted and claret-brown when mordanted with chrome. The latter dissolves in strong sulphuric acid with an intense blue-black, in caustic soda with a deep maroon colour, and dyes wool maroon when unmordanted and sad-brown when mordanted with chrome.

Benzidine-bis-azo-a-hydroxynaphthoic acid,

$$HOCO.(OH).C_{10}H_5.N:N.C_6H_4.C_6H_4.N:N.C_{10}H_5(OH).COOH$$

which might be expected to owe its colour to its ability to assume the diquinonoid arrangement, dyes wool purplish-brown when unmordanted and sad-brown when mordanted with chrome. It dissolves in caustic alkali to a deep magneta-red colour and in strong sulphuric acid to a deep blue solution.

The object of this investigation, viz., to prepare dyestuffs on the same plan as benzene-azo-salicylic acid but with deeper colour, has only very partially been realised. Brown and claret brown shades on chrome-mordanted wool have been obtained, but this only when modifications of the original type have been admitted which, from previous experience, we may expect to be somewhat prejudicial to fastness, either to milling or light.

It seems as though in this group of dyes which we have investigated the effect of increasing the molecular complexity and the number of chromophores and auxochromes is only to deepen the colour to brown, reddish-brown, or purplish-brown, instead of to violet or blue. There are other cases known where increasing the complexity and the number of auxochromes only gives brown dyeings, *e.g.*, Rufigallol, 3:4:5:4′:5′:6′-hexahydroxyanthraquinone, only dyes brown shades, whereas the isomeric Anthracene Blue W.R., 3:5:6:3′:4′:6′-hexahydroxyanthraquinone, dyes blue. There seems, however, no principle known by which we can decide whether increase in complexity will result in the formation of bluish shades or brownish shades.

Experimental.

m-Xylene-azo-salicylic acid,

$$(CH_3)_2.C_6H_3.N:N.C_6H_3(OH).COOH$$

6·05 grms. of *m.* xylidine were dissolved in 150 c.c. of water and 14 c.c. of strong hydrochloric acid were added. The mixture was cooled by surrounding with ice and diazotised by gradually adding a solution of 3·6 grms. of sodium nitrite in 20 c.c. of water. After half an hour the mixture was coupled with an alkaline solution of 6·9 grms. of salicylic acid. The coupling took place very slowly, so the mixture was kept over night. Next day a yellow substance was found to have separated mixed with some tarry matter. It was filtered and the yellow substance separated from the tar by extracting with boiling water. On cooling fine yellow needles of the sodium salt separated out. On acidifying the boiling aqueous solution of the sodium salt an orange-yellow precipitate of the free acid separated, which was crystallised out of dilute alcohol and obtained as fine orange-yellow needles. Yield 7 grms.

Properties:—Orange-yellow needles melting at 201° C., easily soluble in ether, alcohol, benzene, acetone, chloroform and acetic acid, difficultly soluble in ligroin and insoluble in cold water, very slightly soluble on boiling. It dissolves in caustic alkalis to an orange-yellow solution and in strong sulphuric acid with a blood-red colouration. The substance dyes a full yellow shade on unmordanted wool, brown on chrome. Elementary analysis gives $C = 66·23$ per cent.; $H = 5·58$ per cent.; $N = 10·38$ per cent. $C_{15}H_{14}O_3N$ requires $C = 66·66$; $H = 5·19$; $N = 10·37$ per cent.

m-Xylene-azo-α-hydroxynaphthoic acid,

$$(CH_3)_2.C_6H_3.N:NC_{10}H_5.(OH)COOH.$$

m-Xylidine was diazotised and coupled with the calculated quantity of α-hydroxynaphthoic acid as in the last preparation. The sodium salt crystallised out of boiling water in brownish-yellow needles and the free acid out of dilute alcohol in yellowish-brown needles.

Properties:—Yellowish-brown needles melting at 180°; dissolves easily in ether, alcohol, benzene, ligroin, acetone, chloroform and acetic acid, but is insoluble in cold or boiling water. It dissolves in caustic alkalis to a red solution and in strong sulphuric acid with a deep violet colour. It dyes wool an orange-yellow shade, but brown if the wool be previously chrome-mordanted. Analysis gave $C = 71·47$, $H = 5·3$, $N = 8·74$ per cent. $C_{19}H_{16}O_3N_2$ requires $C = 71·25$, $H = 5·0$, $N = 8·75$ per cent.

p-Ethoxybenzene-azo-a-hydroxynaphthoic acid.

$$C_2H_5O.C_6H_4.N:N.C_6H_3(OH).COOH.$$

6·85 grms. of *p*-phenetidine were dissolved in 300 c.c. of water and 14 c.c. of strong hydrochloric acid, cooled by surrounding with ice and diazotised by gradually adding a solution of 3·5 grms. of sodium nitrite in 25 c.c. of water. When the diazotisation was complete it was coupled with 9·4 grms. of α-hydroxynaphthoic acid in alkaline solution. The mixture was kept over night, and next day it was found to have gone green. On acidification a bluish-black substance was precipitated. It was filtered off, dried on a porous plate and extracted with a small quantity of benzene, which dissolved away most of the impurities causing the greenish or bluish appearance. The substance remaining after extraction with benzene was now fractionally extracted with alcohol. The first two extracts on dilution threw down brown amorphous precipitates. The latter extracts on dilution gave a mixture of the brown amorphous substance with yellowish brown needle-shaped crystals, the proportion of crystals being greatest in the last extracts. By further fractional extraction with alcohol the crystalline substance was obtained entirely free from amorphous matter.

Properties :—Yellowish-brown needles, m. pt. 198·5° C. : dissolves easily in boiling alcohol, ether, acetone and hot acetic acid, difficultly in benzene and chloroform, insoluble in ligroin and water. It dissolves in caustic alkalis with a red, and in strong sulphuric acid with a deep violet colour. It dyes wool a brownish-yellow shade, but full brown on chrome mordant. Analysis indicated C=67·39, H=5·02, N=8·57 per cent. $C_{19}H_{16}O_4N_2$ requires C=67·79 ; H=4·76 ; N=8·33 per cent.

Benzene-azo-benzene-azo-salicylic acid,

$$C_6H_5N : N.C_6H_4.N{:}N.C_6H_3(OH)COOH.$$

4·9 grms. of *p*-amino-azo-benzene were diazotised (Hewitt, Chem. Soc. Trans., 1909, **95,** 1394) and the product allowed to drop into an alkaline solution of salicylic acid (3·45 grms.). An orange-coloured precipitate was formed. The mixture was allowed to stand over night and next day filtered to get rid of any uncombined sodium salicylate. The brown precipitate was washed with a solution of sodium carbonate, dried on a porous plate and converted into the free acid. The free acid thus obtained could not be crystallised out of any solvent, though if a drop of a concentrated alcoholic solution were allowed to evaporate on a microscope slide small thick needles were observed round the edges of the disc. Thick prismatic crystals were formed from acetone solution under similar conditions. But all attempts to obtain crystals in a mother liquor were unsuccessful. The substance was therefore purified by precipitating twice from alcohol. An attempt to prepare it by diazotising amino-azo-benzene according to Lawson and Zincke (Ber., **20,** 1181) and coupling with an alcoholic solution of salicylic acid gave the same result.

Properties :—Yellowish-brown powder, mpt. 248°—250° C., moderately soluble in alcohol, acetone, benzene, toluene, xylene, acetic acid, and chloroform, but insoluble in water even on boiling. It dissolves in alkali with a claret and in strong sulphuric acid with a deep violet colour. It dyes wool a full yellow shade which turns brown on chrome mordanting. Its percentage composition was : C=65·46, H=4·08, N=15·75 per cent. $C_{19}H_{14}N_4O_3$ requires C=65·89, H=4·05, N=16·18 per cent.

Benzene-azo-benzene-azo-α-hydroxynaphthoic acid.

$$C_6H_5.N : N.C_6H_4N : N.C_{10}H_5(OH)COOH.$$

p-Amino-azo-benzene was disazotised as before and coupled with the calculated quantity of an alkaline solution of α-hydroxynaphthoic acid. This substance also could not be crystallised out of any solvent, although a drop of a concentrated alcoholic solution evaporating quickly on a glass plate left microscopic crystals. For purification it was precipitated twice out of alcohol.

Properties :—Dark brown powder, mpt. 200°—205° C., moderately soluble in alcohol, acetone, chloroform, benzene and acetic acid, but completely insoluble in water : dissolves in alkali with a maroon and in strong sulphuric acid with a brilliant green colour. It dyes wool reddish-brown when unmordanted and claret-brown when mordanted with chrome. Analysis gave C=70·35, H=4·61, N=14·48 per cent. $C_{23}H_{16}N_4O_3$ requires C=69·69, H=4·05 : N=14·15 per cent.

Benzene-azo-benzene diazo-chloride,

$$C_6H_5.N : N.C_6H_4.N : N.Cl.$$

2 grms. of *p*-amino-azo-benzene were dissolved in 25 c.c. of absolute alcohol and a current of dry hydrogen chloride was passed through it for some time, when deep brown needle-shaped crystals of the hydrochloride of amino-azo-benzene separated. An excess of dry nitrous acid gas was then passed through the mixture when the brown crystals were gradually converted into thick orange prismatic crystals of the diazo-chloride. They were filtered off and dried in a vacuum desiccator over soda-lime. (The whole operation was conducted without contact with any trace of water, as otherwise the desired compound could not be obtained.)

Properties :—Orange prisms not very soluble in alcohol but freely soluble in water with a deep red colour. It explodes when touched with a heated rod. The substance keeps well in a dry atmosphere but in the air gradully decomposes and assumes a dirty appearance. It contained 22·89 per cent. of nitrogen. $C_{12}H_9N_4Cl$ requires 22·90 per cent.

(After we had prepared the compound it was found that Hewitt and Thole (Chem. Soc. Trans., 1910, **97,** 514) had also prepared it, though by a different method.)

As a further test of the substance a quantity was diazotised and coupled with dimethylaniline. The product crystallised readily and was identical with the compound prepared by Hewitt (Chem. Soc. Trans., 1909, **95,** 1395).

An attempt was made to prepare pure benzene-azo-benzene-azo-salicylic acid by dissolving a known weight of the diazo-chloride in water and coupling with the calculated quantity of an alkaline solution of salicylic acid. The product obtained was entirely similar to that already described, and could not be obtained in crystals in the presence of a mother liquor. Coupling with α-hydroxy-naphthoic acid gave similar results, *i.e.* the product did not show any greater tendency to crystallise than the substance already described.

Attempt to prepare naphthalene-(α) azo-naphthalene-(α)azo-salicylic acid.

Naphthalene-(α)-azo-naphthalene-(α)diazosulphate was prepared according to the method described by Nietzki and Goll (Ber., **18,** 297), filtered and washed. In the first experiment the diazo-sulphate was suspended in ice-cold water and an alkaline solution of salicylic acid (1 mol.) was added. The suspended solid did not disappear or obviously change. Next day the insoluble substance was filtered off and examined. It could not be crystallised from any solvent and had no dyeing properties. In a second experiment the mixture was boiled some time after the salicylate had been added. But the product in this case also could not be crystallised out of any solvent and had no dyeing properties. In a third experiment an alcoholic solution of salicylic acid was added to a cold alcoholic solution of the diazo-sulphate and after some time water was added and gave a precipitate. The precipitated substance had no dyeing properties.

It was thought that the failure to obtain the desired compound was probably due to the complete insolubility of the diazo-sulphate in water.

Attempt to prepare benzene-azo-naphthalene-(α) azo-salicylic acid.

On the expectation that it would be more soluble in water than the preceding diazo-compound and could therefore perhaps be coupled with salicylic acid, the less complex benzene-azo-naphthalene-(*a*)-diazo-sulphate was prepared and attempts made to couple it with salicylic acid in alkaline aqueous solution. But no product with dyeing properties was obtained and a large quantity of salicylic acid was recovered from the filtrate. This diazo-sulphate is also apparently completely insoluble in water.

Disulpho-naphthalene-(β) azo-naphthalene-(α) azo-salicylic acid,

$$(SO_3H)_2.C_{10}H_5.N : N.C_{10}H_6.N : N.C_6H_3(OH).COOH.$$

Disulpho - naphthalene - (β)azo - (α)naphthylamine was prepared by diazotising 17·05 grms. of G salt and coupling with 7·2 grms. of α-naphthylamine (*c.f.* preparation of Naphthol Black, Cain and Thorpe, "Synthetic Dyestuffs and Intermediate Products," p. 237). 10 grms. of this base were dissolved with 6 c.c. strong hydrochloric acid in 200 c.c. water and diazotised by gradually adding a solution of 1·4 grms. of sodium nitrite in 20 c.c. water and allowing the mixture to stand for some hours. The diazotised base was coupled with an alkaline solution of 1·38 grms. of salicylic acid. After stirring the mixture for one hour it was heated to 80° C. The product could not be salted out either as sodium or potassium salt nor could it be precipitated as barium, calcium or lead salt. The whole mixture was therefore acidified with dilute hydrochloric acid, extracted with ether to get rid of any uncombined salicylic acid and evaporated to dryness on the water-bath. The product was necessarily mixed with a considerable quantity of sodium chloride, but attempts to remove the latter were not successful.

Properties: Brown powder, very hygroscopic, extremely soluble in water but only very difficultly in alcohol or acetone and insoluble in ether. It dyes wool a reddish-brown shade which is changed to brown if the wool is chrome mordanted. It dissolves in alkalis with a red colour and in strong sulphuric acid to a blue-black solution. It contained 4·5 per cent. of nitrogen, or, corrected for presence of 45 per cent. sodium chloride, 8·2 per cent. $C_{27}H_{17}N_4O_9S_2$ requires 9·2 per cent.

Di-sulpho-naphthalene-(β)azo-naphthalene-(α)azo-(α)hydroxynaphthoic acid,

$$(SO_3H)_2C_{10}H_5.N:N.C_{10}H_6.N:N.C_{10}H_5(OH)COOH.$$

This compound was prepared in exactly the same way as the preceding one, the diazotised solution being coupled with hydroxynaphthoic acid instead of salicylic acid. It could not be salted out as sodium or potassium salt nor precipitated as barium, calcium, or lead salt. After acidifying the reaction mixture it was extracted with ether to remove any uncombined hydroxynaphthoic acid and evaporated to dryness on the water-bath.

Properties:—Reddish-brown powder, hygroscopic, very soluble in water, but very sparingly soluble in alcohol or acetone and insoluble in ether. It dissolves in caustic alkalis with a deep maroon and in strong sulphuric acid with an intense blue-black colour; dyes wool maroon when unmordanted and sad brown when mordanted with chrome. Contained 4·74 per cent. of nitrogen, or, corrected for 43 per cent. NaCl, 8·31 per cent. $C_{31}H_{20}O_9N_4S_2$ requires 8·5 per cent.

Benzidine-bis-azo-(α) *hydroxynaphthoic acid.*

$$COOH(OH).C_{10}H_5.N:N.C_6H_4.C_6H_4.N:N.C_{10}H_5(OH)COOH.$$

4·6 grms. of benzidine were diazotised and coupled with 10 grms. of *α*-hydroxynaphthoic acid in alkaline solution (about 9 grms. of *α*-hydroxynaphthoic acid theoretically required) (*c.f.* the preparation of Chrysamine, Cain and Thorpe's "Synthetic Dyestuffs and Intermediate Products," p. 231).

The sodium salt was dried on a porous plate and converted into the free acid by boiling with dilute hydrochloric acid. The free acid could not be crystallised from absolute alcohol or from alcohol of different strengths or from any other solvent.

Properties: Brownish-black powder which does not melt even at 275 C., freely soluble in alcohol, acetone, nitrobenzene and acetic acid, sparingly soluble in benzene and insoluble in water or ligroin. It dissolves in caustic alkali with an intense magenta colour and in strong sulphuric acid to a deep-blue solution. On account of its insolubility in water the substance in its ordinary form, suspended in water, is not absorbed by textile fabrics, but if freshly precipitated by pouring an alcoholic solution into the dye-vat it is absorbed by cotton and wool. It dyes wool a purplish-brown shade when unmordanted and sad brown when mordanted with chrome. It contains 9·35 per cent. of nitrogen; $C_{34}H_{22}O_6N_4$ requires N = 9·63 per cent.

Obituary.

MORRIS LOEB.

Morris Loeb was born in Cincinnati on May 23rd, 1863. He graduated at Harvard in 1883 and then proceeded to Berlin, where he received the Ph.D. degree in 1887; after a further year's study in Germany he returned to America and from 1888 to 1891 was engaged at Harvard and Clark Universities. In 1891 he was appointed Professor of Chemistry and Director of the Chemical Department at New York University, a post which he held until 1906. From the latter date he carried on private work, among the subjects which he investigated being phosgene derivatives, electrical conductivity of solutions, reaction velocities, and the constitution of some complex salts. American chemists owe to him a lasting debt for his great munificence which made possible the establishment and erection of the Chemists' Club and Building, New York, which he founded in 1909; his donations included the entire equipment of the Meeting Room (Rumford Hall), the Library, and the Trustee Room. Dr. Loeb died in New York on October 8th, 1912, of typhoid fever and double pneumonia, after an illness of eighteen days.

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I.—GENERAL PLANT; MACHINERY.

PATENTS.

Evaporation, distillation, and similar operations. O. Söderlund and N. Testrup, London. Eng. Pat. 12,462, May 23, 1911.

In a method of distilling, evaporating or concentrating liquids or solutions by exposing them to a heating surface, which is heated by the compressed vapour of the liquid, the liquid or solution is distributed as a thin film upon the heating surface and the film kept in rapid motion by causing the liquid or solution repeatedly to traverse the heating surface. In one form of apparatus described, the liquid to be evaporated is pumped continuously from the bottom of a tank to the top, where it flows downwards over a heating coil through which the vapour given off in the tank is circulated at a pressure of about one-tenth above atmospheric by means of a rotary compressor. The apparatus is heated at starting by means of steam which is afterwards cut off. The apparatus is specially suitable for use where fuel is scarce, but mechanical power plentiful, and in many cases it can be used in place of the vacuum evaporators now employed.—H. H.

Distillation: Processes and apparatus for ——. E. A. R. Chenard. Fr. Pat. 443,499, May 7, 1912.

The process is based on two principles:—one, the kinetic and adiabatic decomposition of the mixed vapours, and, two, the more rapid return of the condensed liquid. The mixed vapours from the still are caused to pass through a long, but only slightly inclined, reflux condenser, in which all bubbling of vapour through condensed liquid, is avoided, and which offers a free path to the vapour and allows the vapours of lower boiling point, to outdistance those of higher boiling point. At intervals, vertical return pipes are provided, which conduct the condensed liquid to a point in the condenser, several coils below, so that it is re-vapourised very rapidly.—W. H. C.

Heating and superheating purposes; Apparatus for ——. O. Imray, London. From Luckenbach Inventions Development Co., New York. Eng. Pat. 9745, April 24, 1912.

In coils or chambers which are protected by a metal casing cast around them, avoidance of strain and freedom for expansion and contraction are obtained by first coating the coil or chamber with a mixture of fireclay, graphite and oil. The whole is then heated to "bake" the coating, and afterwards the metal casing is cast around the coil. —W. H. C.

Raising or forcing liquids or compressing gases, Methods of —— *and apparatus therefor.* H. A. Humphrey, London, and W. J. Rusdell, Dudley. Eng. Pat. 18,465, Aug. 15, 1911.

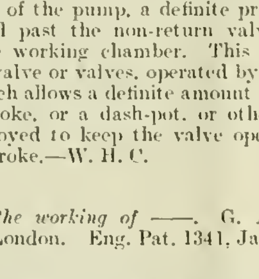
In operating internal combustion pumps it is necessary, when forcing liquids, to use a non-return valve on the rising main which may, or may not, open into an air chamber from which no liquid returns. In order to provide the energy for the return stroke of the pump, a definite proportion of the liquid forced past the non-return valve is allowed to return to the working chamber. This is done by providing a return valve or valves, operated by a float in the air-chamber, which allows a definite amount of liquid to return at each stroke, or a dash-pot, or other timing device may be employed to keep the valve open for a definite time at each stroke.—W. H. C.

Drying kilns: Controlling the working of ——. G. A. Mower and S. Fitzgerald, London. Eng. Pat. 1341, Jan. 17, 1912.

A wet and dry bulb thermometer is exposed to the moisture-laden air of the kiln, and the supplies of heat, return air or water spray are regulated so that the temperatures indicated by the thermometer correspond with those given on a guide-chart.—W. H. C.

Drying-kiln. R. Abernethy, Port Moody, British Columbia, Assignor to R. Hamilton, Vancouver, Canada. U.S. Pat. 1,038,709, Sept. 17, 1912.

The kiln has double walls, the inner wall, 6, being of non-conducting material, whilst the outer wall is divided into a lower portion, 10, also formed of non-conducting material, and an upper portion, 12. The latter is spaced away from the former and consists of a frame, covered with sheets of corrugated metal disposed vertically. A shedding plate, 11, is fixed as shown to collect the condensed water running down the inner surface of the corrugated plates, and to conduct it outside the chamber.—W. H. C.



Drying apparatus. H. S. Hopkins, Brooklyn, N.Y. U.S. Pat. 1,037,254, Sept. 3, 1912.

In an apparatus for drying sheets and fabrics, of the type having a moving conveyor passing through a drying chamber, the conveyor is formed with a wavy outline in the direction of its length, so as to cause the material to lie thereon in a series of waves, and a blast of air is passed over the surface thereof as it is carried through the drying chamber.—H. H.

Desiccating apparatus. J. C. MacLachlan, Chicago, Ill. U.S. Pat. 1,038,773, Sept. 17, 1912.

Heated gases are discharged into the drying chamber through a centrally disposed head, and liquid is injected into the chamber through nozzles passing through the walls. Eddy currents are produced within the chamber to promote desiccation.—W. H. C.

Dryers; Rotary ——. S. W. Bonsall. Fr. Pat. 443,498, May 7, 1912.

The apparatus consists of a chamber, which can be rotated in a horizontal plane, provided with supports for the material to be dried, with steam heating coils, and inlets and outlets for air. As the chamber is rotated, a current of air, induced by the rotation, is caused to pass through it over the material.—W. H. C.

Grinding or crushing apparatus. A. Sepp, Geislingen, Germany. Eng. Pat. 2351, Jan. 29, 1912. Under Int. Conv., Jan. 30, 1911.

A grinding apparatus comprises a disc mounted upon a rotating shaft and two loosely mounted discs on either side, with rollers mounted on fixed axles at right angles to the main shaft between them. The two outer discs are drawn together by springs so that frictional contact is set up between the discs and rollers, with the result that as the central disc rotates in one direction the outer discs rotate in the opposite direction.—H. H.

Filters. E. M. Knight, London. Eng. Pat. 4318, Feb. 21, 1912.

The filter consists of a circular, flat, outer casing, the front part of which is removable. An inner frame, provided with a filter pad or film on each side, fits into the outer casing and is held in position by two projecting feet, on one side, and an adjusting screw, which passes through the outer casing, on the other side. The liquid to be filtered is fed into the space between the inner frame and the outer casing, and passes through the filter films into the interior, from which it is discharged through one of the supporting feet. The adjusting screw serves as a means of admitting air into the interior of the inner frame, or for allowing air to escape.—W. H. C.

Filter. R. P. Johnson, New York. U.S. Pat. 1,038,382, Sept. 10, 1912.

The filtering element is in the form of a bag open at the top and ends, and is passed between rollers in the filter arranged so as to bring the sides of the filtering element together, forming a bag closed at the ends. The filtering element is made endless and passes from the filter, first over rollers which turn the inner side outwards, then through a washer, then over similar rollers and finally back to the filter.—A. T. L.

Filter for the purification of liquids. E. Babrowski. Ger. Pat. 250,047, Dec. 22, 1910.

The filtering material is discharged continuously from one or more hoppers on to a perforated endless band or bucket conveyor or the like, which passes through a descending stream of the liquid to be filtered, the filtered liquid flowing through the perforations into a suitable receptacle. By this means the liquid passes always through fresh filtering material.—A. S.

Gas furnaces; Regenerative ——. F. K. Siemens, London. Eng. Pat. 10,824, May 7, 1912.

The claims are for improvements and modifications in the regenerative gas furnace described in Eng. Pat. 23,534 of 1909 (this J., 1910, 701). The gas and flue ports are formed at the sides of the furnace so as to leave the ends free for the introduction and withdrawal of the articles to be heated. When used for heating dusty materials, that portion of the gas which passes through the regenerators is not allowed to pass over the hearth. In this way frequent cleaning of the regenerators is avoided. The air- and gas-ports are arranged above one another instead of in the same horizontal plane, with the object of attaining a higher temperature. When a very wide hearth is to be heated, several groups of air and gas ports are provided, gas and air being introduced through the centre group of ports and withdrawn through the outside group and *vice-versa.* W. H. C.

Kiln. C. Hook, Vigo, Ohio. U.S. Pat. 1,037,769, Sept. 3, 1912.

A circular kiln having a dome-shaped top is formed with a central flue which extends upwards from the bottom of the kiln within a short distance of the top and is subdivided into a number of vertical passages connected respectively with a number of furnaces arranged at equal distances around the kiln. The gases leave the kiln through perforations in the floor and pass to an annular passage below the floor in communication with a number of smoke stacks.—H. H.

Catalytic reactions; Method of conducting ——. W. M. Grosvenor, New York. U.S. Pats. 1,036,609 and 1,036,610, Aug. 27, 1912.

A process for effecting the catalytic conversion of gases consists in first establishing in the contact mass a temperature suitable for the conversion intended, admitting the gases thereto at a temperature lower than that of reaction, and progressively shifting the contact material and the gas inlet relatively to each other to correspond to the retrogression of the zone of maximum temperature in the mass. The process may be made continuous by having an endless circuit of the contact material and heating a portion thereof only. In another arrangement the temperature of the incoming gases may be raised partly by heat communicated to the initial portion of the mass from that portion of the mass beyond the zone of maximum temperature, and partly by the heat generated by local reaction. In this case the contact mass is arranged in an involute path, the return convolutions of which are adjacent to the incoming convolutions.—H.H.

Acid tank. S. Q. Wilkinson, Belle Vernon, Pa. U.S. Pat. 1,036,761, Aug. 27, 1912.

An acid tank is formed of wooden sections held together by metal bolt-rods embedded therein and has an interior bracing structure consisting of transverse beams running along the sides of the tank with vertical supports holding them together. The upper transverse beams on either side carry reinforcing plates extending upwards over the edges of the tank, and also support a longitudinal beam stretching across the tank for carrying articles to be immersed in the acid. The longitudinal beam can be lifted from the tank by means of chains, and is guided into position, when lowered, by means of guides formed on the sides of the tank.—H. H.

Refrigeration and liquefaction of gases, cooled vapours, gaseous mixtures, mixtures of cooled vapours, and mixtures of gases and vapours; Process for the ——. R. Mewes. Fr. Pat. 442,796, April 22, 1912.

In order to avoid the loss of efficiency, due to the shock with which the working fluid is introduced into the closed chamber by a reciprocating pump or compressor, the introduction is effected without shock by using some form of rotary compressor or pump, which delivers the compressed fluid into a chamber of increasing cross-section. —W. H. C.

Liquefaction of the permanent gases or mixtures of these, and particularly of air; Process for the ——. R. Mewes. Fr. Pat. 442,918, April 24, 1912.

The vapourisation of the liquefied gas is compelled to take place in two or more cycles, rather than in one. —W. H. C.

Separator; Centrifugal ——. W. Michelsen. Fr. Pat. 442,904, April 24, 1912.

Two vertical perforated drums are mounted on shafts on either side of a main central shaft, and driven by friction wheels at the top, from a friction wheel, carried on the central shaft, driven from below. Each drum is surrounded by an outer casing, divided into an upper and a lower chamber, and rigidly attached to the frame carrying the central shaft. The material to be treated is fed into a common hopper at the top, and falls thence into a rotary distributor, carried by the central shaft, and is fed on alternate sides, on to the upper interior surface of the perforated drums. The liquid passes through the perforations into the upper chamber of the fixed casing, and is delivered into a receiver, and the solids, which are alternately submitted to compression and released from compression by the action of vertical ribs, formed on the interior surface of the drums, are finally discharged through the open bottom of the drums into the lower compartment of the fixed casing.—W. H. C.

Power plants in which liquefied gases of low boiling point are used as motive fluid. F. Hildebrand, Wilmersdorf, Germany. Eng. Pat. 20,471, Sept. 15, 1911.

See Fr. Pat. 434,817 of 1911; this J., 1912, 321. Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pat. 2042 of 1908. —T. F. B.

Raising or forcing liquids; Methods of and apparatus for ——. H. A. Humphrey, London. Eng. Pat. 21,609, Sept. 30, 1911.

See Fr. Pat. 438,594 of 1911; this J., 1912, 626.—T. F. B.

Raising and forcing liquids; Processes and apparatus for ——. H. A. Humphrey. Fr. Pat. 443,541, Feb. 28, 1912. Under Int. Conv., May 12, 1911.

See Eng. Pat. 11,527 of 1911; this J., 1912, 626.—T. F. B.

Raising or forcing liquids; Processes and apparatus for ——. H. A. Humphrey. Fr. Pat. 443,543, March 2, 1912. Under Int. Conv., May 16, 1911.

See Eng. Pat. 11,817 of 1911; this J., 1912, 626.—T. F. B.

Raising liquids; Process and apparatus for ——. J. Koerver. Fr. Pat. 443,715, May 11, 1912.

See Eng. Pat. 17,283 of 1911; this J., 1912, 522.—T. F. B.

Refrigerating and drying gases: Apparatus and method for ——. C. H. Leinert, Chicago. U.S. Pats. 1,039,148 and 1,039,149, Sept. 24, 1912.

See Fr. Pat. 424,233 of 1910; this J., 1910, 732.—T. F. B.

Filter-presses; Closing device for ——. D. J. Kelly. Fr. Pat. 442,679, March 2, 1912. Under Int. Conv., March 3, 1911.

See U.S. Pat. 1,015,961 of 1912; this J., 1912, 217.—T. F. B.

Filter with fixed elements. S. Bornett. Fr. Pat. 442,692, March 21, 1912. Under Int. Conv., March 25, 1911.

See Eng. Pat. 7232 of 1912; this J., 1912, 708.—T. F. B.

Filter-press. D. J. Kelly. Fr. Pat. 443,253, March 2, 1912. Under Int. Conv., March 3, 1911.

See U.S. Pat. 1,015,960 of 1912; this J., 1912, 217.—T. F. B.

Filters. F. and F. P. Candy. Fr. Pat. 443,374, May 3, 1912. Under Int. Conv., Oct. 18, 1911.

See Eng. Pat. 22,955 of 1911; this J., 1912, 896.—T. F. B.

Extinguishing fires or flames; Processes, apparatus, and products for ——. Fabrik Explosionssicherer Gefässe G. m. b. H. Fr. Pat. 442,682, March 12, 1912. Under Int. Conv., March 17, 1911.

See Eng. Pat. 6327 of 1912; this J., 1912, 673.—T. F. B.

Adding reagents to liquids or mixing liquids; Apparatus for ——. M. Deacon and W. Gore. Fr. Pat. 442,759, April 19, 1912. Under Int. Conv., May 9, 1911.

See Eng. Pat. 11,251 of 1911; this J., 1912, 576.—T. F. B.

Tunnel kilns. A. Ramén. Fr. Pat. 443,124, April 29, 1912.

See Eng. Pat. 4386 of 1912; this J., 1912, 761.—T. F. B.

IIa. FUEL; GAS; MINERAL OILS AND WAXES.

Coals of Canada; An investigation of the ——, *with reference to their economic qualities. Vol. II.* J. B. Porter and R. J. Durley. Dept. of Mines, Canada. 1912.

The present volume contains detailed descriptions of the boiler tests, gas producer tests, and work of the chemical laboratory, in connection with the investigation of the coals of Canada. A summary of the more important results has been given previously (see this J., 1910, 1191). —A. S.

Explosions in Mines Committee. First Report to the Secretary of State for the Home Department. [Cd. 6307.] Price 11½d.

The report contains a brief review of recent work on the effects of coal dust in coal-mine explosions; descriptions of the experimental distillation at Altofts and some of the results obtained there (this J., 1909, 874, 1024); and a description of the new experimental station at Eskmeals, Cumberland. In an appendix there is a report by J. M. Beattie on the effect produced on the lungs by the inhalation of coal dust, powdered shale, and stone dust rich in silica. The experiments at Altofts indicated that treatment of the roads in the mines with an incombustible dust, such as stone dust, might prove a means of preventing or limiting coal dust explosions, and this expedient has been adopted in some mines and is in course of adoption in others. The Committee state that before any final recommendation can be made, further experiments are needed, especially on the following points:—(1) Whether a flame of coal dust that has attained full explosive violence in a mine will be extinguished on reaching a region where stone dust has been strewn over the coal dust; (2) whether an explosion of fire-damp would not be "extended" by a thin layer of coal dust deposited on stone dust; (3) whether the presence of an incombustible dust might increase the danger of a gas explosion, as suggested by Sir F. Abel. It is concluded, however, that even in the present incomplete state of knowledge as to the exact action of inert dust, the use of incombustible dust should be taken into consideration as a means of obviating danger in the working and transporting of coal on dry and dusty roads. With regard to the effect on health of such dusts, the experiments conducted by J. M. Beattie confirm the view of Haldane that dust of slate or shale or other argillaceous substances is not dangerous, but all kinds of dust containing finely powdered crystalline silica (*e.g.*, the dust from grinding wheels used in the cutlery industry) are apt to produce fibrosis of the lung, a condition which renders the lung very subject to tubercular infection.—A. S.

Foundry coke; Report of the committee on standard methods for determining the constituents of ——. Trans. Amer. Foundrymen's Assoc., 1912, 143—146.

Sampling. The sample is obtained by taking full-length pieces at about equal intervals while the car is being unloaded, and then a piece about the size of an egg from each end and from the middle of each piece until 25—40 lb. are obtained. In the case of a stock pile, 25—30 lb. are taken in a similar manner from every 50 tons. After crushing between hardened manganese- or chrome-steel surfaces, until the coke passes a ½ in.-mesh sieve, it is quartered and one portion reserved for the moisture determination, whilst the other is crushed until it passes a ¼ in.-mesh sieve and again quartered down until about 2 lb. remain. This is crushed till it will pass a 20-mesh sieve and quartered down to about 20 grms., which is ground till it will pass a 100-mesh sieve. *Moisture.* 1 kilo. of the ½ in.-mesh sample is dried at 104°—107° C. Of the ground sample 1 grm. is dried in an open platinum crucible of 20 c.c. capacity for 1 hr. at 104°—107° C. *Volatile matter.* The crucible containing the dried sample is covered with another crucible so that its bottom is not more than ½ in. from the bottom of the outer crucible, and the coke is ignited over a bunsen for 3½ min. and then over a blowpipe for 3½ min. *Ash and fixed carbon.* The crucible is inclined and heated until all the carbon is burnt off. The difference between the weight of the ash and the residue from the volatile matter is fixed carbon. *Sulphur.* 12 grms. of sodium peroxide, 0·5 grm. of powdered potassium chlorate, and exactly 0·7 grm. of coke (80-mesh) are thoroughly mixed with a small spatula in a nickel crucible of 40 c.c. capacity, the lid of which has a small hole. The covered crucible is placed on a stand in a 20 oz. beaker containing enough water to immerse the lower half of the crucible. The mixture is ignited by means of a hot wire, allowed to cool, and then dissolved in the water. After removing the stand and empty crucible, hydrochloric acid is added, then ammonia in slight excess, and the solution is filtered, and the residue washed. To the filtrate one drop of methyl orange is added, and 0·5 c.c. of hydrochloric acid in excess. The solution is heated to boiling, and 10 c.c. of barium chloride added drop by drop, then after boiling for 15 min., and allowing to stand for 2 hrs., the precipitate is filtered off and washed; the weight of barium sulphate × 19·6 = per cent. of sulphur. *Phosphorus.* 5 grms. are ignited in a platinum dish and 10 c.c. of hydrochloric acid (1 to 1) and 20 c.c. of hydrofluoric acid are added to the ash. The mixture is evaporated to dryness and the residue heated to dull redness, fused with 1·5 grms. of sodium carbonate and 2 grms. of potassium nitrate, cooled and dissolved in water. The solution is boiled, acidified with hydrochloric acid, precipitated with ammonia, boiled and filtered. The precipitate is washed and dissolved in dilute nitric acid. If it will not dissolve in nitric acid, hydrochloric acid is used, and the solution is evaporated to 5 c.c., treated with 30 c.c. of nitric acid (sp. gr. 1·20), again evaporated to 5 c.c. and 30 c.c. of nitric acid added. After heating to 70°—90° C., 50 c.c. of molybdate solution are added, the precipitate is filtered off, washed five times with 3 per cent. nitric acid, and five times with a 0·1 per cent. solution of potassium nitrate, transferred to the flask in which the precipitation was made, and 30 c.c. of water and a measured excess of $N/5$ sodium hydroxide added. When all the yellow precipitate is dissolved, 0·1 c.c. of phenolphthalein is added and the solution titrated with $N/5$ sulphuric acid. The c.c. of $N/5$ sodium hydroxide used × 0·0054 = per cent. of phosphorus. *Molybdate solution.* 100 grms. of molybdic acid are added to 250 c.c. of water followed by 150 c.c. of ammonia. After stirring well until solution is complete, 65 c.c. of nitric acid (sp. gr. 1·42) are added. When cold, the solution is poured, with constant stirring, into a cold mixture of 400 c.c. of nitric acid (1·42) and 1100 c.c. of water, and a couple of drops of ammonium phosphate solution are added.—A. H. C.

Cyanogen [in gas manufacture]; Recovery of ——. A. E. Broadberry. J. Gas Lighting, 1912, 120, 31—34.

A method for recovering cyanogen from crude coal-gas, introduced about 1903, consists in scrubbing the crude gas with liquor in which granulated sulphur is kept agitated. The ammonia and hydrogen sulphide in the gas combine with the sulphur to form polysulphides which absorb cyanogen completely, with the formation of ammonium thiocyanate. This process has now been simplified by P. E. Williams, in that the crude gas is bubbled through polysulphide liquor in the lower part of a special oxide purifier. The purifier is charged with spent oxide, and this is kept moist by a daily spraying with water or gas-liquor. It was anticipated that the ammonia and hydrogen sulphide in the gas would form polysulphides with the sulphur in the spent oxide, and that these could be transferred to a cyanogen washer, but it is found that no washer is required, as ammonium thiocyanate is formed in the purifier. Moreover, the quantity of sulphur in the spent oxide increases slightly, so that there must be some decomposition of the hydrogen sulphide in the gas. This method recovers part of the ammonia and is found to lessen the work on the ammonia scrubbers and the ordinary oxide purifiers. The ammonia from the thiocyanate is recovered at the gas-works, and the resulting calcium thiocyanate is sold. In discussion, H. G. Colman pointed out that the process was suitable for small gas-works, and suggested that the current of gas through the spent oxide should be reversed occasionally in order to reduce the back-pressure. P. E. Williams said that at Poplar, 3½ million cub. ft. of gas per day were passed through a layer of spent oxide 24 in. thick in a vessel 20 ft. square, and the whole of the cyanogen was removed. One ton of oxide had served in one month for the removal of the cyanogen in the gas from 350 tons of coal. From 10 to 15 per cent. of the hydrogen sulphide and from 15 to 20 per cent. of the ammonia are removed from the gas, and 3 to 5 lb. of ammonium thiocyanate are made per ton of coal. The liquor obtained contains 2¾ lb. of thiocyanate per gallon.—A. T. L.

Petroleum from Patagonia; Optical and other properties of ——. M. A. Rakusin. Petroleum, 1912, **8**, 9—10.

Crude petroleum (sp. gr. 0·9306) obtained from a depth of 1770 feet at Comodoro-Rivadavia was dextro-rotatory and had the following composition:—Benzine, 2·50; kerosine, 4·70; gasoline, 9·95; heavy lubricating oils, 27·45; and asphaltum, 55·40 per cent. A sample from the province of Chubut gave the following results:—Sp. gr. at 15° C., 0·9570; viscosity at 35° C. (not fluid); at 70° C., 13·20 Engler degrees; flashpoint, 40° C.; ignition point, 80° C.; heating value, 10,519 cals.; distillation began at 215° C., from 270° to 290° C. 4 per cent. coming over; 290° to 310° C. = 5 per cent.; residue over 300° C. = 91 per cent.; and asphaltum, 2·254 per cent.—C. A. M.

[Mineral] Oil emulsions; Properties of ——. *II. The stability and size of the globules.* R. Ellis. Z. physik. Chem., 1912, **80**, 597—616. (See also this J., 1912, 18.)

The stability of a pure oil-water emulsion is at a maximum when the contact potential between the oil globules and water is greatest, that is in faintly alkaline (0·001*N*) solution. The stability varies in the same way as the contact potential on the addition of acid or alkali, and does not depend to any great extent on the surface tension between the two phases. The decrease of stability with decreasing contact potential, is caused by a diminution in the strength of the electrical double-layer, which becomes more easily broken, with the result that the particles can more easily flow or cling together. The concentrations of the salts of uni-, di-, and trivalent metals which are necessary to reduce the charges on the globules to zero, are in the same ratio as the minimum concentrations of the same salts which are required to produce instantaneous coagulation of a colloidal solution. The stability of a suspension colloid depends in the same way as that of an emulsion on the contact potential, and disappears when this attains a value of zero.—W. H. P.

Utilisation of coke-oven gas for the production of nitric acid from atmospheric nitrogen. Dobbelstein. *See* VII.

Patents.

Fuel blocks or briquettes. P. Hoering, Berlin. Eng. Pat. 20,312, Sept. 13, 1911. Under Int. Conv., Feb. 3, 1911.

The patent relates to the utilisation of reed-plants such as occur in large quantities on the Nile. The reed stems are cut or disintegrated in a special machine which produces fine reed-particles from 1 to 3 cm. in length. The mass is brought to a moisture content of about 8 per cent., which can usually be effected by drying in air, and is then pressed into briquettes. These have the sp. gr. 1·0 to 1·3, and calorific value "3500—4000 German calories per kilo. or 13,800—15,800 B.T.U. per lb."—A. T. L.

Peat; Manufacture of fuel from ——. G. Weiss and W. Zeitler. Ger. Pat. 249,639, July 10, 1910.

Dried peat is impregnated with a mixture of fused anthracene and anthracene residues, naphthalene and naphthalene residues, and nitrobenzene, and allowed to solidify in moulds. A. S.

Furnace; Regenerative gas-generating —— *with constant direction of the heating flames.* Stettiner Chamotte-Fabrik Akt.-Ges. vorm. Didier, Stettin, Germany. Eng. Pat. 14,702, June 24, 1912. Under Int. Conv., July 10, 1911.

The waste gases from retort or chamber furnaces used in gas manufacture are much hotter than in the case of coke-ovens, and difficulties arise in using regenerators owing to the high temperature of the gases passing the controlling valves. According to the present invention, the waste gases, before passing to the regenerators, are carried through recuperators so that part of their heat is conducted through the walls and transferred to the heating gases, and the gases are sufficiently cooled before entering the regenerators to avoid difficulty in working.—A. T. L.

Retort settings; Method of constructing ——. G. W. Parker, St. Louis, Mo. U.S. Pat. 1,037,516, Sept. 3, 1912.

A method of constructing the retort setting of a furnace consists in arranging a number of retorts in operative position and moulding refractory material around them so as to form a series of vertical transverse walls through which the retorts pass. The refractory material is used in a plastic state and is finally subjected to a high temperature—H. H.

Retort-coke-oven system. E. W. King, Assignor to Semet-Solvay Co., Syracuse, N.Y. U.S. Pat. 1,038,762, Sept. 17, 1912.

A separate regenerator chamber is provided beneath each oven, and the flues are so arranged that one-half of each regenerator is connected with the waste gas flue and the other half with the air-supply flue. By means of suitable valves the flow of waste gas and air through the regenerators can be reversed.—W. H. C.

Tar tower and retort house governor, Combined ——. W. S. Pickering, Leeds. Eng. Pat. 20,514, Sept. 16, 1911.

A gas-pressure governor valve of any suitable kind is arranged at the outlet of the tar-tower in which tar and ammoniacal liquor are separated from the crude gas. —A. T. L.

Gas producers; Working of ——. J. B. Chadwick and P. Hollinshead, Runcorn, Cheshire. Eng. Pat. 16,168, July 12, 1911.

In the working of gas producers of the Mond or recovery type, with bituminous fuels, about 1 per cent. of powdered slaked lime is mixed intimately with the coal. The yields of ammonia and of hydrogen in the gas are increased and the tendency of the coal to cake together is lessened. —A. T. L.

Gas for driving, heating and other purposes; Apparatus for producing ——. A. Hendunen and A. Simonenko, Moscow, Russia. Eng. Pats. 19,515 and 19,781, Sept. 5, 1911.

The patents relate to gas producers for treating peat, lignite, coal or other fuels containing a high percentage of water or volatile matter, the gas formed in one producer chamber being purified by passing through incandescent coke in a second producer chamber, and the claims are for arrangements by which the depth of the layer of coke traversed by the gases can be varied to suit the requirements of different fuels. (1) The producer comprises two superposed shafts. The grate of the upper shaft is formed by an inverted slotted cone, the open lower end of which is partially closed by a movable conical obturator. By adjusting this obturator, any desired quantity of hot coke can be dropped from the upper producer shaft into the feeding hopper of the lower producer shaft. This hopper is also provided with a feed valve to regulate the admission of the hot coke to the producer chamber. The conical obturator and the feed valve may be on the same vertical spindle or they may be independently operated. The gases from the upper producer shaft are led beneath the grate of the lower producer shaft. (2) The depth of coke traversed by the gases is varied by adjusting the position of the gas outlet. For this purpose, the coke chamber is provided with a number of valved gas-outlets at different heights above the grate. The two producer-chambers may be side by side or in any relative position.—A. T. L.

Gas; Apparatus for making ——. J. H. Hirt, Sewickley, Pa., Assignor to Allis-Chalmers Co., Milwaukee, Wis. U.S. Pat. 1,037.764, Sept. 3, 1912.

A gas producer is formed with two chambers arranged one above the other and separated by a partition having a central orifice surmounted by a perforated cap. The gas-forming material is injected tangentially into the middle of the lower chamber, together with a portion of the gas from the gas-delivery main, by means of a centrifugal fan, and steam is introduced near the top of the chamber. The gas generated passes into the upper chamber, and thence to the delivery main.—H. H.

Gas-producer. J. H. Hirt, El Paso, Tex., Assignor to Allis-Chalmers Co., Milwaukee, Wis. U.S. Pat. 1.038,582, Sept. 17, 1912.

The claim is for an annular gas producer formed of an outer shell and a central vertical column, which is free to expand upwards into a recess formed in the top of the shell. The upper part of the hollow column is perforated, and the gas is withdrawn by a side connection from the bottom of the column.—W. H. C.

Oil-gas; Apparatus for generating high pressure ——. R. Vuilleumier, New Rochelle, Assignor to Pintsch Compressing Co., New York. U.S. Pat. 1.038,691, Sept. 17, 1912.

Oil under a high pressure is forced through a heat interchanger, where it is preheated by the resulting gas as the latter leaves the generator. From the preheater, the oil enters an internally heated generator, into which steam is also forced at a pressure of about 14 atmospheres. The resulting high candle power gas is passed, first through a scrubber, and then through the heat interchanger.
—W. H. C.

Gas; Process of producing ——. J. H. Hirt, El Paso, Tex., Assignor to Allis-Chalmers Co., Milwaukee, Wis. U.S. Pat. 1.039,398, Sept. 24, 1912.

A producer using powdered fuel comprises a combustion chamber in which the flow is directed first upwards, then downwardly into a vertical flue sealed in water at its lower end, and through a lateral gas outlet from this flue. A blast of gas-forming combustible material is directed upwardly into the combustion chamber and ignited, a second blast is introduced at a higher level, and a jet of steam is admitted at the point where the direction of flow is changed.—A. T. L.

Gas producer; Double-zone down-draught ——. E. Ragot and P. Pierre-Hervotte. First Addition, dated April 17, 1912, to Fr. Pat. 435,691, Oct. 26, 1911 (this J., 1912, 377).

The producer described in the principal patent is adapted for working by the suction of an engine by providing a suitable feeding hopper, and a three-way cock on the air inlet pipe for connecting the latter with the atmosphere for normal working or with a fan for starting, and by connecting the gas-outlet directly with the scrubber.
—A. T. L.

Gas-producers; Impts. in —— permitting of the production of steam and hot water. C. Wurmbach. Fr. Pat. 443,263, March 19, 1912.

The shell of the producer is not lined with firebrick, and is formed with a double wall, the annular space thus provided serving as a steam-generator. The usual boiler fittings are provided.—A. T. L.

Gas; Manufacture of a normal lighting and heating —— from Australian bituminous shale. J. Becker. Ger. Pat. 249.369, Dec. 11, 1910.

The carbonisation of the shale is effected at a temperature not exceeding 1000° C. in retorts which are filled gradually while carbonisation is proceeding, and into which steam is introduced. The gases produced are heated in the same or in a second retort with a further supply of steam. In this way normal lighting and heating gas can be obtained from Australian shales (kerosene shale, Hartley shale, Wolgan-Capertee shale) which hitherto have only been useful as additions in the manufacture of coal gas for the purpose of increasing the illuminating power of the latter.
—A. S.

Ammonia and by-products in gas producers; Process for the recovery of ——. W. Hunt, Glasgow. From A. B. Duff, Pittsburg, Pa., U.S.A. Eng. Pat. 20,938, Sept. 22, 1911.

A "horizontally stratified blast" is delivered to the fuel bed of the producer; the upper stratum consists of air fully saturated with steam and of a temperature between 80° and 85° C., which, before delivery, is superheated to not less than 150° C., whilst the lower stratum consists of air saturated with steam and of a temperature between 70° and 84° C. (but always less than the temperature of the upper stratum). The lower stratum may or may not be superheated and contains a larger proportion of air than the upper stratum, the proportion of steam being merely sufficient to check excessive rapidity of combustion. The temperature of the fuel is thus sufficiently resuscitated by the lower stratum of the blast to allow of complete reduction to ash, and types of coking and hard burning coals, which have hitherto given difficulty, may be employed with success for the production of ammonia and by-products.—F. Sodn.

Gas-washing plant. H. D. Williams and W. Ahlen, Duquesne, Pa. U.S. Pat. 1,037,095, Aug. 27, 1912.

A gas-washing plant comprises a number of gas scrubbers, cleaning fans, and centrifugal gas cleaners arranged in series with inter-connecting pipes fitted with valves in such a manner that the flow of gas into and out of any one cleaning device can be cut off, while the others are still in operation.—H. H.

Gases [coal gas]; Process of purifying ——. H. L. Doherty, New York. U.S. Pat. 1.038.315, Sept. 10, 1912.

Crude coal gas is scrubbed with ammonia liquor containing a substantial proportion of hydrated ammonia, and the liquor is withdrawn and heated at a temperature below 200° F. (93·3° C.), whereby most of the carbon dioxide and hydrogen sulphide absorbed from the gas are driven off, while most of the ammonia is retained in solution. The liquor is then divided into two streams, one of which is cooled and used for scrubbing a fresh portion of crude gas, while the other is boiled to drive off free ammonia. This latter portion of the liquor is again divided, part being used to absorb ammonia from the gases evolved in the heating of the liquor from the scrubbers, and the other part to absorb ammonia from the coal gas which has passed through the scrubbers.—A. T. L.

Naphthalene; Process for separating —— from gas. Dr. C. Otto und Co., Ges. m. b. H. Fr. Pat. 443,773, May 13, 1912.

The gas, at a point where the temperature is about 40° C., or where naphthalene begins to separate, is cooled suddenly by injecting a spray of water in such a way as to carry with it the minute crystals of naphthalene which are formed by the sudden cooling.—A. T. L.

Oils; Manufacture of aromatic fractionated mineral ——. H. Grossmann and Terpol A.-G., Zurich, Switzerland. Eng. Pat. 27,348, Dec. 6, 1911.

The patent relates to a process for obtaining an aromatic oil consisting of a mixture of an aromatic substance such as camphor, oil of camphor, turpentine, pine needle oil, lemon grass oil, nitrobenzene, etc., with a fraction of petroleum volatile in steam, without risk of decomposition during the distillation. Refined petroleum of sp. gr. 0·780 to 0·820 is mixed with 1 to 5 per cent. of the aromatic substance and is sprayed by means of a steam-jet, into a vacuum chamber. The steam supply is regulated so that the temperature in the vacuum chamber is below 100° C. The vapours from the vacuum chamber pass through a condenser to a separator.—A. T. L.

Mineral oils, wax, tar and similar substances; Process of treating ——. M. Melamid and L. Grötzinger. Fr. Pat. 443,650, May 10, 1912.

The impurities are separated by treating the oil, etc., with phosphoric acid or a mixture of this acid with pyrophosphoric and phosphorous acids. For example, 1000 kilos. of crude mineral oil are mixed with 300 kilos. of phosphoric acid or with 200 kilos. of this acid and 60 kilos. of pyrophosphoric and 5 kilos. of phosphorous acid, with continual stirring, and the mixture is distilled. The distillates are clear and colourless and need no further refining. —A. T. L.

Briquettes and the like; Means for heating [coking] ——. P. Hein, Essen-Ruettenscheid, Assignor to Diamant Brikett-Werke G. m. b. H., Berlin. U.S. Pat. 1,039,533, Sept. 24, 1912.

See Fr. Pat. 425,442 of 1911; this J., 1911, 882.—T. F. B.

Fuel in plastic form consisting essentially of methyl alcohol. E. Bertini. Fr. Pat. 443,065, April 27, 1912. Under Int. Conv., April 28, 1911.

See Eng. Pat. 2317 of 1912; this J., 1912, 864.—T. F. B.

Fuel; Manufacture of artificial ——. M. Desouches et Cie. Fr. Pat. 443,213, May 1, 1912. Under Int. Conv., May 2, 1911.

See Eng. Pat. 10,651 of 1911; this J., 1912, 19.—T. F. B.

Gas-producing oven; Regenerative ——. A. Gohmann, Assignor to Stettiner Chamotte-Fabrik A.-G. vorm. Didier, Stettin, Germany. U.S. Pat. 1,039,270 Sept. 24, 1912.

See Eng. Pat. 14,702 of 1912; preceding.—T. F. B.

Gas purifying materials; Roasting process for completely regenerating spent ——. K. Burkheiser. Fr. Pat. 443,025, April 25, 1912. Under Int. Conv., Aug. 28, 1911.

See Eng. Pat. 8217 of 1912; this J., 1912, 806.—T. F. B.

Hydrocarbons; Process for purifying liquid ——. T. S. Hamilton. Fr. Pat. 442,891, April 22, 1912. Under Int. Conv., April 22, 1911.

See U.S. Pat. 1,018,971 of 1912; this J., 1912, 324.—T.F.B.

Obtaining ammonium sulphate from gases. Ger Pat. 249,640. *See* VII.

Means for collecting average samples of gas. U.S. Pat. 1,037,695. *See* XXIII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

Distillation of bituminous coal and similar substances. A. G. Glasgow. Fr. Pat. 443,653, May 10, 1912.

The coal is arranged in vertical or horizontal layers, for example 75—150 mm. in thickness, with alternate layers of lumps of refractory material such as firebrick, coke, or hard coal, in a closed chamber, and is heated by passing hot gases through the channels formed by the layers of refractory material. These gases may be provided by the combustion of part of the fuel. When it is desired to recover the gases distilled from the coal, the heating is effected intermittently by introducing a strong blast of air, and the distillation proceeds during the intervals of heating, in consequence of the heat stored up in the layers of refractory material.—A. T. L.

Arc-light electrode. E. J. Guay, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,039,522, Sept. 24, 1912.

The electrode is composed of titanium carbide, 20 to 30 (preferably 25) per cent., cerium fluoride 15 to 25 (preferably 20) per cent., cerium tungstate, 12 to 18 (preferably 15) per cent., cryolite, 5 per cent., and carbon 30 to 35 per cent.—A. T. L.

Chromium; Method of obtaining —— in filaments for incandescent electric lamps, and as mantles for incandescence gas burners. P. M. C. Séguy. Fr. Pat. 443,530, July 17, 1911.

Seven methods of procedure embodying the essential principles are given, the following being typical. A thread of cotton, etc., is immersed in a slightly acid solution of a chromium salt, and is afterwards carbonised out of contact with air. The thread is then heated to incandescence in a rarefied hydrocarbon atmosphere, whereby a carbide of chromium is formed. The filament is finally decarburised and made into a conductor by heating it to a high temperature in an atmosphere of hydrogen.—T. St.

Kilns for burning charcoal. W. Hart and J. M. Deschamps, Brisbane, Queensland. Eng. Pat. 22,214, Oct. 9, 1911. Under Int. Conv., March 14, 1911.

See Fr. Pat. 435,368 of 1911; this J., 1912, 378.—T. F. B.

Charcoal of high decolourising power; Process for the production and revivification of ——. O. Molenda and J. Wunsch, Skrivan, Bohemia. Eng. Pat. 8627, April 11, 1912.

See Fr. Pat. 442,476 of 1912; this J., 1912, 913.—T. F. B.

III.—TAR AND TAR PRODUCTS.

Tar phenols; The applications of ——. F. Raschig. Meeting of the Verein Deutscher Chemiker, New York. Sept. 3, 1912.

After giving an historical survey of the extraction and uses of the various phenols obtained from coal-tar, the author describes the methods employed for the separation of mixtures of the cresols. The disulphonic acid of *p*-cresol, obtained in one of these processes of separation, contains the two sulphonic groups in the o-positions to the hydroxyl group; the *m*-positions appear to be very difficult if not impossible to substitute. When the acid is treated with nitric acid or chlorine, the sulpho groups are replaced by nitro-groups or chlorine groups. The strongest sulphuric acid is ineffective in producing further sulphonation, its only action being to eliminate one mol. of water and to form a kind of anhydride between one of the sulpho-groups and the hydroxyl group: this sulphone formation, though known in the case of naphthalene derivatives, has not previously been observed in the phenols. The potassium and sodium salts of *p*-cresolsulphonic acid are insoluble, whilst the salts with other metals are readily soluble.—T. F. B.

Patents.

Tar obtained from coal, crude petroleum, or shale ; Transformation of —— into pitch by the action of air under pressure. Soc. Anon. des Combustibles Industriels. Fr. Pat. 443,207, July 8, 1911.

Air is forced through a succession of columns about 6 to 10 metres in height containing the tar, which may be mixed with anthracene oil, and the temperature of the tar and oil is maintained above 110° C. Oxidation takes place in the first column and the temperature increases, but any volatile constituents which are distilled are condensed in the next column, where the supply of oxygen is insufficient to heat up the liquid. When the liquid in the first column is completely transformed into pitch, the air is introduced into the second column.—A. T. L.

Nitration products from coal tar ; Production of relatively non-volatile liquid ——. O. Silberrad, Buckhurst Hill. Eng. Pats. 13,861, June 10, 1911, and 712, Jan. 9, 1912.

Products which remain liquid at ordinary temperatures are obtained by nitrating, under suitable conditions, the neutral fractions of coal-tar boiling from about 200° to 350° C. : it is preferable to use oils of which the greater part boils at from 200° to 270° C. According to one method, a creosote oil fraction boiling from 200° to 270° C. is freed from naphthalene and from acid and basic substances, again distilled, and nitrated by adding first 68 parts of nitric acid (sp. gr. 1·50) and then 88 parts of sulphuric acid (sp. gr. 1·84) to each 100 parts of the oil, the contents of the vessel being violently agitated and cooled during the whole process to keep the temperature between 20° and 35° C. ; after standing for about 16 hours the product is separated from the acid and washed in the usual manner, and it may be further purified by distillation *in vacuo* at temperatures not greatly exceeding 240° C. Another process, which is suitable for hydrocarbons which are nitrated with difficulty, such as oils of b.pt. 200° to 260° C., consists in first adding relatively dilute acid and successively adding stronger acid and finally a mixture of nitric and sulphuric acids. It is generally found that the products are more viscous the greater the quantity of nitric acid used.—T. F. B.

Meta-nitro derivatives of benzenic hydrocarbons ; Process for reducing ——. B. J. Flürscheim. Fr. Pat. 443,015, April 19, 1912. Under Int. Conv., April 19, 1911.

See Eng. Pat. 9520 of 1911 ; this J., 1912, 66.—T. F. B.

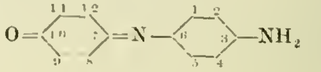
IV.—COLOURING MATTERS AND DYES.

Indophenols and indamines ; The simplest ——. G. Heller. Annalen, 1912, **392**, 16—48.

Although derivatives of indophenol are well-known, the simplest indophenol, $O:C_6H_4:N{\cdot}C_6H_4(OH)$ has only just been studied by the author. An alkaline solution of a mixture of 9·4 grms. of phenol and 14·7 grms. of *p*-aminophenol hydrochloride was rapidly run into a dilute solution of sodium hypochlorite (2 mols.) and common salt, cooled to —10° C., when on allowing to stand, the sodium salt of the indophenol crystallised out. The salts are blue, but the free indophenol, precipitated by acetic acid, is red. It is dissolved and decolourised by a solution of bisulphite, forming the leuco-compound, *p.p*-dihydroxydiphenylamine. With cold dilute acids it yields quinol (hydroquinone) but gives quinone if heated with dilute acid. Sulphuric acid of about 70 per cent. does not decompose it, while higher strengths cause sulphonation. Primary aromatic bases combine with indophenol as with quinones, forming diarylidodihydroxydiphenylamines, $HO(NHR)_2C_6H_2{\cdot}NH{\cdot}C_6H_4OH$, which become oxidised by a second molecule of indophenol to quinones, $HO(NHR_2)C_6H_2{\cdot}N:C_6H_4:O$. The latter on oxidation with chromic acid yield dianilindophenols of the type, $RN:(HO)C_6H_2(:NR){\cdot}N:C_6H_4:O$. These dianil compounds were found to be very stable in respect to acids but undergo a striking molecular change when treated with alcoholic alkali, the change beginning even in the cold ; they are converted into arylated safranols. 7-Anilinosafranol prepared in this way was found to have only a slight affinity for silk and mordaunted cotton. N-*o*-tolyl-7-hydroxysafranol, dyes mordaunted cotton a vivid red to brown. Two methyl-indophenols were prepared and found to be isomeric, viz., $O:(CH_3)C_6H_3:N{\cdot}C_6H_4(OH)$ and $HO(CH_3)C_6H_3{\cdot}N:C_6H_4:O$, respectively, and not mere tautomerides.

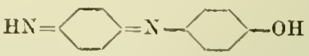
Compounds of the formulæ :—

(III.)



or

(IV.)



are indiscriminately described in the literature as indophenols ; (IV.) should rather be 3-hydroxyindamine, and (III.) 3-aminoindophenol. A compound prepared by oxidising *p*-phenylenediamine and phenol in solution in water, by lead peroxide in presence of sodium phosphate and bicarbonate, was found to dissolve in different organic solvents with different colours : blue in alcohol, violet in chloroform, red-violet in benzene. It is the prototype of the so-called Phenol and Naphthol Blues and stands midway between the indophenols and true indamines of the type, $NH:C_6H_4:N{\cdot}C_6H_4(NH_2)$.

Compounds of the types III. and IV. dissolve readily in alkalis, readily too in acids but with splitting off of quinone or quinol. Introduction of halogens renders them more stable, the dimethylaminotrichloro-indophenol of Schmidt and Andreson (J. prakt. Chem., 1881 [2], 24, 434), being particularly stable and crystallisable from boiling alcohol. Substances of the pure indamine type are usually only crystallisable as double compounds, *e.g.*, Bindschedler's Green, $(CH_3)_2NC_6H_4{\cdot}N:C_6H_4:N(CH_3)_2Cl$, and do not combine with aniline to form dianil derivatives, and the author suggests the latter reaction as a means of determining whether a substance belongs to the indamine or indophenol groups.—A. C.

Azo-salicylic acid and azo-hydroxynaphthoic acid dyes. Sircar and Watson. *See under* Yorkshire Section.

Patents.

Cotton [azo] dyestuffs ; Manufacture of black ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld Germany. Eng. Pat. 20,608, Sept. 18, 1911.

p-Diaminodiphenylamine is tetrazotised and combined with one mol. of 2·5·7- or 2·8·6-aminonaphtholsulphonic acid, and the product is diazotised and combined either with two mols. of *m*-aminophenylglycine or of one of its homologues, or with one mol. of one of these glycines and with one mol. of another azo dyestuff component, *e.g.*, resorcinol. Dyestuffs are produced which dye cotton black shades fast to light ; the shades obtained may be rendered very fast to washing by treatment on the fibre with formaldehyde.—T. F. B.

Dianthraquinonyl thioethers ; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 443,798, May 14, 1912. Under Int. Conv., June 1, 1911.

The dianthraquinonyl thio-ethers, which are of value in that they dye cotton from the vat in shades varying from yellow to orange and reddish-brown, may be obtained by condensing halogen-anthraquinones or their derivatives with anthraquinone-mercaptans or their derivatives, by heating in presence of an indifferent agent. The products from anthraquinone-β-mercaptan and α-chloro-, 1-benzoylamino-4-chloro-anthraquinone, 4-bromo-1-methylanthrapyridone, 1·5-dichloroanthraquinone, and 2-chloroanthraquinone, and from anthraquinone-α-mercaptan and 1-chloroanthraquinone or its sulphonic acid, and also from anthraquinone-1·5-dimercaptan and two mols. of 1-chloro-4-hydroxyanthraquinone, are described in the specification (compare Eng. Pats. 18,240 of 1911 and 10,835 of 1912; this J., 1912, 678, 766).—T. F. B.

Condensation products of the anthraquinone series; Process of making ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 412,757, April 19, 1912. Under Int. Conv., April 22 and May 5, 1911.

A new series of vat dyestuffs is obtained by condensing quinones and their derivatives with anthranol and its derivatives. Thus, when 18 kilos. of anthranol and 11 kilos. of quinone are heated with 180 litres of nitrobenzene for some hours, a product is obtained which dyes fast blue shades from the vat. The product from anthranol and chloranil dyes green shades, when xylene is used as diluent, and blue when a higher-boiling solvent is used; the formation of the dyestuff is facilitated by the presence of anhydrous sodium acetate or a copper salt. By using other derivatives of anthranol or of quinones, dyestuffs giving shades of blue, green, grey, and brown may be produced. Dyestuffs of more greenish tint are obtained by treating the above condensation products with halogenating agents.—T. F. B.

Yellow to brown dyestuffs for wool; Process for making ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 443,809, May 14, 1912. Under Int. Conv., July 25, 1911.

When substituted or unsubstituted *p*-aminodiphenylaminesulphonic acids are condensed with 1·2·4-chlorodinitrobenzene, a new series of dyestuffs is obtained, which dye wool yellow to brown shades fast to light and resistant to the action of alkalis. In the example given, 30 parts of the sodium salt of *p*-amino-*p*-tolylphenylamine-*o*-sulphonic acid is condensed with 20 parts of chlorodinitrobenzene in presence of water at 100° C.—T. F. B.

Condensation products from indigo, its homologues and substitution products; Preparation of —— and their conversion into halogen derivatives, and the conversion of all the products into sulphonic derivatives. Soc. pour l'Industrie Chimique à Bâle. Fr. Pat. 442,948, April 25, 1912. Under Int. Conv., Oct. 2 and Nov. 16, 1911.

See Eng. Pat. 8421 of 1912; this J., 1912, 635. The condensation products may also be converted into halogen derivatives, which may be sulphonated.—T. F. B.

Disazo dyestuffs for wool; Process for producing ——. Soc. pour l'Industrie Chimique à Bâle. Fr. Pat. 443,387, July 12, 1911.

Dyestuffs which dye wool black shades, fast to washing, are obtained by combining *peri*-aminonaphtholsulphonic acids with one mol. of the diazo derivative of an aminodiphenylthio-ether or of a homologue or substitution product thereof, and with a second mol. of the same or a different diazo compound. The preparation of the dyestuffs from *p*-aminothiocresol ether, 1·8·4·6-aminonaphtholdisulphonic acid, and aniline; chloroaminothiocresol ether, 1·8·4·6-aminonaphtholdisulphonic acid, and aminothiocresolethersulphonic acid; *p*-nitraniline, 1·8·4·6-aminonaphtholdisulphonic acid, and *p*-aminothiocresol ether, is described in detail.—T. F. B.

Dyestuffs of the Coeruleïn series; Process for preparing green basic ——. Fabr. de Produits Chimiques ci-dev. Sandoz. Fr. Pat. 443,377, May 3, 1912.

The blue or violet dyestuffs obtained according to Eng. Pat. 14,220 of 1900 (this J., 1901, 803) by condensing pyrogallol with amino-*m*-hydroxybenzoylbenzoic acids substituted in the amino group, can be converted, according to the present invention, into fast green to blue dyestuffs for wool or cotton by treatment with dehydrating agents, such as sulphuric acid. It is stated that the elements of water are eliminated between the carboxyl group and the pyrogallol nucleus. The dyestuffs are stated to be as fast as Coeruleïn, and to possess the advantage of forming hydrochlorides soluble in water (compare Fr. Pat. 382,920 of 1907; this J., 1908, 218).—T. F. B.

Indigoid dyestuffs; Derivatives of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 443,418, May 1, 1912. Under Int. Conv., Dec. 7 and 8, 1911.

The indigoid dyestuffs, with the exception of those which are capable of being split into two like molecules, can be readily converted into bisulphite compounds by treatment with acid sulphites; if the dyestuffs can be produced in the form of salts with mineral acids, these salts are also converted into the bisulphite compounds by the action of bisulphites or of normal sulphites. These new compounds are, for the most part, only slightly coloured. When heated, or when treated with alkalis or acids, the original dyestuff is quantitatively regenerated: thanks to this property they are applicable to textile printing and, especially in the case of the less soluble dyestuffs, to dyeing. They may also be used as a means of purifying the dyestuffs. Further, when treated by halogenating agents, preferably in presence of water, they are converted progressively into halogen derivatives of increasing halogen content. The halogenated bisulphite compounds are generally less soluble in water than the non-halogenated compounds, and are precipitated from their solutions by common salt. They are quickly and completely transformed by heating, or by treatment with acids, alkalis, or reducing agents, into the corresponding halogenated indigoid dyestuffs or their leuco-derivatives. The process is fully described in the specification as applied to Indoxyl Red and to the dyestuffs from isatin chloride and carbazole and from 5-methyl-3-oxy(1)thionaphthene and benzaldehyde.—T. F. B.

Vat dyestuffs; Process for preparing grey to black ——. A. Schaarschmidt. Ger. Pat. 250,091, April 6, 1911.

Grey to black dyestuffs, producing fast shades, are obtained by melting benzanthrone-o-halogen-carboxylic acids with potassium hydroxide at a high temperature, with or without a condensing agent with a reducing or oxidising action. The constitution of the products is uncertain, but they appear to differ materially from the known violet and blue products obtained by melting benzanthrones with alkali hydroxides or alcoholates.
—T. F. B.

Vat dyestuffs of the anthraquinone series; Process for preparing ——. A. Schaarschmidt. Ger. Pats. 250,271 and 250,272, Dec. 15, 1910.

(1.) *o*-Halogen-anthraquinonecarboxylic acids are condensed with thio-anthraquinones, the products are treated with dehydrating agents and nitrated (*e.g.*, in sulphuric acid solution), and the nitro-derivatives reduced. (2.) The amino-compounds obtained as described above are converted into acylamino-compounds.—T. F. B.

Azo dye. W. Herzberg and O. Scharfenberg, Schöneberg, Assignors to Act.-Ges. f. Anilinfabr., Berlin. U.S. Pat. 1,038,884, Sept. 17, 1912.

See Eng. Pat. 2425 of 1912; this J., 1912, 529.—T. F. B.

Sulphurised dyestuffs of the anthracene series; Production of ——. Badische Anilin und Soda Fabrik. Second Addition, dated June 22, 1911, to Fr. Pat. 403,025, Sept. 14, 1908.

See Eng. Pat. 15,979 of 1911; this J., 1912, 66.—T. F. B.

Diazotisable products; Process for making ——. Farbenfabr. vorm. F. Bayer und Co. First Addition, dated April 27, 1912, to Fr. Pat. 426,201, Feb. 18, 1911. Under Int. Conv., May 5, 1911.

See Eng. Pat. 18,205 of 1911; this J., 1912, 678.—T. F. B.

[Azo] dyestuffs producing violet to blue shades on the fibre; Process for making ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 442,697, March 25, 1912. Under Int. Conv., March 27, 1911.

See Eng. Pat. 9433 of 1911; this J., 1912, 182.—T. F. B.

Thiazine derivatives of the anthraquinone series; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 443,159, April 30, 1912. Under Int. Conv., May 9, 1911.

See Ger. Pat. 248,169 of 1911; this J., 1912, 767.—T. F. B.

Indigoid dyestuffs; Process for producing reddish-yellow to orange-yellow —— dyeing from the vat like indigo. Société pour l'Industrie Chimique à Bâle. Fr. Pat. 442,805, June 28, 1911.

See Eng. Pat. 9940 of 1912; this J., 1912, 766.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Cell membrane; The structural elements of the ——, *their analytical determination and technical significance.* J. König. Chem.-Zeit., 1912, **36**, 1101. (Compare this J., 1912, 427.)

The industrial sulphite-celluloses contain notable quantities of pentosans, as well as lignin, and in spite of their white appearance are hardly entitled to the designation of cellulose. By treatment of rasped wood with dilute ammonia or sodium carbonate and with dilute mineral acids under pressure, followed by oxidation with the usual oxidising agents, not only is a product obtained containing at least as much cellulose as that obtained by other processes now in use, but a waste-lye is extracted which is capable of being converted into cattle fodder. When wood or hemp is extracted with a mixture of benzene and alcohol and then with water, and the purified material is treated by the method of Ost and Wilkening (this J., 1910, 688) for the hydrolysis of the cellulose, by treatment with 72 per cent. sulphuric acid and subsequent dilution with water, a slightly coloured solution is obtained, together with a blackish-brown residue which preserves completely the microscopic structure of the cell-membrane. The quantity of this residue, calculated on dry weights, was 29·51 per cent. for beech-wood, 31·28 for spruce-wood and 2·93 per cent. for hemp. The preceding table shows the relation of the residue to the original material.

	Beech-wood.			Spruce-wood.			Hemp.		
	Carbon.	Hydrogen.	Methyl value.	Carbon.	Hydrogen.	Methyl value.	Carbon.	Hydrogen.	Methyl value.
	p. ct.	p. ct.	p. ct.	p. ct.	p. ct.	p. ct.	p. ct.	p. ct.	p. ct.
Original material	48·82	5·85	31·58	49·85	5·75	24·83	44·06	6·17	4·11
Residue from sulphuric acid	65·08	4·97	84·25	64·85	4·86	79·60	56·62	4·81	34·88

The author considers that this residue represents the lignin; it is partly soluble in ammonia and fixed alkalis and is completely oxidised by a mixture of hydrogen peroxide and ammonia or by hypochlorites. The direct isolation of the lignin in a form retaining all the structure of the cell-membrane leads to the conclusion that the lignin and the cellulose are not in chemical combination, but merely mechanically interpenetrating.—J. F. B.

Cellulose; Acetolysis of —— to dextrose acetate. H. Ost. Chem.-Zeit., 1912, **36**, 1099-1100. (See also this J., 1912, 713.)

The total hydrolysis of cellulose to dextrose has only been accomplished by way of its esters. After conversion into the sulphuric ester, cellulose may be completely resolved, by "sulpholysis," by heating the solution with water at 120° C., into its constituent hexose groups. In an analogous manner a similar resolution may be effected by "acetolysis" after conversion into the acetate. Hydrolysis of the cellulose complex must take place by the oxygen atoms, which unite the hexose residues by lactonic linkages, taking up each one molecule of water and forming two hydroxyl groups. Thus the $3mn$ hydroxyls of a cellulose molecule made up of mn dextrose residues will become on hydrolysis n $(3m+2)$ hydroxyls, and a dextrin which may be produced, composed, for instance, of 10 dextrose residues, will contain, not 30, but 32 hydroxyls, whilst the biose will contain 4 and the monose 5 hydroxyls per C_6 unit. This progressive hydrolysis can only be detected by elementary analysis in its later stages, but it is more sharply indicated by the increase in the combined acetic acid in the esters. Thus cellulose triacetate contains 62·5 per cent. of acetic acid, the acetate of a dextrin, $C_{60}H_{102}O_{51}$, (with 32 hydroxyls) contains 64·4 per cent., cellobioseoctaeetate contains 70·8 per cent., and dextrose pentacetate 76·9 per cent. Cellulose may be converted into dextrose pentacetate in the following manner: 5 grms. of cellulose, 25 c.c. of acetic anhydride, 25 c.c. of acetic acid and 5·5 grms. of sulphuric acid are digested at 40°—45° C. for two days. The product is poured into water when it has reached a stage when a minimum precipitation (biose-acetate and humus matters) thereby results. The aqueous solution is exhausted with ether, which extracts a syrupy mixture of various acetates of dextrose. When this mixture is re-acetylated in the cold by acetic anhydride with only traces of sulphuric acid, a very large yield of pure dextrose-α-pentacetate, melting at 112° C., is obtained.—J. F. B.

Sources of nitrogen for agriculture, and utilisation of waste sulphite-cellulose liquors. Nitsche. *See* XVI.

Celluloid; Home Office Committee.

The Home Secretary has appointed a Committee to inquire and report as to the precautions necessary in the use of celluloid in the manufacture and the handling and storage of celluloid and celluloid articles. The names of the members of the committee are:—The Earl of Plymouth (Chairman), Professor J. J. Dobbie, Captain M. B. Lloyd, Mr. H. M. Robinson, and Mr. Edwin O. Sachs.

Patents.

Cellulose films; Manufacture of ——. J. E. Brandenberger, Thaon-les-Vosges, France. Eng. Pat. 4065, Feb. 17, 1912. Under Int. Conv., Mar. 22, 1911.

In starting the apparatus for the manufacture of cellulose films, described in Eng. Pat. 15,190 of 1909 (this J., 1910, 147), a fabric is led by one of its ends through all the parts of the machine, whilst its other end is in the interior of the hopper intended to contain the cellulose solution. A string is then introduced in such a manner as to close temporarily the slot of the hopper whilst it is being charged with cellulose solution. On starting the machine, the string is withdrawn and the cellulose film emerges attached to the leading-fabric.—J. F. B.

Wool-scouring and other industrial purposes: Cleansing preparation for ——. L. Shaw, Sydney, N.S.W. Eng. Pat. 24,675, Nov. 6, 1911. Under Int. Conv., Nov. 7, 1910.

A cleansing compound particularly suitable for wool scouring is composed as follows:—Aluminium silicate, 68 per cent.; sodium borate, 10; sodium carbonate or its equivalent, 15; sodium stearate or its equivalent, 5; *Quillaia saponaria*, 1·5 to 2; and nitrobenzene or other suitable aromatic substance, 0·25 to 1 per cent. Mixtures of the same ingredients in different proportions are recommended for laundry, bath, polishing and general purposes. The aluminium silicate should be in the form of refined kaolin of the highest possible quality. —J. F. B.

Wool, yarn, wood-pulp, paper, etc.; Testing ovens for ascertaining the amount of moisture in ——. G. S. Smith and Taylor and Parsons, Ltd., Bradford. Eng. Pat. 26,276, Nov. 24, 1911.

In a conditioning oven designed to contain several cans of material to be dried, and provided with a weighing apparatus, a turn-table mounted on ball-bearings is fitted into the base, so that all the cans may be brought in turn under the hook of the weighing apparatus. The base-plate carries a central tube having a lever pivoted at its upper end, by which means a rod may be depressed to engage with the pointed end of a central spindle, whereby the base-plate carrying the cans is slightly lifted to rotate on the central spindle. The turn-table is provided with an annular member surrounding a central air-passage which dips into a trough of mercury formed on the base to prevent leakage of air.—J. F. B.

Tobacco waste, stalks, etc.; Manufacture of paper from ——. H. Arledter, Frodsham. Eng. Pat. 20,395, Sept. 14. 1911.

An extract is first made of the less fibrous portions of the tobacco leaf (tobacco dust) and a quantity of fibrous tobacco waste is then disintegrated in this extract to form a paper-pulp. The operations are best carried out in the hermetically closed engine described in Eng. Pat. 2018 of 1910 (this J., 1911, 80). The mixture of tobacco dust and water is first heated under vacuum in this engine and then allowed to cool whilst still under vacuum, so that the aromatic principles volatilised during extraction may be re-absorbed. The fibrous waste is then added and, the vacuum being restored, its reduction to pulp is effected. After the manufacture of the paper, the liquid extract drained from the pulp is returned for further use. Perfumes and flavourings may be incorporated with the pulp, preferably under pressure and while the material is hot.—J. F. B.

[Paper] Pulp-straining machines. J. White and F. W. Gray, Edinburgh. Eng. Pat. 23,892, Oct. 28, 1911.

In a pulp-straining machine are claimed, in combination, a chamber affording an oil bath, means for imparting a variable to-and-fro movement to the diaphragm, such means including a rotating crank or the like, a vibratory member disposed within the chamber and having connections with the crank and with the diaphragm, a member within the chamber affording a fulcrum for the vibratory member, and means disposed externally to the chamber for varying the position of the fulcrum member.—J. F. B.

Peat; Manufacture of paper from ——. B. Granville, New York. Assignor to National Fibre Products Co. U.S. Pat. 1,038,565, Sept. 17, 1912.

Peat is excavated and the peat fibre is separated from the bog, by applying to the peat, as it lies in the bog, a powerful stream of water, thereby "cutting" the peat and carrying the fibre in suspension in a body of water from which it may be separated.—J. F. B.

Flax; Retting of ——. O. Silberrad, and The Fibre Corporation, Ltd. Fr. Pat. 443,146, April 30, 1912. Under Int. Conv., May 4, 1911.

See Eng. Pat. 10,812 of 1911; this J., 1912, 871.—T. F. B.

Spinning solutions for artificial threads and the like; Manufacture of ——. E. de Haën Chem. Fabrik "List," Seelze, Germany. Eng. Pat. 6408, March 14, 1912. Under Int. Conv., June 23, 1911.

See Fr. Pat. 441,063 of 1912; this J., 1912, 812.—T. F. B.

Indian-corn [maize] straw; Process of utilising ——. *[Manufacture of paper and foodstuffs].* B. Dorner, Budapesth, Austria-Hungary. U.S. Pat. 1,038,730, Sept. 17, 1912.

See Eng. Pat. 8638 of 1911; this J., 1911, 1376.—T. F. B.

Pulp for paper-making; Machines for straining ——. J. White and F. W. Gray. Fr. Pat. 442,709, April 6, 1912.

See Eng. Pat. 23,892 of 1911; preceding. T. F. B.

Parchment paper; Process for making ——. E. Fues. Fr. Pat. 443,402, May 4, 1912.

See U.S. Pat. 1,033,757 of 1912; this J., 1912, 769.—T. F. B.

Tanning process [with waste sulphite-cellulose lyes]. Ger. Pat. 248,055. *See* XV.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Dyeing process; The microscope as an aid in the elucidation of the ——. R. Haller. Z. Chem. Ind. Kolloide, 1912, 11, 110—115.

The author has studied dyeings with vat and sulphide dyestuffs in the manner described previously (this J., 1912, 279) and describes the microscopic and ultramicroscopic appearance of fibres dyed with Indigo, Thioindigo Red, Thioindigo Scarlet, Immedial Indogen, Hydrone Blue R, Indanthrene R S, Algol Red extra, and Algol Red B, before and after treatment with cuprammonium solution. In all cases the dye is deposited mainly on the surface of the fibre and only to a small extent in the cell membrane. The fastness to rubbing and the capacity of "dyeing through" are inversely proportional to the size of the particles of the dye deposited on the fibre (compare Binz and Schädel, this J., 1912, 329). In the series: Indigo, Thioindigo Red and Scarlet, Immedial Indogen, Hydrone Blue, Indanthrene, the fastness to rubbing increases and the size of the particles of the deposited dye decreases in the order given; Algol Red extra and Algol Red B, although nearest to Indanthrene in chemical constitution, behave similarly to the sulphide and thioindigo dyes in dyeing. Examination of the vats showed that in all cases the leuco-compounds are present in the colloidal condition, and the particles are much smaller than those of the dye fixed on the fibre. Crystals of hydrosulphite which have a superficial crust, owing to oxidation, yield a solution containing colloidal particles (probably sulphur) when dissolved in water. If a substance could be added to the indigo vat which would cause a diminution in the size of the colloidal particles of indigo white, the fastness to rubbing of the dye would be improved.—A. S.

Patent.

Blue shades on wool [by means of azo dyestuffs]; Process for producing fast ——. Farbenfabr. vorm. F. Bayer und Co. First Addition, dated April 18, 1912, to Fr. Pat. 442,322, March 28, 1912. Under Int. Conv., June 21, 1911.

See Eng. Pat. 14,901 of 1911; this J., 1912, 184.—T. F. B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Nitrous and nitric acids; Conditions of formation of ——, *from nitrogen oxides and water.* E. Briner and E. L. Durand. Comptes rend., 1912, 155, 582—585.

When nitric oxide (NO) is allowed to react with nitric acid of the composition, HNO_3+4H_2O, at atmospheric pressure, a light blue liquid is formed; and as the pressure is increased, this darkens in colour, till at ten atmospheres a second liquid phase forms at the bottom, very deep blue in colour, whilst the brown colour of the gaseous phase gradually lessens in depth. With more concentrated solutions of nitric acid, the formation of the second liquid phase occurs at lower pressures. The explanation is that rising pressure and concentration tend to produce nitrous anhydride; for the gradual dilution of nitrous anhydride produces the same phenomena in inverse order. Dilution of nitrogen peroxide produces the same effects as dilution of nitrous anhydride, but the tints of the liquid are more greenish through the mixture of the two oxides. Compression of nitric oxide with concentrated nitric acid produces two yellow liquid phases, which are also produced from nitric acid and nitrogen peroxide. All these phenomena are due to reversible reactions among the various oxygenated compounds of nitrogen:

(1) $N_2O_3+H_2O\rightleftharpoons 2NO_2H$;
(2) $2NO_3+H_2O\rightleftharpoons NO_2H+NO_3H$;
(3) $3NO_2H\rightleftharpoons 2NO+H_2O+NO_3H$.—J. T. D.

Coke-oven gas; Utilisation of —— for the production of nitric acid from atmospheric nitrogen. O. Dobbelstein. Stahl u. Eisen, 1912, **32**, 1571—1577.

Experiments have been carried out on the Häusser process for the production of nitric acid from atmospheric nitrogen, which depends upon the explosive combustion of gases or liquids. The gases produced in the explosion chamber contain nitric oxide which on cooling combines with the oxygen of the air to form the brown oxides. Diagrams of a large plant are given in which the steel bomb was a cylinder with half-round ends having a capacity of 100 litres. Using illuminating gas containing 44 per cent. of hydrogen, 26 of methane, 14 of carbon monoxide, 3 of carbon dioxide, 1 of nitrogen, 8 of oxygen and 4 of unsaturated hydrocarbons, and which approximates to coke-oven gas, and employing a low pressure, a yield of 35 grms. of nitric acid per cb. m. of gas was obtained, which rose to 125 grms. per cb. m. when the gases were previously warmed, and with a pressure of 5 atmospheres. The addition of 33 per cent. of oxygen and using a pressure of three atmospheres increased the yield from 80 to 130 grms. of nitric acid per cb. m. of gas. The plant did not however permit of the simultaneous use of the three methods of increasing the yield, viz.:—high pressure, previous heating of the gas, and addition of oxygen. Explosion curves are given, and the possible advantages and cost of the process compared with those of other methods.—A. H. C.

Ammonia; Synthetic ——. H. A. Bernthsen. Eighth Int. Cong. Appl. Chem., New York, Sept. 11, 1912.

Following a description of the work of Haber in the direction of the synthesis of ammonia from its elements (see this J., 1910, 485), the author gives an account of the work of the Badische Anilin und Soda Fabrik on the same subject. In the course of the study of the various catalysts, it was found that a number of substances have the power of rendering catalysts in general more active; among these "promoters" are alkali, alkaline-earth, and earth oxides, hydroxides, and salts, and a number of other substances, including many metals themselves (this J., 1911, 1012). Metals such as lead, zinc, tin, and bismuth, and the metalloids, sulphur, selenium, tellurium, arsenic, boron, phosphorus, etc., must be avoided, as they act as "contact poisons." It is very necessary to remove completely these contact poisons from the catalysts and from the gases to ensure satisfactory results (see this J., 1911, 1115). For example, "pure" commercial iron may be freed from sulphur by heating in a current of oxygen and then reducing the mass of oxide, or by reduction of magnetite or other iron oxide (this J., 1911, 1211). Molybdenum and its compounds, such as molybdic acid or ammonium molybdate, are excellent catalysts (this J., 1911, 1057), so also is manganese, even without addition of foreign substances, providing the mixture of nitrogen and hydrogen be completely free from oxygen or water (this J., 1912, 385). Another suitable catalyst is tungsten, either in the form of the metal itself or as an alloy or nitrogen compound; the catalyst should be prepared at temperatures not greatly exceeding 600° C., or by treating a tungsten compound with ammonia, in which case a higher temperature may be employed if necessary (see this J., 1912, 721).—T. F. B.

Bichromates; Electrolytic formation of —— from chromates. E. Müller and E. Sauer. Z. Elektrochem., 1912, **18**, 844—847.

In the electrolytic preparation of bichromates from chromates, it is customary to use the chromate only as anolyte, with a catholyte of dilute alkali, the two being separated by a porous diaphragm. Under these conditions the current yield of alkali falls far behind that of bichromate. This is found to be due to the presence in the diaphragm of a much more concentrated alkali solution than is found in the cathode cell. The reason for this becomes apparent when the diaphragm is considered as a third compartment of the cell and calculation is made of the quantities of the various ions entering and leaving it. The transport numbers of the ions in sodium hydroxide are 0·74 for the hydroxyl ion and 0·26 for the sodium ion, while in sodium chromate each ion has a transport number of about 0·5. From these figures it is deduced that while the net gain in the cathode compartment is only 0·26 equivalent of sodium hydroxide for the liberation of one equivalent of hydrogen, the gain in the diaphragm space is 0·74 equivalent of sodium hydroxide, assuming the latter to have contained only sodium chromate at the beginning.—W. H. P.

Chromyl chloride. E. Moles and L. Gómez. Z. physik. Chem., 1912, **80**, 513—530.

The authors have prepared chromyl chloride of a high degree of purity, by treating a mixture of dry sodium chloride (50 grms.) and potassium bichromate (80 grms.) with fuming sulphuric acid (150 grms.) The reaction vessel is gently warmed, but as soon as the frothing ceases, the heating is stopped, otherwise decomposition of the distillate occurs and chromium dioxide is formed. The residue in the flask shows evidence of the formation of chromium compounds of polythionic acids. The distillate is shaken with mercury to remove chlorine and fractionated, care being taken to avoid contact with organic matter. The product is a dark red mobile liquid without any shade of brown. Chromyl chloride oxidises liquid ammonia and pyridine at —20° C., and readily acts on alcohol, acetone, formic acid, and formamide in the cold. It dissolves unchanged in phosphorus oxychloride, thiophosphoryl chloride, carbon bisulphide, and carbon tetrachloride. The boiling point has been determined between 23 and 80 cm. pressure, and is 116·7° C. at 760 mm. The melting point is $-96{\cdot}5\pm0{\cdot}5°$ C., the density at 0°/4° C. 1·959, and the vapour density 5·31 referred to air, corresponding to a normal molecular weight of 154 (CrO_2Cl_2 requires 155). The heat of solution in water is 17·86 Cals. per gram-molecule. The cryoscopic behaviour of chromyl chloride in various solvents shows some striking anomalies.—W. H. P.

Copper salts; Titration of —— with titanium trichloride. L. Moser. Chem.-Zeit., 1912, **36**, 1126—1127.

The method is a simplification of that proposed by Rhead (this J., 1906, 1175); it consists in dissolving the copper salt, which must be free from nitrate, in concentrated hydrochloric acid, boiling the solution for a minute, quickly cooling in an atmosphere of carbon dioxide, and titrating with titanium trichloride solution, until colourless, in a rapid current of the same gas. The titanium solution is best preserved in bottles of brown glass.—F. Sohn.

Copper sulphate; Examination of ——. H. Fresenius. Z. angew. Chem., 1912, **25**, 2001.

Copper sulphate, chiefly intended for mixing with milk of lime to protect vines and other plants from blight, etc., is often contaminated with basic copper salts and moisture. The contamination may be so skilfully done that the copper content of the mixture corresponds with that of a product containing 98—99 per cent. of $CuSO_4.5H_2O$. The author therefore recommends that both copper and sulphuric anhydride should be determined in copper sulphate marketed for the vine industry, as any basic salts, which the material may contain, are insoluble in water and therefore practically worthless for the above-mentioned purposes.—O. R.

Sulphates; Decomposition of metallic —— at elevated temperatures in a current of dry air. H. O. Hofman and W. Wanjukow. Trans. Amer. Inst. Min. Eng., 1912, 889–943.

The sulphates were heated in an open tube through which a current of dry air was passed, the temperature being measured by means of a thermo-couple. The results are described in detail, with tables and curves. A table is also given showing the temperatures of dehydration of sulphates with water of crystallisation. The chief results referring to the decomposition of metallic sulphates are given in the following table (compare this J., 1912, 333):—

Sulphates.	Temperatures of: Beginning of decomposition.	Temperatures of: Energetic decomposition.	Products of decomposition.	Colour of product of decomposition.
$FeSO_4$	167° C.	480° C.	Fe_2O_3, $2SO_3$	Yellow-brown
Fe_2O_3, $2SO_3$	492°	560°	Fe_2O_3	Red
$Bi_2(SO_4)_3$	570°	639°	$5Bi_2O_3$, $4(SO_3)_3$	White
$Al_2(SO_4)_3$	590°	639°	Al_2O_3	White
$PbSO_4$	637°	705°	6PbO, $5SO_3$	White
$CuSO_4$	653°	670°	2CuO, SO_3	Orange
$MnSO_4$	699°	790°	Mn_3O_4	Dark red to black
$ZnSO_4$	702°	720°	3ZnO, $2SO_3$	White
2CuO, SO_3	702°	736°	CuO	Black
$NiSO_4$	702°	764°	NiO	Brownish-green
$CoSO_4$	720°	770°	CoO	Brown to black
3ZnO, $2SO_3$	755°	767°	ZnO	Hot yellow, cold white
$CdSO_4$	827°	846°	5CdO, SO_3	White
$5Bi_2O_3$, $4(SO_3)_3$	870°	890°	Bi_2O_3 (?)	Yellow
5CdO, SO_3	878°	890°	CdO	Black
$MgSO_4$	890°	972°	MgO	White
Ag_2SO_4	917°	925°	Ag	Silver white
6PbO, $5SO_3$	952°	962°	$2PbO_2$, SO_3 (?)	White to yellow
$CaSO_4$	1200°	——	CaO	White
$BaSO_4$	1510°	——	BaO	White

—A. S.

Metallic oxides and sulphides; Solubility of —— in molten sodium chloride. H. Houben. Metallurgie, 1912, **9**, 592—600.

A complete description is given of methods by which the solubility of oxide of tin, and of the oxides and sulphides of zinc, lead, and copper in fused sodium chloride at varying temperatures was determined, and the results are tabulated. It is concluded that molten sodium chloride can dissolve small quantities of metallic oxides and sulphides and that this solubility depends on the formation of water-soluble compounds. As however the solubility at high temperatures is very small (not more than 1 per cent.) the use of melted salt as a solvent for the more important oxides and sulphides is impracticable for electrometallurgical purposes.—A. H. C.

Silica; Transformations of —— at high temperatures. K. Endell and R. Rieke. Z. angew. Chem., 1912, **25**, 2019—2020.

That quartz is transformed into cristobalite at high temperatures may be proved by the pycnometric determination of the specific gravity of samples, which have been repeatedly heated to the same high temperature. A porcelain furnace, which was maintained at above 1300° C. for 12—14 hours, and above 1400° C. for 4—6 hours, afforded suitable means for the investigations. Rock crystal was found to have decreased but very slightly in density after 5 to 10 ignitions, but strongly twinned, pseudomorphic quartz from the Taunus, and pegmatitic quartz from Norway were found to be converted to a great extent into cristobalite after 2 to 3 ignitions. Powdered silica-glass, amorphous silica, and chalcedony were quantitatively changed into cristobalite after a single burning. The rate at which the transformation took place at 1400° C. seemed to be in direct proportion to the surface area, and was therefore greatest in the case of fibrous quartz. The ignited products were identified as cristobalite by their specific gravity, double refraction, and refractive indices, as well as by their dilatometric, thermal, and optical behaviour at 230° C., the critical temperature of cristobalite. The rate of transformation of silica-glass into cristobalite was found to increase rapidly with the temperature from 1300° C. upwards, and reached a maximum at 1600° C., at which temperature the cristobalite grains themselves increased in volume. Observations of cristobalite at 230° C. showed that at that temperature the transformation of α- into β-cristobalite was accompanied by a volume-increase of 2 per cent., the change being reversible and taking place at a speed of approximately 1 cm. per minute.—O. R.

Alumina from clay. Cowles. *See* X.

Patents.

Corrosive acids; Apparatus for use in recovering —— from their absorbents [kieselguhr]. F. M. Hale, Catford. Eng. Pat. 19,965, Sept. 7, 1911.

The apparatus consists of a retort having a sloping bottom, with an outlet through which the dry kieselguhr freely gravitates, and containing bars or tubes arranged vertically, horizontally, or coiled, which serve to conduct the heat from the side of the retort throughout the mass of the material. There is an outer casing which allows a free passage of the fuel gases around the retort, and there are openings in the retort for the introduction of a thermometer.—F. Sodn.

Sulphuric acid or other liquids: Concentrating ——. J. Mackenzie, Middlesbrough-on-Tees. Eng. Pat. 2389, Jan. 30, 1912.

The special feature of the process, which is carried out in apparatus of the cascade type, is the employment of basins, suitably of "tantiron," having a tube-like pocket or hollow projection; this forms part of the basin itself and contains a loose circulating tube carried on supports at its upper end, so that circulation is effected on the principle of the "Field tube" of steam boilers, and concentration is accelerated.—F. Sodn.

Sulphur-burner. E. Rossiter, Port Edwards, Wis. U.S. Pat. 1,038,442, Sept. 10, 1912.

The burner consists of an outer rotatable drum, having, at one end, a gas outlet, which may be connected with a device for producing suction, and an inner drum, forming a primary sulphur combustion chamber, which is connected so as to rotate with the outer drum and is so spaced as to leave an annular compartment between the two for receiving the heat radiated from the inner drum. The inner drum is provided with air inlets, leading from the outside of the apparatus, and with gas passages connecting it with the compartment between the drums, which also is provided with air inlets. The air inlets and connecting passages are preferably located at opposite ends of the inner drum, and the air inlets to the outer drum, for supplying air to the annular compartment, are located at the end near the connecting passages, the delivery outlet to the suction device being at the opposite end, near the air inlets to the inner drum. The suction causes air to flow inwardly through the various inlets, and the gas is drawn from the inner drum through the annular compartment, where it receives a secondary heating. The inner drum may have an axial peep-hole at its outlet end, through which the interior may be inspected.—F. Sodn.

Furnace-gases [for the production of sulphurous or sulphuric acid]; Treating ——. U. Wedge, Ardmore, Pa. U.S. Pat. 1,039,464, Sept. 24, 1912.

Hot furnace-gases containing sulphur dioxide are passed upwards through a tower in contact with a descending flow of water, and two gas outlets are provided from the tower, one at the top and the other at an intermediate point (see end). The cold water entering at the top of the tower has the power of absorbing a maximum amount of sulphur dioxide, and the gases leaving at this point are free from sulphur dioxide. As the water descends, its temperature is raised and its power of absorbing sulphur dioxide is decreased, with the result that at some intermediate point, the proportion of sulphur dioxide in the gases is a maximum and greater than that in the gases entering the tower. The second gas outlet is arranged at this point.—A. T. L.

Hydrochloric acid; Apparatus for heating and utilising ——. T. C. King, East Orange, N.J. U.S. Pat. 1,038,389, Sept. 10, 1912.

The apparatus, which is intended for the treatment of "metalliferous bodies" with hot hydrochloric acid, consists of a vessel having a lining proof against the hot acid and a suitably resistant heat transmitting substance, such as a copper tube, located therein so as to be submerged in the acid and unexposed to the atmosphere. Means are provided for transmitting heat through the transmitting substance to the contents of the vessel and for giving a reciprocating movement to the vessel.—F. Sodn.

Lime-sulphur solution; Process of making ——. W. Kibler, Indianopolis, Ind. U.S. Pat. 1,038,387, Sept. 10, 1912.

Lime and sulphur are boiled with water in absence of air, the mixture being preferably agitated and the boiling effected under pressure.—F. Sodn.

Calcium-aluminium borate containing active oxygen; Manufacture of a ——. Chem. Fabr. Grünau, Landshoff und Meyer A.G. and A. Bräuer. Ger. Pat. 250,074, June 7, 1911.

Aluminium chloride (55 parts) and boric acid (13 parts) are dissolved in 10 per cent. hydrogen peroxide solution (100 parts), and the double borate formed is precipitated by addition of milk of lime. It contains about 24 per cent. of alumina, 16 of lime, 18 of boric anhydride, 5 of active oxygen, and 37 of water of crystallisation.—A. S.

Barium nitrate; Manufacture of ——. A.-G. für Chemische Industrie and H. Kühne. Ger. Pat. 248,524, Nov. 26, 1911.

Barium sulphate (1 mol.) is fused with an excess (2 mols.) of calcium nitrate, the fused mass is suddenly cooled, and lixiviated with water to extract the barium nitrate formed. Up to 75 per cent. of the barium sulphate is converted into nitrate.—A. S.

Barium compounds which are dissolved or decomposed by acids; Production of —— *from barium sulphate.* C. A. Beringer. Ger. Pat. 249,857, Feb. 3, 1912.

Barium sulphate is mixed with a substance containing aluminium and silica and heated to bright redness for some time, whereby sulphur dioxide is evolved and a barium-aluminium silicate is produced, which is decomposed by acids.—A. S.

Ammonium sulphate from gases; Process for obtaining ——. H. Koppers. Ger. Pat. 249,640, Jan. 18, 1911.

In the manufacture of ammonium sulphate in a saturator having a central gas-inlet pipe in which is disposed a concentric pipe acting as an ejector, the liquor coming from the centrifuge in which the ammonium sulphate is dried, is re-introduced into the saturator through the central pipe containing the ejector.—A. S.

Oxygen gas; Apparatus for generating ——. J. E. and E. R. Arnold and W. Percival, London. Eng. Pat. 17,225, July 24, 1912.

The apparatus consists of an outer vessel to contain a supply of water, and a central inner chamber in which this water acts upon a solid reagent. The upper end of the inner chamber is provided with a box-like cover, which is kept in air-tight union with the chamber by a suitable mechanical pressure device, and is perforated at its sides and base; this is filled with filtering material, such as cotton-wool, through which the evolved gas passes to an annular space surrounding the cover (and closed at its upper end thereby), whence it is discharged through a pipe fitted with a cock, and is then preferably conducted through water in an adjoining vessel. The apparatus may have an open spout for the supply of water or a spout which can be closed, in which case a double-way valve of special design is provided, this operating so as to admit air to the outer casing before opening the gas exit pipe and to close this pipe before shutting off connection with the air.
—F. Sodn.

Phosphorus; Manufacture of red —— *by heating yellow phosphorus, and of phosphorus sesquisulphide, by heating yellow or red phosphorus with sulphur in presence of catalysers.* Vournasos. Ger. Pat. 247,905, April 16, 1911.

The claim is for the use as catalysers, in the processes mentioned in the title, of hydrocarbons, especially high-boiling saturated hydrocarbons of the paraffin series, mineral fats and oils obtained from crude petroleum, bituminous shale or lignite tar, or vegetable or animal fats and oils, especially mixtures of glycerides. The catalysers should contain no free acids.—A. S.

Decolourising charcoal; Manufacture of —— *by ignition of coal or other bituminous substance which has been previously treated with chemicals.* A. Lotz. Ger. Pat. 248,571, Oct. 6, 1911.

The coal or the like, before ignition, is impregnated first with an alkali (*e.g.*, ammonia) or alkali carbonate and then, some time afterwards, with an acid (*e.g.*, sulphuric acid), or it may be impregnated first with acid and subsequently with an alkali or alkali carbonate.—A. S.

Hydrogen and carbon monoxide; Production of ——. F. Hlavati. Ger. Pat. 250,128, Feb. 25, 1911.

An alkali- or alkaline-earth hydroxide, or a mixture of the two, is mixed with charcoal and a finely divided metal or mixture of metals, and the whole is heated in a hermetically sealed vessel, with exclusion of air, and under diminished pressure. Under the action of the metal, the hydroxide is converted into oxide, and hydrogen and carbon monoxide are formed.—A. S.

Nitrates and nitric acid; Process of making ——. O. Schönherr, Christiania, and J. Brode, Christiansund, Assignors to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Christiania. U.S. Pat. 1,039,325, Sept. 24, 1912.

See Ger. Pat. 220,539 of 1909; this J., 1910, 565.—T. F. B.

Sal-ammoniac [galvanisers'] skimmings; Treatment of ——. G. Rigg, Palmerton, Pa., U.S.A. Eng. Pat. 20,713, Sept. 19, 1911. Under Int. Conv., Nov. 12, 1910.

See U.S. Pat. 1,002,317 of 1911; this J., 1911, 1160.—T.F.B.

Zinc oxide ; Process for making pure —— by direct extraction from zinc ores or salts. G. Ranson. Fr. Pat. 443,048, April 26, 1912. Under Int. Conv., April 27, 1911.

Identical with Fr. Pat. 437,889 of 1911 ; this J., 1912, 535.—T. F. B.

Galvanised iron ; Process for treating —— to produce zinc sulphate and derived salts. Ulmar, Villette et Cie. Fr. Pat. 443,740, July 21, 1911.

See Eng. Pat. 29,267 of 1911 ; this J., 1912, 721.—T. F. B.

Oxalates ; Manufacture of ——. D. Strauss, Assignor to Society of Chemical Industry in Basle, Basle. U.S. Pat. 1,038,985, Sept. 17, 1911.

See Eng. Pat. 8093 of 1910 ; this J., 1910, 816.—T. F. B.

Oxygen generator. N. J. Anderson, Coffeyville, Kans. U.S. Pat. 1,038,065, Sept. 10, 1912.

See Eng. Pat. 4860 of 1912 ; this J., 1912, 774.—T. F. B.

Oxygen ; Compound containing active —— and process of making. G. F. Jaubert, Paris. U.S. Pat. 1,039,408, Sept. 24, 1912.

See Fr. Pat. 336,062 of 1903 ; this J., 1904, 323.—T. F. B.

VIII.—GLASS ; CERAMICS.

Transformations of silica at high temperatures. Endell and Rieke. *See* VII.

Patents.

Kilns for burning bricks, tiles or other earthenware, fireclay, or like goods. G. Andina, Trofarello, Italy, and J. W. Bottomley, Leeds. Eng. Pat. 27,858, Dec. 12, 1911.

Loss of heat by radiation from brick kilns is prevented by the provision of a continuous air space or cavity, extending over the whole of the chambers in the kiln, to form a sealed hot-air space. In the case of continuous, chamber kilns, this hot-air space has controlled communication with the respective chambers, with the atmosphere, and with a main air flue or flues, so that the conserved heat may be utilised for pre-heating air which is admitted for combustion, for drying green bricks, or for any other suitable purpose. In the case of a single-chamber kiln, a similar hot-air space, situated over the roof of the firing chamber, is provided with concentric baffles, which cause air that is admitted through a controlled inlet to make two or more circuits of the air space, before passing through a controlled inlet into the firing chamber. In the case of separate, single-chamber kilns, the hot-air space of one kiln may communicate by means of pipes, controlled by dampers, with the hot-air space of another or other kilns, so that the heated air from a kiln that has been fired may be utilised for drying green goods in another kiln.—O. R.

Alumina ; [Moulded] Article of —— and method of making same. L. E. Saunders, Niagara Falls, N.Y., Assignor to Norton Co., Worcester, Mass. U.S. Pat. 1,037,999, Sept. 10, 1912.

Claim is made for a moulded article which is made by binding aluminous particles by means of a flux having a solvent effect upon alumina, and then heating to a temperature near the melting or softening point of alumina, so that the flux is expelled and the mass fritted together. —F. Sodn.

[Titaniferous] refractory article and method of making it. F. M. Becket, Assignor to Electro Metallurgical Co., Niagara Falls, N.Y. U.S. Pat. 1,038,827, Sept. 17, 1912.

A refractory article is composed of a mixture of titanium oxide and carbon, and an adherent facing of titanium carbide formed by reducing the aforesaid mixture.—O. R.

IX.—BUILDING MATERIALS.

Bauxite brick for kiln or furnace lining. S. R. Stone. Min. and Eng. World (Chicago), 1912, **37**, 341—342. (See also this J., 1906, 267 ; 1908, 626.)

Recent applications of bauxite as refractory lining are : (1), for rotary Portland cement kilns, for which purpose a 6-inch bauxite lining has been found superior to a lining composed of 9 inch fireclay blocks ; (2), for the hearths of lead-refining furnaces, in which a single course of 9-inch bauxite bricks has been found to last from five to six times as long as a firebrick lining ; (3), for basic open-hearth steel furnaces, for which bricks made from washed, pisolitic bauxite, containing 6—8 per cent. of silica, have been found to compare favourably with the best magnesite bricks ; such bauxite bricks should, however, have a low silica content, not exceeding 12 per cent. In preparing bauxite for use as a kiln or furnace lining, the crude material is first worked to remove some of the free silica. It is then calcined in a rotary kiln at a temperature of 2500° F. (1371° C.), using oil, gas, or powdered coal for fuel. Between 2390° F. (1310° C.) and 2500° F. (1371° C.) the material undergoes great shrinkage. An analysis of washed, calcined bauxite from Arkansas showed the following percentages : moisture, 0·88 ; silica, 6·40 ; ferric oxide, 1·43 ; alumina, 87·30 ; and titanium oxide, 3·99. For the manufacture of bricks, the calcined material may be "bonded" with fireclay, sodium silicate, or lime, the last-named causing the bricks to set hard in a few hours like "green" silica bricks. After careful drying, the bricks are burned in down-draught kilns at a high temperature, and become hard and tough. A brick 9 by 2½ by 4½ ins. weighs 7½ lb. and has a crushing strength of 10,000 lb. per sq. in.—O. R.

Alumina from clay. Cowles. *See* X.

Patents.

Plaster and the like ; Composition for ——. A. Weiffenbach and M. J. Farrell, Seattle, Wash., U.S.A. Eng. Pat. 20,535, Sept. 16, 1911.

Plastic masses are prepared from 20 parts of Portland cement, 20 parts of charcoal, and 1 part of silicious material, such as silicious or infusorial earth.—O. R.

Pulverizing mills [for cement, etc.]. B. C. Bradley, Canton, Ohio, U.S.A. Eng. Pat. 6817, Mar. 19, 1912.

A pulverizing mill for cement and like material comprises a rotatable carrier with grinding elements such as steel balls and "pushers" adapted to force such elements along a groove in which the material is ground. The pushers are pivoted to the carrier and fitted with springs which absorb shocks and so prevent crystallisation of the metal. The ground material is carried away by a fan having inclined blades working within a sieve-chamber formed with an outer fine sieve, and an inner coarse sieve, so arranged that material which can only pass the coarse sieve is returned to the grinder.—H. H.

Wood ; Process for preserving and reducing the inflammability of ——. Grubenholzimprägnierung Ges. m. b. H. Ger. Pats. 247,694, July 30, 1911, and 248,065, Dec. 14, 1911.

The wood is impregnated with solutions of ammonium and magnesium salts and (1) salts of α-naphthalenesulphonic acid or (2) salts of nitronaphthalenemono- or disulphonic acids, especially the zinc and magnesium salts. —A. S.

X.—METALS ; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron ore resources of Chili. C. Vattier. Iron and Steel Inst., Sept., 1912. [Advance proof.]

Sufficient prospecting has not yet been done to allow of an accurate estimate of the iron ore resources of Chili, but there is little doubt that many millions of tons of high-grade ores containing 60—70 per cent. of iron and very little phosphorus occur under conditions suitable for economical working and transport. The deposits occur all over the country, but principally in the centre, forming an almost continuous line from north to south. Iron oxides of every description are found, but no carbonate. In most of the large deposits, the iron content of the ore ranges from 55 to 70·5 per cent., whilst the phosphorus content varies between 0·09 and 0·3 per cent. in some deposits and is as low as 0·02 per cent. or even less in others. The phosphorus is usually present as apatite in the form of whitish stains, and the amount tends to diminish with the depth of the deposit. The ores are free from or contain only small quantities of sulphur. The gangue is generally silicious and only exceptionally calcareous.—A. S.

Electric heating and the removal of phosphorus from iron. A. E. Greene. Eighth Int. Cong. Appl. Chem., 1912. Met. and Chem. Eng., 1912, 10, 600—601.

The ease with which the temperature and reducing or oxidising conditions can be controlled in an electric furnace allows of greater scope in the selective oxidation of impurities in iron than is possible in the open-hearth and Bessemer processes. The author has found that below about 1400° C. the phosphorus in pig iron is more readily oxidised than the carbon: the phosphorus can be oxidised in presence of lime without any oxidation of the iron or of manganese and with practically no oxidation of the carbon. At certain temperatures between about 1350° C. and the melting point of pig iron, it is possible to oxidise phosphorus in presence of lime, without any appreciable oxidation of silicon. It has been found that phosphorus can be removed in slags containing as much as 30 per cent. of silicon, without any appreciable quantity of iron passing into the slag.—A. S.

Open-hearth steel; Manufacture of —— with reference to improvement in yield. F. W. Paul. Iron and Steel Inst., Sept. 1912. [Advance proof.]

After giving a review of the ordinary practice of open-hearth steel manufacture with reference to the yield obtained, a new method of charging and silicon elimination is proposed. *Charging.* After the pig iron is all charged and the silicon sufficiently removed to permit of superheating the metal without loss, the steel scrap is charged in such quantities as to allow the bath to be kept melted. *Melting.* The pig iron and scrap floating in a molten bath of metal with a protective coating of slag being protected from the oxidising atmosphere of the furnace, less waste ensues and the yield is increased. By these means the melting stage and the silicon elimination stage are merged into one and the silicon is removed during a period of six hours or more with the metal at a low temperature, and therefore the scouring action on the "banks" is considerably diminished and the temperature of the iron and the content of oxide of iron in the slag can be controlled so that the reaction takes place without the emission of brown smoke. The following important features of these proposals have been practically confirmed in a 70-ton furnace. 1. A very decided increase in yield. 2. The practicability of so superheating the de-siliconised metal as to permit of the addition of cold steel scrap without causing partial solidification of the charge. 3. Charges of all-pig iron can be worked with considerable increase in yield compared with charges of pig iron and scrap. 4. The brickwork of the furnace is not subjected to such extreme fluctuations of temperature. 5. During the melting stage the level of the metal in the furnace is continually altering and thus the scouring action on the thin top part of the "banks" avoided, and there is less loss of time for repairs and less risk of "breakouts." 6. The prevention of oxide of iron fumes will probably lengthen the life of the chambers.—A. H. C.

Cast irons; Growth of —— under repeated heatings. (*Parts V. and VI.*). H. F. Rugan. Iron and Steel Inst., Sept. 1912. [Advance copy.]

Part V.:—Part 1. (this J., 1909, 1038). It is concluded (1). That grey irons containing 3·48 per cent. of carbon and 1·13 of silicon lose about 75 per cent. of their strength after 99 heats, and lose their strength in a greater degree per heat during the earlier heats. (2). That white irons such as those containing 3·08 per cent. of carbon, 0·172 of silicon, 0·13 of manganese, 0·019 of sulphur, and 0·010 of phosphorus do not lose in strength but become stronger and more ductile under treatment, and such an alloy appears to be a suitable material for the manufacture of annealing ovens, ingot moulds, grate bars and similar castings.

Part VI.:—*Failure of a cast iron steam separator while in service.* A superheated-steam separator classified as a medium casting and which should have a strength of about 21,000 lb. per sq. in. failed while in service, having been used at a fluctuating temperature of 370° F. to 470° F. (188°—243° C.) The change had penetrated to a depth of 0·1093 in. on the inner surface, and to 0·0781 in. on the outer surface. Tests were also made of the metal at varying depths, and the results are tabulated. It is concluded:—(1). That the strength of the outer fibre of scale surfaces of a casting is greater than that of the metal taken from other portions of the casting. (2). That the temperature of pipe lines using superheated steam is high enough to produce disintegration, causing it to grow and become correspondingly weak. (3). Fittings made of ordinary mixtures of grey cast iron are unfit for pipe-lines intended for superheated steam. —A. H. C.

Iron and nitrogen. J. H. Andrew. Iron and Steel Inst., Sept. 1912. [Advance proof.]

A high pressure furnace capable of withstanding pressures up to 1000 atmospheres is described. Swedish charcoal iron was melted in nitrogen gas under high pressure and after being allowed to cool the pressure was released. Heating and cooling curves were taken and the steel was examined microscopically and for carbon and nitrogen. It is concluded:—1. That iron and iron-carbon alloys absorb small quantities of nitrogen when melted under a high pressure of the gas. 2. That 0·3 per cent. of nitrogen entirely suppresses the critical changes in pure iron, and prolonged heating *in vacuo* is necessary to remove the nitrogen from the metal. 3. That 0·25 per cent. of nitrogen and 0·6 of carbon lowers the Ar 1. point. 4. The effect of nitrogen upon the mechanical properties is made evident by a consideration of its influence upon the critical points. 5. Hydrogen has no influence upon the critical changes when introduced into the liquid metal under pressure. The author considers "that the critical changes occurring in iron and steel are due to a coalescence of like molecules, and that this coalescence is due to the contraction of the metal during cooling bringing the molecules sufficiently near together for the force due to the molecular attraction of like molecules to exert itself and overcome the influence of intervening molecules. The absorption of nitrogen, followed by the formation of iron nitride, hinder the iron molecules and the iron carbide molecules from coalescing with molecules of their own kind by keeping them further apart."—A. H. C.

Cementite; Solubility of —— in hardenite. J. O. Arnold and L. Aitchison. Iron and Steel Inst., Sept., 1912. [Advance proof.]

Steels in the forged state containing 1·46 per cent. of carbon, 0·046 of silicon, 0·10 of manganese, 0·025 of sulphur, 0·012 of phosphorus, and a trace of aluminium, and in the cast state only varying by containing 0·070 per cent. of manganese, were heated and quenched as described in a previous paper (this J., 1912, 492). The forged steel showed the Ac 1.2.3 at 729° C. and the cast steel at 728° C. Specimens of the forged steel were heated at the rate of from 3° to 4° C. per min. to 727° C., 729° C., and 731° C.

respectively and then immediately quenched and microscopically examined. It is concluded that the transformation of "B" or pearlite carbide into hardenite is a phenomenon unattended with the solution at higher temperatures of the "A" carbide by hardenite and the consequent production of austenitic hardenite. The transformation of 13 per cent. of "B" carbide takes place in a range of 3° C. The following table shows the results obtained with the cast steel when heated very slowly.

Specimen.	Temperature maintained for:	Quenched from:	Remarks.
Q.	25 min.	792° C.	Solution well started
K.	12 ,,	868° C.	Much solution taken place
H.	12 ,,	881° C.	Almost completed.
P.	30 ,,	927° C.	Quite finished.

It is shown that the solution of 13 per cent. of "A" carbide in hardenite requires a range of about 200° C. —A. H. C.

Hardenite; Solubility or diffusion of —— in ferrite. J. O. Arnold and C. Chappell. Iron and Steel Inst., Sept., 1912. [Advance proof.]

A steel containing 0·176 per cent. of carbon, 0·051 of silicon, 0·154 of manganese, 0·035 of sulphur, 0·014 of phosphorus, and 0·033 of aluminium was cast as a 1¾ in. square bar, and hammered down to ¾ in. round. It was normalised by heating to from 900° to 950° C. for one hour and allowing to cool in the air. The absorption and recalescent curves showed Ac 1 at 730° C., Ac 2 at 753° C., Ac 3 at 845° C., Ar 1 at 695° C., the lower peak of Ar 2 at 753° C., the upper peak at 765° C., and Ar 3 at 830° C. In order to ascertain the influence (*a*) of temperature, (*b*) of time, and (*c*) of the critical range of temperature on the solubility during heating of a small amount of hardenite in ferrite, bars of the steel were heated in a molten salt bath for a given length of time, quenched, and then examined microscopically. The results are tabulated according to the respective "critical ranges" of temperature. In the α range (below Ac 2) it is shown: (1) That the points Ac1 and Ar1 are reversible, the transformation of pearlite into hardenite which usually takes place at 730° C. is within 30 min. complete at 698° C. (*i.e.*, Ar 1.) (2) That the diffusion of hardenite and ferrite takes place readily in the α range of temperature, the process of solution taking place practically as soon as the hardenite is formed. The microthermal observations in the β range (753° C. to 845° C.) are similar to those in the α range. The steel soaked at 842° C. (Ac 3) showed very clearly the great structural changes brought about at this critical point on heating, and demonstrated the disappearance of the allotrimorphic crystals characteristic of the β range of temperature. In the lower γ range (845° C. to 950° C.) there is a tendency for a ferrite-like substance to precipitate, while in the upper γ range (about 1000° C.) a strongly martensitic structure is developed. It is also shown that the time required for the complete solution of the hardenite in the ferrite becomes more rapid with the rise of temperature, thus:—Between Ar 1 and Ac 1 a minimum of 30 min. heating is required, between Ac 1 and Ac 2 25 min., in the β range within 20 min., and in the γ range less than 15 min. Hardenite is stated to be structureless, confirming Sorby's statement, and that when trapped immediately after its formation by heating the steel to 734° C. and rapidly quenching, it is of the nature of obsidian, or glassy. Experiments were also carried out with steels containing 0·18, 0·55, and 0·81 per cent. of carbon and it is shown that the Ac 1 point is lowered by prolonged heating, *i.e.*, the pearlite into hardenite change can be induced at temperatures below Ac 1 but above Ar 1, the minimum temperature of the change being within 3° C. of Ar 1 itself, and in a similar manner given sufficiently prolonged time conditions it is suggested that there is an ultimate identity of Ac 3 and Ar 3. The paper is illustrated by eighteen microphotographs.—A. H. C.

Steel ingots; A new method of revealing segregation in ——. Sir R. Hadfield. Iron and Steel Inst., Sept., 1912. [Advance proof.]

In order to study the condition of steel ingots at a given time after the steel has been poured, and before it has completely set, the author has poured molten copper into the steel in the ingot mould. The specific gravity of the copper being slightly higher than that of the steel, the copper penetrated the steel remaining molten at the time, and strengthened segregation areas which were not mechanically solid. Sections of the cooled steel were then prepared, and the extent of the penetration of the copper determined by chemical tests and by means of sulphur prints. It was found that the interior of ingots remains hot for a much longer period than has hitherto been thought to be the case. The paper is illustrated by copies of sulphur prints and photographs of sections of ingots to which copper had been added.—T. St.

[*Steel*] *Ingots; Method of producing sound* ——. Sir R. Hadfield. Iron and Steel Inst., Sept., 1912. [Advance proof.]

Piping steel is used, and the head of the ingot is maintained in a fluid condition during the cooling and shrinkage of the metal in the lower part of the mould, by external heat. This is provided by burning on the top of the ingot a layer of solid fuel by means of a blast of compressed air. The fuel is separated from the steel by a layer of slag. A sand or other suitable top, to provide the feeding head portion, is inserted in the moulding box, fixed on the top of the ingot mould. It is better to have the small end of the ingot downwards, as then the cooling and congealing of the lower part of the steel take place more quickly, and this reduces the amount of feeding required later. Sound ingots are thus obtained, and the piping and discard are reduced, as much as 93 per cent. of the ingot being utilisable. The method is applicable for large or small ingots. Pouring in fresh molten steel after the lower part of the ingot has begun to set, does not give satisfactory results. An ingot which was covered with slag but which was not heated in the way described, was excellent as regards soundness, but the discard was greater, and segregations were found much lower. Photographs are given showing the soundness of ingots made by the method described, and of rails rolled from the ingots. An extensive bibliography divided under eleven heads is appended.—T. St.

Steel; Determination of enclosed slag in ——. G. Mars and F. Fischer. Stahl u. Eisen, 1912, 32, 1557—1568.

I. *Metallographic part.* The previous publications with reference to the microscopical examination of slag enclosures in steel are reviewed, and 24 microphotographs are reproduced illustrating the presence and character of the enclosures in specimens of Thomas, acid and basic Martin steel, electro-iron, and crucible steel of which the analyses are given. A very full bibliography of the subject is also given.

II. *Chemical part.* The authors recapitulate the various methods proposed by previous investigators for obtaining the slag enclosures in steel free from iron carbide and phosphide, and in a condition suitable for weighing. The iodine method of Eggertz, modified by the authors, is considered the best, although it is doubtful whether the carbides and phosphides are completely decomposed by the iodine. The following details of the method are given. 10 grms. of the borings are placed in an ice-cooled beaker with 50 c.c. of ice-cold water, and 50 grms. of pure iodine are added. When the steel has dissolved, the solution is heated on a water-bath, stirring continuously in order to destroy the carbide and phosphide. It is then mixed with 200 c.c. of air-free water and allowed to settle. The residue consisting of carbon and slag is collected in a Neubauer crucible and washed with dilute hydrochloric acid and water until free from iron and chlorides, when it is dried and weighed. It is then removed from the crucible and the carbon estimated by burning in oxygen, the difference giving the slag-content.—A. H. C.

Steels; Demagnetisation of —— on heating. F. Robin. Mem. Soc. Ing. Civ. de France, 1912, **65**, 778—801.

Continuing his investigations on the effect of temperature on the properties of different kinds of steel (see this J., 1910, 1312; 1911, 215, 806, 1389; and 1912, 779), the author has studied the effect of temperature on the magnetisation of commercial iron and a large variety of steels. The curves connecting magnetisation with temperature show a slight irregularity at 100° C., which seems to correspond with modifications previously noted for hardness and sonority. At 180° C. an inflexion is noticed which is apparently due to the magnetic transformation of cementite, while at about 300°—350° C. another inflexion appears to be connected with increasing fragility. The heat treatment and the special constituents of the steels have characteristic effects on the shape of the curves. From a consideration of these effects the author develops an empirical method of determining the composition, nature, thermal and mechanical treatment of any article of regular shape made from a steel or nickel alloy without altering it or marking it in any way. The first process consists in determining the magnetisation produced by a given field (300 gauss is suitable for most purposes). The author has studied the effect of varying the length and diameter of the test piece on the extent of magnetisation in typical hard, mild, and extra mild steels, and by comparing the observed results with his curves the steel can be at once referred to one of these classes. The next step is to determine the extent of demagnetisation produced by giving the article a number of sharp blows with a hammer. After about twenty blows a limiting value of magnetisation is reached. The ratio between the limiting value and the original magnetisation depends on the type and previous treatment of the steel, and from the author's tables further information as to the composition of an unknown steel, may be obtained by this process of demagnetisation. Finally the effect of gradually rising temperature on the magnetisation is observed, as well as the return of magnetisation on cooling. If the demagnetisation is very slight and regular, with little or no indication of discontinuity, the original magnetisation being very high, a high-speed chromium tungsten steel is indicated. In the same way the curves for iron-nickel alloys show a characteristic shape. With quenched steels the curve for the return of magnetisation on cooling indicates the temperature of annealing, and finally for carbon steels the characters of the inflexions at 100° and 180° C., as well as the phenomenon of magnetic inversion which is sometimes observed, will give an approximate idea of the percentage of carbon and the thermal treatment.—W. H. P.

Steel; The gases evolved on heating —— to its melting point in a vacuum. G. W. Austin. Iron and Steel Inst., Sept. 1912. [Advance proof.]

The following results were obtained by electrically heating to the fusion point, in a vacuum, bars of iron and steel supported in such a manner as to be out of contact with any other heated material:—

[Silver]. Cyanide treatment; Lead salts in ——. J. E. Clennell. Eng. and Min. J., 1912, **94**, 597—599.

A study of the action of lead compounds upon cyanide solutions in connection with the extraction of silver from ores containing silver sulphide. The lead salt appears to act by removing, as fast as it is formed, the alkali sulphide produced by the interaction of the cyanide and silver sulphide. The soluble salts of lead (chiefly the acetate) are usually employed, but it was found that the oxides, carbonate, sulphate and sulphide behave in a similar manner, the efficiency of the material depending upon the proportion of lead present in the compound; the extraction of silver was diminished however when lead tartrate was employed. For a given ore, a maximum increase in the extraction of silver was obtained in the presence of a certain proportion of lead acetate or litharge; as this proportion was exceeded, the amount of silver dissolved diminished progressively and was ultimately lower than when cyanide alone was used. Experiments with fresh solutions showed that although the destructive effect of sodium thiosulphate, copper sulphate and potassium thiocyanate on the cyanide was not completely neutralised by lead acetate, except when these compounds were present in small quantities (about 2 kilos. per ton of ore), in most cases the extraction of silver was considerably higher than that obtainable by the use of cyanide alone; the addition of lead acetate to mill solutions containing sodium thiosulphate was, however found to be rather injurious than otherwise. As regards the solubility of lead acetate and litharge in working cyanide solutions, it was found that by agitating 500 c.c. of a solution (containing 0·31 per cent. of potassium cyanide and 0·09 of lime) with 1 grm. each of litharge, chemically pure lead acetate and commercial lead acetate, separately, the amounts of lead actually dissolved were respectively 11·6, 15·1 and 13·1 per cent. of the quantities present; the consumption of cyanide was approximately 0·5 kilo. for every kilo. of lead salt added. Although by the use of weak cyanide solutions the lead content of the latter may be minimised without materially diminishing the silver extraction, it is pointed out that lead may be removed from the solution at small cost by precipitation with alkali carbonate or bicarbonate before passing the liquid through the zinc boxes. The following method is recommended for the determination of lead in cyanide solutions:—Sufficient sodium carbonate to completely precipitate the lead and calcium is added to 1 litre of the solution, which is then agitated and allowed to stand until clear. The precipitate is filtered off, washed with cold water, dissolved in boiling acetic acid (20 per cent.) and reprecipitated with excess of potassium chromate. After filtration the resulting lead chromate is boiled with 10 c.c. of sulphuric acid (25 per cent.) and the liquid cooled to room temperature, when 5 c.c. of acetic acid and a little potassium iodide are added and the liberated iodine titrated with $N/10$ sodium thiosulphate; the latter is standardised against pure lead foil which is dissolved in nitric acid, evaporated to dryness, re-dissolved in acetic acid and precipitated as chromate, etc., in the manner described.

—W. E. F. P.

Material.	Analysis of material.					Analysis of gas.			Quantity of gas
	C.	Si.	Mn.	S.	P.	CO_2.	CO.	H, N, etc.	c.c. per grm.
1. Cast iron	3·50	2·50	0·60	0·05	1·50	3·1	23·0	73·9	0·24
2. Crucible steel	1·10	0·24	0·39	0·02	0·02	0·4	44·2	55·4	1·73
3. Medium steel	0·49	0·35	0·72	0·02	0·02	0·6	45·1	54·3	1·35
4. Open-hearth mild steel	0·09	0·05	0·75	0·05	0·05	(a) 5·6 (b) 0·7	31·5 43·0	62·9 46·3	0·66 0·31 0·97
5. Bessemer mild steel	0·05	0·09	0·29	0·06	0·05	(a) 5·2 (b) 3·8	59·8 43·5	35·0 52·7	0·87

(a) Extracted during the first stage of the heating. (b) Extracted during the remaining stages.

—W. E. F. P.

Coinage alloys; Annealing of ——. T. K. Rose. Inst. of Metals, Sept. 1912. [Advance proof.]

The coinage alloys of gold-copper, silver-copper, nickel-copper, bronze, and the pure metals gold, silver, copper, nickel, zinc, cadmium, and aluminium were cast into bars either $\frac{1}{2}$ or $\frac{1}{4}$ in. thick and rolled down to $\frac{1}{20}$ in. thick when the maximum hardness was obtained. They were annealed at 100° C. in water or oil, between 100° and 250° C. in oil or glycerin, and above 300° C. by means of an electric heater. The hardness of the metals and alloys was measured by the scleroscope using the "magnifier" hammer, and on the scale used in the paper the hardness of lead is 1·5, of soft annealed copper about 13, and of a hardened steel die about 175. Tables are given showing the temperature of annealing, its duration, and the hardness, the results being graphically illustrated, and a summary is given in the following table.

Substance.	Hardness.		Lowest temperature at which softening is perceptible. ° Centrigrade.	Temperature at which softening is nearly completed in ° C.	
	Max. on rolling.	Min. on annealing.		In 30 min.	In less than 1 min.
Gold	35	4·5	80	130	200°
Silver	48	7	80°	400°	500°
Copper	46	13·5	275°	360°	400°
Nickel	75	36	300°	700°	—
Zinc	36	15·5	15°	125°	—
Aluminium (2 per cent. of iron)	25	7	250°	300°—400°	—
Cadmium (not pure)	19	10	15°	150°	—
Gold-copper alloys:—8·33 per cent. copper	65	30	290°	500°	600°
10·0 ,, ,,	69	29	300°	500	600°
Silver-copper alloys:—					
7·5 per cent. copper	56	20	230°	550°	600°
8·33 ,, ,,	71	23	230°	600°	—
10·0 ,, ,,	73	23·5	230°	600°	—
16·5 ,, ,,	75	28·5	(?) 230°	650°	—
20·0 ,, ,,	76	31	300°	700°	700°
28·1 ,, ,,	77	28·5	300°	700°	—
Coinage bronze	65	15·5	200°	470°	600°
Nickel copper alloys —					
20 per cent. nickel	64	17·5	300°	550°	—
25 ,, ,,	75	23·5	300°	650°	—
30 ,, ,,	77	21·5	300°	600°	—
50 ,, ,,	87	31·5	400°	700°	—

The effect of time on annealing is discussed and the results of the examination of some ancient gold and silver trial plates dating back to the 15th century are tabulated: it is shown that the older the plates the softer they were, and the author considers that all hard metals are gradually softening at the ordinary temperature. The micrographic structure of the annealed metals, and the alteration of specific gravity is also given. The following general conclusions are drawn:—1. Metals and alloys when hardened by rolling are in an unstable condition at ordinary temperatures and undergo a gradual change to the soft state, and at temperatures considerably below their melting point the change is almost instantaneous. 2. The annealing action at any given temperature is most rapid at first, and a state of equilibrium is not attained in any short space of time except perhaps at high temperatures. 3. When the change takes place recrystallisation occurs almost if not quite simultaneously. 4. Visible recrystallisation and softening occur so rapidly at 200° C. in pure gold as to preclude the possibility that they are dependent on diffusion. 5. In some cases (gold-copper alloys) the alloys do not begin to soften until temperatures above that at which the predominant metal can be annealed. 6. The expansion taking place on softening is far greater in alloys than in pure metals.—A. H. C.

Copper; The influence of impurities in "tough-pitch" —— with chief reference to antimony. [*Determination of antimony in copper.*] F. Johnson. Inst. of Metals, Sept., 1912. [Advance proof.]

Antimony, like arsenic, checks the absorption of gases during poling, and thus tends to prevent "spewing" in ingots which have gone "over pitch," but overpoled antimonial copper which has not "spewed" may yet be red-short. With antimony up to 0·5 per cent., however, the copper has splendid hot working properties if either under or up to "pitch." It is even possible successfully to forge copper containing 1 per cent. of antimony, if sufficient oxygen be present. The oxygen and antimony form an insoluble compound which appears under the microscope as slate-coloured "oxydules." Antimony not thus combined forms Cu_3Sb and enters into solid solution. The less antimony present in the latter form in antimonial copper, the higher will be the conductivity. The mechanical properties of "tough-pitch" pure copper after rolling and annealing, are but little altered by small additions of antimony. The tensile strength is slightly raised, and the elongation is lowered. A slight gain in toughness is probably traceable to the greater soundness of the cast ingot. "Tough-pitch" arsenical copper (0·4 per cent. of arsenic) is slightly hardened for hot-rolling by the presence of antimony (0·2 per cent.), but otherwise, its mechanical properties are slightly improved. Lead, like antimony and arsenic, tends to check "spewing" in the ingot, but some copper with 0·35 per cent. of lead, and 0·38 per cent. of arsenic, when poled so as to give an ingot with a level surface, was badly "red-short." The oxygen in this sample had been reduced to 0·012 per cent. The addition of tin, (0·2 per cent.), to "tough-pitch" arsenical copper is attended by an increase in hardness during hot and cold rolling, and an increase in tensile strength. The elongation is correspondingly lowered, but the toughness is unimpaired. *Determination of the antimony* in the samples was made by precipitating it along with added iron as basic antimoniate of iron, by means of ammonia. It was then converted into sulphide, and separated from copper contaminations by dissolving in 10 per cent. potassium sulphide solution. After re-precipitating as sulphide, it was separated from arsenic by dissolving in strong hydrochloric acid. Bromine was then added, reduction effected by sodium sulphite, and the antimony titrated with potassium bromate.—T. St.

Copper and its alloys; Effect of temperatures higher than atmospheric on the tensile tests of ——, and a comparison with wrought iron and steel. A. K. Huntington. Inst. of Metals, Sept., 1912. [Advance proof.]

The mechanical tests of electrolytic copper, arsenical copper, alloys of copper with tin, nickel, zinc, and aluminium, and of wrought iron and steel, of which the analyses are given, were made while the test bars were heated by a specially designed burner, the method of recording the temperature either by a thermometer or thermo-couple being described. The results are tabulated and graphically illustrated. Taking electrolytic copper as a standard, all its alloys possess the same characteristics, the curves for the yield points approximating to straight lines except in the case of the zinc alloy containing 40 per cent. of zinc in which there is a rapid fall between 400° and 750° F. (205° and 400° C.). The breaking load curves also approximate to straight lines but show signs of being influenced by the second metal at the higher temperatures. In the elongation and reduction of area curves there is a rapid rise above 800° F. (427° C.) in the copper-tin curve, a steady rise to 500° F. (260° C.) in the copper-zinc curve, and a close resemblance between the 7 per cent. aluminium-copper alloy and electrolytic copper. The reduction of area curves have a great similarity to the elongation curves, except that the reduction of area up to 500° F. (260° C.) in the case of copper-zinc alloys does not show the rise which occurs in the elongation. The curves for the copper alloys are then compared with those for wrought iron and steel, and it is shown that in the yield point curves the only resemblance to iron and steel is found in the case of copper-zinc alloys, and the breaking load curves for iron and steel are markedly different from those of the non-ferrous metals. In the elongation curves instead of the horizontal portion found in the case of copper and its alloys, except copper-zinc which shows a steep rise, iron and steel exhibit a rapid fall in elongation, and in the reduction of area there are considerable differences.—A. H. C.

Copper and its principal alloys, and aluminium; Autogenous welding by means of oxygen and acetylene of ——. F. Carnevali. Inst. of Metals, Sept., 1912. [Advance proof.]

Copper. A great development in the size of the crystals takes place at the weld, and a zone of weakness is formed near the weld, resulting from the absorption of gases from the oxy-acetylene flame by the copper which does not melt, the gases being only partially eliminated as the metal cools. Reheating tends to remove this defect, as also to relieve the internal strains often set up within the metal. The welding causes a marked reduction in ductility and capacity to resist fracture, and a marked increase in brittleness. *Bronze.* Tin, lead and zinc all become partly oxidised, and tin dioxide diffuses into the mass of the alloy. The structure of the alloy becomes heterogeneous. *Brass.* There is with brass less tendency to absorb the gases of the flame, but the zinc oxidises considerably and inclusions of zinc oxide are numerous. In general, copper and its alloys suffer great deficiency in mechanical properties by oxy-acetylene autogenous welding. The practical application is limited to those parts of machinery which are not of large dimensions, and are not subjected to severe mechanical stresses. *Aluminium.* The crystalline structure becomes coarser and in spite of deoxidising agents, inclusions of oxide are formed. Intimate union takes place between the welding material and the main body. Hammering tends to approximate the structure of the weld-zone to the original texture of the metal, and reheating tends to make the texture of the entire weld-zone homogeneous, at the same time eliminating the internal strains set up within the metal, as a consequence of rapid fusion and rapid cooling. The change in the mechanical properties of pure aluminium, such as breaking strain, ductility, hardness of weld-zone, are not very profound, although a notable increase in brittleness is observable, as is shown by the results of shock tests. Oxy-acetylene autogeneous welding of aluminium, when carried out with the necessary precautions, is capable of extensive application in practice, especially in the case of small machine parts. *Aluminium with 3 per cent. of copper.* The addition of copper aids the oxidation of the metal during welding, and modifies profoundly, in a detrimental sense, the mechanical properties of the aluminium.—T. St.

Brass; Oxygen in ——. T. Turner. Inst. of Metals, Sept., 1912. [Advance proof.]

From the fact that copper oxide is reduced by heating with zinc, whereas zinc oxide is not similarly reduced by copper, the conclusion is drawn that, when present in brass, oxygen occurs in the form of zinc oxide; since there is no micrographic evidence of the separation of the latter as a eutectic or in any other form, it is concluded that the zinc oxide (in oxidised brass) is mechanically entangled in the alloy. The temperature of reduction of zinc oxide being considerably higher than the boiling point of zinc, oxygen present in brass cannot be determined—as in the case of copper—by ascertaining the loss in weight on heating the metal in hydrogen; attempts to determine this constituent by heating the brass to a high temperature in hydrogen and collecting the water produced were unsuccessful, since the zinc vapour formed was re-oxidised by the water as soon as a favourable (lower) temperature was reached.—W. E. F. P.

Metals and alloys; Influence of [combined] oxygen on the properties of ——. E. F. Law. Inst. of Metals, Sept., 1912. [Advance proof.]

The subject is treated from a general standpoint, the examples given referring mainly to copper and copper alloys. It is pointed out that the oxides are generally insoluble in the corresponding metals and occur in the latter as entangled particles of variable size and distribution. The minimum effect upon the mechanical tests of the metal is produced when the oxide occurs in massive form (*e.g.*, arsenical coppers), the maximum being produced when the oxide is present as a network between the crystals (*e.g.*, certain bronzes); from the users' point of view the former method of occurrence is the more serious, since oxidised metals frequently pass the mechanical tests and fail in practical use. The author is of opinion that experiments on corrosion in which the presence of metallic oxides is disregarded are of little value, since the differences of potential between metals and their oxides are far greater than those existing between the separate metallic constituents of alloys. The inclusion of combined oxygen as a constituent for determination in the analysis of metals and alloys is urged.—W. E. F. P.

Galena-antimonite; The system —— *and the lixiviation of antimonial galena.* K. Wagenmann. Metallurgie, 1912, **9**, 518—523 and 537—543.

The equilibrium diagram of mixtures of galena and antimonite was first determined, and the existence of the following was proved: a compound corresponding to $Pb_2Sb_2S_5$, a eutectic of this compound and antimony trisulphide, and mixed-crystals of two kinds, viz., firstly of antimony trisulphide dissolved in $Pb_2Sb_2S_5$, and secondly of antimony trisulphide or $Pb_2Sb_2S_5$ dissolved in lead sulphide (containing at most 4·1 per cent. of antimony sulphide). By lixiviation with a hot solution of sodium sulphide, antimony present in the form of trisulphide, $Pb_2Sb_2S_5$, or mixtures of these, can be entirely dissolved out. Antimony can only be dissolved out from mixtures containing lead sulphide down to the saturation-point of antimony trisulphide in lead sulphide, that is, 4·1 per cent. of antimony sulphide. Direct lixiviation of antimonial lead sulphide can therefore only separate the two metals quantitatively when the amount of antimony present is equal to, or greater than, that corresponding to the formula $Sb_2Pb_2S_5$, or 41·2 per cent. of antimony sulphide. Ores containing less than this proportion of antimony must first be fused with sufficient antimonite to bring the amount of antimony sulphide present up to 41·2 per cent. at least, when the whole of the antimony can be leached out as above. The process of lixiviation is greatly hastened by the presence of sodium sulphate. This latter also causes the iron sulphide present to precipitate in a form in which it can be easily separated by filtration: if sodium sulphide alone be used, the iron sulphide partly goes into colloidal form, and cannot be separated by filtration.—R. W. N.

Alumina from clay. A. H. Cowles. Eng. and Min. J., 1912, **94**, 535—537.

A mixture of clay, carbonaceous matter, and common salt is made into perforated briquettes, which are dried and subjected to the action of superheated steam while at a temperature of about 1035° C. Sodium silico-aluminate and hydrochloric acid are produced, the ultimate reaction being represented by the equation:

$$Al_2O_3.2SiO_2+4NaCl+2H_2O+yH_2O+xC+xO=(Na_2O)_2(SiO_2)_2.Al_2O_3+4HCl+yH_2O+xCO.$$

It is stated that most of the heat required is furnished by the combustion of the carbonaceous matter, but the primary function of the latter is to increase the permeability of the briquettes, the original form of which is retained throughout the operation. Definite quantities of steam and air are passed into the furnace and the hydrochloric acid produced is condensed with the surplus water vapour; it is stated that no appreciable loss of sodium chloride occurs. Pure clays are preferred, but iron, if present, is volatilised as ferric chloride during the operation and condensed with the acid. The sodium silico-aluminate is pulverised, mixed with just sufficient lime (as limestone or marl) for the production of dicalcium silicate, and heated to the clinkering temperature of the mixture. The cooled mass being broken into fragments and leached with water for the recovery of the sodium aluminate, the latter is treated as usual for the production of soda and alumina, which latter is subsequently reduced to metal. To the insoluble residue of dicalcium silicate one molecular equivalent of lime (as limestone free from iron) is added and the mixture is heated to the clinkering temperature; it is stated that in composition the clinker produced conforms to Newberry's formula for the best and strongest hydraulic cement, but that being free from iron, the material is white and therefore of much greater value than ordinary cement. The author is of opinion that by the general adoption of this process, the cost of production of metallic aluminium should be reduced by 4 or 5 cents (2d. to 2½d.) per lb. The process may also be employed for the extraction of potash from felspar.—W. E. F. P.

Alloys; Electrical conductivity of ——. in the liquid state. K. Bornemann and G. von Rauschenplat. Metallurgie, 1912, **9**, 472—486, and 505—515.

A CONTINUATION and extension of the work of Bornemann and Müller (this J., 1910, 884). The alloys investigated were: Completely, *i.e.* from 0 to 100 per cent., antimony-copper, copper-nickel (all systems composed entirely of homogeneous solutions); incompletely, *i.e.* the pure solvent and dilute solutions only, in mercury, of lithium, sodium, calcium, cadmium, thallium; in sodium, of antimony, cadmium, thallium, lead; in potassium, of thallium; in lead, of potassium, sodium; in tin, of lead, zinc, antimony, sodium, potassium. In addition, cuprous sulphide in the liquid and partially in the solid state. The measurements were all made by observing the drop of potential in a cylinder of liquid of known length and cross-section, when it carried a known current (of from 12 to 50 ampères). For comparatively low temperatures glass U-tubes were used, with side-tubes for the introduction of the auxiliary electrodes, and provided (in the case of the alkali-metal alloys) with special arrangements for melting the alloy under an indifferent gas, and introducing it into the U-tube without access of oxygen. For higher temperatures, the quartz tube described by Bornemann and Müller was used; and for very high temperatures, horizontal tubes of quartz or magnesia, with short vertical attachments for the current-carrying electrodes, the auxiliary electrodes and the thermo-couple for temperature measurement. The electrodes for these high temperatures were copper-tipped brass tubes, cooled by a current of water brought down close to the tip by a narrower concentric brass tube; for lower temperatures carbon electrodes were used, and corrections were in all cases made for any thermoelectromotive force generated in the auxiliary electrodes. The electrodes in the case of the amalgams and alloys of low melting-point were simply iron wires. The apparatus was heated in an oil-bath or in an appropriately arranged electric furnace according to the temperature necessary. The preparation of the alloys is described in the paper in detail, and the results are embodied in a large number of tables and diagrams. The following is a summary of them:—*Amalgams:* Whilst potassium lowers the conductivity of mercury, sodium does so too to a less extent (Bornemann and Müller); the authors have confirmed the lowering by sodium, and find that lithium has a barely perceptible action in the same direction. According to Liebenow, this indicates the gradually lessening tendency, from potassium to lithium, to react and form compounds with mercury. Thallium and calcium slightly raise the conductivity of mercury, but not so much so as cadmium, which shows no tendency to combine with it. *Alkali metals:* All of the metals which were alloyed with sodium or potassium lowered the conductivity considerably. In this respect, then, as also in their high temperature-coefficient of loss of conductivity, the melted alkali-metals resemble solid metals. *Lead:* Potassium and sodium both lower the (already low) conductivity of liquid lead; in this respect lead shows the fullest analogy with mercury. *Tin:* All the metals tried were found to lower the conductivity, so that liquid tin, though it has a very low temperature-coefficient, yet resembles a solid metal. The influence of the tendency to combine can be traced here, for the alkali-metals, which show this tendency most strongly with tin, also lower the conductivity most strongly. *Antimony-copper:* The addition of antimony to copper rapidly lowers the conductivity. The compounds, Cu_3Sb and Cu_2Sb, are both distinguishable upon the curve, but as the temperature rises they both (especially Cu_3Sb) become less noticeable, no doubt because of dissociation. As antimony increases beyond Cu_2Sb, the conductivity slightly rises, and then remains almost constant till it falls again slightly in the near neighbourhood of pure antimony. Thus small additions of copper to antimony raise its conductivity. *Nickel-copper:* Starting from either metal, addition of the other lowers the conductivity, to a point almost midway between the two. There is no indication of any compound. Generally, in the case of alloys containing low percentages of one constituent, it cannot be predicted, from the higher or lower conductivity of the solute, whether the liquid alloy will conduct better or worse than the solvent. The tendency of the metals to form compounds has an important effect on the conductivity; the addition of a metal with this tendency usually lowers it (copper in antimony forms an exception to this). If a metal without this tendency lowers the conductivity, it is usually to a less extent than a metal which does tend to form compounds. In the case of more "concentrated" alloys, antimony-copper for example, the compound, Cu_3Sb, is marked by a minimum on the concentration-conductivity curve. A well-marked minimum on the corresponding curve for nickel-copper, on the other hand, indicates no compound. Generally, whilst a compound seems always to be marked by a singular point on the curve, the converse is not always true. As the compound gradually dissociates with rising temperature, so the corresponding minimum in the curve gradually lessens and disappears. The parallelism between the curves of conductivity-concentration and temperature coefficient-concentration, which has been observed in solid alloys, holds also with concentrated, but not with dilute alloys in the liquid state. In the case of certain antimony-copper alloys negative temperature coefficients, or coefficients negative at low temperatures and positive at higher temperatures, were observed, no doubt due to the increasing dissociation of Cu_3Sb. The temperature coefficients of pure metals (except potassium and sodium) are very small; perhaps this indicates a not very simple molecular constitution of most liquid metals.—J. T. D.

Hardened metals; Crystallisation through annealing of ——. F. Robin. Comptes rend., 1912, **155**, 585—587.

WHEN a hardened metal is annealed, the size of the resulting crystals does not as a rule increase regularly with rise of the annealing temperature. Usually the crystals, large near the melting-point, decrease rapidly at first with fall of temperature, then change very little down to the temperature at which annealing begins: in some instances they even increase a little, so that their size at this temperature is a maximum. The following figures, showing the average area of the crystals, in hundredths of a square millimetre, give some idea of the magnitude of the phenomenon:—*Tin.* At 45° C., 9 to 50; 60°, 9; 100°, 4 to 9; 150°, 64; 220° C., 900. *Lead.* At 80° C., 4 to 225; 150°, 4 to 81; 250°, 16 to 100; 300° C., 225. *Zinc.* At 80° C., 4 to 16; 200° to 300°, 0·04 to 1; 400° C., 4 to 16. *Aluminium.* At 250° C., 4 to 12;

350° to 480°, 0·25; 550° C., 9 to 16. *Copper.* At 350° to 450° C., 0·01, 500°, 0·09; 600°, 0·49; 650°, 1; 750°, 2·25; 900° C., 16. *Iron.* Extremely variable; at 600°—700° C., about 1 for sheet-iron, and about 6·25 for very mild steel. These results are averages of very variable quantities. The effect of impurities in the metals is as a rule, very considerable; they usually diminish the size of the crystals, but do not alter the temperature at which annealing begins, but zinc in copper is an important exception.—I. T. D.

Metallic wires; Influence of absorbed gases on the electrical resistance of ——. A. Sieverts. Int. Zeits. Metallogr., 1912, **3**, 37—60.

The most exact measurements were those of the effect of hydrogen on the resistance of palladium at various temperatures up to 820° C. The resistance is perceptibly increased by absorption of hydrogen. At a given temperature the relative increase in resistance is proportional to the concentration of the absorbed hydrogen, which is in turn proportional to the square root of the hydrogen pressure. The increase in resistance caused by one mgrm. of hydrogen in 100 grms. of palladium is about 0·23 per cent. at 720° C., 0·24 per cent. at 620° C., and about 0·3 per cent. at temperatures between 180° and 320° C. "Cathodic" hydrogen obtained by cathodic absorption at 18° C. in small quantities has about the same influence as the same amount of "molecular" hydrogen, obtained by gaseous absorption at high temperatures. When the concentration is more than 0·016 per cent. (20 vols. of hydrogen to 1 vol. of palladium), the effect of "cathodic" hydrogen is greater than that of molecular hydrogen. The relative increase in resistance due to cathodic absorption between 0° and 150° C. for higher hydrogen concentrations depends on the concentration alone and not on the temperature. The temperature-coefficient of the resistance of such alloys is therefore the same as that of pure palladium. The resistance measurements confirm earlier conclusions that alloys prepared from palladium wire and hydrogen must be classed as solid solutions. The resistance of the metals which dissolve hydrogen, viz., platinum, copper, nickel, and iron are not appreciably affected in hydrogen at atmospheric pressure between 20° and 920° C. This is not surprising, as calculations made from the known solubility of hydrogen in these metals, assuming the hydrogen to have an effect equivalent to that on palladium, gives only small changes of resistance (fractions of one per cent.) for the saturated solution at 720° C. The resistance of silver wire is increased by heating in hydrogen and the increase is maintained when the wire is subsequently heated *in vacuo* or in oxygen. This cannot be attributed to absorption of hydrogen, since silver does not dissolve hydrogen. The resistance of nickel is unaltered by heating in carbon monoxide up to 1000° C. Copper wires when heated in sulphur dioxide show an increase of resistance which disappears on subsequent heating in hydrogen. This is probably due to combination of cuprous oxide with the porcelain containing tube.—W. H. P.

Tungsten; Ductile ——. C. G. Fink. Eighth Int. Cong. Appl. Chem., 1912. Met. and Chem. Eng., 1912, **10**, 580—581.

A description of the properties and uses of ductile tungsten (see this J., 1910, 825; 1911, 1264; 1912, 20, 134). Some of the applications mentioned are the use of tungsten wire gauze for separating solids from acid liquors, etc., the use of the metal for standard weights, acid-proof dishes and tubes, watch springs, etc., and in conjunction with molybdenum for thermo-couples, *e.g.*, for measuring high temperatures in the "tungsten-hydrogen furnace"; the electromotive force of the couple increases with the temperature up to about 540° C. (12½ millivolts), then decreases and becomes *nil* at about 1300° C.—A. S.

Diffusion in solids. C. H. Desch. Brit. Ass. Report, Dundee, 1912. Pp. 25.

A concise review of the knowledge relating to diffusion in solids. The final conclusion is that the occurrence of diffusion in metals is proved beyond doubt, but that in transparent crystals of minerals, salts or organic substances, the occurrence of diffusion has not been established. The principle of solid diffusion is used to explain cementation and the decarburisation of iron and the phenomena of segregation and recrystallisation in metallic alloys. —E. F. A.

Alkali metals; Preparation of —— with calcium carbide and aluminium. H. Speketer. Nernst-Festschrift, 424—427. Chem. Zentr., 1912, **2**, 1095.

Alkali metals can be prepared by heating alkali fluorides or sulphides with calcium carbide, or by the action of metallic aluminium on fused alkali fluorides.

$$2KF(K_2S)+CaC_2=2K+CaF_2(CaS)+2C;$$
$$6NaF+Al=3Na+AlNa_3F_6.$$

With aluminium powder the reaction proceeds with explosive violence. In the case of potassium fluoride and calcium carbide, the reaction begins at 900° C.; the potassium distils over and can be collected in a pure condition under petroleum.—A. S.

Standard methods for determining the constituents of foundry coke. See IIa.

Solubility of metallic oxides and sulphides in molten sodium chloride. Hauben. See VII.

Bauxite brick for kiln or furnace lining. Stone. See IX.

Other applications of the process of precipitation of iodides in sulphuric acid solution. [Determination of arsenic and antimony in presence of tin, and of arsenic in copper]. Bressanin. See XXIII.

Patents.

Iron ores; Roasting of ——. A. J. Boult, London. From Cöln-Müsener Bergwerks Aktien-Verein, Creuzthal, Westphalia. Eng. Pat. 20,404, Sept. 14, 1911.

In a process for effecting the removal of the last traces of arsenic from iron ores, a mixture of 95 parts of the latter with 5—10 of iron pyrites, or of 75 parts of the iron ore with 25 of roasted pyrites, is heated under oxidising conditions. The roasting is conducted first at a comparatively low, and then at a high, temperature, the latter being reduced towards the end of the operation. —W. E. F. P.

[Iron]. Flue-dust; Process for briquetting ——, *and the article of manufacture produced thereby.* R. Hubner, Elizabeth, N.J. U.S. Pat. 1,038,370, Sept. 10, 1912.

A mixture of the flue-dust with clay, silica, lime, and magnesia is moistened with a dilute solution of hydrofluoric acid and moulded under pressure, the resulting briquettes, it is claimed, being porous and strong and infusible at any temperature below that required for the separation of metallic iron by smelting.—W. E. F. P.

[Iron] Oxides; Process for the economic reduction of —— *by carbon and carbon monoxide.* Soc. Electro-Métallurgique Française. Fourth Addition, dated July 6, 1911, to Fr. Pat. 432,721, Oct. 10, 1910 (this J., 1912, 135, 541, 730, 929).

Experience has shown that in carrying out the process described previously, it is desirable to pass a greater quantity of ore through the rotary furnace than is actually reduced there, and in some cases to feed the electric furnace entirely through the rotary furnace. The carbon necessary to complete the reduction of the ore is added either at the exit of the rotary furnace, or in this furnace itself, at a point below where air is admitted to burn combustible gases. The two furnaces automatically adjust themselves; for example, in the event of too little carbon monoxide being present in the rotary furnace, a greater quantity of unreduced ore passes on to the electric furnace, and a corresponding increase in the production of carbon monoxide follows.—T. St.

Iron; Method and means of refining ——, of roasting ores, and of reducing iron directly from its ores, the blast being heated by the hot gases issuing from the furnace. S. B. Froumkine. Fr. Pat. 443,631, May 9, 1912.

The furnace consists of an annular tube cased in sheet iron and lined with refractory material, and is normally in a horizontal position. It is mounted on trunnions at such a height above the ground that it may be revolved through 180°. A single tuyère admits a blast of heated air in a tangential direction, and the outlet being near the tuyère, the air thus sweeps round the whole furnace, passing over the surface of all the metal present. On leaving the furnace, the hot gases are led round tubes through which the blast-air is passing to the furnace, and are finally burnt at the boiler of the blowing-engine. The blast has the effect of making the molten metal circulate round the furnace, thus conducing to homogeneity. During the conversion of iron into steel, the refractory lining above the metal becomes heated to incandescence, and this heat may be utilised for raising the temperature of the metal by rotating the furnace through 180°. It is claimed that a better product is obtained than in an ordinary converter or a Martin furnace, that the installation is much cheaper, and that the working costs are less. A cheap iron rich in sulphur and poor in manganese and silicon may be used. In utilising the furnace for roasting and desulphurising ores, a thin layer of ore is used and the fuel is placed apart, near the air inlet. The blast carries with it particles of slag formed on the surface of the fragments of ore, and thus agglomeration is avoided. A dust catcher may be interposed in the circuit of the issuing air and any oxide of iron recovered by means of a magnetic separator. If it is desired then to reduce the roasted ore, a greater quantity of coke is placed in the furnace near the air inlet. As the reduced metal melts, the grains of gangue are carried away by the air current, so that a bath of molten metal is left, free from slag. To raise the percentage of carbon, wood-charcoal is added, the blast stopped, and the furnace rocked several times through 180°. Manganese or silicon ores may be similarly added, if desired.—T. St.

Iron and other metals; Method of improving the properties of ingots of ——. T. Goldschmidt Akt.-Ges. Fr. Pat. 443,652, May 10, 1912. Under Int. Conv., Nov. 28, 1911.

When the ingot is partly solidified, the interior being still liquid, the metal is agitated either by thrusting a thermit mixture to the bottom of the ingot, or alternatively by means of a slow explosive, by forcing a gas under pressure through the metal, or by the application of an electric current. Bubbles of gas, particles of slag, and segregations, are thus forced to the surface of the ingot. The level always immediately falls appreciably, and must at once be restored by pouring in fresh metal. The method is especially applicable to mild non-siliconised steel intended for rolling into plates, experience having shown that the number of faulty plates is reduced to about 0·3 per cent.—T. St.

Iron; Process for refining metals, especially —— by the combined use of electrical heating and fuel. A. Helfenstein. Ger. Pat. 249,032, June 11, 1911.

The refining is effected in a long tubular furnace, through which the heating gas is passed, over the surface of the molten metal, whilst at the same time the latter is heated also by a short-circuit current passed through it in the longitudinal direction. The poles by which the current is transmitted to the metal, at either end of the furnace, are composed of conductors of the first class and are water-cooled, so that the portions of the metal bath in contact with them are solidified.—A. S.

Steel; Process of making ——. J. McConnell, Assignor to The United Steel Co., Canton, Ohio. U.S. Pat. 1,039,428, Sept. 24, 1912.

The steel is made by the basic open-hearth process and during the closing period of "the carbon reducing portion" of the process, pure steel billets, having less than 0·05 per cent. of carbon and from 2 to 5 per cent. of silicon, are added in order to deoxidise and decarbonise the molten iron.—T. St.

Armour plates; Alloys for ——. S. S. Wales. Fr. Pat. 442,687, Mar. 13, 1912.

Claim is made for steel, preferably made in the Martin furnace, of the following composition:—Carbon 0·10 to 0·50, manganese 0·25 to 0·40, nickel 3 to 10, chromium above 0·50 and preferably below 1·00, tungsten (or its equivalents) above 0·50 and preferably below 1·00, vanadium 0·15 to 0·50 per cent. It is preferable to have silicon below 0·15, and sulphur below 0·04 per cent., and it is important that phosphorus does not exceed 0·04 per cent. Molybdenum up to 1 per cent. may in certain cases be substituted for tungsten, and in some cases may be additional. It is preferable to add the nickel unheated to the furnace charge, and to add the chromium, tungsten, and vanadium, in the molten state in the form of ferro-alloys, to the steel in the ladle. It has been found that the resistance and hardness of armour plates are increased by the combination of tungsten and molybdenum, while the elongation is not much diminished, especially when a small quantity of chromium is present in the alloy. Plates of the given composition may be subjected to the usual treatments, and one face may be tempered or not as desired.—T. St.

[Steel] Furnaces; Impts. in the electrical arrangement of electric —— which combine arc- and resistance-heating. Westdeutsche Thomasphosphat-Werke Ges. m.b.H. Fr. Pat. 442,912, April 24, 1912. Under Int. Conv., April 27, 1911.

The object of the invention is so to regulate the quantities of heat supplied by the arc and by resistance respectively, as always to be most suitable at a given time, having regard to the state of the charge at that time, and so reduce to a minimum the oscillations which tend to be set up during the fusion of a solid charge. Claim is made for the following electrical arrangement:—(1) A transformer on a three-phase circuit. (2) Three electrodes in the chamber of the furnace, and three electrodes in the bed of the furnace, each electrode of the first set being connected with one of the second at the secondary terminals of the transformer. (3) A second transformer either independent of or combined with the first, whose secondary windings are connected with the three electrodes in the bed of the furnace. (4) Suitable means for regulating electrically the tension of the current feeding these latter electrodes, several alternative methods of accomplishing this being given.—T. St.

Ferro-silicon; Method of producing ——. C. Bingham, London. Eng. Pat. 22,755, Oct. 16, 1911.

The product is obtained by the reduction, in an electric furnace, of silica bricks (containing absorbed iron) which have been used as a lining for steel furnaces.—W. E. F. P.

[Titaniferous iron] Compound and method of producing same. A. J. Rossi and W. F. Meredith, Niagara Falls, N.Y., Assignors to The Titanium Alloy Manufacturing Co., New York, N.Y. U.S. Pat. 1,039,672, Sept. 24, 1912.

Claim is made for iron containing not less than 5 per cent., and not more than 80 per cent. of carbide of titanium in intimate mixture.—T. St.

Metallic [gold, zinc, etc.] salts in dissolution; Precipitation of —— and apparatus therefor. G. Jacquier, Johannesburg. Eng. Pat. 20,066, Sept. 9, 1911.

Solutions of metallic salts (such as those containing gold and zinc, produced in the cyanide process for recovering gold) are treated with metallic aluminium in such manner that, before or during treatment, the solution, which is preferably heated to about 30° C., is subjected to the action of sunlight. The apparatus consists essentially of a precipitation vessel, in which are supported one or more sheets of aluminium, and suitable means for introducing the solution, preferably so as to strain and aerate it, for allowing access of sunlight to the solution, and for withdrawing the spent liquor. In the example described, which comprises a series of precipitating tanks and an overhead storage tank, a false bottom covered with a sheet of aluminium is provided; this is lowered into the tank to be filled, and a removable funnel is used, in conjunction with the straining device, in charging the tank with solution. The aluminium plates are carried by a frame and may be lowered into any desired tank, the tank being then preferably covered by a sheet of glass to keep out dust. After precipitation is complete, the plates are lifted out and cleaned, the exhausted liquor is run out through a tap, provided with a strainer, at the bottom of the tank, and the false bottom is removed, so as to recover the whole of the deposit. When the solution to be treated is that of zinc sulphate (containing gold), produced in the cyanide process, the gold is first deposited, generally in one or two days, and the aluminium sheets are then taken out and cleaned, after which they are returned to the liquid, when the zinc is completely deposited, in 3—5 days, as the crystalline oxide.—F. Sodn.

Zinc; Extraction of ——, from zinc ore. Roitzheim, Düren, Prussia. Eng. Pat. 19,587, Sept. 2, 1911.

With the object of avoiding the formation of zinc dust, the charge of zinc ore and carbonaceous matter is heated to a temperature not exceeding 600° C. before being introduced into the reduction chamber.—W. E. F. P.

Zinc-reducing furnaces; Heater for ——. C. Roitzheim, Cologne, Germany. U.S. Pat. 1,038,205, Sept. 10, 1912.

In a zinc furnace the vertical, cylindrical reduction chamber is surmounted by a charging device (comprising a number of relatively narrow, vertical passages) and the whole is surrounded by an annular heating chamber.—W. E. F. P.

Foundry sand; Treatment or renovation of ——. A. Poulson, Widnes, and Poulson's Foundry Specialities, Ltd., Leeds. Eng. Pat. 20,204, Sept. 12, 1911.

A mixture of aluminium sulphate and sodium chloride and/or magnesium chloride is added to the sand, a suitable quantity for 100 tons of the latter being 3½ to 5 tons of the "renovator" prepared by grinding 3 parts by weight of aluminium sulphate with 2 of water and adding 6 parts of a mixture of magnesium and sodium chlorides in equal proportions.—W. E. F. P.

Plated or otherwise metallically coated sheet metal; Process for the recovery of the coating and the foundation material from waste parts or scraps of ——. M. O. Wurmbach, Berlin. Eng. Pat. 21,052, Sept. 23, 1911. Under Int. Conv., Sept. 24, 1910.

The scraps of coated metal (iron or other metal not attacked by ammonia) are subjected to the action of an electric current in an electrolyte consisting of an aqueous solution of ammonia and ammonium sulphate, the metal scraps serving as the anode. (Reference is directed to Eng. Pats. 4053 of 1877 and 717 of 1906; this J., 1907, 55.)
—W. E. F. P.

[*Nickel, copper, etc.*] *Recovery of the coating and the foundation material from the scrap or waste of sheet-metal plated or otherwise coated with metal.* M. O. Wurmbach, Berlin. Eng. Pat. 21,512, Sept. 29, 1911. Under Int. Conv., May 5, 1911. Addition to Eng. Pat. 21,052 of 1911 (see preceding abstract).

The cathodes employed in the process are enveloped in diaphragms (preferably made of jute) to prevent contamination of the deposited metal with ferric hydroxide.
—W. E. F. P.

Zinc; Process for removing —— from zinciferous substances [galvanised iron] by treatment with sulphur dioxide. C. A. Beringer. Ger. Pat. 250,283, Sept. 21, 1911.

Galvanised iron or the like is treated with sulphur dioxide gas either alone or mixed with other gases (*e.g.*, combustion gases containing sulphur dioxide), and at the same time water is allowed to trickle over the metal, or steam is added to the gases used. The zinc dissolves owing to its ready solubility in sulphurous acid.—A. S.

Aluminium alloys. W. N. Naylor, London, and S. P. Hutton, Beckenham, Kent. Eng. Pats. 27,382, Dec. 6, 1911, and 15,689, July 4, 1912.

Claim is made for alloys of aluminium, magnesium and phosphor-tin alone and with phosphorus, phosphor-copper or metallic sodium, the following examples being given:— An alloy for use in sea water is composed of 1½ lb. of aluminium, 1¼ oz. of magnesium, 3 grms. of phosphor-tin, and 2 grms. of phosphorus, the tensile strength of the material being increased by the substitution of 1¼ oz. of phosphor-copper for the phosphorus. When the alloy is to be rolled or drawn, a mixture of 4 lb. of aluminium, ½ oz. of magnesium, and 2 grms. of phosphor-tin is employed, this composition being varied by replacing 1 grm. of the phosphor-tin by 2 grms. of metallic sodium when the alloy is required for dental purposes.—W. E. F. P.

Crucible furnace. H. Koch, Zürich, Switzerland. Eng. Pat. 28,567, Dec. 19, 1911.

In a crucible furnace of the type in which the crucible, resting upon a stationary, hollow stand, is encircled by a sectional shaft, the stand is so formed as to serve as an air-supply pipe situated above the crucible transporter. The hoop of the latter embraces the stand, the arrangement being such that when the shaft members are swung out, the crucible is sufficiently free to be rendered easy of removal by raising the transporter.—W. E. F. P.

Blast-furnace. C. Hicks, Auburn, Pa. U.S. Pat. 1,039,282, Sept. 24, 1912.

The lower portion of the blast-furnace wall is formed solid, and the upper portion is constructed of a number of hollow castings disposed one upon the other. The lower portion of the furnace is surrounded by a water-jacket formed of a number of superimposed independent compartments. A water-supply main surrounds the upper end of the furnace, and connections are provided between the lower portion of the interior of the hollow castings and compartments, and the supply-main, by means of feed and branch pipes, the feed pipes depending from the main and decreasing in diameter at spaced points in a downward direction. Surrounding the lower portion of the furnace is a discharge main from which drain pipes extend vertically, decreasing in diameter at spaced points in an upward direction. Branch drain pipes connect the vertical drain pipes with the upper portion of the interior of the hollow castings and compartments.—T. St.

Converter bottoms; Process for burning basic ——. A. Nippert. Ger. Pat. 249,461, Dec. 14, 1911.

The bottoms, after they have been air-dried in the moulds are coated with a layer of graphite or other suitable material, then placed in a large receptacle and molten slag poured in, so that they are completely surrounded by a layer of slag from 0·5 to 1 metre thick. The heat of the molten slag serves to "burn" the bottoms, and after cooling, the slag is chipped off.—A. S.

Furnace for annealing bright metal articles in inert gases H. Gärtner. Ger. Pat. 249,644, Sept. 4, 1910.

The devices for introducing and withdrawing the articles are disposed in shafts, which form angular, gas-tight extensions of the annealing chamber and cooling chamber respectively, and these shafts extend downwards so far—below the sole of the furnace—that the annealed articles can cool completely therein, in an atmosphere of the inert gas, without any danger of oxidation.—A. S.

Plating metals; Process of ——. M. W. Franklin, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,037,887, Sept. 10, 1912.

A non-conducting vitreous surface is prepared for the reception of an electrolytic deposit by covering the surface with a thin coating of adhesive material, such as a gum, soluble in water and permeable with respect to and soluble in the electrolyte in which the object is to be plated. A finely-powdered conducting metal is incorporated in the gum, and the resulting conductive layer employed as the cathode.—B. N.

Metals; Method of oxidising —— to render them weatherproof. E. Tonet. Fr. Pat. 443,623, May 9, 1912.

The metal to be oxidised is first cleansed by plunging it into a bath composed of ferrous sulphide and phosphoric acid heated to boiling. The surface having thus been rendered smooth, the metal is coated with sulphoricinic acid or other suitable fatty material and then submitted to the action of a flame fed by a mixture of petrol, fine wood-charcoal, common salt, ammonia solution, and turpentine. The temperature of the flame is too low to modify the temper of steel. The surface thus formed is stated to be of unlimited durability, being unaffected by shock or exposure to weather.—T. St.

Ferromanganese and other ferro-alloys; Process and furnace for melting ——. J. I. Bronn, Rombach, Germany. Eng. Pat. 20,121, Sept. 11, 1911. Under Int. Conv., Nov. 4, 1910.

See Fr. Pat. 434,120 of 1911; this J., 1912, 236.—T. F. B.

Copper; Production of —— by electrolysis. R. Douvreleur, Veauche, France. Eng. Pat. 21,593, Sept. 30, 1911.

See Fr. Pat. 434,584 of 1911; this J., 1912, 342.—T. F. B.

Refining crucibles; Electric ——. E. C. R. Marks, London. From Patents Purchasing Co., Appleton, Wis., U.S.A. Eng. Pat. 8790, April 13, 1912.

See U.S. Pat. 1,026,281 of 1912; this J., 1912, 591.—T.F.B.

Metals [nickel and iron]; Electrodeposition of ——. A. Leuchter, New York. Eng. Pat. 9075, April 17, 1912.

See U.S. Pat. 1,026,627 of 1912; this J., 1912, 591.—T.F.B.

Electrolytic deposits [of nickel and iron]. A. Leuchter. Fr. Pat. 442,830, April 18, 1912.

See U.S. Pat. 1,026,627 of 1912; this J., 1912, 591.—T.F.B.

Annealing metallic articles; Device for ——. A. Kreidler, Stuttgart, Germany. U.S. Pat. 1,038,901, Sept. 17, 1912.

See Ger. Pat. 245,355 of 1911; this J., 1912, 543.—T. F. B.

Nickel ores containing iron and copper, or other products; Process for treating sulphurised —— by melting, roasting, extraction, and precipitation. V. von Hartogensis. First Addition, dated April 18, 1912, to Fr. Pat. 437,774, Dec. 18, 1911. Under Int. Conv., Dec. 29, 1911.

See Ger. Pat. 248,802 of 1911; this J., 1912, 933.—T. F. B.

Cleaning of metal wires, etc.; Process for the electrolytic ——. Langbein-Pfanhauser-Werke A.-G. Fr. Pat. 442,868, April 23, 1912. Under Int. Conv., April 24, 1911.

See Eng. Pat. 9609 of 1912; this J., 1912, 781.—T. F. B.

Metallurgical furnaces. G. H. Benjamin. Fr. Pat. 443,421, May 4, 1912.

See U.S. Pat. 1,026,197 of 1912; this J., 1912, 591.—T.F.B.

Zinc; Metallurgy of ——. A. L. J. Queneau. Fr. Pat. 443,750, May 13, 1912. Under Int. Conv., June 8, 1911.

See U.S. Pat. 1,006,877 of 1911; this J., 1911, 1319.—T.F.B.

Zinc alloys. T. A. Bayliss and B. G. Clark. Fr. Pat. 443,796, May 14, 1912. Under Int. Conv., May 23, 1911.

See Eng. Pat. 12,457 of 1911; this J., 1912, 647.—T. F. B.

Apparatus for heating and utilising hydrochloric acid. U.S. Pat. 1,038,389. *See* VII.

XI.—ELECTRO-CHEMISTRY.

Electrolytic formation of bichromates from chromates. Muller and Sauer. *See* VII.

Pyrogenic decomposition of methyl alcohol by means of the electric current. Löb. *See* XX.

Patents.

Furnaces; Electric ——. A. E. Bourcoud, London. Eng. Pat. 20,033, Sept. 8, 1911.

The upper part of the vertical or inclined electrode, which protrudes from the top of the furnace, is fixed in a bell which dips down into the space formed between the double walls of a vessel fixed to the top of the furnace. A metal or alloy, having a low melting point and high boiling point, such as fusible metal, or a granular mass, such as sand, is employed as a seal in the space between the walls. The bell is adapted to be rotated so as to disturb the sand or liquid seal, and thus prevent an excessive temperature being reached in the space enclosing the electrode. The arrangement may be employed for a tilting furnace, the upper edges of the liquid container being of such a shape as to prevent spilling of the liquid, and guide springs may be used for centralising the bell in the container.—B. N.

Electric melting-furnace. W. D. Ludwick, Assignor to H. Hewitt, jun., Tacoma, Wash. U.S. Pat. 1,038,614, Sept. 17, 1912.

The apparatus comprises a stationary outer casing in which two circular hearths are adapted to rotate together about a horizontal shaft, one hearth being rigidly secured to the latter and the other adapted to slide along it. The adjacent sides of the hearths are connected by a spring or other yielding means, and the two outer edges are provided with telescoping flanges, the object of this arrangement being to maintain an even pressure between the two hearths, independently of the temperature of the same. Each hearth is provided with a stationary, vertical electrode extending to within a short distance of the horizontal shaft, and with a series of conducting blocks electrically connected and equally spaced. Provision is made for the introduction and equal distribution of the charge to the hearths, for the separation of the fused from the unfused portion of the charge, and for conducting the latter portion to the hottest part of the hearth.
—W. E. F. P.

Electric resistance material. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, U.S.A. Eng. Pat. 28,869, Dec. 21, 1911.

The material consists of a solution of ordinary commercial rutile in cryolite, the proportions being preferably 25 parts of rutile in 75 of cryolite. Such material conducts when cold, and has a high negative resistance coefficient. It i particularly useful therefore in motor starters, therma cut-outs and the like. The cryolite is first heated to about 900° C., and the rutile is then stirred in. The heating is continued for about a half hour to complete the solution. The mass is allowed to cool and when solidified is powdered. The powder is packed into a graphite crucible or other suitable container and reheated in an electric furnace to about 1800° C. to render it thoroughly homogeneous. When solidified it is cut into slabs of desired dimensions and provided with suitable electrical contacts. From room temperature to 300° C. the conductivity of a resistor made as described increases about 100-fold.—T. St.

Electrical resistance. E. Thomson, Swampscott, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,039,463, Sept. 24, 1912.

A resistance body is made by heating a mixture of silicon and inert material considerably above the melting point of silicon, and shaping the mixture into the desired form. The body is strong and tough and has a resistance higher than that of silicon.—A. T. L.

[Magnetite] Electrodes; Method of manufacturing ——. R. W. Davis, jun., Assignor to Pennsylvania Salt Manufacturing Co., Wyandotte, Mich. U.S. Pats. 1,039,034 and 1,039,071, Sept. 17, 1912.

A process for coating iron or steel (electrodes or similar articles) with magnetic iron oxide. The articles are heated to a temperature of 600° C., or above, in a chamber fired with hydrogen—to which only just sufficient air for the combustion is admitted.—W. E. F. P.

Ozone; [Electrical] Apparatus for producing ——. S. Held, Chicago, Ill. U.S. Pat. 1,038,130, Sept. 10, 1912.

The apparatus comprises a casing, with an arm extending from the same, and a drum mounted on the arm. A vacuum tube is supported within but insulated from the drum, and a tubular electrode is located in the tube, resting at one of its ends on a series of projections on the inner surface and near one of the ends of the vacuum tube. Another tubular electrode surrounds the vacuum tube and the first electrode, each of the ends of the outer electrode being provided with a series of inturned lips arranged in pairs. An insulating piece, resting on the outer surface of the vacuum tube, is located between each pair of lips. The current is conveyed to the electrodes by suitable connections from a transformer located within the casing, and air is passed between the tube and the outer electrode by means of a fan mounted near one end of the drum; the fan is driven by a motor or rotary converter which is connected with the source of current and with the transformer.—B. N.

Viscous liquid; Oxidation of a —— by ozone. Soc. Anon. "Cava." Fr. Pat. 443,407, May 4, 1912.

The ozonisers open directly into the ozonising chamber and are placed one above the other alternately on opposite sides of the chamber. The liquid to be treated enters at the top of the chamber and falls in a thin stream down inclined planes facing each ozoniser from side to side of the chamber alternately, and passes away at the bottom. —J. H. J.

Storage-battery electrodes; Lead —— and processes of making them. W. Morrison, Des Moines, Iowa, U.S.A. Eng. Pat. 7253, March 25, 1912.

See U.S. Pats. 1,021,990, 1,021,991, and 1,021,992 of 1912; this J., 1912, 441.—T. F. B.

Electrolysis; Diaphragm for ——. O. Dieffenbach, Darmstadt, Germany. U.S. Pat. 1,039,266, Sept. 24, 1912.

See Fr. Pat. 430,613 of 1911; this J., 1911, 1394.—T. F. B.

Oxidising or reducing chemical substances by way of electrolysis; Process of ——. G. Kolsky, New York. U.S. Pat. 1,039,415, Sept. 24, 1912.

See Fr. Pat. 434,310 of 1911; this J., 1912, 343.—T. F. B.

Electric arcs of high efficiency for effecting reactions in gases; Process for producing ——. Badische Anilin und Soda Fabrik. Fr. Pat. 443,729, May 11, 1912. Under Int. Conv., May 13, 1911.

See Eng. Pat. 16,636 of 1911; this J., 1912, 544.—T. F. B.

XII.—FATS; OILS; WAXES.

Hardened oils. A. Bömer and K. Leschly-Hansen. Chem. Rev. Fett Ind., 1912, 19, 218—221; 247—249.

The method of hardening oils studied was that of Wilbuschewitsch, according to which the oil is mixed with the catalytic agent (nickel reduced on kieselguhr) and heated in an autoclave under pressure whilst a current of hydrogen is introduced. The following results are typical of those obtained with hardened arachis, sesamé, cottonseed, whale and cocoanut oils:—

Oil.	M. pt. ° C.	Solid. pt. ° C.	Refractometer reading at 40° C.	Acid value.	Sapon. value.	Iodine value.
Gambia arachis .	51·2	36·5	50·1	1·0	188·7	47·4
Sesamé	47·8	33·4	51·5	0·5	190·6	54·8
Do. technical	62·1	45·3	38·4 (at 50° C.)	4·7	188·9	25·4
Cottoaseed	38·5	25·4	53·8	0·6	195·7	69·7
Whale..........	45·1	33·9	49·1	1·2	192·3	45·2
Cocoanut, natural	25·6	20·4	37·4	0·3	255·6	11·8
,, hardened	44·5	27·7	35·9	0·4	254·1	1·0

The general results showed that hardening the fats raised the m. pt. and solid. pt., lowered the refractometer and iodine values, but had little effect on the saponification value. The liquid fatty acids separated by Farnsteiner's method, showed iodine values of 82·9 to 91·8 for hardened arachis oil; 88·9 for hardened sesamé oil; 115·6 for hardened cottonseed oil, and 96·0 for hardened whale oil. The softer products closely resembled lard in colour and appearance, while the harder products (*e.g.*, from whale oil) could scarcely be distinguished in appearance, taste, or odour from mutton tallow. The hardened oils also closely resembled lard and tallow in their analytical values. Special tests showed that phytosterols were not affected by the hardening process, and that the phytosteryl acetate test may be used for the detection of small amounts of hardened vegetable fats in animal fats. The Baudouin reaction for sesamé oil was intensified, but Halphen's reaction for cottonseed oil was completely inhibited by the process. On the other hand the Hauchecorne reaction for cottonseed oil was not affected. For the detection of nickel in such fats, from 5 to 10 grms. are heated for 30 minutes in a test-tube in boiling water, with frequent shaking, the acid extract evaporated, and the residue tested with a 1 per cent. alcoholic solution of dimethylglyoxime. If the acid extract is of a very dark colour, treatment with animal charcoal may be necessary before applying the test. Repeated crystallisation of a hardened arachis oil and its fatty acids showed that the most insoluble glyceride consisted of tristearin (about 2 to 3 per cent.). Physiological tests have proved that hardened fats may be used as food, and that no injurious compounds are formed in the hardening process. It is essential however that they should be free from nickel or other foreign bodies used in their preparation.—C. A. M.

Oils from the seeds of bryony and laburnum. A. Diedrichs. Chem. Rev. Fett Ind., 1912, 19, 238—239.

Bryony seed oil.—Dried seeds of the bryony (*Bryonia dioica*) yielded 27·55 per cent. of a reddish-yellow viscous oil giving the following values:—Refraction at 40° C., 67·2; acid value, 3·2; saponification value, 193·0; Hehner value, 95·63; Reichert-Meissl value, 0·66; iodine value, 135·09; Polenske value, 0·30. *Fatty acids:* Refraction at 50° C., 52·5; neutralisation value, 201·43; iodine value, 141·87; and mean mol. weight, 278·8. The oil gave a bluish-violet colouration in Bellier's test. *Laburnum seed oil.*—The seeds of the laburnum (*Cytisus laburnum*) yielded a viscous brownish yellow oil resembling crude rape seed oil. It gave the following values:—Refraction at 40° C., 65·3; saponification value, 192·60; and iodine value, 131·0. In Bellier's test it gave a similar colouration to that given by bryony seed oil. Neither oil yielded any insoluble bromide.—C. A. M.

Tiger's fat. D. Hooper. Chem. and Drug., 1912, 81, 512.

Tiger's fat has a considerable local reputation in India as a healing remedy for ulcers and skin affections. The sample examined was somewhat decomposed, its acid-value being 133. The chemical and physical characters were: Sp. gr. at 40° C., 0·8912; m. pt., 35° C.; saponification value, 200·8; iodine value, 57·7; 95 per cent. of fatty acids melting at 37·5° C.; neutralisation value, 208·2, consisting principally of oleic and palmitic acids.

Oils from plants belonging to the order Cruciferae. C. Grimme. *Part II.* Pharm. Zeit., 1912, **57**, 520—521. *Part III.* Pharm. Zentralh., 1912, **53**, 733—734. Chem. Zentr., 1912, **2**, 613—617. (See also this J., 1912, 500.)

The author has examined the oils extracted from the seeds of the mustard and allied plants and of the more important of the cultivated edible cruciferous plants. The characters of the oils and of the fatty acids separated therefrom are given in tables.—A. S.

Triglycerides; Saponification of ——. V. Fortini. Chem.-Zeit., 1912, **36**, 1117.

When triolein was fractionally saponified with alcoholic potassium hydroxide solution, and the results plotted in a curve in which the amounts of triolein undecomposed represented the ordinates and the periods of time the abscissæ, the curve showed three distinct phases. In the second of these the original speed of reaction showed a pronounced retardation, whilst in the third phase it regained its original velocity. Apparently these phases corresponded to the successive formation of di- and monoglyceride, followed by complete saponification. This conclusion was confirmed by determinations of the acetyl values of the products of the reaction at stated intervals. When these were plotted in a curve with the times as the abscissæ as before, it was found that during the first period the acetyl value was higher than in the case of the original material; during the second period it still showed a considerable increase; but during the third period it suddenly fell. For example, the following acetyl values were obtained after the intervals mentioned: Original fat, 14; after 30 minutes, 35; 1 hour, 61; 2 hours, 162; 3 hours, 194; 4 hours, 150; 5 hours, 79; and 6 hours, 40. The maximum values indicated the presence of monoglycerides, whilst in the first and third periods the formation of diglycerides and the disappearance of the glyceryl ester were respectively indicated. These experiments thus support the views of Lewkowitsch (this J., 1900, 254).—C. A. M.

Fats; Fractional saponification of ——. A. J. J. Vandevelde and A. Vanderstricht. Ann. Falsif., 1912, **5**, 417—421.

Cocoanut oil, lard and butter fat were saponified with half the amount of sodium hydroxide required for their complete saponification, and the unsaponified fat extracted with ether. The saponification value was lowered from 271 in the original fat to 254 in the unsaponified portion in the case of cocoanut oil, and from 236 to 219 in the case of butter fat, but remained fairly constant in the case of lard. The refractive indices and the critical temperatures of solution were also lowered in each case though in variable proportions. The chief differences were in the mean molecular weights of the insoluble non-volatile fatty acids, which were invariably lower in the saponified portion of lard and butter, though fairly constant with cocoanut oil.—C. A. M.

Glycerol in fats; Determination of ——. R. Willstätter and A. Madinaveitia. Ber., 1912, **45**, 2825—2828.

The drawbacks of the method of Zeisel and Fanto (this J., 1902, 992) due to incomplete hydrolysis of the fat by the hydriodic acid are obviated by using acid of sp. gr. 1·8 with small quantities of the fat (0·15 to 0·35 grm.). About 0·2 grm. of the glyceride is treated with 10 c.c. of hydriodic acid (sp.gr. 1·8) in the flask of Zeisel and Fanto's apparatus, the mixture heated to 100° to 115° C. until the reaction starts, and the temperature then kept constant for 20 to 40 minutes until the silver solution in the absorption flask becomes clear again, after which the heating is continued for an hour at 130° to 140° C. The glycerol is then calculated from the amount of isopropyl iodide as in the original method. The results quoted are in close agreement with the calculated amounts.—C. A. M.

Chief constituent of Japan lac. III. Catalytic reduction of urushiol [and of elaeostearic acid]. Majima. *See* XIII.

Chinese wood oil; Rules for determining the character of ——. Oil, Paint, and Drug Rep., Sept. 23, 1912. [T.R.]

The New York Produce Exchange, on the recommendation of the Committee on Vegetable Oils and Fats, has adopted the following rules as determining the basis of character and quality for Chinese wood oil, in which the practicability of the heating test is recognised:—

Sec. 9. Prime Chinese wood oil shall be pale in colour (according to season's production), merchantably free from foots, dirt, and moisture; the total impurities shall not exceed 1 per cent.; but, unless otherwise provided for, impurities not plainly adulterations, up to 5 per cent., shall not justify rejection; but allowance shall be made by sellers for such impurities in excess of 1 per cent.

Otherwise, the oils to be accepted as commercially prime shall show, for viscosity, on a Tagliabue instrument from 7·25 upward; the viscosity to be taken on a viscosimeter at a temperature of 70° F., the process to be followed strictly as advised by the makers of the instrument. The oil to satisfy the requirements of either the Bacon test (this J., 1912, 782), or Worstall test, herewith subjoined.

Worstall's test.—One hundred grms. of the oil is heated in an open metal pan, 6 inches in diameter, as rapidly as possible, to a temperature of 540° F. The time required to heat the oil from room temperature to 540° should be, as nearly as possible, the same each time, four minutes being sufficient with gas burners. Hold the oil at or as near to 540° as possible, stirring until it starts to solidify. Note the time required after the oil reached 540°, until it started to solidify. This should not exceed 7½ minutes for any pure wood oil. When the oil has solidified in the pan, turn it out while still hot, and cut with a knife. Pure wood oil gives a product that is pale, firm, and cuts under the knife like dry bread, not sticking. If the oil requires more than 7½ minutes after reaching 540° until starting to solidify, or if the product is dark, soft or sticky, the oil should be rejected.

Patents.

Oils; Apparatus for the extraction of vegetable ——. J. T. Hawkins, London. Eng. Pat. 20,061, Sept. 9, 1911.

The material, especially palm fruit, is subjected in a rotating pan to the simultaneous action of superheated steam and of a solvent or de-greasing agent.—C. A. M.

Linseed and other vegetable oils; Process of imparting the qualities of boiled poppy seed oil [" huile de pavot rebats "] to ——. E. Villette. Fr. Pat. 442,305, June 17, 1911.

The linseed or other oil is first clarified by vigorous agitation with a mixture of 0·43 kilo. of water and 3·25 kilos. of sulphuric acid of 66° Bé. per 1000 kilos. of oil, after which it is transferred to a second tank where it is subjected for at least 5 hours to the action of fine jets of steam under a pressure of not less than 5 kilos.—C. A. M.

Soap; Process of treating —— and apparatus therefor. L. H. Parsons, Leicester. Eng. Pat. 13,045, June 3, 1912.

For convenience in storing and handling, the soap is formed into threads by being passed through an apparatus containing dies of the required size.—C. A. M.

Cleaning compound. C. A. Nowak, Assignor to A. G. Wackenreuter, Chicago, Ill. U.S. Pat. 1,038,783, Sept. 17, 1912.

Carbon tetrachloride is incorporated with, say, twice its weight of a solution of saponin of, say, 3 to 4 per cent. strength, and the resulting emulsion is separated from the residual liquid. Such an emulsion will contain over 92 per cent. of carbon tetrachloride, less than 7 per cent. of water, and less than 1 per cent. of saponin.—C. A. M.

Fatty substances of any kind ; Process for rapidly separating suspended or emulsified water from ——. A. Rost, Dresden, Germany. Eng. Pat. 6795, March 19, 1912. Under Int. Conv., Sept. 12, 1911.

See Fr. Pat. 440,474 of 1912 ; this J., 1912, 827.—T. F. B.

Filter for oil, grease, and other substances. G. G. Scurfield, Carlisle. U.S. Pat. 1,039,451, Sept. 24, 1912.

See Eng. Pat. 8228 of 1908 ; this J., 1909, 663.—T. F. B.

Filter-press for oleaginous and analogous substances. E. Zander. Fr. Pat. 443,831, May 15, 1912. Under Int. Conv., Feb. 19, 1912.

See Eng. Pat. 11,932 of 1912 ; this J., 1912, 885.—T.F.B.

Separator for liquids [lubricating oils, etc.] working by capillary action. G. Reggio. Fr. Pat. 443,624, May 9, 1912.

See Eng. Pat. 22,734 of 1911 ; this J.,1912, 673.—T. F. B.

Soaps and cleansing compositions ; Organic-chloro-compound ——. G. Koller, Forest Gate. U.S. Pat. 1,038,900, Sept. 17, 1912.

See Eng. Pat. 15,288 of 1910 ; this J., 1911, 967.—T. F. B.

Cleansing preparation for wool-scouring, etc. Eng. Pat. 24,675. *See* V.

Edible oil product. U.S. Pat. 1,037,881. *See* XIXa.

Hydrogenated butter substitute. U.S. Pat. 1,038,545. *See* XIXa.

XIII.—PAINTS ; PIGMENTS ; VARNISHES ; RESINS.

Ultramarine campounds. L. Wunder. Z. anorg. Chem., 1912, **77**, 209—238.

Experiments are described which have resulted in the replacement of the sodium in blue ultramarine by univalent mercury, cadmium, lead, and divalent iron, and partially by lithium, ammonium, and calcium, this being effected by heating with solutions of the corresponding metallic salts in sealed tubes, at temperatures between 120° and 200° C. ; attempts similarly to introduce trivalent metals resulted in the decomposition of the ultramarine. Mercury-ultramarine is characterised by loss of mercury on heating, a sky-blue silicate residue being obtained, which is yellow at temperatures above 500° C., becoming blue again on cooling. The effects of heating ultramarine in the presence of phosphorus, sulphur chloride, phosphorus trichloride, hydrogen, nitric oxide, iodine solution, and fuming sulphuric acid are also described. Reduction by means of phosphorus dissolved in carbon tetrachloride, at 150° C., gives a leuco-compound which becomes blue when treated with bromine and sodium hydroxide. Violet ultramarine is prepared by passing a mixture of chlorine, hydrogen chloride, and steam over blue ultramarine at 170°—250° C. It loses water when heated, assuming a bluer shade, and is decomposed by dilute acids, with evolution of sulphur dioxide, and also by a solution of alum on warming. Unlike blue and red ultramarines, it is unaffected by warming with mercurous nitrate solution. Red ultramarine is prepared by heating violet ultramarine, obtained as above, in a current of hydrogen chloride at 130°—150° C., or by heating blue ultramarine in a current of pure dry nitric oxide, at about 400° C., which gives a product containing considerably less sulphur and sodium than the original blue. Red ultramarine, on heating, becomes bluish, sulphur dioxide being evolved, and the same gas is liberated by the action of dilute hydrochloric acid. It is attacked by acetic acid much more slowly than blue ultramarine and, unlike this, is not affected by alum solution. On fusing with potassium nitrate, the colour becomes dark blue, and with phosphorus trichloride, at 180° C., a carmine-red product is obtained. Both red and violet, like blue ultramarine, when heated in a current of hydrogen, give pale blue products, which contain smaller proportions of sulphur than the original material. The results of the experiments are considered to indicate that red and violet ultramarines must be regarded as chemical individuals.—F. Sodn.

Japan lac ; Chief constituent of ——. *III. Urushiol ; Catalytic reduction of* ——. *[and of elæostearic acid].* R. Majima. Ber., 1912, **45**, 2727—2730.

Catalytic reduction of urushiol from Japan lac (this J., 1907, 1245 ; 1909, 532, 1212), by the method of Willstätter (this J., 1908, 642, 829) with hydrogen and platinum black, yielded crystals of hydro-urushiol, $C_{20}H_{34}O_2$, which melted at 58° to 59° C. after recrystallisation from hot xylene. The formation of this, the first crystalline derivative obtained, confirms the former conclusion that urushiol has the constitution of a dihydroxybenzene with a large unsaturated side-chain. Diacetyl- and dimethyl-urushiol were also converted into crystalline hydro-compounds by the catalytic reduction of the corresponding compounds. *Elæostearic acid* :—Catalytic reduction of elæostearic acid from tung oil gave an almost quantitative yield of stearic acid, thus proving the normal linkage of the carbon atoms in the original acid (see this J., 1909, 316).—C. A. M.

Patents.

White lead ; Manufacture of ——. C. White and J. W. Patterson, London. Eng. Pat. 9638, Apr. 23, 1912.

A solution of lead acetate is treated with lead oxide (litharge) until no more will dissolve, and the resulting clear solution of basic lead acetate is treated at approximately boiling temperature with soda ash or other form of solid sodium carbonate in order to precipitate the white lead, which is then washed, pressed and dried. By heating the solution of basic lead acetate, it will dissolve still more lead oxide, and in the case of such saturated solutions a certain proportion of sodium bicarbonate should be used for the precipitation after the addition of the sodium carbonate. Excellent results are obtained by dissolving the lead in 10 per cent. acetic acid and diluting the solution (after the addition of the lead oxide) to a sp. gr. of about 1·2, before the boiling and precipitation.—C. A. M.

Turpentine substitute. W. J. Earles, H. Robertson, F. F. Mote, and T. A. Cartwright. London. Eng. Pat. 19,927, Sept. 7, 1911.

Petroleum lamp oil is purified by treatment with a saturated solution of potassium hydrogen oxalate or potassium carbonate and then with a mineral acid or an acid ester, after which it is heated to, say, about 80° F. (27° C.) and thinned with methylated spirit. The mixture is again heated to about 100° to 160° F. (38°—71° C.), and after cooling to about 100° to 120° F. (38°—49° C.) is treated with powdered naphthalene and still further cooled to about 90° F. (32° C.). Finally a suitable proportion of a readily oxidisable essential oil or oils (*e.g.*, *Eucalyptus amygdalina* and *Pinus siberica*) is added. A better quality of product is obtained by dissolving a further proportion of naphthalene in the boiling mixture thus prepared, thinning the solution with methylated spirit, and mixing it with about twice its volume of "white spirit" and about its own volume of "benzoline."—C. A. M.

Insoluble bodies derived from phenol alcohols ; Process of making ——. L. H. Baekeland, Yonkers, N.Y., Assignor to General Bakelite Co., New York. U.S. Pat. 1,038,475, Sept. 10, 1912.

Phenol-alcohols or their anhydrides are transformed into hard, coherent, infusible bodies by the action of formaldehyde (or substances capable of producing it) in the presence of condensing agents, and with or without the aid of heat and pressure. Suitable filling substances may also be introduced.—C. A. M.

Yellow pigments from ilmenite or titaniferous iron ores; Process for producing ——. P. Farup. Fr. Pat. 443,081, April 27, 1912. Under Int. Conv., April 28, 1911.

See Eng. Pat. 10,368 of 1911; this J., 1911, 1125.—T.F.B.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Pará rubber; "Insoluble" [nitrogenous] constituent of —— and its influence on the quality of the rubber. C. Beadle and H. P. Stevens. India-rubber J., 1912, 44, 551—555 and 603—604.

The behaviour of "sheet" plantation rubbers—rubbers which have been prepared from the coagulum by a process of squeezing between even speed rollers, and not otherwise worked—towards solvents is similar to that of unworked wild-grown Pará. The "insoluble" constituent in these cases swells up enormously and, in light solvents such as benzene, slowly settles to the bottom of the containing vessel. Crêpe rubbers, if unsmoked, behave similarly to masticated Pará, only a portion of the nitrogenous "insoluble" constituent separating from the solution, whilst the remainder is held up under the influence of the rubber acting as a protective colloid. Smoked crêpes, on the other hand, deposit a much higher proportion of their nitrogenous constituent. Thus in the case of pale crêpe containing 0·45 per cent. of nitrogen, 0·40 per cent. remained in the clear solution after the insoluble matter had settled. In the case of fine hard Pará the proportions were 0·58 and 0·23 per cent.; fully smoked sheet, 0·38 and 0·05 per cent.: smoked crêpe 0·44 and 0·19 per cent. This effect of smoking on crêpe is explained as being due to a tanning action on the protein by the smoke. A similar effect is produced by preparing rubber with tannin, *e.g.*, with "biscuit" prepared with tannin, the figures were 0·56 per cent. of nitrogen in the original rubber, and 0·06 per cent. in the clear solution. By allowing solutions of smoked sheet in benzene to stand for a long time, removing the clear supernatant solution from time to time and replacing with fresh benzene, the authors were able to obtain, by spontaneous evaporation of the solution, rubber which was almost free from nitrogen, and, on the other hand, from the heavier portions a rubber containing a high percentage of nitrogen. These two samples were compared with each other and with the original rubber (both before and after treatment with benzene) and it was found that the high-nitrogen rubber vulcanised more rapidly and combined with a higher percentage of sulphur than either the original rubber or the rubber free from nitrogen. The strength and resiliency of the rubber rich in protein was moreover greater than that of either of the other samples, the purest sample being the weakest. It is pointed out that synthetic rubber, being devoid of protein, will always be inferior to the natural product, for added protein is not likely to assume the form of a microscopic network of films throughout the rubber. Simple treatment of smoked sheet with benzene, without agitation, was shown by the figures obtained on vulcanisation to have very little effect on the rubber.—E. W. L.

Patents.

Indiarubber, guttapercha, and balata; Process of manufacturing hot vulcanised froth from ——. F. Pfleumer, Dresden, Germany. U.S. Pat. 1,038,950, Sept. 17, 1912.

See Fr. Pat. 430,473 of 1911; this J., 1911, 1323.—T. F. B.

Producing beta-gamma-dimethylerythrene. Addition to Fr. Pat. 425,582. *See* XX.

Obtaining isoprene and its homologues from dipentenes and their isomerides and homologues. Fr. Pat. 442,980. *See* XX.

XV.—LEATHER; BONE; HORN; GLUE.

Patents.

Oil-tanned grain leather. S. R. Holder, Mitcham Surrey. Eng. Pat. 13,168, June 4, 1912.

Skins are dressed so as to yield oil-leather without removing the grain so that the finished chamois leather has, on one side, a grained surface.—D. J. L.

Tanning process [with waste sulphite-cellulose lyes]. Chemische Industrie- und Handels-Ges. m. b. H. Ger. Pat. 248,055, Aug. 30, 1910.

In the use of waste sulphite-cellulose lyes for tanning, claim is made for the addition of glycerin as well as of chromium compounds. The chromium compounds diminish the solubility of some of the organic constituents of the liquors and hence prevent to some extent their removal from the hide by washing. By the addition of glycerin, the possibility of concentrating the liquors to the desired extent whilst still maintaining them in the liquid state is achieved.—A. S.

Tanning; Process of ——. G. H. Lindström, Assignor to Fitzroy Tanning Co., Ltd., New Plymouth, New Zealand. U.S. Pat. 1,039,150, Sept. 24, 1912.

See Eng. Pat. 2499 of 1910; this J., 1910, 580.—T. F. B.

Tanning drum. Herrenschmidt und Co. Fr. Pat. 443,762, May 13, 1912. Under Int. Conv., June 6, 1911.

See Eng. Pat. 12,867 of 1912; this J., 1912, 940.—T. F. B.

Patent leather and the like; Process for treating —— by means of light. A. Junghans. Fr. Pat. 443,406, May 4, 1912. Under Int. Conv., Feb. 13, 1912.

See Eng. Pat. 10,971 of 1912; this J., 1912, 694.—T. F. B.

Glue; Process for making —— and product resulting therefrom. J. M. Neil. Fr. Pat. 442,949, April 25, 1912. Under Int. Conv., May 27, 1911.

See U.S. Pat. 1,023,523 of 1912; this J., 1912, 504.—T.F.B.

Elastic substances insoluble in water; Process for making —— from albumin. G. Diesser. Fr. Pat. 442,710, April 9, 1912.

See Eng Pat. 8402 of 1912; this J., 1912, 735.—T. F. B.

XVI.—SOILS; FERTILISERS.

Soils; Black cotton —— of India. W. H. Harrison and M. R. Ramaswami Sivan. Mem. Dept. Agric. India, Chem. Series, 1912, 2, 261—280.

The black colour of the cotton soils of India is accounted for usually either by the presence of organic matter in the form of humus or in combination with iron, or by the presence of a black mineral common to these soils wherever they may be found. It is shown that it is possible to divide the soils into several types depending on (1) the percentage of particles of high specific gravity, (2) the percentage of heavy magnetic particles, (3) the proportion of the heavy magnetic to the heavy non-magnetic particles. The minerals present are distinctly related to those of the underlying formations. It is concluded that "regur" soils are derived from many diverse rock formations and are of comparatively local formation. Titaniferous magnetite is only found in some of the soils and it cannot be regarded as the substance which gives the characteristic colour or the physical properties to these soils but only as a modifying agent. The peculiar properties are associated with compound particles of low specific gravity which are found in all the soils. One of these substances is a colloidal hydrated double iron and aluminium silicate which is mainly concerned in the formation of compound particles. The other is possibly an organic compound of iron and aluminium.—E. F. A.

Nitrogen; Sources of —— for agriculture and the utilisation of waste sulphite-cellulose liquors. P. Nitsche. Z. angew. Chem., 1912, **25**, 2058—2061.

A summary of the existing sources of nitrogenous manures. Stress is laid on the need of enriching the soil with a carbohydrate nutrient so as to afford a cheap source of energy for the nitrogen-fixing bacteria. Waste sulphite-cellulose liquors when neutralised with lime so as to leave them faintly alkaline are suggested as admirably suited for this purpose; they contain a variety of directly available carbohydrates as well as lignin substances. Such application of these liquors for agricultural purposes will solve the problem of their disposal in the rivers.
—E. F. A.

Nitrates in soils; Observations on the behaviour of ——. I. Vogel. Chem.-Zeit., 1912, **36**, 1104—1105.

When a soil containing sodium nitrate was exposed under a bell-jar in presence of a vessel of water for 10 days, the water was found to contain a considerable quantity of nitrous acid, whilst the quantity of nitric-nitrogen in the soil had diminished; hence the nitrate was decomposed with evolution of nitrous gases. The general view, that sodium nitrate remains practically unaltered in soils in which no growth is taking place, is thus found to be untenable under certain conditions. The conditions under which such a decomposition of nitrates takes place are fulfilled when the soil is spread out in layers only a few mm. thick, and when a certain proportion of moisture is present for some time. The proportion of moisture may vary, but for average soils the limits generally lie between 15 and 20 per cent. If the moisture be sufficient to cause the soil to become sticky, the decomposition of the nitrates does not occur. Micro-organisms are not concerned in this process of decomposition; nor is it due to chemical reduction in the ordinary sense, since the decomposition proceeds in soils almost totally free from oxidisable constituents (humus). Generally, there appears to take place a catalytic dissociation of the nitrate into sodium oxide and nitrogen pentoxide; in the presence of humus colloids nitrogen tetroxide is also formed. The process is therefore probably a result of colloido-chemical actions, which take place at the limits of the solid and liquid phases in very thin layers, and in this respect is analogous to the process of conversion of calcium cyanamide into urea. In agricultural practice the nitrate existing in the uppermost layers of the soil would be affected by this process of decomposition, particularly since Chili saltpetre is most frequently employed in the form of a top-dressing.
—J. F. B.

Potassium: Vegetation experiments with different minerals containing ——. D. Prianischnikow. Landw. Vers.-Stat., 1912, 77, 399—411. Chem. Zentr., 1912, **2**, 1232.

The results of the author's experiments show that whilst some aluminosilicates form a tolerably good source of potassium for plants, others are quite useless. Of the minerals examined, nepheline rock (from the coast of the White Sea), mica-shale, and biotite gave the best results, then phillipsite and muscovite, whilst eläolite, leucite, apophyllite, sanidine, orthoclase, and microcline were less useful, the availability of the potassium in the minerals named decreasing in the order given. Essentially the same order was obtained when the minerals were arranged according to the amount of potash extracted from them by treating a finely powdered sample with a solution of a neutral salt (ammonium chloride, barium chloride).—A. S.

XVII.—SUGARS; STARCHES; GUMS.

Sugar beet; Influence of phosphoric acid on the growth and quality of ——. H. Wilfarth, H. Roemer, G. Wimmer, G. Geisthoff, O. Ringleben and H. Bufleb. Z. Ver. deutsch. Zuckerind., 1912, 1037—1107.

The fullest details with tabulated results are given of the cultivation of beetroots in tubs in an artificial soil consisting of sand and 6 per cent. of purified peat with varying quantities of phosphatic and nitrogenous fertilisers, the potash added being kept constant and the moisture varied. The phosphatic fertilisers used were mono- and di-calcium phosphate, and the nitrogenous fertilisers, calcium nitrate and sodium nitrate. The application of 1·065 grm. of phosphoric acid, 2·250 grms. of nitrogen and 4·230 grms. of potash appeared to satisfy the normal requirements of the beet, yielding 102·75 grms. of sugar (18·28 per cent.), the quotient of purity being 90·15 and the non-sugar 2·31. An increase in the phosphoric acid with a corresponding increase of nitrogen causes, it is true, an increase of sugar but of lower purity, and does not cover the increase of the fertiliser used. Such normal beets trimmed contained 0·25 per cent. of phosphoric acid, the top with leaves 0·45 per cent., and the whole plant 0·31 per cent. The above amounts of fertiliser also gave the most favourable results as regards total weight, leaves, formation of pectin, invert sugar and the ripening of the beets.—L. J. de W.

Sugar; Solubility of ——, in water and in syrups of various quotients of purity. A. T. Höglund. Z. Ver. deutsch. Zuckerind., 1912, 1118—1127.

The author has calculated, by the method of least squares, a series of curves for the solubility of sugar in syrups of varying purity from the results obtained by Schukow (this J., 1900, 455) with the non-sugar residue from the desaccharification of molasses by the strontia process at the Dessau refinery, the various qualities of syrup examined being made by mixing weighed quantities of residue, sugar and water. The results of the calculation are exhibited in the following table in which, in the column

Temperature ° C.	Grams of sugar in 100 grms. of water in saturated solutions at real quotients of purity:								
	100	81	78	75	72	69	66	63	60
25°	211·4	191·2	197·4	204·4	210·8	219·0	227·3	236·3	245·1
30	219·5	198·7	202·8	207·9	214·1	221·6	230·2	240·0	250·4
35	228·4	207·9	210·5	214·4	220·7	228·1	237·6	248·6	260·9
40	238·1	218·8	220·6	223·9	230·8	238·7	249·4	262·0	276·6
45	248·7	231·5	233·0	236·4	244·3	253·2	265·6	280·2	297·5
50	260·4	245·8	247·8	252·0	261·2	271·6	286·2	303·3	323·5
55	273·1	261·8	264·9	270·6	281·5	294·0	311·3	331·2	354·7
60	287·3	279·6	284·3	292·2	305·2	320·4	340·7	364·0	391·1
65	302·9	299·1	306·1	316·8	332·3	350·8	374·6	401·5	432·7
70	320·5	320·2	330·2	344·5	362·9	385·2	412·8	443·9	479·4
75	339·9	343·1	356·6	375·2	396·8	423·4	455·5	491·1	531·3
80	362·1	367·6	385·4	408·9	434·2	465·7	502·6	543·2	588·4
85	386·8	393·9	416·5	445·6	471·9	512·0	554·1	600·1	650·7
90	415·7	421·9	450·0	486·4	519·1	562·2			
95	448·6	451·6							
100	487·2								

under the quotient of purity 100, are given von Lippmann's recalculation of Herzfeld's determinations of the solubilities of pure sugar in water for comparison. This table (and the series of curves which are drawn from it) shows that at low temperatures the solubility of sugar in dilute syrup and molasses solutions is not very different from the solubility in pure water. When the amount of non-sugar is so small that the quotient is higher than 69, the solubility of sugar at the temperature under consideration is even less than in pure water. These syrup solutions thus salt out the sugar, a circumstance which led Marschall to designate them anti-melassigenic. If the non-sugar, however, is present in greater quantity, so that the quotient is below 69, there is a slight increase in solubility even at low temperatures. These solutions therefore act as positively melassigenic. With increasing temperature the solubility of the sugar increases under all circumstances and at a higher rate the greater the amount of non-sugar. For example, according to the table, a syrup of purity 60 at 78° C. contains 565 grms. of sugar in 100 of water, while the same quantity of pure water at the same temperature is only able to dissolve 353 grms. This syrup therefore dissolves 1·6 times as much as pure water. The number 1·6 is called by Claassen the saturation quotient of the syrup at 78° C. Although the curves are not applicable to exact scientific work, they are sufficiently reliable for practical use for finding the saturation and supersaturation quotient of a syrup. The following equations serve to connect the data given in the table (or curves) with the figures obtained in the usual analytical work of the factory.

$$\text{Dry solids} = \frac{100 \times \text{Sugar}}{\text{Sugar} + \text{Quotient}}$$

$$\text{Polarisation} = \frac{100 \times \text{Sugar} \times \text{Quotient}}{\text{Sugar} + \text{Quotient}}$$

$$\text{Quotient} = \frac{100 \times \text{Polarisation}}{\text{Dry solids}}$$

$$\text{Sugar} = \frac{\text{Dry solids} \times \text{Quotient}}{100 - \text{Dry solids}}$$

$$\text{or} = \frac{100 \times \text{Polarisation}}{100 - \text{Dry solids}}$$

By "sugar" here is to be understood the weight of sugar in grams dissolved in 100 grms. of water.—L. J. de W.

Glutamates; Decomposition of —— on heating in aqueous solution; and a new optically-active non-sugar [and its influence in the double polarisation method of determining sucrose]. V. Staněk. Z. Zuckerind. Böhm., 1912, **37**, 1—17.

Solutions of potassium glutamate were heated in closed glass tubes to temperatures from 90° to 250° C. for periods of time varying from ½ to 24 hours, the rotation in presence of basic lead acetate and of hydrochloric acid being finally examined. It was found that when heated at a low temperature, and for a comparatively short duration, lævo-rotatory substances were formed; and that when heated at a temperature above 200° C., and for a longer time, the optical activity was almost entirely destroyed. On studying the products of decomposition thus obtained, it was found that lævo-rotatory glutimic acid, $C_5H_7NO_3$, is formed at the lower temperatures, such in fact as are used in practice: but that above 200° C. the optically inactive isomeride of the same acid is almost exclusively produced. In presence of hydrochloric acid, even in the cold, it was noticed that the optically active isomeride gradually loses its lævo-rotation and becomes dextro-rotatory, finally, in fact, becoming hydrolysed to glutamic acid hydrochloride, $C_5H_9NO_4.HCl$. This observation has an important bearing on the determination of sucrose by the double polarisation method in beet products, and it is computed by the author that if only 3 per cent. of the lævo-rotatory glutimic acid be present in beet molasses, the error will be 0·90 per cent., when the ordinary basic lead acetate direct reading is followed; but only about 0·05 per cent. if the acid direct polarisation, using hydrochloric acid and urea, be employed.—J. P. O.

Betaine hydrochloride; Extraction of —— from waste molasses. F. Ehrlich. Ber., 1912, **45**, 2409—2413.

The use of hydrochloric acid and alcohol for the isolation of betaine from molasses (see Stoltzenberg, this J., 1912, 788) is not new. In a process patented in 1904 (see Stiepel, this J., 1904, 1229; Ehrlich, this J., 1908, 992) these reagents were employed, but in the reverse order. By first extracting the molasses with strong alcohol, and afterwards treating the concentrated extract with hydrochloric acid, a purer product is obtained, and with much less trouble, than by Stoltzenberg's procedure. With economic working, waste molasses can be made to yield 10—12 per cent. of the hydrochloride, and the author calculates that about 8000 tons of betaine are lost annually in the waste products of the German sugar industry. In aqueous solution betaine hydrochloride is hydrolysed, and the whole of the hydrochloric acid can be directly and accurately titrated with alkali, using the ordinary indicators. The salt thus forms a very convenient material for standardising volumetric alkali solutions. As prepared from molasses by the author's method, it can be completely purified by recrystallising twice from alcohol and drying at 110° C. It is not hygroscopic.—J. H. L.

Starch; Crystalline polysaccharides from ——. H. Pringsheim and A. Langhans. Ber., 1912, **45**, 2533—2546.

The two crystalline dextrins, α and β, formed by the action of *B. macerans* on starch paste (see Schardinger, this J., 1911, 439), have been further investigated. On acetylating the α-compound, $(C_6H_{10}O_5)_4$, with acetic anhydride and zinc chloride, a crystalline hexa-acetate of a disaccharide is formed, and on hydrolysis this disaccharide is obtained as a new crystalline dextrin, $(C_6H_{10}O_5)_2$, which does not reduce Fehling's solution and gives no colour with iodine. Dextrin-β is so slightly soluble in water that the authors were unable to determine its molecular weight, but it probably corresponds to $(C_6H_{10}O_5)_6$. On acetylation it yields, almost quantitatively, a nono-acetate of a trisaccharide, from which a new crystalline dextrin, $(C_6H_{10}O_5)_3$, is liberated on hydrolysis. The latter substance, like dextrin-β, gives a brownish red colour with iodine. All these crystalline dextrins possess a decidedly sweet taste, and yield dextrose on hydrolysis with acids, but none of them reduces Fehling's solution. The authors suggest for them the designation "amylose," the four mentioned above being di-, tri-, tetra- and (probably) hexa-amyloses. Their behaviour towards enzymes will be investigated. —J. H. L.

Dextrin; Production of —— and its use. E. Parow. Z. Spiritusind., 1912, **35**, 507—508, 519—520.

Dextrin is produced from the starch of potatoes, maize, cassava, and wheat. It occurs in commerce in three forms, viz., a powder preserving the structure of the starch grains, a granular amorphous form, and a thick, milky solution. Powdery dextrin is prepared by heating starch meal alone or with 0·1—0·5 per cent. of acid; this constitutes the chief method of manufacture, and in preparing liquid dextrins and "crystal-gum" some factories use roasted dextrin instead of boiling the starch with dilute acids, since the dry heating of starch produces less sugar than boiling with acids. In the roasting of dry starch without acids, temperatures of 100°—250° C. are employed, according to the desired colour and solubility of the product. When the starch is "prepared" (see below), the roasting is carried out for 1 or 1½ to 2 hours at 100°—125° C. according as the product is to be white or yellowish. The "preparation" of the starch consists in admixture with ¼—⅓ per cent. of hydrochloric or nitric acid, and subsequent drying and powdering. The acid, diluted with water, may be injected into a drum in which the starch is kept well agitated; after breaking up any lumps, the product is stored for 24—26 hours to allow thorough impregnation of the acid, and then well dried, ground, sifted and fed to the roasting apparatus. By the use of suitable mixing plant, however, the starch meal can be acidified in the dry state and roasted at once. In Blumenthal's apparatus, devised for this purpose, the meal is kept well agitated in a rotating drum, and the acid (0·25 kilo. of nitric acid of 40° Bé. per 100 kilos. of starch) is injected in steam. In the process of Wulkan and Neumann, the total quantity of acid is first mixed with 6—8 per cent. of the starch, and this substantially dry mixture is thoroughly incorporated with the rest of the starch (cp. this J., 1911, 565). In Fielding's process (this J., 1910, 1265), the starch is completely dried at 70°—80° C. before adding the acid; it is claimed that a pure white soluble dextrin can be thus obtained. Uhland acidifies undried starch by allowing it, in the form of very fine flocks, to fall down a shaft into which the acid is blown in the form of spray; the product is again well mixed and strewed on drying floors. The roasting process is carried out in drums or pans. An easy control of the temperature is of the utmost importance, and is best attained by using roasting pans heated by oil, air, or steam. Uhland's apparatus consists of an outer and an inner cast iron vessel, the space between being filled with oil. The inner vessel is provided with an outlet for the escape of volatile products, and contains a stirring mechanism which, turned in one direction, mixes the goods, and turned in the other, empties the vessel quickly. The outer vessel is heated by fires which can be easily regulated. In Lehmann's apparatus the roasting pan rests in an air space. Close below it are several closed iron tubes three-quarters filled with water, the ends of which extend into a fire. The pressure within these heating tubes, as shown by a manometer, is kept at about 150 atm. This method of heating is the most perfect, but is costly. Blumenthal's apparatus consists of a covered pan, containing stirring gear, and heated by fire. The starch is fed on to the middle of the pan and gradually worked towards the edge where it passes between rollers before escaping through the outlets. The roasting plate and rollers are of polished marble, granite or similar material. In the production of white dextrin the product should be cooled as rapidly as possible. Apparatus for this purpose has been devised by Uhland (this J., 1906, 859). The dextrin passes in turn over several shallow cylindrical wrought iron pans about 3 metres diam., situated one above another, and well cooled by air. A central slowly-rotating shaft passes through all the pans and bears stirring arms in each of them. The moisture-content of dextrin, after roasting, is about 3 per cent., and various means are in use to raise this to the normal content of the dextrins of commerce (10—12 per cent.). The material may be spread in thin layers in a chamber into which steam is injected, or it may be exposed, in motion, to moist air. The moistened product is finally sifted and well mixed. In a process devised by Pieper (see this J., 1894, 824) a current of ozonised air is passed through the roasting apparatus while the starch is being heated; it is claimed that by this means the colour, flavour and odour of the product are improved. In Harweg's process use is made of the electric current. The starch powder is moistened with salt solution, and then if necessary, acidified with organic or mineral acids. The mixture is sifted through a drum sieve by means of revolving brushes, and the fine powder obtained is exposed to an electric current in a suitable receptacle. "Crystal-gum" ("Arabin," "*Gummi Germanikum*") is made by dissolving slightly darkened dextrin, obtained by roasting, in hot water, decolourising with bone charcoal, filtering, evaporating to dryness, and grinding the residue. Commercial dextrin contains as a rule, 10—12 per cent. of moisture, 5 per cent. of dextrose, and 0·3 per cent. of ash, and possesses an acidity corresponding to 3 c.c. of $N/1$ caustic soda per 100 grms. White dextrin may contain 20—75 per cent. of matter soluble in cold water, slightly coloured products contain about 97 per cent., and "yellow" dextrins are almost completely soluble. The annual production of dextrin in Germany is about 30,000 tons (value about £320,000). The quantity exported (chiefly to Great Britain and the United States) was 7000 tons in 1911—a poor year for potatoes—and 9000 tons in 1910. —J. H. L.

Patents.

Syrup; Continuous conversion, at atmospheric pressure, of refinery —— into large or small crystals. P. Lagrange. First Addition, dated March 1, 1912, to Fr. Pat. 425,199, Jan. 25, 1911 (this J., 1911, 914).

In carrying out the process described in the principal patent, the syrup is concentrated in a vessel provided with two valves, one communicating with the air, and the other with a vacuum pump. The concentration is started *in vacuo*, and finished under pressures gradually increasing to 1 atm. When the charge contains only 5—6 per cent. of water, it is run out into the rotatory apparatus of Lafeuille, of known construction, in which it is brought to the desired temperature according to the size of the crystals to be produced (*loc. cit.*). The outlet of the latter apparatus is provided with a steam jacket, to prevent crystallisation during the outflow of the charge into the moulds.—J. H. L.

Gum or mucilage from carob seeds; Process for manufacturing ——. A. Pinel. Fr. Pat. 443,275, July 10, 1911.

After a preliminary dressing, by which a portion of the husk is removed, the seeds are macerated in an alkaline liquid, *e.g.*, for 12 hours in a 10 per cent. solution of sodium hydroxide, and well agitated from time to time. By this means the rest of the husk is softened, detached from the seeds, and broken into small pieces which are subsequently separated by washing the product on a metal sieve. The seeds are then dried in the air, and, if necessary, the maceration with alkali, washing and drying are repeated. The seeds are next soaked for about 6 hours in a 3—4 per cent. solution of borax or boric acid, dried in the air, and powdered. Any excess of reagents is removed by washing with warm water, and the powder is made into a paste with water, and treated with sugar to render the gum present soluble; an antiseptic may also be added. After thorough mixing, the material is ready for use. In certain cases, some of the operations mentioned may be omitted. The product may be used as a substitute for gum tragacanth or starch gum, *e.g.*, in the preparation of textiles.—J. H. L.

Sugar; Manufacture of ——. F. T. M. Everard and F. Severus, Djombang, Java. Eng. Pat. 19,858, Sept. 6, 1911.

See Fr. Pat. 430,430 of 1911; this J., 1911, 1327.—T. F. B.

XVIII.—FERMENTATION INDUSTRIES.

Yeasts and moulds; Power of assimilating acid-, beer-, and wort-dextrins, possessed by ——. P. Lindner. Z. Spiritusind., 1912, 35, 528—529. (See also this J., 1910, 1221; 1911, 654.)

The dextrins employed were the same as in earlier experiments on fermentation (this J., 1911, 1131), but the number of organisms tested was considerably less. The culture liquids used contained 5 per cent. of dextrin, besides inorganic salts; 5 c.c., and in some cases 1 c.c., were used for each test, observations being made ten days after inoculation. The results are tabulated. Comparison with the fermentation tests (*loc. cit.*) shows that very many organisms, especially wild yeasts, mycoderma yeasts, and moulds, assimilate dextrins readily, but are unable to ferment them. With strongly attenuating yeasts and moulds, fermentation and assimilation are more frequently observed together. Dextrin is tolerably readily assimilated by Frohberg yeast, but scarcely at all by Saaz yeast. A number of wild yeasts were found to have sporulated after ten days' growth in the dextrin solutions. These tests were carried out in presence of air. Bottom-fermentation culture yeasts probably possess a weaker assimilating power in absence of air, as appears from their behaviour in bottled beers.—J. H. L.

Diastase; Further experiments on the preparation of pure ——, and its properties. E. Pribram. Biochem. Zeits., 1912, **44**, 293—302. (See Fränkel and Hamburg, this J., 1906, 945.)

The author has simplified the method of preparation used in the earlier investigation (*loc. cit.*). Five kilos. of pale kilned malt were mashed in the ordinary way with 20 litres of water (*loc. cit.*). After separation from the grains, the wort was at once treated with 500 grms. of a pure top-fermentation distillery pitching yeast, and 500 grms. of calcium carbonate were also added to prevent accumulation of lactic acid. The completely fermented liquid, containing no reducing sugar, was filtered and evaporated *in vacuo* until it formed a stiff paste owing to crystallisation of calcium lactate. After draining this paste with the aid of the pump, the syrupy filtrate, and also the crystals, were found to be very rich in diastase, which, however, often showed no activity until after the addition of a little lactic acid. The particulars given below refer to specimens of the enzyme purified by dialysing for several days against distilled water through pig's bladder or parchment; the solutions were afterwards concentrated *in vacuo*, filtered from colouring matter which separated, and then completely dried *in vacuo* over sulphuric acid. The brown powder finally obtained contained 7·703 per cent. of nitrogen and 1·49 per cent. of ash. Calcium and iron were present in the ash, but neither sulphur nor phosphorus. On boiling and filtering a solution of the dried enzyme, a nitrogenous precipitate was obtained representing 15 per cent. of the diastase taken. This precipitate contained 1·5 per cent. of ash and gave a strong Millon reaction, a very weak biuret reaction, and no tryptophane reaction. The filtrate possessed no cupric-reducing power, gave strong α-naphthol- and orcinol-reactions, but produced no hydrazone or osazone. On boiling the filtrate for an hour with 20 per cent. sulphuric acid, a strongly reducing substance was formed, from which a barium salt but no osazone was prepared. The author concludes that diastase purified as described, contains two main constituents: (1) a substance of polypeptide character, containing relatively few amino-acid residues, and (2) a strongly reducing substance of carbohydrate character, which forms no osazone, and which appears only after hydrolysis with acid. Possibly a polymeric carbohydrate acid is present combined with the polypeptide. Pure diastase appears to be active only in presence of dissociated ions (cp. Starkenstein, this J., 1910, 507), especially hydrogen ions, and it may therefore be somewhat basic in character. The author succeeded in passing a diastase solution completely through an ultra-filter of collodion (the construction of which is described fully): the enzyme must therefore be a highly disperse colloid. The ultra-filtered solution showed slight lævo-rotation. The author claims to have prepared for the first time, considerable quantities of diastase of such purity as to be quite free from proteins and sugars, and the investigation will be continued with a view to identifying the two chief hydrolytic products of the enzyme, viz., the peptide (which contains tyrosine) and the carbohydrate acid.
—J. H. L.

Maltase; Influence of some antiseptics on the action of ——. W. Kopaczewski. Biochem. Zeits., 1912, **44**, 349—352.

In studying the action of maltase under aseptic conditions, the best antiseptics to use are chloroform and toluene (saturated aqueous solutions), as neither of these accelerates or retards hydrolysis. Sodium chloride exerts no appreciable influence even at a concentration of 5 per cent. Mustard oil is unsuitable as it possesses a considerable cupric-reducing power. Formaldehyde, mercuric chloride, and silver nitrate were found to arrest hydrolysis completely at concentrations of 1, 0·6 and 0·4 per cent. in the respective cases. Sodium fluoride (a specimen reacting faintly alkaline to litmus) was found to accelerate hydrolysis, the acceleration being a maximum at concentrations of 0·4—0·5 per cent. of the salt; at 5 per cent. concentration hydrolysis was strongly retarded. Free acids exert a retarding influence.—J. H. L.

Mashing and fermentation processes; Behaviour of lime, magnesia, and sulphuric and phosphoric acids during the —— when waters of different kinds of hardness are employed. C. Bleisch and W. Wenzel. Z. ges. Brauw., 1912, **35**, 415—450, 459—463.

Parallel experiments were carried out in which 500 grms. of a dark malt were mashed with 3·5 litres of water. After saccharification, the upper liquid was drawn off and added again after the grains had been heated to boiling for half an hour and cooled. The filtered worts were boiled with hops and fermented. Three kinds of water were employed: (1) distilled water; (2) an exceptionally hard natural gypseous water containing 1·128 grms. of sulphuric anhydride per litre, and (3) a moderately hard natural carbonate water containing very little sulphate. From analysis of the malt, waters, worts and beers, the following conclusions are drawn:—The greater part of the magnesium present in beers and worts is derived from the malt. Of the total calcium and magnesium in the mash, only a part (the authors found 41·3—53·4 per cent. for calcium and 35·8—63·8 per cent. for magnesium) reappears in the wort. On the other hand the wort contains practically the whole of the sulphuric acid originally present in the mash, whatever the kind of water employed. Part of the sulphuric acid originally combined with lime, must in the wort be combined with some other base, since the wort only contains about half of the lime present in the mash. The lime-, magnesia-, and sulphate-contents of wort undergo practically no change during fermentation. Although, therefore, the amount of these substances required for the growth of the yeast appears to be extremely small, their presence in considerable quantities may be necessary for the proper physiological action of the yeast. The total phosphorus in wort represents only a part of that present in the mash (30 per cent. was found with the gypseous water, 50 per cent. with the carbonate water, and 60 per cent. with distilled water). When enzymatic transformations are excluded (by Adler's method, see this J., 1912, 697), carbonate water extracts most, and gypseous water least phosphorus from malt. During mashing, conversion of insoluble into soluble phosphorus compounds takes place, but to only a very slight extent when carbonate water is employed. Fermentation is accompanied by an appreciable decrease (12—28 per cent.) in the total phosphorus of the wort, and this is most marked with gypseous water, probably owing to greater activity and growth of the yeast. The decrease of organic phosphorus is less than that of inorganic, except when gypseous water is used. The nature of the hardness of brewing water clearly influences to a considerable extent the inorganic and the organic phosphorus-contents of worts and beers.—J. H. L.

Hops; Quantitative determination of the bitter substances of ——. L. Adler. Z. ges. Brauw., 1912, **35**, 406—410.

The author modifies Lintner's method (see this J., 1899, 179) by boiling 10 grms. of the hops, shredded in a mincing machine, for 7 hours with 200 c.c. of petroleum ether of "boiling temperature" 48° C. By "boiling temperature" is meant that indicated by a thermometer immersed in the liquid boiling under a reflux condenser. After cooling, the volume is made up to 255 c.c., and 50 c.c. of the filtered liquid are directly titrated with N/10 alcoholic caustic potash in presence of phenolphthalein (10 drops of a 1 per cent. solution). The titration is finished when, after thorough shaking, the yellowish brown layer which settles to the bottom just shows a distinct reddish tint. The volume of alkali required, multiplied by 2, gives the percentage of bitter substances present in the hops. The "boiling temperature" of petroleum ether can be adjusted to 48° C. by adding benzine or lower-boiling spirit, but the author found that a variation of 10° C. in the "boiling temperature" made a difference of only 0·5 in the percentage of bitter substances found.—J. H. L.

Hops; Quantitative determination of the bitter substances of ——. R. Hermann. Allgem. Z. Bierbrau. u. Malzfabr., 1912, **50**, 443—449.

A table is given showing the external characters of 38 samples of hops of different types, and their contents of α- and β- bitter acids, as determined by Adler's procedure (see preceding abstract), using petroleum ether of boiling point 30°—50° C. The content of bitter substances ranged from 6·65 to 17·61 per cent. of the dry substance of the hops, and showed a general correspondence with the quantity of lupulin present as estimated visually. In the seven samples of English hops investigated, the bitter substance-content ranged from 8·53 to 11·4 per cent. of the dry substance. Deterioration produced by long or bad storage of hops is revealed by a strikingly low content of bitter substances and by the dark colour and shrivelled appearance of the lupulin under the microscope.—J. H. L.

Vinegar; Evaporation losses in the manufacture of —— by the rapid process. H. Wüstenfeld and T. Foehr. Dtsch. Essigind., 1912, **16**, 197—199, 206—208, 213—215. Chem. Zentr., 1912, **2**, 1166.

The loss of alcohol by evaporation in the generators in an experimental plant ranged from 5 to 19 per cent. of the raw material; the loss of acetic acid from this cause never exceeded 2 per cent.—A. S.

Patents.

Stout, beer and other fermented alcoholic liquors: Pasteurising of —— in bulk. A. S. Marriott, Gravesend, Kent. Eng. Pat. 20,056, Sept. 9, 1911.

The liquid is passed through a system of heating and cooling tubes whereby it is first raised to the temperature of pasteurisation, remains at this temperature for a sufficient time (*e.g.*, 15 minutes), and is afterwards again cooled. It then passes to a carbonating apparatus in which it is made to re-absorb the gas given off during pasteurisation, together with a further quantity of carbon dioxide, if necessary. A suitable type of carbonator is that in which the liquid enters at the top of a chamber containing carbon dioxide under pressure, and trickles over superposed baffles in the chamber. The whole process is continuous.—J. H. L.

Alcohol; Process for manufacturing ——. H. Verlinden. Fr. Pat. 443,323, May 2, 1912.

The necessary malt extract is made by mixing ground malt, rich in diastase, with water, and sterilising by addition of a mixture of "*formol*" with "*aldehydes éthyliques*" or esters obtained from the distillation of alcohol. The mash is maintained between 25° and 45° C. for at least three hours. After filtering, and washing the residue, the latter is heated to at least 75° C. By this means the starch present is converted into paste, and diastatic saccharification at a high temperature, with consequent production of a large proportion of unfermentable dextrins, is avoided. The other starchy materials used (maize, potatoes, etc.) are heated as usual, but with water faintly acidified with hydrochloric acid; and about 1—2 per cent. of beer yeast is added to furnish nutriment for the growth of the yeast in the subsequent fermentation. The heated product is diluted with cold water to a sp. gr. of not more than 18° Bé., and cooled to 50°—56° C. The malt extract is next added, and the mixture left for 2—40 hours, during which it may be further cooled to 32° C. The yeast, together with a little calcium chloride, is then added, at the latter temperature. By using 2 parts of malt to 98 parts of maize, etc., and 0·1 part of yeast, a yield of 77—80 per cent. of alcohol can be obtained.—J. H. L.

Wines, beers, and other liquids; Apparatus for the continuous de-alcoholisation of ——. G. Ciapetti. Fr. Pat. 443.573, May 8, 1912.

The liquid first passes through apparatus in which it is heated sufficiently to drive out the gas and very volatile esters. The latter, after dephlegmation, are cooled and subsequently mixed with the de-alcoholised liquid after the latter has been cooled. The wine, beer, etc., thus freed from gas and esters, passes to the de-alcoholising column, in which it runs in a thin layer over a number of discs, placed step-wise one above another, and each heated by steam or water. The de-alcoholised liquid is rapidly cooled, and after being mixed with the esters previously separated (see above), passes to one of two reservoirs which can be discharged alternately. The alcoholic vapours pass to a dephlegmating column, in which they are further concentrated, and the alcohol-free condensed portion returns to the discs in the main column and serves to dephlegmate the alcohol at these discs. The whole process is carried out *in vacuo*, and the rapid cooling of the liquid after passing through the main column prevents rise of pressure in the apparatus, and deterioration in the flavour of the de-alcoholised product, which can be subsequently carbonated if necessary. Owing to the purity and flavour of the alcohol obtained by this process, it serves well for the preparation of brandies, to which it imparts all the qualities usually acquired only after long storage.—J. H. L.

Fermenting worts; Fatty product ["carbovore"] for absorbing carbon dioxide disengaged from —— and thus reducing the production of froth to a minimum. C. S. Scouvemont. Fr. Pat. 443,811, May 10, 1912.

Thirty-five parts of suint (wool-fat) are dissolved by heating in 60 parts of "oil" of sp. gr. 0·903—0·905, and the solution is left to stand for 10 hours. Five parts of milk of lime of 20° Bé. are then slowly added, with stirring, so as to effect partial saponification. The formation of froth on beet juices, which has always been a source of annoyance to distillers, can be considerably diminished by adding this preparation.—J. H. L.

XIXa.—FOODS.

Chemical and bacteriological study of fresh and frozen New Zealand lamb and mutton. Wright. *See under* Sydney Section.

Hardened oils. Bömer. *See* XII.

Patents.

Edible oil product. C. Ellis, Montclair, N.J. U.S. Pat. 1,037,881, Sept. 10, 1912.

A mixture of cottonseed oil and cocoanut oil is hydrogenated and then aerated so as to retain at least five per cent. by volume of air.—J. H. J.

Butter substitute; Hydrogenated ——. C. Ellis, Montclair, N.J. U.S. Pat. 1,038,545, Sept. 17, 1912.

An edible hydrogenated vegetable oil is incorporated with "milk material," and the excess of moisture is, if necessary, removed by pressure.—J. H. L.

Milk; Sterilisation of ——. V. Henri, A. Helbronner, and M. von Recklinghausen. Fr. Pat. 442,807, June 28, 1911.

The milk is raised quickly to a temperature of 60° C. by passing through a heated filter, which process weakens the microbes without any injurious effect on the chemical constituents of the milk. It is then submitted to the sterilising action of ultra-violet rays by being passed in a thin stream at the rate of 3 litres per hour through an apparatus in which it is exposed to the radiations from a quartz mercury-vapour lamp, working at 3 ampères and 220 volts. Means are taken to prevent any further increase in the temperature of the milk.—J. H. J.

Milk; Sterilised ——. A. Helbronner, V. Henri, and M. von Recklinghausen. Fr. Pat. 442,924, July 1, 1911.

The milk is sterilised in the same way as described in the foregoing abstract, except that after the heating process it is passed through a homogenising apparatus kept at the same temperature, before being submitted to the action of the ultra-violet rays.—J. H. J.

Milk and similar foods ; Machines for the desiccation of ——. J. O. A. Amundsen. Fr. Pat. 443,057, April 26, 1912. Under Int. Conv., May 2, 1911.

Three forms of machine are described. In one, the milk is fed between two small wheels, touching each other, which revolve against the upper portions of two large revolving desiccating cylinders, also touching. The two wheels carry a film of the milk on to the cylinders, where it is evaporated, and the dried residue is scaped off each cylinder by a star wheel which holds a knife in position against the side of the cylinder. The second machine is similar, but the feeding wheels are fixed separately at the lowest point of the desiccating cylinders, and dip in the milk contained in channels. A current of air is drawn upwards around the cylinders. In the third machine, an endless metallic band is carried round four cylinders situated in a chamber with a large opening in one side, closed only by the metallic band. At this opening are situated the wheel for feeding the milk on to the band, and, at the lower portion, the knife for removing the dried residue from the band. Heated air is blown through the chamber.—J. H. J.

Butter ; Process of making ——. A. W. K. Witte, Hamburg, Germany. U.S. Pat. 1,039,627, Sept. 24, 1912.

See Eng. Pat. 10,972 of 1912 ; this J., 1912, 835.—T. F. B.

Baking powder. C. H. Boehringer Sohn. Fr. Pat. 443,087. April 27, 1912. Under Int. Conv., May 19, 1911.

See Eng. Pat. 10,122 of 1912 ; this J., 1912, 657.—T. F. B.

XIXb.—WATER PURIFICATION ; SANITATION.

Examination of copper sulphate. Fresenius. *See* VII.

Patents.

Air and gases, Washing and cooling ——. S. W. Cole, London. Eng. Pat. 21,605, Sept. 30, 1911.

The air is forced into the bottom of a chamber provided with perforated shelves above the inlet and a water spray above the shelves. As the air passes upwards through the perforations, it meets the water passing downwards, and is thus thoroughly washed, and at the same time cooled by evaporation of some of the water. Above the water spray are muslin screens which withdraw particles of water from the air before it passes out of the exit pipe at the top of the chamber. If dry air is required, a solution of calcium chloride replaces the water.—J. H. J.

Sewage ; Extraction of gases from ——. C. Hickling and G. J. Tomlinson, Nottingham. Eng. Pat. 22,792, Oct. 16, 1911.

At a convenient point in the main sewer leading to the disposal area, the sewage is diverted into two or more tanks working alternately. Along two sides of each tank are boilers supplying superheated steam to small perforated pipes which pass across the bottom of each tank. At the top of each tank is a wide pipe for conducting the gases into condensing chambers. The injection of steam and the inflow of sewage commence together, and when the tank is sufficiently filled, the inflow is directed to the companion tank. The air is then pumped out of the filled tank, and under the vacuum created, the sewage begins to boil and is kept boiling for an hour, all the gases passing into the condensing chamber. At the end of the hour the tank is emptied rapidly. In emptying, the sewage may be passed through a screen to retain the solids, and the practically clean water run into the nearest stream.
—J. H. J.

Sterilising and purifying water ; Process of oxidation for ——. L. Linden. Fr. Pat. 443,609, May 9, 1912. Under Int. Conv., May 12, 1911.

Barium peroxide or other peroxide is made into a cream with water and submitted to the action of carbonic (or other) acid for half an hour, with the production of barium percarbonate (or other per-salt) and hydrogen peroxide. The solids are allowed to settle and the supernatant liquid containing 6—12 grms. of hydrogen peroxide per litre is added in suitable proportions to the water to be treated. In order to eliminate traces of the reagent used, a hypochlorite solution, or a solution of similar action, is added which decomposes any percarbonate and peroxide in solution with the formation of nascent oxygen, which takes part in the purifying and sterilising process. Should the carbonic acid have been used in excess, leading to the formation of bicarbonate, then there is added finally sodium sulphate to remove the barium as sulphate.
—J. H. J.

Waste-liquids ; Purification of —— *and extraction of water from sludges.* Richter und Richter. Fr. Pat. 443,789, May 14, 1912. Under Int. Conv., June 6, 1911, and April 13, 1912.

Clay, calcined in absence of air, is treated with concentrated sulphuric acid and small quantities of water so as to secure as high an elevation of temperature as possible and the separation of the silica in the gelatinous condition ; after cooling, the mixture solidifies and is ground to a powder. This preparation forms a good precipitant for the waste liquids of paper works, tanneries, laundries, slaughterhouses, etc. It is also suitable for precipitating town sewage and for extracting water from sludges. For certain liquids, it is desirable to add a very small quantity of hydrochloric acid in the preparation of the powder to increase its precipitating power.—J. H. J.

Sterilising liquids by ultra-violet rays ; Apparatus for ——. A. Neveu, Assignor to Soc. Anon. Française Banque du Radium, Paris. U.S. Pat. 1,038,631, Sept. 17, 1912.

See Eng. Pat. 15,010 of 1911 ; this J., 1912, 149.—T. F. B.

Sewage ; Percolating bacteria beds and contact beds for ——. Deutsche Filtercompagnie G. m. b. H. Fr. Pat. 443,127, April 29, 1912.

See Eng. Pat. 5983 of 1912 ; this J., 1912, 761.—T. F. B.

Process of making lime-sulphur solution. U.S. Pat. 1,038,387. *See* VII.

Apparatus for and method of producing formaldehyde. U.S. Pats. 1,038,546 and 1,038,547. *See* XX.

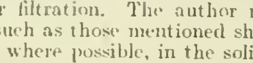
XX.—ORGANIC PRODUCTS ; MEDICINAL SUBSTANCES ; ESSENTIAL OILS.

Pharmaceutical preparations ; Alteration of some —— *in light.* C. Neuberg and O. Schewket. Biochem. Zeits., 1912, 44, 495—501.

Nearly all organic substances undergo photochemical changes, to some extent, in presence of certain inorganic salts, even though the latter alone are not photo-sensitive (cp. this J., 1910, 1035). Most of the salts of the heavy metals act in this way as photo-catalysts, and particularly ferric and ferrous salts. Under the influence of such catalysts, chemically indifferent substances, such as those produced by the living organism, are usually transformed into more reactive compounds (aldehydes, ketones, phenols, etc.) of lower molecular weight. The author found that certain pharmaceutical preparations containing iron, viz., *Liquor ferri oxydati saccharati, Liquor ferri mangani saccharati, Ferrum kalium tartaricum, Ferrum malicum, Ferrum lacticum, Ferrum glycerophosphoricum* and ferric-ammonium citrate, undergo considerable decomposition on exposure to light. They were exposed for periods up to 14 days to full daylight, and for 4—6 hours of each day to direct sunlight. In all cases alterations could be detected after 24 hours, and the preparations soon acquired strong cupric-reducing powers. From 5 grms. of *Ferrum lacticum*, dissolved in a litre of water, and exposed for 14 days, a quantity of acetaldehyde corresponding to 1 grm. of the *p*-nitrophenylhydrazone was obtained on distillation. The polarimetric reading of a solution of *Ferrum saccharatum* diminished from +9·2 to +2·4 after 10 days' exposure, and in the case of *Ferrum mangani saccharatum* a reading of +18·0 changed to —4·2 after 8 days. Before polarising these liquids, the iron was precipitated by adding a solution of colloidal ferric hydroxide and then a trace of an electrolyte (magnesium sulphate or sodium chloride). By this means the iron can be completely removed and a colourless liquid obtained after filtration. The author recommends that preparations such as those mentioned should be stored in the dark, and where possible, in the solid form, solutions being made up shortly before use.—J. H. L.

Terpenes and essential oils. 111th Communication. O. Wallach. Annalen, 1912, **392**, 49—75.

The present communication is divided into three parts. The first deals mainly with the reduction products of carvenolide, $C_{10}H_{14}O_2$, and of the isomeric pulegenolide and their structural relationships, and the reduction of pulegene, C_9H_{16}, to dihydropulegene, C_9H_{18}. The second part deals with ascaridol (see this J., 1912, 950). In the third part the constitution of so-called "isocamphor," $C_{10}H_{16}O$, and of its reduction product, $C_{10}H_{18}O$, is discussed. Isocamphor is produced when the nitrimines, $C_{10}H_{16}N_2O_2$, obtained by the action of nitrous acid on fenchone-oxime or camphor-oxime, are dissolved in concentrated sulphuric acid, and the solution decomposed by water. In accordance with the work of Angeli and Rimini (Gaz. chim. ital., 1896, **26**, II., 44, 518), it has been hitherto regarded as Δ^6-methyl(1)-isopropyl(5)-cyclohexenone(2), but the author now shows that dihydroisocamphor is identical with dihydropinolone (acetyl-1-isopropyl-3-cyclopentane), and that isocamphor itself is a C_5-ring derivative, and in all probability identical with isopinolone,



$$\mathrm{HC}\left\langle\begin{array}{l}\mathrm{C(COCH_3)——CH_2}\\ \mathrm{CH[CH(CH_3)_2]\cdot CH_2}\end{array}\right.$$

(See also this J., 1911, 306, 1229.)—A. S.

Borneol; Action of sulphuric acid on ——. P. G. Golubeff. J. Russ. Phys.-Chem. Soc., 1912, **44**, 1061—1067.

The action of aqueous sulphuric acid on borneol yields: (1) bornyl ether, $(C_{10}H_{17})_2O$, which boils at 312°—314° C., yields camphor when heated with concentrated nitric acid, and is converted into camphene hydrochloride when heated under pressure with concentrated hydrochloric acid; this ether is isomeric with that obtained in 1894 by Bouchardat and Lafont by the action of monohydrated sulphuric acid on inactive camphene; (2) camphene, $C_{10}H_{16}$, which is very similar in properties to natural camphene from the essential oil of the Siberian fir, but is optically inactive.—T. H. P.

Glycerin; Action of concentrated phosphoric acid on ——. II. A. Contardi. Gaz. chim. ital., 1912, **42**, II., 270—282.

By the interaction of 3 mols. of phosphoric acid with 1 mol. of glycerol or of triacetin, glycerotriphosphoric acid, $C_3H_5(PO_4H_2)_3$, is formed almost exclusively, whilst even when equimolecular proportions of glycerol and phosphoric acid are used, a notable quantity of the glycerotriphosphoric acid is formed, and this is the cause of the low yields in the technical manufacture of glycerophosphates. The glycerotriphosphoric acid was identified by means of its barium salt, $C_3H_5(PO_4Ba)_3+H_2O$. When an equimolecular mixture of anhydrous glycerin and phosphoric acid was heated for 10—12 hours at 130° C. at 18—20 mm. pressure, one-half of the phosphoric acid was converted into glycerotriphosphoric acid and the other half into ordinary glycerophosphoric acid ($\alpha+\beta$; see Tutin and Hann, Chem. Soc. Trans., 1906, **89**, 1749), whilst one-third of the glycerin remained unaltered. By continuing the heating, the reaction becomes more complicated. By heating glycerotriphosphoric acid with 2 mols. of glycerol *in vacuo*, a substance is obtained identical with the solid neutral ester of Carré (this J., 1904, 128). The author discusses also the constitution of the different products of the interaction of glycerin and phosphoric acid.—A. S.

Formic acid; Bromometric determination of ——. H. Mäder. Apoth.-Zeit., 1912, **27**, 746—747.

The method, which depends on the quantitative oxidation of formic acid to carbonic acid by means of bromine, is carried out as follows:—10 c.c. of the solution to be examined, which should contain about 0·3 per cent. of formic acid, are transferred to a stoppered bottle, and 50 c.c. each of the volumetric solutions of potassium bromate and potassium bromide of the German Pharmacopœia (0·835 grm. and 3 grms. respectively per litre) and 10 c.c. of the officinal phosphoric acid are added. The mixture is kept in the dark for 12—15 hours, and then 1 grm. of potassium iodide is quickly introduced and the bottle well shaken. Finally, the solution is acidified with about 10 c.c. of hydrochloric acid, and, after 1—2 minutes, the liberated iodine is titrated with *N*/10 thiosulphate. The quantity of formic acid is obtained by subtracting the number of c.c. of thiosulphate used from 30 and multiplying the resulting number by 0·0023. Acetic acid and its normal homologues are not oxidised by bromine under the above conditions, and the method gives, therefore, a means of determining formic acid and formates in the presence of these acids.—F. Sodn.

Ether [Explosive residue]. G. Kassnei. Arch. Pharm., 1912, **250**, 436—447.

A quantity of ether which had been stored for a prolonged time, originally over metallic sodium, exploded when vapourised in a small flask heated in a water-bath. It was found that the sodium in the storage vessel had become completely converted into a syrupy solution of sodium hydroxide. The ether gave no reaction for hydrogen peroxide, but contained considerable amounts of low-boiling vinyl compounds resulting from the auto-oxidation of the ether. These were detected by the abundant yellowish-white precipitate produced with Nessler's reagent. Aldehydes were absent. When a little of the ether was evaporated in a test-tube, the last portion disappeared with a puff or slight explosion. It appears that the sodium hydroxide withdrew the hydrogen peroxide from the ether, leading to the formation of vinyl alcohol and an organic peroxide, probably diethyl peroxide, $(C_2H_5)_2O_2$, which would accumulate in the last portions of the ether on evaporation, and might under favourable circumstances, cause an explosion.—F. Shdn.

Methyl alcohol; Pyrogenic decomposition of —— by means of the electric current. W. Löb. Z. Elektrochem., 1912, **18**, 847—850.

If methyl alcohol is heated in the absence of air in a vessel provided with a reflux condenser, by means of a platinum or nickel wire electrically heated to about 700° C., hydrogen and carbon monoxide with slight traces of carbon dioxide are given off, and formaldehyde is found in the reaction vessel. The reactions taking place are: $CH_3OH=CH_2O+H_2$, and with a slightly lower velocity; $CH_2O=CO+H_2$. Finally a very small quantity of the carbon monoxide is oxidised by the steam: $CO+H_2O=CO_2+H_2$. If ammonia be dissolved in the methyl alcohol, the formaldehyde is converted into hexamethylenetetramine.
—W. H. P.

Metal [silver] organosols. C. Amberger. Z. Chem. Ind. Kolloide, 1912, **11**, 97—100.

Wool fat or the product obtained therefrom by treatment with alkali is very efficacious as a protective colloid, resembling in this respect the protalbinic and lysalbinic acids of Paal (this J., 1902, 994, 996). If wool fat be triturated with solutions of salts, and the resulting soft masses treated with caustic alkali, the corresponding hydroxides or oxides are produced in the colloidal condition. If salts of easily reducible metals (silver, gold, platinum, etc.) be used, the metals themselves are obtained in the colloidal condition, and after removal of water and electrolytes, the resulting products form organosols with solvents of wool fat, *e.g.*, ether, petroleum spirit, chloroform, carbon bisulphide, carbon tetrachloride, etc. A solution of 3·5 grms. of silver nitrate in 5 c.c. of water was incorporated with 15 grms. of wool fat, and after standing for some hours, a solution of 1 grm. of sodium hydroxide in 5 c.c. of water was added gradually, with constant stirring. The mass becomes at first yellow, and then brown, owing to the formation of colloidal silver oxide, but on standing, even in the dark, and more rapidly in the light, and with gentle warming, the colour changes gradually to dark brown, the silver oxide being reduced to colloidal silver. The mass is dissolved in chloroform, treated with petroleum spirit and calcium chloride, in order to remove water, etc., and the solution separated and evaporated. An organosol, prepared in this way contained 9·9 per cent. of silver. By coagulating a chloroform solution by means of absolute alcohol, separating the flocculent coagulum, washing with 96 per cent. alcohol, and drying, a product containing 50·2 per cent. of silver was obtained, which was still completely soluble in chloroform, ether, fatty oils, and paraffin. By using the wool fat alcohols (the unsaponifiable portion of wool fat) and proceeding in a similar manner, an organosol containing 74·3 per cent. of silver was obtained.—A. S.

Gold; Organosol of ——. C. Amberger. Z. Chem. Ind. Kolloide, 1912, **11**, 100—102.

The organosol of gold was prepared in a similar manner to that of silver (see preceding abstract), using however sodium carbonate instead of sodium hydroxide, and facilitating the reduction of the gold hydroxide by addition of a few drops of hydrazine hydrate. Organosols containing 68·4 and 83·8 per cent. respectively of gold were prepared, which were readily soluble in chloroform, fatty oils, and paraffin.—A. S.

Japanese peppermint oil and menthol industry. Board of Trade J., Oct. 10, 1912. [T.R.]

The dementholised peppermint oil of Japan is disagreeable in taste and odour and cannot compare with that of other countries, but owing to the large percentage of crystallisable menthol contained in the raw oil the product is nevertheless a valuable one and the export considerable. The exports of menthol in 1911 amounted to 151,538 lb., valued at £98,300, and of peppermint oil to 229,800 lb., valued at £63,900. The best oil is produced in Okayama and Hiroshima Prefectures, where three crops are obtained, viz., in May, June, and August. The first crop contains about 47 per cent. of menthol, the second about 53 per cent., and the third about 60 per cent. In Yamagata Prefecture two crops are obtained, and in the Hokkaido only one, but the acreage planted in the Hokkaido is far larger than that in the other districts, so that even though Hokkaido oil contains only about 45 per cent. of menthol and there is only one crop, more than half the menthol comes from that province. Attempts have been made to introduce the American and English peppermint plants, but they have not been successful. The process of distilling the oil is the same throughout the different producing districts. It lasts four hours, and 82 lb. of dried leaves of the first crop should produce 14 oz. of oil, of the second crop 24 oz., and of the third crop 21 oz. of oil. The second crop is the most plentiful—a field, for instance, which will produce 300 lb. of leaves for its first crop, will give 800 lb. for the second, and 600 lb. for the third. One acre produces roughly 5,000 lb. of dried leaves, which should produced 80 lb. of raw oil. The consumption of menthol in Japan is about 15,000 lb. annually.

Patents.

Glycerophosphoric acid and its salts; Manufacture of ——. Southall Bros. and Barclay, Ltd., and C. S. Roy, Birmingham. Eng. Pat. 2882, Feb. 5, 1912.

The process consists in causing glycerol in a nascent state to act on phosphoric acid; for example, neutral glycerophosphates are produced by adding phosphoric acid to a dimetallo glycerolate or by adding a di-acid phosphate to a mono-metallo glycerolate and heating at normal or diminished pressure. Acid glycerophosphates are formed when phosphoric acid is heated with mono-metallo glycerolates of an alkali or alkaline earth metal or of magnesium; when these acid salts are dissolved in water and neutralised with the base of a metal other than that first used, a mixed or double glycerophosphate is produced. The acid mixed glycerophosphates may be obtained by heating with phosphoric acid a solution of an oxide (*e.g.*, of iron) in a glycerin solution of an alkali glycerolate. Monoglycerophosphoric acid is prepared by heating a mixture of monocalcium or monobarium glycerolate, glycerin, and phosphoric acid, and decomposing the product with sulphuric acid.—T. F. B.

Formaldehyde; Apparatus for and method of producing ——. G. Fernekes, Pittsburgh, Pa., Assignor to J. A. Snee, West Elizabeth, Pa. U.S. Pats. 1,038,546 and 1,038,547, Sept. 17, 1912.

(1). A burner supplying mixed air and gas is surrounded by a combustion chamber closed at the top and bottom and having screen-like (gauze) sides. The flame from the burner strikes the top of the chamber before complete combustion has occurred, and the gaseous products are thus directed towards the walls, through which they escape. The screen-like walls are adapted to cool the escaping gases and to confine the flame within the chamber. (2). A gaseous stream containing air and methane is heated to such a temperature that formaldehyde is produced, *e.g.*, by allowing the outer envelope of the stream to become ignited, whilst external air is excluded from the inner part, and complete combustion is prevented by baffling the stream against a cooling surface.—J. H. L.

Sterile coating on the skin; Means for producing a ——. H. Grauert. Ger. Pat. 250,095, May 3, 1911.

The composition claimed consists of a mixture of defibrinated blood with from 0·1 to 5 per cent. of formalin. When applied to the skin, this mixture rapidly sets to an insoluble elastic coating, which prevents bacterial growth. —A. S.

Beta-gamma-dimethylerythrene; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. First Addition, dated April 11, 1912, to Fr. Pat. 425,582, Feb. 4, 1911. Under Int. Conv., July 28, Sept. 8, and Sept. 18, 1911.

See Eng. Pat. 1557 of 1912; this J., 1912, 951. Normal salts of sulphonic acids having acid reactions, or sulphuric acid or aromatic or aliphatic sulphonic acids may take the place of the normal sulphates.—T. F. B.

Isoprene and its homologues from dipentenes and their isomerides and homologues; Process for obtaining ——. I. Ostromislensky, and Soc. pour la Production et la Vente des Articles en Caoutchouc "Bogatyr." Fr. Pat. 442,980, March 21, 1912.

It is stated that a yield of isoprene, amounting to 80 to 90 per cent. of the theoretical yield, can be obtained from dipentenes, limonene, turpentine oil, etc., by heating their vapours at temperatures below their boiling point: this is effected by adding some solvent of low boiling point, the vapours of which can be readily condensed, and which is not decomposed and has no action on the products used or to be prepared at the temperature employed; thus benzene or its homologues, or naphthalene may be used as solvent. The vapours are heated by means of hot metallic wires or gauze, and the products are preferably removed continuously from the apparatus. The vapours of limonene mixed with benzene, for example, can be produced at a temperature of 95° to 115° C. The hydrocarbon obtained, together with caoutchouc, by the polymerisation of divinyl (erythrene), can be again converted into divinyl by the above process.—T. F. B.

Hydrogen peroxide and urea; Process for producing a compound of ——. Farbenfabr. vorm. F. Bayer und Co. First Addition, dated May 1, 1912, to Fr. Pat. 436,095, Nov. 8, 1911. Under Int. Conv., June 19, 1911.

In producing the compound of hydrogen peroxide and urea by the interaction of the components at low temperatures (see this J., 1912, 409), the presence of an acid results in the formation of a product of increased stability; a mineral or an organic acid may be used. For example, 600 parts of urea are dissolved in 1500 parts of 20 per cent. hydrogen peroxide containing 1·2 per cent. of sulphuric acid, and the compound is separated by cooling.—T. F. B.

CC-Monoallyl- and -diallylbarbituric acids; Process for making ——. Soc. pour l'Industrie Chimique à Bâle. First Addition, dated April 22, 1912, to Fr. Pat. 442,001, April 1, 1912 (see Eng. Pat. 9078 of 1912; this J., 1912, 795).

CC-Alkylallylbarbituric acids may be obtained by treating monoallylbarbituric acids with an alkyl halide, or by treating monoalkylbarbituric acids with allyl halide. Further, monoalkyl-, diallyl-, or alkylallylbarbituric acids are prepared either by replacing the imino group in corresponding mono-, di-, or tri-iminobarbituric acids by oxygen by known methods, or by condensing the corresponding allylmalonic esters with urea or its alkyl derivatives, or by treating the allyl derivatives of malonamide with urea, allyl or alphyl carbonates, or carbonyl chloride, using a condensing agent when necessary.—T. F. B.

Acetic anhydride; Process for making ——. Soc. L'Oyonnithe. Fr. Pat. 442,738, June 27, 1911.

Acetic anhydride is obtained by the action of chlorous anhydride on acetaldehyde; the chlorous anhydride is prepared by the action of chlorine on dry mercuric oxide, and is collected in a suitable diluent (*e.g.*, acetic anhydride) which is constantly renewed to avoid excessive concentration of the chlorous anhydride. The solution obtained is added very gradually to acetaldehyde, the temperature being kept below 0° C., and the product is very gently heated and slowly brought to the boiling point of the acetic anhydride. The acetaldehyde may be produced by any of the known methods, or by passing purified acetylene into a very dilute, boiling solution of a salt of mercury, cadmium, zinc, or magnesium. (Compare Fr. Pat. 420,346; this J., 1911, 307.)—T. F. B.

Colloidal solutions; Preparation of ——, *and obtaining colloids in solid form from the solutions.* Chem. Fabr. Grünau, Landshoff und Meyer A.-G. and R. May. Ger. Pat. 248,526, March 1, 1911.

The reactions by which the colloids are produced are carried out in presence of norgine (this J., 1910, 1300), and solid colloids are obtained from the resulting solutions by evaporating at low temperatures or by precipitation with indifferent organic solvents, soluble in water, *e.g.*, alcohol, ether or acetone. Norgine is stated to possess in a high degree the properties of a protective colloid. Colloidal preparations obtained in this way are suitable for pharmaceutical purposes, etc.—A. S.

Isoprene; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 18,356, Aug. 14, 1911.

See Fr. Pat. 435,312 of 1911; this J., 1912, 409.—T. F. B.

Isoprene from terpenic hydrocarbons; Process for producing ——. Badische Anilin und Soda Fabrik. Second Addition, dated April 26, 1912, to Fr. Pat. 425,885, Jan. 28, 1911. Under Int. Conv., Aug. 14, 1911.

See Eng. Pat. 21,519 of 1911; this J., 1912, 702.—T. F. B.

Bromodiethylacetylurea; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. Second Addition, dated April 15, 1912, to Fr. Pat. 417,803, July 2, 1910. Under Int. Conv., June 23 and Nov. 18, 1911.

See Eng. Pat. 1170 of 1912; this J., 1912, 900.—T. F. B.

Manufacture of aromatic fractionated mineral oils. Eng. Pat. 27,348. *See* IIa.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Development with diaminophenol; Chemical and micrographic study of ——. F. Monpillard. Bull. Soc. Franç. Phot., 1912, 58, 289—303.

As a result of a number of microphotographic studies of films developed with diaminophenol in acid and in neutral solutions, the author confirms the statements of Balagny (this J., 1912, 662) that with a certain composition of developer, the development commences from the back of the film. Further, as the proportion of reducing agent to sulphite and bisulphite is increased, the more will the deposit of reduced silver be localised in the lower layers of the film: on the other hand, increase in the proportions of sulphite and bisulphite tend to give the developer the character of an alkaline developer, although the halide is reduced throughout the whole thickness of the film. From the fact that addition of tartaric or sulphurous acid to neutral diaminophenol developers gives solutions having similar properties to the acid solutions, the author concludes that the peculiar character of these solutions is solely due to the presence of free sulphurous acid.—T. F. B.

Patents.

Film screens with coloured elements for the photography of colours, and process for making them. L. Dufay. Fr. Pat. 442,881, June 30, 1911.

A very thin film of celluloid is softened by means of a suitable solvent, and pressed on to a hard surface engraved in such a manner as to produce a number of small depressions in the film. After hardening, these depressions are filled with a transparent fatty substance, coloured with one of the four colours which is to constitute the screen, and then the same side of the film is stained by means of an alcoholic solution of the second of the four colours, which only stains the celluloid in the parts not protected by the fatty substance. The other side of the film is now treated similarly, using the remaining two colours, and an emulsion is applied to one side to produce the finished colour screen film.—T. F. B.

Plastic substances for the manufacture of cinematograph films; Solvents for ——. H. Danzer. Fr. Pat. 443,031, July 4, 1911.

This patent relates to the use of the various ether oxides of glycerol as solvents of cellulose esters, especially cellulose acetate, for use in the preparation of cinematograph films. These solvents possess the advantage of being insoluble or slightly soluble in water and of high boiling point, hence they are not removed from the films during subsequent treatment, and the films retain their suppleness. The term "ether oxides of glycerol" includes all glycerol derivatives in which one or more hydroxyl groups are replaced by a phenolic or alcoholic residue, *i.e.*, the mono-, di-, or tri-ethers of glycerol, the phenol ethers of glycide, and the phenolic or alcoholic ethers derived from the chlorhydrins, acetins, etc.—T. F. B.

Photographic papers; Process for obtaining positive ——. T. del Fabro. Fr. Pat. 443,633, May 9, 1912.

A printing paper which gives black tones by development with water alone, is obtained by treating paper with a solution prepared by mixing three volumes of a ferric oxalate solution with one volume of a 16 per cent. silver nitrate solution, and adding 10 drops each of saturated ferric chloride solution and of hydrochloric acid to each gramme of solution. The ferric oxalate solution is prepared by dissolving 36 grms. of ferric oxalate and 5 grms. of oxalic acid in 100 c.c. of water and adding a sufficient quantity of 10 per cent. permanganate solution to convert all the iron to the ferric state.—T. F. B.

XXII.—EXPLOSIVES ; MATCHES.

Explosives ; Annual Report of the Chief Inspector (Major A. B. Denne) of —— for the Union of South Africa for the year 1911.

Manufacture. There are in South Africa three large explosives factories : (1) *The British South African Explosives Co., (Modderfontein).* The average number of employees during the year was 255 whites and 639 coloured. The quantity of explosives manufactured during the year amounted to 256,627 cases ; the quantity issued was 264,081 cases. (2) *Kynoch, Ltd. (Umbogintwini)*, employed 239 whites and 810 coloured ; manufactured 208,627 cases of explosives, and issued 206,491 cases, of which 204,313 went to the Rand, 2162 to places in Natal, 6 to the Cape, and 10 to the Orange Free State. (3) *Cape Explosives Works (Somerset West)*, employed 397 whites and 575 coloured ; manufactured 427,538 cases of explosives, and issued 427,541 cases, of which 8065 were exported to Australia, and 5751 to Rhodesia. This is the only factory which makes its own collodion cotton. *Storage.* The numbers of licensed mine magazines of all kinds in use during 1911 were :—Transvaal 231, Natal 24, Orange Free State 16, Cape 150.

Imports of explosives into the Transvaal.

	From oversea.	From Cape.	From Natal.	Total.
Blasting cartridges (cases)	4	290,724	205,522	496,250
Detonators, Nos. 6 and 6D (number)	26,619,500	—	—	33,372,569
Detonators, Nos. 8 and 8D (number)	6,140,100	—	—	
Detonators, Electric (number)........	612,969	—	—	
Safety fuse (cases of 500 coils)	17,221	—	—	17,221

The safety fuse came from the United Kingdom (10,904), Germany (4974), and Belgium (1343).

The imports into Natal were : Gelignite 560 cases, Dynamite I 220 cases, Permitted explosives 2880 cases, Blasting powder 533 cases or barrels (chiefly compressed cartridges), Detonators (No. 3A) 59,000, Detonators (No. 6) 280,000, Detonators (electric) 470,000.

No data of a similar nature are available for the Orange Free State or the Cape.

Samples tested. 85 samples of safety fuse and 208 of explosives, etc., were tested at Johannesburg, and 277 samples of explosives were tested at the Government Laboratory at Durban. These figures do not include the hundreds of cartridges examined for exudation during the year. The samples of explosives tested at Capetown and Port Elizabeth (including exudation tests) numbered 126, which all passed with the exception of one doubtful case. 1065 samples of safety fuse were tested, of which 28 were rejected. (See also this J., 1912, 46.)—T. St.

Explosion : Report on the circumstances attending the —— of an Elswick Exploder No. 10, which occurred on the 16th August, 1912, *at the Works of Sir W. G. Armstrong, Whitworth and Company, Limited, Scotswood, Newcastle-upon-Tyne, in the County of Northumberland.* Major H. Coningham, H.M. Inspector of Explosives.

The Elswick Exploder No. 10 is made of bronze and consists of a base percussion fuse to which is attached a gaine filled with explosive. The base fuse contains a percussion pellet held in position with three centrifugal bolts. On firing a shell the bolts fly out, and on impact or graze the pellet moves forward and the detonator, which contains 3½ grains of ordinary cap composition and is at the front end of the pellet, is fired by striking against a needle. This ignites a charge in the pellet, the flash from which passes to a magazine plug containing a powder pellet which explodes the composition in the gaine, and so the explosive in the shell. At the rear end of the cavity of the percussion pellet there is a copper washer which serves, amongst other functions, to prevent the pellet rebounding on the shock of the discharge. Three fuses from each batch are subjected to dropping tests which, to be satisfactory, must cause no portion of the internal parts to be disarranged. At the time of the accident two men were engaged in packing exploders into wooden transport boxes lined with zinc, each exploder being contained in a stout cardboard cylinder. There would appear to be no doubt that one of the exploders was dropped gaine end downwards and that it exploded on hitting the table. The distance the exploder fell was probably only a few inches. The explosion did not communicate to any other exploders. The man concerned received very severe injuries from which he died about two hours afterwards. The other man was injured somewhat, as was a girl who was just leaving the compartment at the time of the explosion. The damage done to the room was very slight. Chemical tests made on the explosive from one of the gaines in the building showed it was in very good condition, and the most probable cause of the explosion is considered to be that the centrifugal bolts were not in their recesses in the percussion pellet. This might have resulted from a slight excess of material in the copper washer, the percussion pellet being thereby forced forward a little out of place. After the accident all the exploders in the room were taken to pieces and were found to be correct in all details. Three fuses from the batch had previously been tested as described with satisfactory results. The company are adopting various modifications in the internal arrangements of the fuse to ensure as far as possible against a recurrence of an accident of a similar nature.—T. St.

Report of Explosions in Mines Committee. See IIa.

Patents.

Blasting explosives ; Manufacture of ——. O. Silberrad, Buckhurst Hill. Eng. Pat. 13,860, June 10, 1911.

The liquid nitration products from coal-tar, prepared according to Eng. Pat. 13,861 of 1911 (see under III., p. 978), termed "nitrol," are employed in the manufacture of blasting explosives. A stable blasting explosive is composed, for example, of the following mixture :—Nitrol, 15 to 25 parts ; oxygen-bearing salts (chlorates, perchlorates, nitrates), 50 to 85 parts ; soluble nitrocellulose or collodion-cotton, up to 5 parts ; preservative (alkali bicarbonate or ammonium benzoate), 0·1 to 1 part ; wood meal, up to 5 parts. A mixture of nitroglycerin, 80 to 90 parts ; soluble nitrocellulose, 8 to 12 parts ; nitrol, 5 to 10 parts, constitutes a blasting jelly of lowered freezing point and increased plasticity. Further, a gelignite may be prepared of the following ingredients :—Nitroglycerin, 58 to 60 parts ; soluble nitrocellulose, 3 to 6 parts ; potassium nitrate, 20 to 40 parts ; wood meal, *nil* to 6 parts ; nitrol, 1 to 10 parts ; and a trace of sodium bicarbonate.—T. F. B.

Nitro-compounds or other chemical substances ; Melting apparatus for liquefying ——. Deutsche Sprengstoff-A.-G. Ger. Pat. 249,978, Jan. 3, 1912.

The floor of the melting vessel slopes towards the discharge opening, and the side walls are inclined to the floor, so that the vessel is wider at the top than at the bottom. The floor is provided with an annular discharge trough leading to the outlet opening and in front of the latter is a screen formed of tubes, through which a heating agent is passed, in order to prevent stoppage of the outlet opening.—A. S.

Explosives. W. Fairweather, London. From Dynamit Act.-Ges. vorm. A. Nobel und Co., Hamburg, Germany. Eng. Pat. 19,577, Sept. 2, 1911.

See U.S. Pat. 1,036,906 of 1912 ; this J., 1912, 954.—T.F.B.

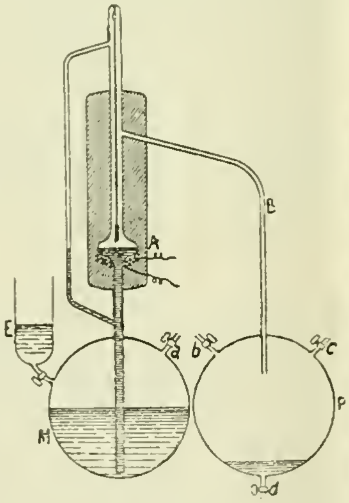
Explosives containing common resin ; Method of producing ——. O. B. Carlson, Mânsbo, Assignor to O. F. Carlson, Stockholm. U.S. Pat. 1,038,847, Sept. 17, 1912.

See Eng. Pat. 5707 of 1910 ; this J., 1911, 448.—T. F. B.

Manufacture of red phosphorus by heating yellow phosphorus and of phosphorus sesquisuphide by heating yellow or red-phosphorus with sulphur in presence of catalysers. Ger. Pat. 247,905. *See* VII.

XXIII.—ANALYTICAL PROCESSES.

Distillation of easily decomposable liquids ; Apparatus for the distillation of mercury in vacuo and for the ——. L. Dunoyer. Ann. Chim. Phys., 1912, [8], 26, 419—432. Chem. Zentr., 1912, 2, 1173—1174.



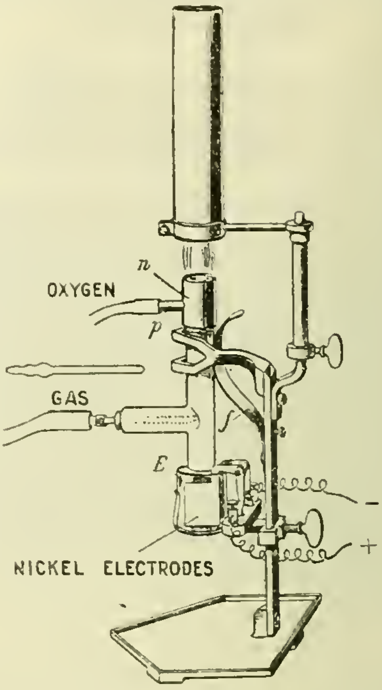
A modified form of the author's apparatus for the distillation of mercury (see Fr. Pat. 426,036 of 1911 ; this J., 1911, 962) is suitable for the distillation of easily decomposable liquids. The liquid is introduced into the funnel, E, and suction is applied through *a* and *b*, the taps, *c* and *d*, being closed. Before the desired degree of vacuum is attained, the liquid is allowed to flow into M from E, and the tap, *a*, is closed. The degree of suction is then regulated so that the liquid rises into the bulb, A, as shown in the figure. This bulb is surrounded by a heating coil, which is itself embedded in a block of heat-insulating material. The liquid distils from A into P, the connecting tube, B, being provided with a cooling jacket.—A. S.

Thermo-couples ; Base metal ——. O. L. Kowalke. Eighth Int. Cong. Appl. Chem., 1912. Met. and Chem. Eng., 1912, 10, 585.

Comparisons of different thermo-couples of base metals with a standardised platinum couple in an electrically heated tube furnace showed that with couples of nickel-chromium and nickel-iron, nickel-iron and nickel containing a little iron, nickel and nickel-steel, and nickel-copper and iron-manganese, heated over 4 in. and 15 in. respectively, the error is not greater than 25° at 1000° C. The nickel-chromium nickel-iron couple undergoes a marked change after being heated for 24 hours at 800° C., and then gives indications resulting in differences of over 100° C. at 35 millivolts. With a couple of nickel-steel and nickel containing a little aluminium, there is a decided point of inflection, which would introduce difficulties in arranging a scale for the indicating instrument. When using couples of base metals, they should be frequently calibrated.—A. S.

Polarisation ; Sodium lamps for ——. E. Beckmann. Ber., 1912, 45, 2523—2529.

In using the ordinary method of producing a sodium flame for polarimetric work, it is difficult to secure lasting uniform illumination, and considerable quantities of sodium chloride are volatilised, with detriment to the atmosphere and possibly to the polarimeter. In the burner represented in the figure, a small electrolytic vessel, E, provided with nickel electrodes, and containing a 2—4 per cent. solution of sodium hydroxide, is situated at the base of the gas-mixing tube. Electrolysis is conducted at such a rate that the minute bubbles of gas evolved give the liquid a somewhat turbid appearance. By this effervescence sufficient sodium is projected out of the liquid to colour the gas flame as intensely as when sodium chloride is used in the ordinary way. The gas-mixing tube is of porcelain, quartz-glass, or similar material, and is held in position by the spring, *f*. The current required for electrolysis may be obtained from two accumulators or three dry-cells. If desired, the intensity of the flame colouration may be very much increased by surrounding the flame with a zone of oxygen. For this purpose the top of the burner is provided with an outer porcelain or iron jacket, *n*, the intermediate annular space being supplied with oxygen by the tube, *p*. The oxygen may be prepared from hydrogen peroxide and bleaching powder in a Kipp's apparatus. It has been found that for the production of coloured flames the colouring salt need only be introduced into the outer envelope of the flame. The author has accordingly devised a second type of burner, in which a small annular electrolytic vessel, containing cylindrical nickel electrodes, surrounds the upper part of the gas-mixing tube, and is made of porcelain in one piece with the latter. This electrolytic vessel is provided with an annular cover which leaves a space 1·5 mm. in width round the tube of the burner, and the latter projects about 2 mm. above the cover. In order to increase the intensity of illumination, oxygen may be fed to the outside of the flame, or the coal gas may be replaced by hydrogen. In the latter case the air holes at the base of the burner must be closed. The hydrogen may be prepared in a Kipp's apparatus, since only a small flame is required. In employing flames of very high temperature, the colour produced is not quite of the same quality as at lower



temperatures, and it is therefore advisable to employ a chromate filter in the polarimeter. The apparatus described have been patented.—J. H. L.

Iodides in sulphuric acid solution ; Other applications of the process of precipitation of —— [*Determination of arsenic and antimony in presence of tin, and of arsenic in copper*]. G. Bressanin. Gaz. chim. ital., 1912, 42, II., 97—101. (See also this J., 1912, 90, 93, 332.)

Tin, like arsenic and antimony, is precipitated by potassium iodide from solution in sulphuric acid of 50° B. (sp. gr. 1·53): the canary-yellow precipitate is easily soluble in hydrochloric acid. With stannic salts the precipitate consists of stannic iodide, and with stannous salts the stannous iodide first produced appears to undergo more or less rapid oxidation to the stannic compound, so that tin cannot be determined iodometrically as in the case of arsenic and antimony (this J., 1912, 93). If the tin be first oxidised to the stannic condition, it does not interfere with the determination of arsenic and antimony by the method previously described (*loc. cit*). With suitable modifications, the iodometric method for the determination of arsenic may be applied to the determination of that element in copper. 0·5 grm. of the copper is dissolved in 5 c.c. of *aqua regia*, the solution is evaporated till acid fumes are no longer evolved, and the residue is dissolved in about 250 c.c. of sulphuric acid of 50° B. (sp. gr. 1·53). The solution is treated with 25 c.c. of a 30 per cent. solution of potassium iodide, and after 20 minutes, the liquid is decanted through a filter of very fine asbestos connected with a pump. The precipitate (cuprous iodide and arsenic tri-iodide) is next transferred to the filter and washed with 30—40 c.c. of sulphuric acid (50° B., sp. gr. 1·53) containing 5 per cent. of the 30 per cent. solution of potassium iodide. The arsenic tri-iodide is then dissolved from the filter by a dilute solution of sulphurous acid, which also removes any remaining free iodine. The solution, after filtering if necessary, is titrated with iodine in presence of starch to oxidise the excess of sulphurous acid, and then after making alkaline with sodium bicarbonate, the arsenic is determined by continuing the titration with iodine as described previously (*loc. cit.*).—A. S.

Standard methods for determining the constituents of foundry coke. *See* IIa.

Titration of copper salts with titanium trichloride. Moser. *See* VII.

Determination of enclosed slag in steel. Mars and Fischer. *See* X.

Influence of impurities in "tough-pitch" copper, with chief reference to antimony. [*Determination of antimony in copper.*] Johnson. *See* X.

Determination of glycerol in fats. Willstätter and Madinaveitia. *See* XII.

Decomposition of glutamates on heating in aqueous solution ; and a new optically-active non-sugar [*and its influence in the double polarisation method of determining sucrose*]. Staněk. *See* XVII.

Determination of the bitter substances of hops. (1) Adler. (2) Hermann. *See* XVIII.

Bromometric determination of formic acid. Mäder. *See* XX.

Patents.

Gas : Means for collecting average samples of ——. H. J. Westover, New York. U.S. Pat. 1,037,695, Sept. 3, 1912.

In an apparatus for collecting an average sample of gas from a furnace, the sample is withdrawn by an automatic collector from a tube through which a strong current of the furnace gas is flowing under the action of a steam ejector at the outlet end.—H. H.

Calorimeters. C. Féry, Paris. Eng. Pat. 13,270, June 5, 1912. Under Int. Conv., Nov. 13, 1911.

See Fr. Pat. 436,330 of 1911 ; this J., 1912, 461. T. F. B.

Books Received.

The World's Cane Sugar Industry, Past and Present. By H. C. Prinsen-Geerligs. Norman Rodger, Altrincham, Manchester. 1912. Price 12s. net.

Large 8vo volume containing 369 pages of subject matter with 7 illustrations in the text, 7 plates, and 12 maps; also an appendix, a general index, and an index of geographical and proper names. The subject matter is classified as follows:— Part I. General history of the cane sugar industry: (1) from the beginning till the introduction of the "Continental system"; (2) from the introduction of the "Continental system" down to the present day. Part II. Condition of the cane sugar industry in the different countries of production. Two diagrams are given showing the world's production of raw sugar in the different countries in 1900 and 1910 respectively. The appendix contains the text of the Brussels Sugar Convention; a list of additional duties to be levied from bounty-fed sugar imported into countries adhering to the Brussels Convention; and tables of measures, weights, and currency mentioned in the book, with their British equivalents.

The Simple Carbohydrates and the Glucosides. By E. Frankland Armstrong, D.Sc., Ph.D., Fellow of City and Guilds of London Inst. One of the series of Monographs on Biochemistry edited by R. H. A. Plimmer, D.Sc., and F. G. Hopkins, D.Sc., F.R.S. Second Edition. Longmans, Green, and Co., 39, Paternoster Row, London. Also New York, Bombay, and Calcutta. 1912. Price 4s. net.

Royal 8vo volume containing 133 pages of subject matter, a full bibliography, and an alphabetical index. The system of classification adopted is as follows:— (1) Glucose. (2) Chemical properties of glucose. (3) Hexoses and pentoses. (4) Disaccharides. (5) Relation between configuration and properties. (6) Hydrolysis and synthesis. (7) Natural and synthetical glucosides. (8) Function of carbohydrates and glucosides in plants.

Die Existenz der Moleküle. Von The Svedberg, Professor an der Universität Upsala. Akademische Verlagsgesellschaft m. b. H. Leipzig. 1912. Price M. 12.

8vo volume, containing 239 pages of subject matter, with 76 illustrations, and alphabetical indexes of subjects and authors. The text is classified as follows:— Multimolecular Phenomena. I. Light absorption. 1. Colourimetric measurements. 2. Spectroscopic measurements. II. Diffusion. Paucimolecular phenomena. 1. Brownian movements. 2. Spontaneous variations of concentration in radio-active solutions and gases.

Untersuchungen über die Bildungsverhältnisse der ozeanischen Salzablagerungen insbesondere des Stassfurter Salzlagers. Von J. H. van't Hoff, und W. Meyerhoffer, J. d'Ans, E. F. Armstrong, H. Barschall, O. Biach, W. C. Blasdale, G. Bruni, D. Chiaraviglio, F. G. Cottrell, H. M. Dawson, R. B. Denison, F. G. Donnan, T. Estreicher-Rozbiersky, H. von Euler-Chelpin, A. O'Farelly, F. Farup, N. Grassi, W. Hinrichsen, G. Just, N. Kassatkin, F. B. Kenrick, L. Lichtenstein, H. Sachs, A. P. Saunders, N. Smith, G. L. Voerman, F. Weigert, Percy Williams, Harold

Wilson. Herausgegeben von Prof. Dr. H. Precht und Prof. Dr. Ernst Cohen, mit einer Gedächtnisrede auf van't Hoff von Prof. Dr. Emil Fischer, Exz. Akademische. Verlagsgesellschaft m. b. H. Leipzig. 1912. Price M. 16.

Large 8vo volume, containing 374 pages of subject matter, with 8 tables and 39 illustrations. There is no alphabetical index, but a detailed table of contents is provided for the fifty-two chapters into which the work is divided including two reports by Van't Hoff on the scientific investigation of the German potash deposits.

Utilisation of Atmospheric Nitrogen. By Thomas H. Norton. Dept. of Commerce and Labour. Bureau of Manufactures. Special Agents Series. No. 52. Government Printing Office, Washington, U.S.A. 1912.

8vo volume, containing 176 pages of subject matter, and a bibliography of two pages. There are 5 illustrations. The text is classified as follows:—I. Present supply of nitrogen. II. Available sources. III. Synthetic methods for the production of ammonia, etc. IV. Synthesis of nitric acid from atmospheric nitrogen and oxygen. V. Schönherr process. VI. Pauling process. VII. Synthesis of hydrocyanic acid and the cyanides from atmospheric nitrogen. VIII. Calcium cyanamide from atmospheric nitrogen, and costs. IX. Coal waste and peat as sources of ammonia. Bibliography.

Treatise on General and Industrial Inorganic Chemistry. By Dr. Ettore Molinari. Third revised and amplified Italian edition. Translated by Dr. Ernest Feilmann. J. and A. Churchill, 7, Great Marlborough Street, London. 1912. Price 21s.

This is a translation of Molinari's original work, noticed in this J., 1910, 1415, and consists of a large 8vo volume, containing 672 pages of subject matter, with 280 illustrations in the text, and two phototype plates. There is an alphabetical index of names and subjects. The scheme of arrangement is as follows:—I. General. (i), Prefaces. (ii), History of Chemistry. (iii), Laws of matter in the gaseous state. (iv), Chemical equations. (v), Matter in the liquid state. (vi), Study of dilute solutions. (vii), Matter in the solid state. II. Non-metals. (i), Classification of the elements. (ii), Hydrogen compounds of the elements. (iii), Oxygen compounds of the halogens, etc. (iv), Vanadium. Niobium. Tantalum. (v), Carbon group. (vi), Silicon. (vii), Titanium. Zirconium. Rare earths. Boron. III. Metals. (i), Alkali metals. (ii), Alkaline earth metals. (iii), Magnesium sub-group. (iv), Copper, silver and gold. (v), Trivalent metals. (vi), Tetravalent metals. (vii), Bismuth. (viii), Chromium, molybdenum, tungsten, uranium. (ix), Manganese. (x), Iron and its metallurgy. Nickel. Cobalt. (xi), Platinum group.

A Practical Guide to Patents for Inventions. By E. R. Royston (Fellow Char. Inst. Pat. Agents and Consulting Engineer). Tower Building, Water Street, Liverpool. Danes Inn House, 265, Strand, London, W.C. 1912. Price 6d.

Pamphlet, containing 67 pages of text, with the necessary information concerning British and Foreign patents, copyrights, Exhibitions, Licenses, Registration of trade marks, etc.

Subject List of Works on Mineral Industries in the Library of the Patent Office. Part I. Coal Mining. New Series. WN—XX. 39. Patent Office, Southampton Buildings, W.C. Price 6d.

Review of the Trade of India in 1911–12. Wyman and Sons, Fetter Lane, London, E.C. [Cd. 6345.] Price 1s. 1d.

Foolscap volume of 99 pages, with map, being a review of the trade of British India with foreign countries during the official year ended March 31st, 1912.

The Elements of Qualitative Chemical Analysis with Special Consideration of the Application of the laws of Equilibrium and of the modern theories of Solution. By Julius Stieglitz, Professor of Chemistry in the University of Chicago. Vol. I. Parts I. and II. Fundamental Principles and their Application. The Century Co., New York, U.S.A., 1912. Price $1.40.

8vo volume, containing 308 pages of subject matter, with 14 illustrations, and an alphabetical index. Part I. of this work, devoted to fundamental principles is classified as follows:—I. and II. Osmotic pressure and theory of solution. III. Theory of ionization. Ionization and electrical conductivity. Ionization and osmotic pressure. Ionization and chemical activity. IV. Chemical equilibrium. The law of mass action. V. Physical or heterogeneous equilibrium. The colloidal condition. VI. Simultaneous chemical and physical equilibrium. The solubility- or ion-product. Part II. Systematic analysis, and the application of fundamental principles.

Vol. II. Parts III. and IV. Laboratory Manual. Price $1.20.

This volume contains 148 pages of subject matter, and an alphabetical index. The book has blank pages interspersed with the text, for notes, etc. Its general scheme is as follows:—Part III. Study of reactions. Part IV. Systematic analysis. a. Preliminary analysis. b. Solution of substances for the systematic analysis for metal ions. c. Analysis for metal ions of substances soluble in water, hydrochloric acid, nitric acid, or aqua regia. d. Analysis for the acid ions of substances soluble in water, acids, or aqua regia. e. Analysis of substances insoluble in water, acids, and aqua regia; the analysis of silicates. Appendix. Table of solubilities. Table of exact solubilities. Reagents and solutions.

The Physics and Chemistry of Mining. An Elementary Class-Book for the Use of Mining Students. By T. H. Byrom. Second Edition. Crosby, Lockwood and Son, 7, Stationers' Hall Court, Ludgate Hill, London, 1912. Price 3s. 6d. net.

Small 8vo volume, containing 188 pages of matter, with 60 illustrations, and an alphabetical index. It comprises matter classified as follows:—I. Physical properties of matter. II. The atmosphere. III. Laws relating to the behaviour of gases, etc. IV. Gaseous diffusion, etc. V. Composition of the atmosphere. VI. Sundry constituents of the atmosphere. VII. Water. VIII. Carbon. IX. Fire-damp. Combustion Coal dust and its action. X. Explosives. XI. Composition of various coals and fuels. XII. Methods of analysing coal. XIII. Strata adjoining the coal measures.

Elementary Chemical Theory and Calculations. By Joseph Knox, D.Sc. Gurney and Jackson, 33, Paternoster Row, London, E.C. 1912. Price 2s. nett.

Small 8vo volume, containing 100 pages of matter, and an alphabetical index. Answers are given to all the problems.

Der Kautschuk. Seine Gewinnung und Verarbeitung. Von K. W. Wolf-Czapek. Union Deutsche Verlagsgesellschaft. Zweigniederlassung, Berlin. 1912. Price M. 4.

Small volume, pocket book size, with 128 pages of matter, with 50 illustrations and tables, and an alphabetical index of subjects. The text is arranged as follows:—I. Origin and extraction of india-rubber. II. India-rubber as a commercial article. III. Chemistry of india-rubber. IV. Additions to rubber. V. Preparatory operations in the manufacture. VI. Solutions of caoutchouc. VII. Vulcanisation. VIII. Manufacture of soft rubber articles. IX. Fabrics "proofed" with caoutchouc. X. Threadless rubber goods. XI. Manufacture of hard rubber goods.

Journal of the Society of Chemical Industry.

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Scottish Section.

Meeting held at Glasgow on Tuesday, February 20th, 1912.

PROFESSOR THOMAS GRAY IN THE CHAIR.

THE ACIDITY AND ALKALINITY OF NATURAL WATERS.

BY JAMES WALKER, D.SC., F.R.S., AND SYDNEY A. KAY.

(University of Edinburgh.)

Natural waters may be acid, neutral, or alkaline according to the substances which are dissolved in them. The acidity or alkalinity of water is usually determined by means of an indicator, but since different indicators yield different results, and as the selection of an indicator is largely a matter of individual habit, it not infrequently happens that one and the same sample of water is reported as acid by one analyst, and as alkaline by another.

An accurate and reliable method of estimating the actual acidity or alkalinity of a water is by means of measurements of electromotive force with hydrogen electrodes. Such measurements, however, though accurate, are troublesome to make, and recently a more convenient method has been applied to the investigation of solutions such as are met with in natural waters. It depends on the use of standard solutions of known acidity or alkalinity, and comparison, by means of an indicator, of such known solutions with the unknown solutions whose acidity is to be determined.*

It is the object of this paper to explain the method in theory and in its practical application to waters which are nearly neutral, to give directions for the preparation of the solutions of known acidity and alkalinity, and finally to suggest a standard in terms of which the acidity or alkalinity may be simply expressed.

Neutrality, acidity, and alkalinity.—The properties which we include under the general term "acidity" are due to the presence of the acid ion, hydrion, H˙, in water; the properties which we include under the general term "alkalinity" are due to the alkaline ion, hydroxidion, OH′, in water. Absolutely pure water has these two opposed substances in chemically equivalent proportions, and is neutral, and all truly neutral solutions have the same concentration of hydrion and hydroxidion in them as pure water. The concentrations of the two ions are of course equal, and the following table contains the values given by A. A. Noyes for different temperatures.

0° C.	$0{\cdot}30 \times 10^{-7}$ normal
18° C.	$0{\cdot}68 \times 10^{-7}$,,
25° C.	$0{\cdot}91 \times 10^{-7}$,,
100° C.	$6{\cdot}9 \times 10^{-7}$,,

Now, according to the ionisation theory, the product of the concentrations of hydrion and hydroxidion in any dilute solution must always be equal to the corresponding product for pure water at the same temperature. All solutions then with a hydrion concentration greater than $0{\cdot}68 \times 10^{-7}$ at 18° are acid, and the hydrion concentration may be taken as a measure of the extent of the acidity. All solutions with a smaller concentration of hydrion than $0{\cdot}68 \times 10^{-7}$ are alkaline, and the hydrion concentration may be taken likewise as a measure of alkalinity.

Relative acidity and alkalinity.—For theoretical purposes this mode of stating acidity or alkalinity in terms of hydrion (or hydroxidion) concentration is convenient, but for the practical requirements of the water analyst it is unsuited, owing to the rapid variation with temperature, and also to the smallness of the concentrations dealt with.

We therefore propose for practical purposes that the acidity or alkalinity of a solution be stated in terms of the acidity or alkalinity of ideally pure water at the same temperature. In short, we propose that (just as in the case of density, specific heat, and many other physical properties) water be taken as standard substance and that the acidity or alkalinity of all aqueous solutions be referred to it under the same conditions. We therefore take the acidity of pure water = 1, and the alkalinity of pure water = 1 at all temperatures, no matter what the actual value or the hydrion concentration may be. That the acidity and alkalinity of pure water should be each made equal to 1 is necessary, since neutral water can have no excess of either.

Thus a water which has a hydrion concentration of $1{\cdot}36 \times 10^{-7}$ and a hydroxidion concentration of $0{\cdot}34 \times 10^{-7}$ at 18° would be stated to have a *relative acidity* of 2 and a *relative alkalinity* of 0·5. Under this system the product of relative acidity and relative alkalinity must always be equal to 1, that being the value of the product for pure water. In practice the value of the relative acidity alone would be given for acid waters, and of relative alkalinity alone for alkaline waters.

Standard solutions.—The next requisite is a set of standard solutions of known relative acidity and alkalinity. Such a set has been used for a long time by workers on indicators, and the solutions have been set up and checked by means of measurements of electromotive force. The standards are made by mixing equivalent solutions of mon-acid and di-acid phosphates in different proportions.

TABLE I.

Relative acidity.	Na_2HPO_4.	KH_2PO_4.
300	0	1000
100	11	989
50	24	976
40	30	970
30	42	958
20	63	937
15	82	918
10	125	875
9	137	863
8	153	847
7	171	829
6	195	805
5	225	775
4·5	244	756
4	268	732
3·5	296	704
3	330	670
2·5	378	622
2	434	566
1·8	461	539
1·6	492	508
1·4	526	474
1·2	567	433
Neutrality.	612	388
Relative alkalinity.		
1·2	660	340
1·4	698	302
1·6	729	271
1·8	754	246
2	776	224
2·5	818	182
3	847	153
3·5	870	130
4	888	112
4·5	902	98
5	914	86
6	931	66
7	947	53
8	957	43
9	965	35
10	971	29
15	990	10
20	1000	0

Two solutions are prepared, one of the salt, $Na_2HPO_4.12H_2O$, containing 23·88 grms. per litre; the other of the salt, KH_2PO_4, containing 9·08 grms. per litre. The former salt is of sufficient purity when clear crystals are picked from a supply of the "chemically pure" substance. It is well to recrystallise the potassium dihydrogen phosphate, and then to dry it first at 100° C., and lastly in a desiccator before weighing off the required quantity. The solutions thus prepared are equivalent and of the molecular concentration N/15.

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* Sörensen, Biochem. Zeit., 21, 131, 22, 352, 1909; A. A. Noyes, J. Amer. Chem. Soc., 1910, 32, 823; G. S. Walpole, Biochem. J., 1910, 5, 207.

The preceding table gives the proportions by volume in which they must be mixed in order to give the different degrees of relative acidity or alkalinity.

Experimental Method.

Two methods of procedure are described below. The first method is simple and rapid, and a preliminary examination of the sample should be made by this method. If the sample is devoid of colour, as compared with distilled water, this method gives sufficiently accurate results; if, however, the water is peaty, or has a decided colour, a further examination must be made by the second method. If the water sample is turbid, the suspended matter must be allowed to subside and a clear portion syphoned off for use. Filtration must be avoided, since contact with filter-paper almost invariably increases the acidity of the water.

First Method.—Three solutions only are required—the two phosphate solutions and the neutral mixture. The water sample is first compared with the neutral standard, in order to ascertain whether it is decidedly acid, nearly neutral, or decidedly alkaline. To accomplish this, 25 c.c. of the water and of the neutral standard are measured into two porcelain basins of about 120 c.c. capacity, 1 c.c. of a 0·1 per cent. azolitmin (Kahlbaum) solution is added to each, and the tints are compared.

If the sample proves to be decidedly acid, 25 c.c. of the acid phosphate is measured into another similar basin, the indicator is added, and the alkaline phosphate is run in from a burette until the colour of the mixture matches that of the water sample with indicator. The volume of the water sample, in this preliminary titration, should be kept roughly equal to the volume of the mixed phosphates by adding more of the sample at intervals, and a second titration should then be made, commencing with a volume of the sample such that, when a good match is obtained, the bulk of liquid in the two vessels is practically the same. In this way, the concentration of the indicator and hence the *depth* of colour in the solutions compared is the same, and the exact matching of the *tints* is easier. The amount of indicator may be varied to suit personal preference, care being taken to add the same quantity to each of the solutions under comparison. Cork ("suberit") rings make convenient supports for the basins. The titration should be made in good diffused light. The acidity of the sample, corresponding with the composition of the phosphate mixture at the matching point, is given in Table II.

TABLE II.

For decidedly acid waters.

Volume of KH_2PO_4 used = 25 c.c.

Acidity.	Volume of Na_2HPO_4 required.
300	—
100	0·28
50	0·63
20	1·68
15	2·23
10	3·57
9	3·97
8	4·52
7	5·18
6	6·05
5	7·26
4·5	8·07
4	9·15
3·5	10·5
3	12·3
2·5	15·2
2	19·2
1·8	21·1
1·6	24·2
1·4	27·7
1·2	32·7
(Neutral) 1·0	39·4

TABLE III.

For nearly neutral and alkaline waters.

Volume of Na_2HPO_4 used = 25 c.c.

Acidity.	Alkalinity.	Volume of KH_2PO_4 required.
	20	—
	15	0·24
	10	0·75
	9	0·91
	8	1·11
	7	1·39
	6	1·77
	5	2·35
	4·5	2·72
	4	3·15
	3·5	3·74
	3	4·52
	2·5	5·58
	2	7·22
	1·8	8·15
	1·6	9·30
	1·4	10·8
	1·2	12·9
(Neutral) 1·0	1·0	15·8
1·2		19·1
1·4		22·6
1·6		25·8

If the sample is alkaline or nearly neutral, 25 c.c. of the alkaline phosphate is measured into a basin, the indicator is added, and the acid phosphate is run in until a good match is obtained. The acidity or alkalinity of the sample, corresponding with the volume of acid phosphate required, is given in Table III.

Second method.—If the water sample is coloured, the above method gives inaccurate results. The colour of the water itself so modifies the colour of the indicator, that it is difficult to match the tints satisfactorily, and the effect of the yellow colour of a peaty water, for example, results in the measured acidity of the sample being too high. In order to overcome this difficulty, it is necessary in such cases to compensate for the colour of the water under examination. It saves time, however, to make a preliminary titration by the first method in order to obtain a rough estimate of the acidity or alkalinity.

The further examination is then carried out by matching the water sample and the phosphate standards in 50 c.c. Nessler tubes.* The colour of the water sample is compensated for by causing the light which illuminates the phosphate standard to pass through another tube containing the water sample (without indicator), whilst the light which reaches the eye through the water sample (with indicator) is made to pass through a similar tube containing distilled water. The tubes are arranged as shown in the figure.

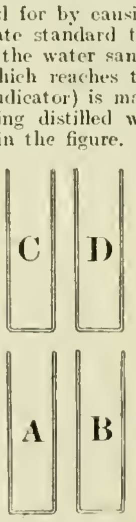

FIG. 1.

A contains distilled water.
B contains the water sample.
C contains the water sample and indicator.
D contains the phosphate standard and indicator.

The four tubes may be held in the hands or, more conveniently, may be supported in a frame, as close together at the upper ends as possible.

The procedure in the case of a coloured water is as follows:—A preliminary examination by the first method is made: suppose for example, that the water is found to be acid, and that it approximately matches a mixture of 25 c.c. of KH_2PO_4 solution with 15 c.c. of Na_2HPO_4 (total volume of mixture = 40 c.c.). Forty c.c. of distilled water is placed in tube A, an equal volume of the water sample in tubes B and C, and 25 c.c. of the acid phosphate in D. One c.c. of 0·1 per cent. azolitmin is added to C and D. The alkaline phosphate is then gradually run into D with frequent stirring (by means of a glass tube on which a bulb of appropriate size is blown) until the tints in C and D match exactly.

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* G. S. Walpole, Proc. Physiological Soc., 1910, **40**, 27.

If the preliminary examination of the water shows it to be nearly neutral or alkaline, 25 c.c. of the alkaline phosphate is measured into D, and the acid phosphate is run in until a good match is obtained. If many samples of water, differing only slightly in acidity or alkalinity, have to be examined, it has been found convenient to prepare a series of standards covering the probable range of the samples. These standards may be prepared in half litre quantities using the proportions given in Table I.

In order to economise the standards, the measurements may be made in tubes holding only 20 c.c. without any loss of accuracy. If no compensation is necessary, one of the tubes is filled to the mark with the sample, a suitable quantity of the indicator is added (0·4 c.c. of a 0·1 per cent. solution), and the tint is compared with that given with various standards, contained in similar tubes with the same quantity of indicator, until one is found which gives the same or the nearest tint.

When compensation is required, the tubes are arranged as in Fig. 1. The tubes A, B, and C contain respectively 20 c.c. of distilled water, the water sample alone, and the water sample with indicator, and other tubes, containing various standards, are tried in the position of the tube D until a good match is obtained.

Influence of dilution on the phosphate standards.—If the standards are diluted with water, their relative acidity is increased. This effect is not due solely to the influence of the carbon dioxide contained in the diluent, since a similar, though less pronounced increase of acidity is observed when the dilution is made with an alkaline tap-water. A ten-fold dilution of the neutral standard with distilled water gave a mixture the acidity of which was 2, and a similar dilution made with tap-water—the relative alkalinity of which was 2·1—produced a mixture with an acidity of 1·2. The acidity of a mixture containing 20 per cent. of the neutral standard in distilled water was 1·5, and that of a 50 per cent. mixture was 1·2.

It is not permissible, therefore, to dilute the standards to any considerable extent, but the error introduced by the use of wet vessels is altogether negligible. For rinsing purposes, tap-water is probably better, as a rule, than distilled water.

Influence of temperature.—A point of some importance was to ascertain whether the total effect of temperature change on the phosphate standards, on the hydrolysis of the bicarbonates in water, and on the indicator would influence to an appreciable extent the results of the colorimetric determination of acidity or alkalinity.

Effect of temperature on the standards.—Three tubes were charged with the neutral standard and azolitmin was added. One of the tubes was cooled in ice, another was heated to 25° C., and the temperature of the third was 18° C. On examining the tints, it was found that the cold standard was acid and the warm standard alkaline, as compared with the standard at 18° C. In other words, cooling increases the acidity. Another experiment showed that the neutral standard at 6° C. exactly matched a standard, the relative acidity of which was 1·2 at room temperature. Similar changes with temperature were observed with acid and alkaline standards.

Effect of temperature on the water sample.—Three tubes containing tap-water and azolitmin at temperatures of 2°, 18°, and 25° C., respectively were compared with each other. It was found that, as in the case of the standards, the effect of cooling was to increase the acidity or diminish the alkalinity of the water. Using standards at room temperature, the alkalinity of the water at 25° C. was found to be 2·0, and that of the water at 2° C. was 1·5.

Total effect of change of temperature.—The separate effects of temperature on the standards and on the water sample almost exactly counterbalance one another, and are therefore without influence on the actual results. A sample of tap-water, for example, was examined and was found to match at 17° C. a standard the alkalinity of which was 1·3. Both tubes were then cooled and at 2° C. were again compared. The water now appeared to be slightly more alkaline than the standard, the actual value being 1·4. Even when the standard was warmed to 20° C. and the water cooled to 2° C., the difference observed was less than 0·2 of a unit.

Within reasonable limits, therefore, the influence of temperature may be neglected, and between, say, 12° C. and 18° C., the results will be accurate to within 10 per cent., *i.e.*, to within 0·1 of a unit in the neighbourhood of the neutral point.

Stability of the standards. The phosphate solutions keep satisfactorily for at least many months without showing appreciable sediment. The stability of the neutral standard was tested after an interval of eight months by comparing it with a freshly prepared standard. The two were identical. After the addition of the indicator the standards do not keep so well. Exposed to light in stoppered bottles the indicator bleaches slowly. In darkness the colour of the indicator does not fade, but the tint slowly changes. Three samples of the neutral standard mixed with indicator were examined after keeping them for eight months in the dark. They were identical in tint but had acquired an apparent acidity of 1·5.

In open tubes, the standards change more rapidly, becoming sometimes acid, sometimes alkaline, according to the state of the laboratory atmosphere. The influence of atmospheric carbon dioxide is very slight and may be neglected. Doubtless the water samples are more sensitive to carbon dioxide than the standards.

Relation between temporary hardness and acidity. In contrast with pure water, which is neutral, distilled water, in equilibrium with air and free from all impurities except dissolved air, is acid. The only substance in the (pure) atmosphere which confers acidity on water is carbon dioxide, and the relative acidity of water in equilibrium with air may be calculated from known data to be about 20.

It is a common experience to find that ordinary distilled water has a marked acidity towards phenolphthalein and, as a rule, the relative acidity will be found to exceed 20. This is due to it containing excess of carbon dioxide derived from the bicarbonates in the water which is being distilled.

Natural waters containing dissolved bicarbonates in addition to carbon dioxide, may be neutral, alkaline, or acid. The degree of hydrolysis of the bicarbonate, which varies with the concentration of the carbon dioxide in the water, is the chief factor which determines the alkalinity (or acidity) and, for a given hardness, if the concentration of the carbon dioxide is fixed, the hydrolysis, and hence the alkalinity of the water will have a perfectly definite value. If air, free from carbon dioxide, is passed through the water, the concentration of the carbon dioxide in the water will ultimately become zero and the water will become alkaline.

Treatment with ordinary air, on the other hand, may either increase or diminish the alkalinity of the water. The concentration of the carbon dioxide in the water, whatever it may originally be, reaches a fixed value at equilibrium, and the "temporary" hardness of the water determines whether the ultimate state of the water will be neutral, alkaline, or acid. In other words, the relative alkalinity of the water, if it is in equilibrium with air, depends on the "temporary" hardness. If the "temporary" hardness of a *natural* water, commonly ascertained by measuring the so-called "alkalinity" with standard acid and methyl orange, is really due to bicarbonates alone, the relative alkalinity of the natural water, after it is brought into equilibrium with air, ought to be equal to that of a synthetic water of the same temporary hardness.

In order to afford a basis of comparison of waters containing only bicarbonate hardness with natural waters, synthetic waters of definite hardness were prepared by adding standard lime-water to distilled water containing carbon dioxide. Two portions of each of these waters, contained in bottles of "Resistance" glass, were taken, excess of carbon dioxide was passed into one until it was quite acid, and air, filtered through a long tube containing cotton wool and washed with water, was aspirated through both for several hours.

The alkalinity of the two portions was then measured in the usual way and the certainty that true equilibrium had been attained was proved by the observation that the alkalinity, or acidity, of the two portions, one of which was, in most cases, originally alkaline and the other acid, attained the same value.

Similar experiments were made with waters containing only magnesium bicarbonate. The alkalinity of the latter is less than that of a water containing the same amount of calcium bicarbonate. The experiments were carried out at room temperature, about 15° C. In cold weather the bottles were immersed in a large vessel of water but, as no attempt was made to keep the temperature quite constant, the results are only approximate.

Synthetic waters containing calcium bicarbonate, in equilibrium with normal air.

Hardness (parts $CaCO_3$ in 100,000).	Acidity.	Alkalinity.
0·25	2·3	—
0·5	1·5	—
1·0	1·0	1·0 (Neutral)
2·0	—	2·3
4·0	—	5·8
5·0	—	7·5

Synthetic waters containing magnesium bicarbonate, in equilibrium with normal air.

Hardness (as parts $CaCO_3$ in 100,000).	Acidity.	Alkalinity.
1	1·0	1·0 (Neutral)
2	—	1·9
4	—	4·2

Kendall[*] has recently determined the solubility at 25° C., 50° C., and 100° C. of calcium carbonate in water which is in equilibrium with normal air. By extrapolation from his results, the solubility at 15° C. appears to be about 0·056 grm. per litre, *i.e.*, the saturated solution has a hardness of 5·6. Accordingly, a water, the hardness of which is greater than 5·6 should deposit calcium carbonate at 15° C. if normal air is passed through it. Equilibrium is reached, however, exceedingly slowly and it was found that, with a water of 20° hardness, the precipitation became visible only after the air current had passed for several hours, and even after 36 hours, the residual hardness was still 9·6°.

Practical applications.

The method sketched out above is of importance as affording a means for determining the *actual* acidity or alkalinity of a water, and not merely the *potential* acidity or alkalinity as given by ordinary titration. It is on this actual state of the water that the rate of its action on metals, etc., depends. For example, a very soft natural water of relative acidity 1·3, had its acidity increased to 5·0 after mechanical filtration with addition of aluminium sulphate. The quantity of aluminium sulphate added was equivalent to not more than half the temporary (bicarbonate) hardness present in the original water, so that the filtered water still possessed temporary hardness and contained no free acid save carbonic acid, to excess of which the high relative acidity was due. Yet the effect of the increased acidity was to increase the action of the filtered water on lead to three times that of the unfiltered water, and render the supply, for this reason, undesirable. The same filtered water was found to act briskly on mixed deposits of rust and the carbonates of lime and magnesia, dissolving the latter and liberating the iron rust.

Meeting held at Glasgow on Tuesday, March 19th, 1912.

PROF. THOMAS GRAY IN THE CHAIR.

THE STARCH INDUSTRY OF GREAT BRITAIN.

BY JOHN TRAQUAIR.

This industry does not appear to have been the subject of any communication to the Journal, although the maize or corn starch industry of America has been dealt with in several papers.[*]

These papers have treated the subject so exhaustively, that I can only venture a few observations on some aspects of the manufacturing process, and review matters of general and historical interest regarding the starch industry of Great Britain. At the same time I hope to indicate some fields of research which promise fruitful results.

The location of this industry is unique. The maize starch industry is centred in Paisley, Scotland, rice starch manufacture being located in England, while to the credit of Ireland stands the whole of the wheat starch produced in the United Kingdom.

The founding of the starch industry in Paisley was due to the fact that in the middle of last century that town was the centre of several starch-consuming industries.

Potato starch had previously been manufactured in Scotland in several small mills, but these only operated during a few months of the year and in seasons when potatoes were plentiful and cheap.

Starch was first made in Paisley by Messrs. Wm. Fulton & Co., of Glenfield, for use in their bleaching and finishing works, and in 1847 they sold their process, rights, etc., to Mr. Wm. Wotherspoon, who transferred the factory to Bladda and then in 1850 to Maxwellton, known from that date as the "Glenfield Starch Works."

The raw material employed was East India sago flour and the process and plant were alike simple. Oak tubs fitted with a removable hand-driven propeller stirrer were used and in each about 200 lbs. crude sago flour was churned with water. After allowing the sago flour to settle for 6 to 12 hours, the supernatant liquor was decanted, and the starch stirred with sufficient calcium hypochlorite bleach of 4½° Tw. sp. gr. to give a thin milk, and allowed to stand for at least 12 hours. The bleach was then removed by repeated washings and the process completed by souring with sulphuric acid and washing by decantation two or three times. By removing the top and bottom layers containing respectively the light glutinous impurities, and any sand, etc., a very pure starch was obtained which was dried in the usual way. Glenfield starch was packed in blue paper packets with a green label, and aided by energetic advertising the sales of this starch during the '60's, '70's and '80's reached a substantial figure, over 500 tubs being in operation.

The introduction of rice starch, however, gradually displaced Glenfield starch from the premier position as a household laundry starch. Sago starches are still made in Glenfield Starch Works for textile and other purposes but the process and plant has been modernised.

Starch was used to stiffen buckram, and in the early fifties Messrs. Brown Johnston & Co. (one of the leading buckram makers at that time, and now the only one in Paisley), in searching for a suitable starch other than sago, decided to use Indian corn starch then being made on a small scale in America. Thus the firm of Messrs. Brown & Polson came into existence and started operations in 1854.

At one time there were some 10 plants manufacturing maize starch in Paisley and neighbourhood: at present there are five. These grind about 600 tons of Indian corn weekly and produce roughly 20,000 tons of starch and corn flour per annum.

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[*] Keadall, Phil. Mag., 1912, 958.

[*] This Journal Page 617, 1900. Prof. C. F. Chandler's Presidential Address.
,, ,, ,, 4, 1902. Manufacture of Maize Starch. Dr. G. Archbold.
,, ,, ,, 343, 1909. The American Industry of Corn Products. Dr. T. B. Wagner.
,, ,, ,, 527, 1910. Maize Products and Maize Starch and its Products. Dr. W. P. Kaufmann.

The process of manufacture in Paisley is practically identical with that employed in America, the raw material being maize or Indian corn imported from various and often widely different sources.

For practical purposes the original corn may be regarded as made up of (a) husk or enveloping cellular tissues; (b) germ; (c) starch containing tissues, resolved by the manufacturing process into (1) starch, (2) gluten—by-product. For each of the non-starch components there is a characteristic chemical criterion, thus the husk yields a high proportion of furfural on distillation with acids. The pure maize husk yields about 20 per cent. and it is easy to separate the husk in a relatively pure condition.

I have investigated its use as a paper-making material. It shows only 13 per cent. of actual cellulose when estimated by any of the standard analytical methods, but when heated to boiling point with a 1 per cent. solution of caustic soda it yields at once a soft fibrous pulp.

After removing the alkaline liquor by washing and neutralising, the product, after a slight bleaching and beating, yields a soft waxy tissue of great transparency. The product has been tested on a large scale but the difficulty of removing small circular black specks, which seem to be present in certain classes of corn, seriously impairs its value for white papers. As the product has a cattle food value, at present about £6 per ton, its field is limited from a paper-maker's point of view.

(b) The germ is separated in most of the Paisley works and the oil is extracted, etc., as described in the papers referred to.

(c) Starch-containing tissue. The separation of the maximum percentage of starch of a marketable quality is the main object of the starch manufacturer. The process is almost entirely mechanical and consists of wet grinding followed by a graduated separation of the starch by sieving and settlement on runs or tables. The preliminary process of steeping has an important bearing on the yield of starch and is the only one having a chemical basis.

After a cleaning process the corn is steeped, generally in large wooden tuns for 50 to 60 hours, with warm sulphurous acid water. The water is circulated and the temperature is not allowed to exceed 140° F. The sulphurous acid was at first used merely to keep the corn sweet, but not until later was it realised that it prevents fermentation, bleaches the corn, and improves the colour of the starch, and has a softening effect on the starch—containing tissues, and therefore assists the separation of the starch in the subsequent process. The effect of the weak sulphurous acid solution is similar in character although much different in degree to the bisulphite treatment of wood in the production of sulphite pulp.

The corn absorbs 60 per cent. of its weight of water and this enters by the germ end and does not penetrate the waterproof cellular husk. By steeping in a solution of a suitable colour, the rate and direction of penetration can be followed.

The other important constituent of the starch-containing tissues is the maize glutens; these at present have only a value as cattle food and a large and fruitful field of research is open for their application in various industrial spheres.

During the process of starch manufacture, gluten is separated at three points: (1) *On the shaker sieves.* The residue from these consists mainly of husk and the more resisting portions of the corn and only contains from 12 to 15 per cent. of actual gluten. (2) *The tailings from the runs.* These consist mainly of gluten with light starch in a finely divided condition as it has gone through sieves of at least 140 meshes per inch. The percentage of gluten varies considerably according to the general settling conditions in the runs but from 25 per cent. to 35 per cent. gluten, is the usual limit of variation. (3) *Gluten from tuns.* In the purifying process the starch from the runs is treated with a weak solution of caustic soda which saponifies the oil and dissolves the easily soluble proteids, forming an emulsion with the remaining gluten. This product varies according to the depth to which the gluten layer is removed on settling, but usually contains from 10 per cent. to 15 per cent. gluten. It has good sizing properties and is used in connection with the jute and cotton industries where a first-class colour is not essential.

The run gluten is the most important, as it is produced in large quantity in a finely divided condition. Pure gluten is easily obtained therefrom, by heating the product with water, removing the swollen starch by diastatic treatment and filtering off the flocculent gluten. Soluble gluten in a pure form is also easily separated by acidifying the alkaline liquor from the tuns with acetic acid and collecting the precipitate. The real problem is to find a suitable solvent for the maize gluten and one which will give a concentrated solution.

T. J. Osborne in a paper on "The proteids of the maize kernel" has dealt exhaustively with the nature and composition of these bodies. (See J. Amer. Chem. Soc., 1897, 525—532; see also "Hydrolysis of the proteins of maize"—T. J. Osborne and S. H. Clapp; Amer. J. Physiol., 1908, **20**, 177—199).

E. Donard and H. Labbé ("Albuminoid substances from maize," Comptes rend., **135**, 744—746) have dealt specially with the alcohol-soluble albuminoids from maize.

The run gluten, when separated from the 3 or 4 per cent. of oil, which is unfortunately always present, dries to a hard mass; 30 per cent. of this is soluble in 70 per cent. alcohol, being the product zein, or maizin, 20 per cent. is soluble in 0·2 per cent. caustic soda in the cold, the remainder being more insoluble. More drastic chemical treatment at higher temperatures, to effect the solution of this insoluble gluten, generally leads to its decomposition.

The future development of the maize starch industry seems to lie along the line of (1) technical utilization of the maize glutens; (2) the application of diastatic conversion to the production of starch sugar in a concentrated solution; (3) new acid conversion methods and products.

The peculiarity of the British position is that the corn is all imported and shows a wide diversity of quality and origin. Maize or Indian corn from America, Europe, Egypt, India, South Africa, and Argentina is used indiscriminately and as opportunity offers. This state of affairs calls for some flexibility in the process to enable the best results to be obtained. The moisture variation is not so great, usually 12 per cent. to 15 per cent. although as high as 19·5 per cent. is sometimes recorded, but with the higher moistures the corn is frequently in bad condition owing to heating during the voyage.

Some corns are very hard and give a poor yield, and the process and grain used, requires selection according as the main product is an edible corn flour, or a laundry starch. For example, the small round Danubian corn gives the finest corn flour with a process where a minimum of chemicals and a maximum of pure water are used, whereas the big flat white American corn gives the largest yield and the strongest starch.

Commercial position. The position of the industry is really a precarious one. The import of American maize starch exceeds the home production, and represents the surplus of the enormous production of the United States of America, it being frequently sold at a price which hardly covers the cost of production. This policy has resulted in the closing of the smaller starch works and has compelled the others to go in for special products and treat American pearl starch more as a raw material than a manufactured article.

It is not easy to see where the solution of the difficulty lies, but possibly as the consumption of the United States more nearly approximates to the production, the position of the British manufacturer may be improved. Meantime the consumer can congratulate himself on getting his supplies of maize starch at cost price or less, and an industry which should have grown proportionally with the increased consumption has been languishing and unprofitable.

The import of starch from the United States exhibits a steady expansion. The Board of Trade figures for the last three years are:—

	1909.	1910.	1911.
Tons	14,470	25,800	34,700
Value	£164,493	£250,000	£693,266

The total export of maize starch from America in 1911 was 37,430 tons, so that 92 per cent. of the total American export comes to Britain.

The price variation for the same period for pearl starch was from £6 15s. to £12 per ton c.i.f. British ports.

Britain imports maize or Indian corn annually to the extent of two million tons (1911, 1,930,100 tons, value £10,713,000), and the price of this cereal has been gradually advancing. In 1898 the average price of the maize used for starch making was £3 11s. 4d. per ton. In 1908 it had risen to £5 16s. 8d. per ton, while the average price for the last three years is £6 per ton, ex quay, Glasgow.

Rice starch. The rice starch industry is located in England and mainly on the East coast. The raw material is broken rice, and from a chemical point of view the process is simply the solution and separation of the proteids and fibre by treatment with a weak alkaline solution. This is effected by steeping to soften, grinding, sieving, floating and settling.

Rice starch is unequalled as a cold water laundry starch as it easily penetrates the fabric owing to its very small granule and is swollen during the ironing process. It gives a very hard finish which is sometimes desired, but when not, can be modified by using suitable softeners. There are 10 to 12 plants in operation but only three or four of these are large. As no statistical data are available it is almost impossible to give an accurate estimate of the production of rice starch in Britain. Last year 13,500 tons of rice starch were imported, one half of this coming from Belgium, and the remainder from Germany, Netherlands, France, and Austria-Hungary.

Wheat starch is the best starch for linen dressing and finishing, and the location of two plants in the North of Ireland follows the natural course. The raw material in the modern process is wheat flour and the gluten is recovered instead of being lost as in the old fermentation process. Some quantity of wheat starch is also imported from Germany and Austria-Hungary, but no statistics are available.

The following statistics from the Board of Trade returns may be of interest :—

Imports.

	1909.	1910.	1911.
Rice starch .... Tons Value	11,170 £216,405	12,310 £241,201	13,540 £60,576
Farina and potato flour Tons Value	38,690 £439,669	36,980 £437,286	43,180 £515,226

The farina comes from Germany and the Netherlands practically in equal quantities.

The following additional figures for 1911 show that the British market is of considerable importance. There were imported :—

		1911.	
(1) *Arrowroot*		1,540	Tons
From British West Indies	Value	£35,580	,,
(2) *Mandioca or tapioca flour.*			
From Java. (Directly or indirectly, *via* Netherlands)		21,490	Tons
From the Straits Settlements and Dependencies, usually *via* Singapore		3,212	,,
	Total	24,702	,,
	Value	£188,000	
(3) *Cassava powder and tapioca*			
From Java		3,640	Tons
From the Straits Settlements		9,477	,,
	Total	13,117	,,
	Value	£263,858	
(4) *Sago, sago meal and flour.*			
From Java and other foreign countries		1,038	Tons
From Straits Settlements and Dependencies ..		25,646	,,
	Total	26,684	,,
	Value	£260,267	

No. 3 includes pearl and flaked tapioca, while cassava powder is used for warp-sizing and as a raw material in glucose making.

No. 4 does not differentiate between sago flour and pearl sago, but I would put the sago flour imported at 15,000 tons annually.

The figures are on the whole high, as they include a considerable proportion of low quality flour which goes to make part of the 50,000 tons of glucose manufactured annually in this country. Against this, no figures are given for the large quantity of wheat flour used for adhesive purposes, warp-sizing and textile finishing.

The census of production, which has given some valuable figures regarding certain industries, unfortunately does not give separate figures for the starch trade. The grouping is as follows :—" Factories and Workshops, manufacturing farinaceous preparations and household articles of cleansing and polishing (except soap)," and under this we find farinaceous preparations including starch, corn flour, patent oats, barley, macaroni, etc. 1,249,000 cwt. value £1,657,000 were produced in Britain in 1907.

Under " Bread and Biscuits " we find farinaceous preparations including foods, corn flour, etc., 113,000 cwt. value £147,000 were produced. The officials state that care was taken that the industries and works were grouped, so that no one could trace the production of any individual firm. They have succeeded admirably, not only so, but it is impossible to find what is the actual production of starch and corn flour in Britain.

Journal and Patent Literature.

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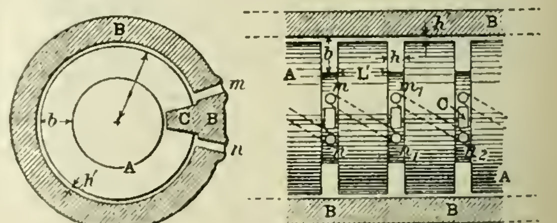
I.—GENERAL PLANT ; MACHINERY.

Air pumps ; Gas friction and a new principle for ——. The molecular pump. W. Gaede. Verh. deuts. physik. Ges. ; through Electrician, 1912, 70, 48—50.

THE author has devised an air pump based on a new principle, viz. the direct influencing of the molecular motion of gases. A cylinder, A (see fig.), which rotates rapidly in the casing, B, has grooves of depth, *b*, and width, *h*, cut in it, and projections, C, fixed to the casing, B, extend into the grooves. With A rotating in the direction of the hands of a clock, the air at *m* is compressed and that at *n* is rarefied, and the effect is increased by connecting *m* with n_1, m_1 with n_2, etc. The casing is closed



and the cylinder shaft rotates in air-tight bearings. The pump is effective only at low pressures, and hence an auxiliary pump is used to produce a preliminary partial vacuum. Advantages of the pump are the speed with which it exhausts (more than ten times as fast as the Gaede mercury pump at low pressures), and the fact that it removes vapours as well as gases, thus obviating the necessity of using drying agents. In practice the cylinder is rotated at a speed of about 8000 revolutions per minute, and some of the results which have been obtained are shown in the following table, where n is the number of revolutions per minute, and p_1 and p_2, the initial and final pressures (in mm. of mercury) respectively.

n	p_1	p_2	n	p_1	p_2
8200	0·1	0·00000*	6200	10·0	0·002
8200	1·0	0·00002	6200	20·0	0·8
8200	10·0	0·0005	4000	0·1	0·00003
8200	20·0	0·005	4000	1·0	0·0003
6200	0·1	0·0001	4000	10·0	0·08
6200	1·0	0·00005	4000	20·0	3·0

* "Not readable."

It is stated that for extremely high vacua, joints sealed with sealing wax are better than those sealed with rubber grease as recommended by Ramsay.—A. S.

Refrigeration; Power required for ——. J. J. Smith. Met. and Chem. Ind., 1912, **10**, 657—659.

To abstract a quantity of heat, Q, B.T.U., from material to be refrigerated at an initial absolute Fahrenheit temperature T_1 and a final temperature of T_2, it is necessary to supply $\frac{Q(T_1-T_2)}{T_1}$ units of energy. If this quantity be removed every minute, the horse power necessary is derived by multiplying by 778 (the mechanical equivalent of heat) and dividing by 33,000 (converting foot pounds per minute to horse power). Thus the horse power is theoretically equal to $0{\cdot}0235\ Q\ \frac{T_1-T_2}{T_1}$ for a reversible process. The capacity of refrigerating machines is generally expressed in tons per 24 hours, referring to the number of tons of ice which would absorb the same amount of heat in melting. One ton per 24 hours is equal to 197 B.T.U. per minute. Thus, if the capacity of a refrigerating machine be known, and the temperatures between which it works, it is easy to calculate the theoretical horse power required. The author has compared the theoretical with the actual horse power for a large number of values of $\frac{T_1-T_2}{T_1}$. The actual values are taken from tables given in the catalogue of the York Manufacturing Company. The ratio actual : theoretical horse power is found to be given by $R=1+3{\cdot}7\ \frac{T_1-T_2}{T_1}$ or if $\frac{T_1-T_2}{T_1}$ be written Z, then the actual horse power $= 0{\cdot}0235\ Q\ (Z+3{\cdot}7Z^2)$. This formula emphasises the fact that the power required, increases enormously with the temperature-interval involved, and that all refrigeration should be done at as high a temperature as possible. It should also be as direct as circumstances will permit, *i.e.* it should involve as few transfers of heat from one medium to another as possible. (See also Johnson, this J., 1906, 760.)—W. H. P.

Passivity of iron under boiler conditions. Byers and Voris. *See* X.

Patents.

Refrigerating apparatus. Maschinenfabrik Surth G.m.b.H., Surth on the Rhine, Germany. Eng. Pat. 26,261, Nov. 23, 1911. Under Int. Conv., April 1, 1911.

In an ice-making apparatus the jacketed cooling coil for cooling the brine is placed in a compartment divided off by a perforated partition from the main tank containing the ice boxes, and the brine is circulated through the coil and through both compartments in such a manner that it passes over the outer surfaces of the cooling jackets of the coil and is thus subjected to a double cooling effect.—H. H.

Furnace. F. F. Corliss, Bradford, Pa., Assignor to Corliss Carbon Co. U.S. Pat. 1,039,101, Sept. 24, 1912.

The furnace consists of an outer thick walled chamber formed of highly refractory material and an inner chamber of a similar character having a number of openings therein which are sealed by means of relatively thin plates of a material such as fused quartz through which heat can radiate. Burners of the blow-pipe type, adapted to give an intensely hot flame, are arranged opposite these plates, so that the flames impinge thereon.—H. H.

Dryer. R. de C. Greene, Nichols, Fla. U.S. Pat. 1,039,385, Sept. 24, 1912.

The dryer consists of an outer fixed cylinder and an inner rotatable cylinder, both arranged horizontally. The inner cylinder communicates at one end with a furnace for supplying heated gases, and at the other end it communicates with the outer cylinder. The material to be dried is fed into the outer cylinder through a hopper adjacent to the furnace end thereof, and is carried to the opposite end by spiral conveyer members fitted on the outside of the inner cylinder. The material then passes into the inner cylinder and is carried forward towards the furnace by oppositely arranged spiral conveyers, being finally discharged through a passage arranged in front of the furnace hearth.—H. H.

Dryer. G. E. Scott, Chicago, Ill. U.S. Pat. 1,039,449, Sept. 24, 1912.

The apparatus comprises a rotary vertical drum having an inner cylindrical wall and an outer conical wall, the walls being porous to allow gases which are heated by a heating device in the inner cylindrical space to come into contact with the material to be dried which is contained in the space between the two walls.—H. H.

Drying apparatus. T. Suzuki, Tokyo, Japan. U.S. Pat. 1,039,841, Oct. 1, 1912.

Inlet and outlet chambers are provided at the ends of an intermediate drying chamber, and there are arrangements for transferring the trucks, on which the materials to be dried are carried, from one section of the drying chamber to the other. Deflecting plates direct the air or other drying medium, which passes in the opposite direction to that taken by the materials under treatment, on to the surface of the materials.—W. H. C.

Evaporator. R. B. Hall, Assignor to S. Atkinson, Madison, Ga. U.S. Pat. 1,039,525, Sept. 24, 1912.

A trough is arranged round an open evaporating vessel and provided with removable strainers containing bagasse or other filtering material, so that any overflow from the evaporator is caught in the trough, filtered, and returned to the evaporator through openings connecting the bottom of the trough with the evaporator.—H. H.

Gases; Cleaning, cooling, and mixing ——. H. E. Theisen, Munich, Germany. U.S. Pat. 1,039,677, Sept. 24, 1912.

The apparatus comprises a casing against one side of which rotates a disc carrying an outer ring of fan blades and an inner ring of "disintegrators" projecting at right angles from the disc. A series of fixed disintegrators, alternating with the rotary ones, projects from the opposite side of the casing, so that as the gas is drawn radially from the centre of the casing to the periphery by the action of the fan blades, it becomes thoroughly agitated in passing the disintegrators.—H. H.

Distillation; Process and apparatus for fractional ——. M. A. Rosanoff. Fr. Pat. 443,054, April 26, 1912. Under Int. Conv., April 29, 1911.

Fractional distillation is effected by means of a series of inter-connected distilling chambers maintained at temperatures varying from the boiling point of the least volatile constituent (in the lowest chamber of the series) to that of the most volatile constituent (in the highest chamber). The distilling chambers consist of thin annular chambers forming the curved sides of open-ended cylinders immersed in a vertical position in baths of liquid maintained at the desired temperature, with stirrers for producing thorough circulation thereof. The bottom edges of the distilling chambers are inclined, so that the liquid condensed in each chamber runs to the lowest point and is thence conducted through a tube to the highest point of the next distilling chamber.—H. H.

Filtration of materials difficult to filter; Means for facilitating the ——. C. Leclaire. Fr. Pat. 443,397, May 4, 1912. Under Int. Conv., May 4, 1911.

The filtration of plastic ceramic and similar materials is facilitated by the addition of from 0·002—0·010 part of slaked lime either in the dry state or as a paste.—H. H.

Filter-press of variable capacity. P. Meura. Fr. Pat. 443,727, May 11, 1912.

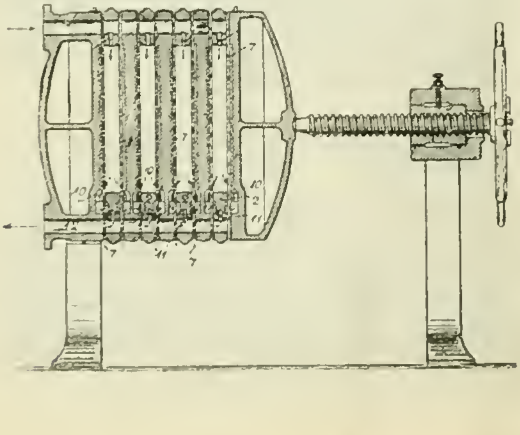
The capacity of a filter-press is varied by the introduction of a solid plate at various positions along its length, suitable pipes and three-way valves being provided to enable air to escape when filling the press, and to secure a proper drainage of liquid.—H. H.

Filter-press. C. Prandtl. Ger. Pat. 249,719, June 25, 1911.

The filter-press is composed of a series of recessed filter-plates between each pair of which is interposed a hollow frame. The openings in the filter-plates which serve for the distribution of the liquid to be filtered are connected together by short conduits fixed to the hollow frame but projecting on either side of this to a distance corresponding to the depth of the recessed portion of the filter-plate; these conduits serve also to keep the filter-cloths in position. By this arrangement it is possible to have relatively large openings in the periphery of these conduits through which the liquid to be filtered passes from the distributing channel to the chambers formed between adjacent recessed filter-plates. The arrangement described allows of the easy conversion of an ordinary chamber filter-press into a frame filter-press.—A. S.

Filter-press; Frame —— *with auxiliary filters between the main filters and the outlet channel.* Badische Maschinenfabrik und Eisengiesserei vorm. G. Sebold und Sebold and Neff. Ger. Pat. 250,882, Feb. 14, 1912.

Auxiliary filters, 2 (see fig.) are provided, with suitable connections, 10, 11, so that should the main filter cloth, 7, be torn from any cause, turbid liquid cannot pass into the outlet channel, 12, but is filtered in passing through the auxiliary filter, 2.—A. S.



Gases; Apparatus for purifying, cooling, and washing ——. H. E. Theisen, Münich, Germany. Eng. Pat. 27,696, Dec. 9, 1911. Addition to Eng. Pat. 22,433, Sept. 27, 1910.

See U.S. Pat. 1,039,677 of 1912; preceding.—T. F. B.

Centrifugal machine [separator]. W. Michelsen, Jatibonico, Cuba. U.S. Pat. 1,040,373, Oct. 8, 1912.

See Fr. Pat. 442,904 of 1912; this J., 1912, 973.—T. F. B.

Volatile liquids; Process of recovery of ——. G. Claude, Assignor to L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploit. des Procédés G. Claude, Paris. U.S. Pat. 1,040,886, Oct. 8, 1912.

See Fr. Pat. 397,791 of 1908; this J., 1909, 880.—T. F. B.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal gas; Electrical separation of tar from ——. A. H. White, J. W. Hacker, and F. Steere. J. Gas Lighting, 1912, **119**, 825—826.

An electric separator for separating tar from crude coal gas by the action of a silent high-tension electric discharge was constructed of an iron cylinder, 12 in. in diameter and 20 in. long, having a tin can wound with cloth hung in the centre, to act as the positive electrode. The gas was treated at temperatures varying from 75° to 150° F. (24°—65·5° C.), and it was found that the elimination of tar was so complete that the gas leaving the separator appeared perfectly colourless and left only a faint brown stain on a piece of filter paper through which a cubic foot of gas had been filtered. In one test the separator operated continuously for five hours upon gas at 154° to 130° F. (68°—54·5° C.), generated from 400 lb. of coal, the ordinary condensers separating 12·8 lb. of tar and 12·2 of water and the electric separator effecting a further removal of 17·7 lb. of tar and 2·8 lb. of water. In some experiments the cloth became coated with tar, whereupon the discharge became disruptive and the separating effect largely destroyed.—H. H.

Petroleum products; Adsorption in connection with ——. L. Gurwitsch. Petroleum, 1912, **8**, 65—68.

The fractionation of petroleum by filtration through a finely porous medium was attributed by Day to the differences in the speed of diffusion of the constituents through the capillary passages between the granules. Against this view the author cites the results of several experiments which point to the separation being the result of adsorption. Thus it is shown that filtration of the same oil through different porous media gave very different results. For example, on filtering a solution of "*oil goudron*" in petroleum spirit (benzine) through the finest sand, only the slightest effect was produced, whereas on filtration through "floridin" (silicates of aluminium, magnesium, etc.), 9·98 per cent. of the "*goudron*" constituents were retained. Moreover, on shaking this solution with the floridin until no further adsorption occurred, the amount retained by the earth was 9·94 per cent. The different constituents of petroleum varied in the manner of their adsorption. In the case of paraffin wax there was a fairly pronounced adsorption (1·64 per cent.) by 20 per cent. of floridin, not only from a 10 per cent. solution of the wax in petroleum spirit, but also from its solution in benzene. On the other hand, heavy lubricating oil hydrocarbons showed only a very faint degree of adsorption (0·2 per cent.) on treatment with the earth. The results obtained by treating a white vaseline with 40 per cent. of floridin for 4 hours at 120° C., with frequent agitation, were as follows:—

	Paraffin wax.	Viscosity E_{50}.	Viscosity E_{100}.	Dropping point.
	Per cent.			°C.
Original vaseline	9·35	6·69	1·73	37
After treatment	6·80	12·6	2·34	36

Paraffin wax is thus adsorbed more energetically from an admixture with heavy lubricating oil hydrocarbons than from a solution in petroleum spirit. These experiments also show that, contrary to the generally accepted view, treatment of petroleum products with adsorbent agents may cause an increase in the viscosity. Treatment of petroleum spirit solutions of asphaltic or resinous constituents of petroleum with floridin caused considerable adsorption. The substances adsorbed could be extracted from the earth by benzene, ether, etc., but not by petroleum spirit; but on evaporating the extracts residues were left which were now soluble in petroleum spirit. In explanation of this it is suggested that in the adsorption of the colloidal asphaltic and resinous substances they become transformed from the sol into the gel condition, in which they are not soluble in such a weak solvent as petroleum spirit. Adsorbed resinous and asphaltic substances recovered by extraction from the floridin and added to the remaining oil again, caused the colour of the latter to be much darker than before. This is attributed to polymerisation of unsaturated resinous compounds by the floridin. Naphthenic acids were energetically adsorbed and could be quantitatively extracted by ether from the floridin. They were recovered in the form of free acids and not as soaps.
—C. A. M.

Adsorption by incandescent charcoal. Arndt and Schraube. *See* VI.

Purification of blast-furnace gases. Gouvy. *See* X.

Drum furnace for wet spent tan. Pollak. *See* XV.

Mechanism of oxidation processes. Wieland. *See* XX.

Patents.

Fuel briquetting plants and the like. T. Rigby, Dumfries, and N. Testrup, London. Eng. Pat. 14,624, June 20, 1911.

The patent relates to means for conveying dried powdery fuel, such as peat or lignite, from the dryers to a briquetting press without risk of explosion. The dryers are arranged so that only a limited quantity of air is admitted to them, or flue gases may be introduced. The dried fuel passes to the inlet of a centrifugal fan, to which steam or moist air is also admitted, and the fan delivers it through a steam-jacketed conduit leading to the neighbourhood of the briquetting press. The fuel is separated from the blast by means of a cyclone separator. Combustion products instead of steam may be admitted with the dried fuel to the fan.—A. T. L.

Burning finely-divided fuel; Apparatus for ——. Babcock and Wilcox, Ltd., London. From The Babcock and Wilcox Co., New York. Eng. Pats. 27,672 and 27,673, Dec. 11, 1911. Additions to Eng. Pat. 18,712, Aug. 19, 1911.

The air for burning the finely divided fuel, is given a rotary or whirling motion, by being passed through a grid in the furnace front. (1). The grid is conical and has blades inclined outwards from the surface of the cone between the openings for the air. (2). The blades are so arranged that their inclination can be varied as desired.
—W. H. C.

Burning finely-divided fuel; Apparatus for ——. Babcock and Wilcox, Ltd., London. From The Babcock and Wilcox Co., New York. Eng. Pat. 27,671, Dec. 9, 1911.

In order to obtain broad flattened flames from so called "round flame" burners, the air for combustion is admitted through an oval or oblong opening in a suitable frame or casing set in the wall of the furnace. In this way a greater volume of air is admitted below and above the flame than at the sides, or a greater volume at the sides than above and below, with the result that the flame is flattened either horizontally or vertically. Means may also be provided to impart a whirling motion to the air (see preceding abstract).—A. S.

Flue gases and the like; Filtering and condensing moisture from ——. E. P. Ward, Brighouse, Yorks. Eng. Pat. 3661, Feb. 14, 1912.

An apparatus for filtering and condensing moisture from samples of flue gases to be used for analysis, etc., consists of a disc of woven fabric, with the "raised" surface upwards, supported upon wire gauze and held in position by a metal plate resting upon it and having a slightly conical upper surface. A second metal plate is supported at a slight distance above the first, and the gas to be filtered is led by a pipe from below into the centre of the narrow space formed between the two plates. The moisture which condenses upon the plates runs down into an annular trough formed in the periphery of the apparatus, while the gas passes through small holes in the outer edge of the lower plate and thence downwards through the filter. The filter can readily be replaced upon the removal of the two plates, which are held in position merely by their own weight.—H. H.

Vertical gas retorts; Discharge of coke from ——. H. J. Toogood and R. Dempster and Sons, Ltd., Elland, Yorks. Eng. Pat. 17,616 of 1912; date of Appl., July 22, 1911.

The patent relates to retorts of the "continuous" or "semi-continuous" type, and the object is to discharge the coke with as little breakage as possible. The lower part of the retort forms a cooling chamber, having a cross-section not less than the maximum cross-section of the retort, so that the charge passes through the same without compression, and breaks into large pieces merely by cooling as in other types of vertical retorts. This cooling-chamber is surrounded by flues for heating the primary and secondary air, or by a jacket for generating steam. The charge is supported directly upon the moving discharging apparatus which is described in Eng. Pat. 11,210 of 1912.—A. T. L.

Gas production and retort coking; Process for accelerated ——. W. Röder and A. W. Peust. Ger. Pat. 248,620, Nov. 14, 1911.

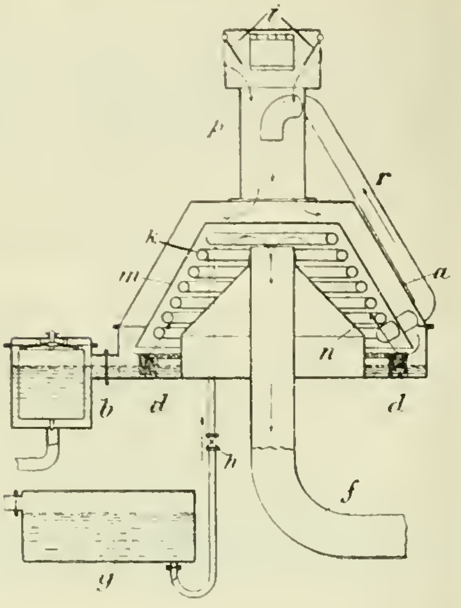
Briquettes prepared from different kinds of coal are used, of which one kind has a "light" (open) structure and acts as an oxygen carrier, so that the briquettes rapidly become incandescent throughout and a more rapid evolution of gas is produced—A. S.

Gas-making apparatus. J. M. W. Kitchen. East Orange, N.J. U.S. Pat. 1,039,959, Oct. 1, 1912.

The claim is for the combination of a gas generator with a superheater, in which the tar and vapours contained in the gas, are converted into permanent gas. The superheater is heated by compressed gas or by solid fuel, burned in a current of compressed air. The gas to be superheated is passed downwards through the superheater, and the heating gas upwards.—W. H. C.

Gaseous fuel; Production of ——. A. W. Southey, Mill Hill, London. Eng. Pat. 21,363, Sept. 27, 1911.

Gaseous fuel for use with internal combustion engines, is produced by vapourising petroleum or other heavy oils without combustion, and then converting the vapour into a fixed gas, by means of the heat generated by the partial combustion of a portion of the vapour. The apparatus comprises a casing, *a*, containing a heating coil, *k*, arranged between baffles, *m*, *n*. The coil is heated by oil burning on an annular wick, *d*, which is fed from a float-chamber, *b*. Oil under pressure is fed from a tank, *g*, through the cock, *h*, to the upper end of the coil, *k*, and is vapourised and superheated in the coil. The superheated vapour passes through the pipe, *r*, to the dome, *p*, where it mixes with air drawn in through non-return valves, *i*, and passes down in contact with the baffle, *m*, to the flame from the wick, *d*, and is there converted into a fixed gas. This gas, mixed with the combustion products, is drawn off at *f*, by the suction of the engine. In another form of the apparatus, the pipe, *r*, delivers beneath the baffle, *n*, which is open at the lower end.—A. T. L.



Converting liquid hydrocarbons into gas or vapour; Method and apparatus for ——. E. B. Benham, New London, Conn., Assignor to Hydrocarbon Converter Co., New York. U.S. Pat. 1,040,124, Oct. 1, 1912.

The hydrocarbons are passed along or through a heated, porous substance, and at the same time are submitted to the action of an electric current, passed between plates disposed on the opposite sides of the porous substance. —W. H. C.

Carburetted water gas; Manufacture of ——. A. G. Glasgow, London. From J. M. Busby, Philadelphia, U.S.A. Eng. Pat. 9293, April 19, 1912.

See U.S. Pat. 1,030,332 of 1912; this J., 1912, 710.—T. F. B.

Gas-producer. W. Climie, Bo'ness, Scotland. U.S. Pat. 1,040,148, Oct. 1, 1912.

See Fr. Pat. 434,027 of 1911; this J., 1912, 220.—T. F. B.

Paraffin-wax or like mixtures (compositions) of substances which melt at different temperatures; Process for sweating crude ——. D. Pyzel, Balik Papan, Borneo. U.S. Pat. 1,040,408, Oct. 8, 1912.

See Eng. Pat. 22,313 of 1910; this J., 1911, 795.—T. F. B.

Apparatus for the fractional distillation of tar, mineral oil, and the like. Ger. Pat. 250,578. *See* III.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

Decolourising powder from lignite; Manufacture of a ——. A. Lotz. Ger. Pat. 250,741, Dec. 24, 1911.

Ordinary earthy lignite is heated for several hours at a high temperature (up to 1200° C.) with exclusion of air, then exposed for a short time (up to 5 mins.) to the air, and afterwards cooled with exclusion of air.—A. S.

Incandescent gas mantles; Manufacture of ——. J. O. Zdanowich, London. Eng. Pat. 21,315, Sept. 27, 1911.

The threads of which the fabric, which forms the basis of the mantle, are composed, are formed either of a partly nitrated cellulose, or of a mixture of cellulose threads and nitrocellulose threads.—W. H. C.

III.—TAR AND TAR PRODUCTS.

Hydrogenation of aromatic compounds. H. Wieland. Ber. 1912, **45**, 2615—2617.

Willstätter and Hatt (this J., 1912, 634) have shown that under certain conditions benzene and other aromatic hydrocarbons can be completely hydrogenised by platinum black and hydrogen, and they consider that this invalidates the author's statement (see this J., 1912, 276) that there is a certain parallelism between the behaviour of unsaturated olefinic hydrocarbons and aromatic hydrocarbons towards hydrogenation in presence of platinum or palladium and oxidation with permanganate respectively. The author adheres to his statement that this parallelism exists under the experimental conditions he used, and he points out that the action of permanganate varies considerably under different conditions. For example if a layer of benzene be superposed upon a saturated solution of calcium permanganate to which dilute sulphuric acid has been added, a vigorous reaction ensues. Cyclohexane is hardly affected under similar conditions and can be easily distinguished from benzene in this way. Palladium black is less sensitive to "poisons" than platinum black, for in its presence benzene containing thiophen absorbs hydrogen with considerable velocity, although not nearly so rapidly as pure benzene.—A. S.

Diphenylamine; New reactions of ——. J. J. Lutschinsky. Chem.-Zeit., 1912, **36**, 1239.

When a solution of diphenylamine sulphate is treated with pure chlorine water, a blue colouration is produced similar to that obtained with nitrates and nitrites. With nascent chlorine the reaction is more sensitive, and in presence of hydrochloric acid less than 0·01 mgrm. of potassium bichromate can be detected in this way. Potassium hypochlorite, permanganate, and chlorate, and manganese dioxide also give the reaction in presence of hydrochloric acid. In absence of hydrochloric acid, potassium bichromate gives a green and potassium permanganate a yellow colour. Diphenylamine sulphate also gives a blue colour with a 0·01 per cent. solution of hydrogen peroxide and with pure sulphuric acid (sp. gr. 1·84) which has been electrolysed between platinum electrodes at —10° C. and then diluted with pure water; the electrolysed acid does not produce the blue colour after it has been warmed.—A. S.

Patents.

Tar; Process for the continuous distillation of —— *under reduced pressure.* H. Beck. Ger. Pat. 250,420, April 30, 1910.

The tar is heated indirectly only, and entirely by highly superheated steam, to temperatures up to 400° C.; the apparatus consists of a vertical double-walled vessel, containing a system of tubes, which is divided up into a number of communicating compartments, insulated from one another by means of double walls. The exclusive use of superheated steam is said to be specially advantageous when distilling tars for hard pitch, which is then obtained free from coke. Further, it is stated that no pyrogenic decomposition of the fractions takes place, hence the phenols and the anthracene oil are obtained in a much purer condition than usual, and the crude anthracene is of high grade, furnishing a particularly pure product. —T. F. B.

Tar, mineral oil, and the like; Apparatus for the fractional distillation of ——. E. Munster. Ger. Pat. 250,578, Aug. 17, 1911.

The substance to be distilled is intimately mixed with hot furnace gases, preferably those resulting from the use of liquid fuel. The furnace gases are suitably purified and introduced into the distilling apparatus through valves working in conjunction with atomising apparatus. —T. F. B.

Meta-cresol; Process for the manufacture of pure ——. F. Hoffmann-La Roche und Co., Grenzach, Germany. Eng. Pats. 2458, Jan. 30, 1912, and 3923, Feb. 16, 1912. Under Int. Conv., April 24 and 26, 1912.

The *m*-cresol prepared according to Fr. Pat. 434,531 of 1911 (this J., 1912, 277) contains substantial quantities of the *p*-compound. It is found, however, that pure *m*-cresol can be obtained (1) by suitably purifying the *m*-cresolmonosulphonic acid obtained from cresol mixtures by the previous patent (*loc. cit.*), *e.g.*, by crystallisation from dilute sulphuric acid, and finally decomposing the pure sulphonic acid in the known manner; (2) by the sulphonation of a mixture of *m*- and *p*-cresols with the quantity of concentrated or fuming sulphuric acid necessary for the formation of the monosulphonic acids of both cresols, or with less sulphuric acid, either in the cold or at a slightly elevated temperature (below 100° C.), allowing the *m*-cresolsulphonic acid to crystallise out, converting it into *m*-cresol, and repeating the whole series of processes as often as is required to produce a pure product.—T. F. B.

Aceto-acetic anilide and its homologues; Manufacture of ortho-substitution products of the ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 16,928, July 20, 1912. Under Int. Conv., July 21, 1911.

Ortho-substituted derivatives of aceto-acetanilide or its homologues are obtained by heating aceto-acetic ester in indifferent solvents (*e.g.*, solvent naphtha or chlorobenzene) with *o*-halogen-, *o*-nitro-, *o*-alkyloxy-, *o*-aralkyloxy-, or *o*-aryloxy-derivatives of aniline or of its homologues. The products may serve as raw materials for the preparation of dyestuffs.—T. F. B.

Anthraquinone carboxylic acids; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 250,742, Aug. 4, 1911.

Methylanthraquinones may be converted into the corresponding anthraquinone-carboxylic acids by treatment with nitrogen-oxygen compounds containing no hydrogen, preferably in presence of a suitable solvent or diluent. The nitrogen-oxygen compound may be added as a gas or liquid to the solution or suspension of the methylanthraquinone, or it may be generated, for example, by the action of chlorine on nitro-compounds such as mono- or dinitrobenzene, dinitronaphthalene, etc.; if this latter process be used and if the methylanthraquinone contains nitro-groups, these are wholly or in part replaced by chlorine. —T. F. B.

Anthrapyridone-carboxylic acids; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 250,885, Feb. 7, 1911.

o-Aminoanthraquinone or one of its derivatives is condensed with malonic acid or a malonic ester, in molecular proportions, and the product is treated with an alkaline substance, whereby ring formation ensues and an anthrapyridone carboxylic acid is produced. The products serve for the preparation of vat dyestuffs, acid wool dyestuffs, etc.—T. F. B.

Anthraquinonyl indophenols; Process for preparing ——. Farbwerke vorm. Meister, Lucius und Bruning. Ger. Pat. 251,103, Feb. 28, 1911.

Arylamino- or diarylamino-anthraquinones or their derivatives, containing a free *p*-position to the imino group in an aryl residue, are condensed with *p*-nitrosophenols or oxidised in presence of *p*-aminophenols. The indophenolic compounds thus produced may be utilised for the preparation of dyestuffs, *e.g.*, by melting with alkali sulphides.—T. F. B.

Purification of nitro bodies. Eng. Pat. 799. *See* XXII.

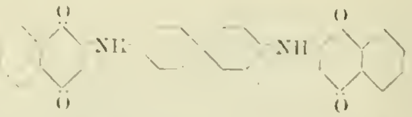
IV.—COLOURING MATTERS AND DYES.

[*Colour-lakes*] *Precipitates formed by metallic salts and dyestuffs containing hydroxyl groups.* P. B. Guggiari. Ber., 1912, 45, 2142—2147.

The author protests against a too frequent explanation of phenomena connected with dyeing from the standpoint of colloidal chemistry, and remarks that some of the simplest chemical facts have been obscured by such attempts at explanation. A large number of the so-called colour-lakes were prepared, apart from the fabrics on which they are usually precipitated, and submitted to analysis. Though the conditions are not exactly the same, still the compounds (lakes) cannot differ very greatly from those precipitated on the fibre. The "lakes" were prepared from alizarin, β-nitroalizarin, quinizarin, napthazarin, etc. The dye was dissolved in sufficient hot 70—80 per cent. alcohol to ensure no separation at a temperature of 50°—60° C., a few drops of acetic acid being added when necessary. A very weak solution (in alcohol and water) of the acetate or formate of the metal in consideration, was added, well shaken and allowed to stand. Some 50 to 100 per cent. more than the calculated quantity of the salt was used. In each case, the precipitate was collected on a smooth hardened filter paper and washed with warm 70 per cent. alcohol. It was next transferred to a flask and vigorously shaken with water at 50°—60° C. to bring any of the precipitating salt still present, into solution, then again collected on a hardened paper and washed successively with aqueous alcohol, absolute alcohol and ether. After drying, the precipitate was rubbed up in an agate mortar and extracted with ether in a Soxhlet apparatus. The portion to be analysed was dried for 20—40 hours and the metal present estimated as oxide, sulphate or iodide. The analytical results indicated a strong tendency to the formation of normal salts, *i.e.*, the "lakes" were definite compounds in which all the hydroxyl hydrogen had been replaced by a metal. In a number of cases the "lake" appeared to consist of a fixed number of mols. of the normal salt and of the precipitating salt or its hydroxide, while in a few cases it was necessary to assume a fixed number mols. of water. The nature of the precipitates specially lends itself to the presence of foreign matter, such as water, metallic salts and hydroxides, which are exceedingly difficult to remove. A striking similarity was found between the alizarin and isomeric quinizarin lakes—the latter however were much more sensitive to weak acids, a few drops of acetic acid entirely preventing their formation. This is in accordance with Liebermann's observation, that the colours produced by the *o*-dihydroxy dyestuffs are much more stable than those produced from compounds with the hydroxyl in other positions.—A. C.

Anilido-quinones; Oxidation of —— *to benzidine derivatives.* K. Brass. Ber., 1912, 45, 2529—2533.

Pummerer and Brass (Ber., 1911, 44, 1647) found that vat dyes possessing substantive properties could be obtained by condensing 2 mols. of *a*-naphthoquinone with 1 mol. of *p*-phenylenediamine, but that with benzidine, only 1 mol. of the quinone could be got to combine. The author has now prepared N.N′-bis-*a*-naphthoquinonyl-2-benzidine,



in an indirect way by oxidising 2 mols. of 2-anilido-*a* naphthoquinone. 2-Anilido-*a*-naphtho-quinone was dissolved in about 20 times its weight of concentrated sulphuric acid, cooled to —8° C., and mechanically stirred during the addition of manganese dioxide; the mixture was poured on ice, when the dyestuff was obtained in dark brown flakes. During the oxidation the red colour of the solution changes to violet. N.N′-bis-3-chloro-*a*-naphthoquinonyl-2-benzidine, prepared in an analogous manner from 2-anilido-3-chloro-*a*-naphthoquinone, dissolves in concentrated sulphuric acid with an intense blue colour. With hydrosulphite it gives a golden yellow vat from which cotton is dyed a reddish violet colour, which is very fast to washing and unaffected by concentrated sulphuric acid. The shades produced are more reddish and considerably faster to washing than those given by 2-benzidino-3-chloro-*a*-naphthoquinone prepared by condensation of 2.3-dichloro-*a*-naphthoquinone and benzidine in glacial acetic acid solution.—A. C.

Disulphides; Reduction of —— by glucose. Preparation of mercaptans. M. Claasz. Ber., 1912, **45**, 2424—2428.

The author has found that disulphides are converted into the corresponding mercaptans, with good yields, by reduction with glucose and alkali. For example *oo*′-dinitrodiphenyldisulphide (1 mol.) when suspended together with glucose (1 mol.) in alcohol and treated with a solution of caustic soda (3–4 mols.), is converted rapidly and quantitatively into *o*-nitrophenylmercaptan, and the latter without being isolated can then be condensed with monochloroacetic acid to give an almost quantitative yield of *o*-nitrophenylthioglycollic acid, an intermediate product in the manufacture of sulphazone dyestuffs (see this J., 1912, 379). In a similar manner dithiosalicylic acid can be converted into thiosalicylic acid, and the latter, without isolation, condensed with monochloroacetic acid to give thiophenylglycin-*o*-carboxylic acid.—A. S.

Mercaptans of anthraquinone. L. Gattermann. Annalen, 1912, **393**, 113—197.

The author has prepared and examined a considerable number of mercaptans of anthraquinone and its derivatives. The method of preparation adopted in most cases consisted in diazotising an amino-derivative of anthraquinone in concentrated sulphuric acid solution by means of nitrosylsulphuric acid, boiling the diazo-sulphate, dissolved or suspended in water, with potassium thiocyanate solution, and then converting the resulting thiocyanogen derivatives into the corresponding mercaptans by boiling with alcoholic alkali. It is not easy to isolate the free mercaptans in a pure condition, owing to the ease with which they are oxidised to disulphides, but derivatives can be readily obtained from the alkaline solutions. Comparison of the mercaptans with the corresponding hydroxyanthraquinones shows that the substitution of sulphur for oxygen causes a "deepening" of colour in the direction: yellow——→ orange——→ red——→ violet——→ blue——→ green. Substituent groups influence the colour in approximately the same manner as in the hydroxyanthraquinones. When wool is treated with the mercaptans, suspended in water faintly acidified with acetic acid, the colour is completely taken up from the bath at 40°—50° C., but the dye is not fast to soap. If, however, the bath be heated to vigorous boiling, the colour becomes somewhat paler, owing to the conversion of the mercaptan into the corresponding disulphide, and now the dyed wool is resistant to soap; very even dyeings are obtained. That the fast colours are due to the disulphides is confirmed by the fact that the shades produced by the mercaptans at low temperatures are converted into shades resistant to soap by treatment with cold dilute hydrogen peroxide. Moreover from the 1·5-, 1·6-, and 1·7-anthraquinonemercaptan-sulphonic acids the corresponding disulphide-disulphonic acids can be obtained in a crystalline condition, and these give the same shades on wool as those produced by the mercaptan sulphonic acids. The disulphide-disulphonic acids possess so great an affinity for wool, that they must be added gradually to the dye-bath, in small quantities, in order to obtain even dyeings; the dye-baths are completely exhausted. Silk is dyed less intensely than wool by anthraquinonemercaptans and cotton is not dyed at all. The *a*-mercaptans yield much purer shades than the *β*-mercaptans; the di-mercaptans do not give very good results as dyestuffs. The hydroxymercaptans act also as mordant dyestuffs: for example anthraquinone-4-hydroxy-1-mercaptan gives a reddish orange on unmordanted wool, a shade similar to Turkey red on an alumina mordant, and a brownish red on a chrome mordant. The aryl and alkyl ethers of anthraquinonemercaptan-sulphonic acids also dye wool in a bath rendered faintly acid with acetic acid, producing yellow shades very resistant to soap.—A. S.

Azo dyestuffs containing arsenic. Aromatic arsenic compounds. II. P. Karrer. Ber., 1912, **45**, 2359—2363.

The first azo dyestuff prepared from an aromatic arsenic compound was a red dyestuff obtained by Ehrlich and Bertheim by combining diazotised arsanilic acid with *β*-naphthylamine (see Eng. Pat. 3929 of 1907; this J., 1908, 355). Dyestuffs containing two arsenic acid residues have also been prepared (see Eng. Pat. 7905 of 1909; this J., 1909, 697), and it was found that increase of the number of arsenic acid residues in the molecule improved the properties of the dyestuffs. The author has prepared a number of azo dyestuffs from the nitroso-derivatives of arylarsinic acids (Ber., 1912, 45, 2065). For example by condensing *p*-nitroso-phenylarsinic acid with *p*-toluylenediamine in presence of hydroxylamine hydrochloride, the same red dyestuff,

$$H_2O_3As.C_6H_4.N:N.C_6H_2(CH_3)(NH_2)_2,$$

as that described in Eng. Pat. 3929 of 1907 (*loc. cit.*) was obtained. By condensing *p*-nitrosophenylarsinic acid with aniline in glacial acetic acid solution, *p*-azobenzene-arsinic acid, $H_2O_3As.C_6H_4.N:N.C_6H_5$, was produced. In a similar manner the nitroso-compound yields azobenzene-*p.p*′-diarsinic acid (azo-arsinic acid), $H_2O_3As.C_6H_4.N:N.C_6H_4.AsO_3H_2$, when condensed with *p*-aminophenylarsinic acid, disazobenzene-*pp*′-diarsinic acid, $H_2O_3As.C_6H_4.N:N.C_6H_4.N:N.C_6H_4.AsO_3H_2$, when condensed with *p*-phenylenediamine; and disazobenzenetriarsinic acid,

$$H_2O_3As.C_6H_4.N:N.C_6H_3(H_2O_3As).N:N.C_6H_4.AsO_3H_2,$$

when condensed with *p*-phenylenediaminearsinic acid (this J., 1911, 1468). All these azo dyestuffs are dark brown to black amorphous powders, easily soluble in alkalis, alkali carbonates, and ammonia. Azobenzenearsinic acid is more toxic than disazobenzene-*pp*′-diarsinic acid, and the latter is more toxic than disazobenzenetriarsinic acid.—A. S.

Azo dyestuffs; Volumetric determination of —— by means of hydrosulphite. E. Grandmougin and E. Havas. Chem.-Zeit., 1912, **36**, 1167—1169.

Monoazo dyestuffs are readily reduced by means of sodium hydrosulphite, according to the equation:

$$R.N:N.R'+2Na_2S_2O_4+4H_2O= R.NH_2+R'.NH_2+4NaHSO_3.$$

The titration is carried out by adding alkaline hydrosulphite to an acid solution of the colouring matter in an atmosphere of coal gas, the colouring matter itself acting as indicator. The hydrosulphite should be made fresh for use, and should be standardised on a pure specimen of the same colouring matter. If this cannot be obtained, it is standardised on a pure sample of say Orange II, Fast Red or Chrysoin, and the titre for the dyestuff under investigation determined from its molecular weight.—W. H. P.

Patents.

Anthracene derivatives [dyestuffs]; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 26,944, Dec. 1, 1911.

Dyestuffs which dye wool fast violet to blue shades are obtained by the action of phenols, either in the form of their alkali salts or in presence of alkalis, on derivatives of α-amino-anthraquinone which contain negative substituents in the β-position and an auxochrome group, such as amino, alkylamino, arylamino, or hydroxyl, in the *p*-position to the amino-group. In the specification dyestuffs are described prepared from the following aminoanthraquinones:—1·4-Diamino-2·3-dichloroanthraquinone; 1-amino-2-bromo-4-tolylaminoanthraquinone and its sulphonic acid sulphonated in the aryl residue; 1·5-diamino-2·6-dibromo-4·8-disulpho-di-*p*-tolylaminoanthraquinone; 1·5-diamino-4·8-dihydroxy-3-bromoanthraquinone-7-sulphonic acid; 1·5-diamino-4·8-dihydroxy-3·7-dibromoanthraquinone. The products may be sulphonated if necessary.—T. F. B.

Dyestuffs of the anthraquinone series containing sulphur; Manufacture of ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 12,865, May 31, 1912. Under Int. Conv., June 20, 1911.

Dianthraquinonyl thio-ethers, identical with the products obtained according to Eng. Pat. 7699 of 1912 (this J., 1912, 809) are obtained by treating halogen-anthraquinones or their derivatives with alkali sulphides, other than sulphydrates, in such a manner that the alkali metal is replaced by two anthraquinonyl residues. *Example:* 20 parts of fused sodium sulphide is slowly added at 150° C. to a mixture of 20 parts of α-chloroanthraquinone and 100 parts of naphthalene and the mixture is stirred at the same temperature for 30 hours. The melt is poured into 150 parts of toluene, and the precipitate washed with hot water, boiled with alcohol, and recrystallised from nitrobenzene. It dyes unmordanted cotton yellow shades from hydrosulphite vats.—T. F. B.

Vat colouring matters; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 2346, Jan. 29, 1912.

When an α-isatin halogenide, or a derivative thereof, is caused to react with derivatives of 1·8-naphthylenediamine in which the two nitrogen atoms form part of a third ring containing six atoms, vat dyestuffs are obtained; if these dyestuffs are halogenated, the products produce dyeings which are generally faster than, and of different shades to the unhalogenated products. As naphthylenediamine derivatives may be used the *peri*-naphthiminazoles (perimidines), naphthylenediamine-thiourea, or dihydropyrimidones. *Example:* A solution of α-isatin chloride prepared from 70 parts of isatin, 100 parts of phosphorus pentachloride, and 600 parts of benzene, is allowed to run slowly into a boiling mixture of 100 parts of perimidine and 1000 parts of benzene; after boiling for half an hour the colouring matter is separated and washed with benzene and then with an alcoholic solution of sodium acetate. It dyes cotton and wool violet-blue shades from the yellow vat.—T. F. B.

Indigo, its homologues or halogen substitution products; Preparation of condensation products from ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 250,744, April 29, 1911.

Condensation products in the form of slightly coloured, neutral substances, are obtained by heating indigo or its homologues or halogen derivatives with benzoic anhydride or with the anhydrides of substituted benzoic acids in presence of zinc chloride.—T. F. B.

Colouring matters containing selenium and tellurium; Process for the manufacture of ——. A. von Wassermann and E. Wassermann. Fr. Pat. 443,554, March 30, 1912. Under Int. Conv., Nov. 4, 1911.

Suitable salts of selenium or tellurium, such as the double ammonium, sodium, or potassium salts of these elements and cyanogen, are made to interact with relatively concentrated solutions of salts of the dyes of the triphenylmethane series or their derivatives, especially their halogen or alkyl derivatives. For example, about 4 parts of potassium cyanoselenide are added to a solution of 10 parts of commercial sodium eosate in 40 parts of water, and the mixture is allowed to stand; a dark red deposit slowly separates. The new products serve not only as dyestuffs, but for introducing selenium or tellurium into the animal organism.—F. Sodn.

Sulphurised [sulphide] dyestuffs; Manufacture of ——. A. G. Bloxam, London. From Act.-Ges. f. Anilinfabr., Treptow, Germany. Eng. Pat. 25,157, Nov. 15, 1911.

See Fr. Pat. 436,373 of 1911; this J., 1912, 426.—T. F. B.

[Sulphide] dyestuffs; Process of manufacturing leuco-compounds of certain ——. Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 27,379, Dec. 6, 1911. Under Int. Conv., Dec. 12, 1910.

See Fr. Pat. 437,809 of 1911; this J., 1912, 529.—T. F. B.

Anthraquinone series; Manufacture of derivatives and dyestuffs of the ——. F. Ullmann, Charlottenburg, Germany. Eng. Pat. 2948, Feb. 5, 1912. Under Int. Conv., July 7, 1911.

See Fr. Pat. 440,303 of 1912; this J., 1912, 809.—T. F. B.

Anthraquinonyl ethers of anthraquinonyl-mono- or di-mercaptans: Manufacture of —— and of derivatives of these compounds. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 12,614, May 28, 1912. Under Int. Conv., June 1, 1911.

See Fr. Pat. 443,798 of 1912; this J., 1912, 978.—T. F. B.

Nitro-dyestuffs of the Rhodol series; Manufacture of mordant ——. Farbwerke vorm. L. Durand, Huguenin, und Co., Basle, Switzerland. Eng. Pat. 15,140, June 28, 1912. Under Int. Conv., July 17, 1911.

See Ger. Pat. 245,231 of 1911; this J., 1912, 484.—T. F. B.

Preparing anthrapyridone-carboxylic acids. Ger. Pat. 250,885. *See* III.

Manufacture of orthosubstitution products of the acetoacetic anilide and its homologues. Eng. Pat. 16,928. *See* III.

Preparing anthraquinonyl-indophenols. Ger. Pat. 251,103. *See* III.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Bamboo as material for production of paper pulp. W. Raitt. Indian Forest Reports, 1912. **3**, Part 3, 1—37.

After a detailed account of the investigations, the results of which have been given previously (this J., 1912, 870), the author discusses the commercial aspect, taking as his basis a mill manufacturing 200 tons of air dry, unbleached bamboo pulp per week, in the neighbourhood of Rangoon. The cost of plant and buildings is estimated at £50,000, which includes £8000 for a modern soda recovery plant. The manufacturing costs per ton of cellulose are estimated as follow:—Bamboo ($2\frac{1}{4}$ tons), 36s. 6d.; chemicals, 39s. 9d.; fuel (2 tons), 23s.; labour and superintendence, 9s. 4d.; depreciation and repairs (10 per cent.), 8s. 5d.; royalty, 1s. 4d.; insurance, taxes, stores, and sundries, 4s. 9d.; total, 123s. 1d., or say £6 3s. 4d. per ton.

The market for the pulp would, in the first place, be Calcutta, with subsequent extension to China and Japan. The present consumption of paper in British India is 60,000 to 70,000 tons, not more than 25,000 tons of which are manufactured at the Indian mills. These mills, besides consuming all the available supply of paper-making grass within a suitable radius, also import 8000 tons of European wood pulp. The paper mills of China and Japan import 30,000 tons of European pulp which could be replaced on advantageous terms as regards freight by Indian pulp. Finally, it appears quite possible that the bamboo pulp could be produced at a price which would enable it to compete on the European markets.—J. F. B.

Paper pulp: Chemical reactions in the sizing of —— with rosin, soda, aluminium sulphate, and hard water. E. L. Neugebauer. Z. angew. Chem., 1912, **25**, 2155—2159.

When an excess of aluminium sulphate is added to hard water, a voluminous precipitate of basic aluminium sulphate is produced. The quantity and composition of this precipitate are approximately constant for proportions of aluminium sulphate ranging from twice to seven times the theoretical equivalent of the bicarbonates present in the water. With nine times the theoretical proportion of aluminium sulphate, no precipitate is produced. The basic aluminium sulphate contains approximately 70 per cent. of aluminium oxide and 30 per cent. of sulphuric anhydride. Hence it results that for the neutralisation of 10 grms. of calcium oxide in the form of bicarbonate, 59 grms. of hydrated aluminium sulphate ($Al_2(SO_4)_3 + 18H_2O$) must be allowed instead of the normal equivalent of 40 grms. When a dilute solution of neutral rosin size (0·25 per cent.) is precipitated with aluminium sulphate, the precipitate consists approximately of one-third of free rosin and two-thirds of basic aluminium resinate. The greater the excess of aluminium sulphate used the higher is the proportion of free rosin in the precipitate, but the limits lie within the range of 31—41 per cent. of free rosin, the latter limit being obtained with twelve times the theoretical equivalent of aluminium sulphate. The temperature at which the precipitate is formed has no influence on its composition but greatly affects its bulk. A precipitate formed at 20° C. occupied a volume of 77 c.c. whilst the same quantity precipitated at 90° C. occupied only 28 c.c. The free rosin may be extracted from the precipitate or from paper by means of alcohol of a strength of 75 per cent. by volume (sp. gr. 0·8773), which does not dissolve the basic aluminium resinate. Ether on the other hand dissolves both the free rosin and the resinate. The latter contains 3·8 to 4·2 per cent. of aluminium unless an abnormally large excess of aluminium sulphate has been employed. The theoretical value for Al_2OR_4 is 3·7 per cent. of aluminium, where the mean molecular weight of the rosin acids is 353. For the precipitation of 100 grms. of rosin in the form of neutral size, 33 grms. of hydrated aluminium sulphate are required. The amount of free rosin in the sized pulp will consist of the whole of the free rosin in the size *plus* one-third of the combined rosin. In the finished paper the free rosin ranges from 50 to 75 per cent. of the total rosin.—J. F. B.

Celluloid: Colourimetric determination of acetanilide in ——. H. Barthélemy. Caoutchouc et Gutta Percha, 1912, **9**, 6638—6640.

It is often impossible to determine acetanilide in celluloid by distillation with phosphoric acid, etc., owing to the presence of acetylcellulose. The following method, based on hydrolysis, diazotisation, and conversion into an azo dyestuff is stated to give good results: 10 grms. of finely divided celluloid are treated with a 25 per cent. solution of caustic soda and distilled in steam. The distillate is treated with 10 c.c. of hydrochloric acid of 22° B. (sp. gr. 1·18) and extracted with benzine to remove camphor. The acid liquid is made up to 500 c.c., and 50 c.c. are placed in a beaker and cooled to at least 0° C. Then a solution of sodium nitrite (33 per cent.) is allowed to run in from a burette, shaking constantly (keeping the temperature not above 0° C.) and testing with starch-potassium iodide paper. About 5 drops excess are added, and the solution is allowed to stand for 5—10 mins. Another beaker in the freezing mixture contains 30 to 35 c.c. of a solution of 37·5 grms. of sodium β-naphtholdisulphonate (2.6.8) and 15 grms. of caustic soda dissolved in water and made up to 1 litre. The diazotised solution is poured quickly into the other, with vigorous stirring: the washings are added and the whole made up to 1 litre. This solution is then compared colourimetrically with a solution obtained by diazotising and otherwise treating in the same way 50 c.c. of a solution of 10 grms. of aniline and 30 grms. (about 25 c.c.) of hydrochloric acid of 22° B. (sp. gr. 1·18) in water to make 1 litre. The colours compared should be very light. The aniline solution is equivalent to one of 14·494 grms. of acetanilide per litre. If the dye solution is not quite clear, the turbidity may be rectified with a drop of alcohol, though this will not be necessary if the β-naphtholdisulphonate is pure.
—H. E. P.

Patents.

Vegetable fibres [hop stems]; Treatment and utilisation of ——. C. A. Müller and D. Wolf. Fr. Pat. 443,133, April 29, 1912.

Hop stems are treated for the separation of the bast from the wood, either or both of which may be reduced to paper pulp. This treatment is best effected by means of a mixture of soda or potash soap and a small proportion of caustic soda. The bast fibre is particularly suitable for the manufacture of banknote papers, or it may be dissolved to a gelatinous solution applicable for the manufacture of artificial filaments, plastic masses, etc. For this latter purpose, the purified fibre is boiled in a jacketed vessel with a solution of "zinc chlorate" until it is reduced to a homogeneous gelatinous mass. If plastic mixtures similar to gelatin or celluloid are desired, 5 per cent. of "formalin" is added to promote the hardening. When the solution is to be spun into artificial filaments, calcium chlorate may advantageously be added shortly before spinning.—J. F. B.

Flax wastes; Treatment of ——. A. Kube. Fr. Pat. 443,205, May 1, 1912.

The flax waste is freed from chips by scutching and drawing, then boiled gently in a bath containing 5 kilos. of caustic soda in 400 litres of water, washed and dried. Subsequently the material is digested at about 45° C. for about an hour in an emulsified bath containing, per 220 litres of water: 500 grms. of soda crystals, 250 grms. of "black soap"; 1000 grms. of pure dry tartaric acid, 150 grms. of painters' size, 250 grms. of olive oil, and 1000 grms. of 20 per cent. acetic acid. Instead of washing and drying after the first treatment, the material may be drained in the hydro-extractor and introduced directly into the acid emulsion, in which case the soda crystals and the glue are omitted from the latter. The treated material is passed through a softening "willow" and carded for spinning.—J. F. B.

Fabrics; Treatment of —— for aeroplane wings, planes, balloons, and the like. Leduc, Heitz, et Cie., Paris. Eng. Pat. 6798 of 1912, date of appl., Sept. 28, 1911. Under Int. Conv., Oct. 7, 1910.

Fabrics for aeroplanes, balloons, etc., are rendered impermeable to water and gases by coating with solutions or varnishes of cellulose esters (see Fr. Pat. 429,788 of 1911; this J., 1911, 1267).—T. F. B.

Clothes, furs, skins, etc.; Preservation of —— from the attacks of moths and other insects. Act. Ges. für Anilin-Fabrikation. Fr. Pat. 442,719, April 18, 1912. Under Int. Conv., Oct. 26, 1911.

For the preservation of furs, etc., and for killing moths, beetles, butterflies, etc., the use of *p*-dichlorobenzene is specified, either in the form of blocks, powder, solution or vapour. The *p*-dichlorobenzene may also be absorbed in inert materials, such as paper, or mixed with camphor or naphthalene.—J. F. B.

Cellulose and paper manufacture; Manufacture of a raw material for ——. P. Hoering, Berlin. Eng. Pat. 21,328, Sept. 27, 1911.

This improvement on Eng. Pat. 20,312 of 1911 (this J., 1912, 975) consists in reducing the material to a finer state of division and in this condition subjecting it to less pressure than in the original process.—P. F. C.

Wood-pulp; Apparatus for the production of mechanical ——. G. C. Howard, Everett, Wash. U.S. Pat. 1,039,286, Sept. 24, 1912.

A revolving cylinder is provided with intake devices for pulp material and water at one end and with discharging means at the other end. In order to introduce additional water into the cylinder, a pipe is arranged peripherally around the cylinder with one end delivering into the cylinder whilst the other end is open. The cylinder is so mounted above a receptacle containing water that at each revolution the open end of this pipe is submerged, takes up water and delivers it into the cylinder. The inside of the cylinder is provided with mechanical macerating devices.—P. F. C.

Wood pulp; Treatment of the waste caustic lyes from the digestion of ——. J. M. Neil. Fr. Pat. 442,850, April 23, 1912.

The precipitation of the organic matters from the black lyes in the digestion of wood by the caustic soda process, is facilitated by adding to the lyes an alkali compound in which "a metal acts as an acid radical," preferably sodium aluminate or sodium zincate. The lye containing this salt is heated and agitated with the addition of sodium bicarbonate or the passage of carbon dioxide through the liquid. The metallic compound and the organic matters are thereby precipitated; they are removed by filtration and the clear lye is re-causticised by treatment with lime. The precipitate may be treated with organic solvents to recover resins, etc.; and the metallic oxide may be recovered by incinerating the residue. In some cases it is desirable to oxidise the purified lye with ozone.—J. F. B.

Cellulose ester. H. S. Mork, Assignor to Chemical Products Co., Boston, Mass. U.S. Pat. 1,039,782, Oct. 1, 1912.

Cellulose acetate is dissolved in methyl chloroacetate with the optional addition of a monohydric alcohol of the paraffin series, boiling below 80° C.—P. F. C.

Threads, films, etc., from viscose by coagulation in a saturated saline bath containing sulphuric acid; Manufacture of brilliant ——. Vereinigte Kunstseidefabriken. Fr. Pat. 443,621, May 9, 1912. Under Int. Conv., June 26, 1911.

In coagulating threads or films of viscose in a bath composed of a saturated solution of a salt, *e.g.*, sodium sulphate, containing sulphuric acid, the proportion of acid present exerts a considerable influence on the quality of the product. If the acid be too strong, the threads are deficient in lustre, whilst if too weak, they are not rapidly hardened and show opaque patches. In this specification the limits of concentration between 1 and 5 per cent. of sulphuric acid are claimed in combination with a saturated saline solution.—J. F. B.

Celluloid, plastic masses, etc.; Manufacture of non-inflammable ——. H. Dreyfus. First Addition, dated April 1, 1912, to Fr. Pat. 432,047, July 6, 1911 (this J., 1912, 24).

In making plastic masses with certain types of cellulose acetate in combination with acetylene tetrachloride and other substitutes for camphor (*loc. cit.*), the cellulose acetates sparingly soluble in chloroform, mentioned in the original specification, may be replaced by acetates which are readily soluble in chloroform and at the same time in alcohol and chloroform or alcohol and benzene. Such acetates are prepared, preferably in a single operation, according to the addition, dated July 7, 1911, to Fr. Pat. 432,046 of July 5, 1911 (see this J., 1912, 21, 225, 329).—J. F. B.

Vegetable and textile fibre; Apparatus for treating waste —— *for the manufacture of paper.* L. Herz, Nuremberg, Germany, Assignor to Papeterie de la Seine, Nanterre sur Seine, France. U.S. Pat. 1,039,941, Oct. 1, 1912.

See Fr. Pat. 422,190 of 1910; this J., 1911, 533.—T. F. B.

Varnish having a base of cellulose esters; Process for the preparation and application of ——. Leduc, Heitz, et Cie., Paris. Eng. Pat. 21,426, Sept. 28, 1911. Under Int. Conv., Oct. 7, 1910.

See Fr. Pat. 429,788 of 1911; this J., 1911, 1267. Reference is directed to Eng. Pats. 1411 and 18,076 of 1910.—T. F. B.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Chromium in chrome mordants; A process for the rapid determination of ——. S. Jakubowski. Färber-Zeit., 1912, **23**, 415—416.

The chromium is oxidised to chromic acid by means of an unstable oxidising agent; the excess of oxidising agent is next destroyed by heating and the chromic acid is estimated by iodometric titration. The best oxidising agents to use are hydrogen peroxide, sodium peroxide or sodium percarbonate made alkaline with sodium hydroxide. The neutral or slightly acid solution of the mordant is diluted so that 25 c.c. contain about 0·05 grm. of chromium oxide. To 25 c.c. of the solution are added a little sodium hydroxide solution and 2—3 c.c. of 3 per cent. hydrogen peroxide solution. The mixture is then diluted slightly, heated to vigorous boiling in 10 minutes, next cooled and finally titrated iodometrically. If the chrome mordant contains much organic matter, it is evaporated to dryness and fused with sodium hydroxide and sodium peroxide in order to destroy the organic matter and oxidise the chromic oxide simultaneously.—P. F. C.

[*Colour-lakes*] *Precipitates formed by metallic salts and dyestuffs containing hydroxyl groups.* Guggiari. *See* IV.

Patents.

Mercerising cotton piece goods and like fabrics; Machine for ——. J. Byrom, J. Lithgow and J. Beswick, Bury. Eng. Pat. 3583, Feb. 13, 1912.

The fabric is padded in the mercerising liquor, then passed over a driven roller, over an intermediate roller and on to a batching bobbin; the batching and intermediate rollers may be driven positively or by frictional contact from the driven roller. Above the batching roller and bearing upon the cloth thereon is a pressure roller the pressure exerted by which is regulated and controlled by any suitable means. The machine is also fitted with tension devices to keep the cloth straight and with means for "knocking-off" the machine and or disconnecting the batching roller when the batch has attained a certain size.—P. F. C.

Hank dyeing machine for cotton, wool, and all textile materials. J. Decock. Fr. Pat. 442,713, April 10, 1912.

The machine described in Fr. Pat. 208,506 of 1890 is improved by devices for lessening the rate of movement of the yarn and for preventing felting. Thinner yarn sticks are also used.—P. F. C.

Dyeing and scouring of fibrous materials whether in the raw state or in the form of ribbon, yarn or fabric. Harmel Frères. Fr. Pat. 443,424, May 4, 1912.

A dyeing machine constructed on the circulating bath principle.—P. F. C.

Wool scouring machines; Continuous, horizontal —— with arrangements for decanting concentrated insoluble matters from the scouring fluids. Thibeau et Cie. Fr. Pat. 442,930, April 20, 1912.

Each of the successive tanks below the horizontal bed of the scouring machine is divided into two unequal compartments by partition plates which do not reach quite to the bottom of the tank. The smaller compartment contains the circulating scouring liquid which is used to feed the tank next in order of increased concentration by means of a valve and float. The larger compartment contains liquid practically at rest, so that the insoluble greasy matters separated out of the liquid float therein and are decanted off. The clear liquid at the bottom of the tank between the two compartments is withdrawn by a pump and sprayed over the layer of wool to be scoured. —J. F. B.

Composition for rollers such as those used in printing presses. F. W. J. Henning and J. Wetter, London. Eng. Pat. 20,230, Sept. 12, 1911.

The composition is obtained by adding about 1 part of emery powder and 4 parts of starch to a saturated solution of 5 parts of magnesium chloride. The well-stirred mixture is cast into moulds and allowed to gelatinise or caused to gelatinise by heating. The proportions named may be varied and other substances may be used instead of or in addition to the starch and the emery.—P. F. C.

Calico printing. Horridge and Cornall, Ltd., and J. Horridge, Bury. Eng. Pat. 27,671, Dec. 9, 1911.

The fabric is printed on both sides with a wax resist or discharge, the pattern on one side being different from but complementary to that on the other side. The fabric is then dyed.—P. F. C.

Colouring fabrics; Process of —— and means for applying it. J. Rousseau. Fr. Pat. 443,310, April 26, 1912.

The required pattern is produced by piercing the fabric by needles which are coated with the printing colour. —P. F. C.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Sulphuric acid; Contact —— from brimstone. G. W. Patterson and L. B. Cheney. J. Ind. Eng. Chem., 1912, 4, 723—725.

The authors describe the plant for the manufacture of sulphuric acid by the Schroeder contact process (this J., 1903, 348) at the U.S. Naval Proving Ground, Indian Head, Md. By using Louisiana brimstone instead of pyrites (from New York and Virginia), not only has the capacity of the plant been increased, but the costs of coal and of upkeep have been reduced and losses due to shutting down for repairs have been minimised, so that altogether, the cost of manufacture has been reduced nearly 2 dollars (8s. 4d.) per ton of 98 per cent. acid. The brimstone is burned in a Tromblee and Paull burner, consisting of a horizontal iron cylinder, 8 ft. long and 3 ft. diam., with conical ends, which revolves on its axis once in two minutes. At the exit end the cylinder is connected with a rectangular cast-iron box of 37 cb. ft. capacity, provided with a vertical uptake pipe leading to a brick dust-catcher; the combustion of the sulphur is completed in the box and uptake pipe. The burner has a capacity of 5500—6000 lb. of sulphur per day, and only needs to be cleaned about once in two months. From the dust-catcher the gases pass through a system of lead cooling pipes, a coke box, two scrubbers in series fed with sulphuric acid of sp. gr. 1·75, a second coke box, and two dry filters (slag wool upon a mat of asbestos). The purified gases then pass through a positive pressure blower to the preheater where they are raised to a temperature of 380° C., and then through the contact chamber, which is a vertical cast-iron cylinder, 6 ft. diam. and 8½ ft. high, divided into five horizontal sections, having baffles for distributing the gases. The contact mass (anhydrous magnesium sulphate carrying 0·2 per cent. of finely divided platinum) is spread on wire-mesh trays (one in each section) to a depth of 14—16 inches. After leaving the contact chamber, the gases pass through an air-cooled iron pipe, 180 ft. long, to the absorbing system. It is stated that the contact chamber has been worked for 18 months, without any indications of "poisoning" of the contact material. The gases entering the contact chamber contain 6·5—7 per cent. of sulphur dioxide; a conversion of 95—95·5 per cent. is obtained; and the average consumption of coal is 21·8 lb. per 100 lb. of sulphur trioxide made. During six months, the average output was a little more than 6 tons of acid per day, and the average yield on sulphur fed to the burner was 93·36 per cent.—A. S.

Nitric acid; Detection of —— in sulphuric anhydride. W. N. Iwanow. Chem.-Zeit., 1912, 36, 1170.

The use of diphenylamine in testing sulphuric anhydride and fuming sulphuric acid for nitric acid is unreliable under ordinary conditions, since an acid containing over 20 per cent. of free anhydride gives a pink to blue colouration with this reagent. To test an acid containing, say 30 per cent. of free anhydride, it should be first diluted with about twice its volume of pure sulphuric acid of sp. gr. 1·84 so as to produce approximately the monohydrate, which gives no colouration in the absence of nitric acid. The diphenylamine test may be used in the absence of nitric acid to give a rough estimate of the percentage of anhydride in fuming sulphuric acid. —W. H. P.

Sulphuric, nitric, and nitrous acids; Determination of —— in waste and mixed acids. G. Finch. Z. ges. Schiess- und Sprengstoffw., 1912, 7, 337—339.

The disadvantage of the method previously described (this J., 1912, 358), that the nitrogen acids are not determined directly, is overcome in the following modification. The total acidity is determined by titrating with $N/10$ barium hydroxide solution with phenolphthalein as indicator. The solution is then heated to boiling, and the barium sulphate is filtered off, filtration being assisted by the addition of cellulose fibre. The precipitate is washed free from barium salts and the filtrate, heated to boiling, is titrated with $N/5$ normal potassium chromate solution. The end-point is shown by the permanence of the yellow chromate colour. The reactions are as follows:

$$(1)\ H_2SO_4+2HNO_3+2SO_2{\cdot}OH{\cdot}ONO+5Ba(OH)_2= \\ 3BaSO_4+Ba(NO_3)_2+Ba(NO_2)_2+8H_2O;$$

$$(2)\ Ba(NO_3)_2+Ba(NO_2)_2+2K_2CrO_4= \\ 2BaCrO_4+2KNO_2+2KNO_3.$$

The chromate solution must be free from carbon dioxide and should be just neutral. It is important that the titration be carried out with the hot solution and that the chromate solution be run in slowly, as otherwise the barium chromate precipitate settles very slowly. It is necessary to filter the barium sulphate precipitate formed in the first titration, as potassium chromate, even in dilute solution, reacts with barium sulphate. The nitrous acid is determined as in the original method by titrating with potassium permanganate.—T. St.

Potassium hydroxide; Reaction of certain elements with fused ——. M. Le Blanc and O. Weyl. Ber., 1912, 45, 2300—2315.

The various substances were heated in crucibles of nickel or gold in a vertical tube in an electric furnace. A slow stream of nitrogen could be passed through the tube, and the issuing gas passed a calcium chloride tube to absorb any water, then a tube of red-hot copper oxide, finally a calcium chloride tube to absorb water formed by the combustion of any hydrogen evolved. It was found that a temperature of 400° C. was sufficient to drive off all extraneous water from the hydroxide, which then corresponded in composition with the formula, KOH, and that up to 660° C. no dissociation into oxide and water occurred, though the hydroxide very sensibly volatilised. At temperatures between 550° and 660° C., gold, aluminium, manganese, and potassium showed no sensible action on the hydroxide. Iron, cobalt, and nickel were sensibly attacked, though no evolution of water, hydrogen, or potassium could be detected. Chromium, molybdenum, and tungsten were also very slightly attacked, but free potassium and hydrogen were in these cases evolved. The reaction with carbon or magnesium was similar but much more marked, and silicon reacted violently even at 400° C., evolving hydrogen. The reaction of sodium was remarkable: in all probability the first stage was a condition of equilibrium of the reversible reaction $Na+KOH \rightleftharpoons K+NaOH$; and the sodium then reacted with the sodium hydroxide, forming sodium oxide and hydrogen, whilst the potassium volatilised.—J. T. D.

Magnesium salts; Utilisation of —— from the effluents of potash works. Rohland. Chem.-Zeit., 1912, **36**, 1169—1170.

The effluent from a potash works consists mainly of a solution of magnesium chloride of about 30 per cent. concentration, and its disposal is becoming an important economic problem in Germany. The author considers the possible methods of utilising it which include the spraying of streets, the manufacture of cement from a mixture of magnesia (which may be obtained by heating magnesium chloride) and concentrated magnesium chloride solution, and the manufacture of a building material, "tekton." A suggested application in conjunction with chalk as a manure is not considered valuable. The use of magnesium chloride as a source of hydrochloric acid and of metallic magnesium is not likely to prove profitable, on account of the cheapness of hydrochloric acid, and the relatively small field of application of magnesium.—W. H. P.

Nitrites; New method for the volumetric determination of —— and separation of nitrous and nitric acids. W. M. Fischer and N. Steinbach. Z. anorg. Chem., 1912, **78**, 134—140.

The method depends upon the facts that nitrous acid is esterified by methyl alcohol with extreme rapidity and that the resulting methyl nitrite is very volatile (b.pt.—12° C.) and can be completely removed by a current of air. A mixture of the nitrite solution (10 c.c. containing about 0·09 grm.) and 5 c.c. of methyl alcohol is placed in a flask fitted with a rubber stopper with three holes, through which pass respectively an air-inlet tube, the stem of a tap-funnel, and a tube leading to a water-pump. A mixture of a measured volume of *N*/10 hydrochloric or sulphuric acid and 1 c.c. of methyl alcohol is placed in the tap-funnel. A current of air is drawn through the nitrite solution, and the acid is allowed to drop in. After all the acid has been introduced, the current of air is continued for 5 mins., and then the excess of acid is titrated with *N*/10 alkali, using phenolphthalein as indicator.

$$NaNO_2+HCl+CH_3OH=NaCl+CH_3ONO+HCl.$$

For the determination of nitric acid in presence of nitrous acid, the mixture of nitrate, nitrite, and methyl alcohol is added, drop by drop, to a mixture of sulphuric acid and methyl alcohol through which a current of air is passed, whereby the nitrous acid is removed as methyl nitrite. The nitric acid in the solution is then reduced by means of Devarda's alloy and potassium hydroxide, and the ammonia distilled over into excess of standard acid. —A. S.

Iron salts; Behaviour of —— towards certain reagents in the presence of proteins and other organic substances. H. J. M. Creighton. Trans. Nova Scotian Inst. Sci., 1912, **13**, 61—75.

Results of an investigation on the associations of iron with proteins indicate that the latter prevent the ordinary reactions of substances containing trivalent iron. There is reason to believe that this phenomenon is partly physical and partly chemical: physical in that the colloid attracts the iron salts and forms adsorption compounds which do not possess a constant composition; and chemical in that the protein actually combines with the iron salt. The supposition that chemical compounds are formed is supported by the fact that the coagulating point of albumin is raised when trivalent iron is present; also by the disappearance of the colour of soluble Prussian blue on the addition of albumin or gelatin to its solution, and because the rate of fading of the blue colour increases as the temperature of the solution is raised. These physical and chemical complexes are broken down readily by hydrochloric acid. Complexes of soluble Prussian blue with gelatin are decomposed in solution by hydrogen peroxide, whilst those with albumin are not, and in both cases the complexes are stable at a temperature of 100° C. It is probable that, through the formation of complexes of proteins with soluble Prussian blue, the trivalent iron of the latter is reduced to the divalent state, but no indication has been obtained that complexes are formed by proteins and salts containing divalent iron. The presence of albumin in a solution of ferric chloride prevents the usual reaction of the latter with ammonia, alkali hydroxide, and potassium ferrocyanide. Sucrose, glycerol, and tartaric acid do not appear to form chemical or adsorption compounds with either ferrous or ferric salts. The results given above are of some physiological importance, as the ready formation of the complexes may possibly throw new light on the metabolism of iron. W. P. S.

Silicates; Crystallisation velocity and crystallisation power of ——. E. Kittl. Z. anorg. Chem., 1912, **77**, 335—364.

Direct measurements have been made of the velocity of crystallisation of silicates by means of Doelter's high temperature microscope, the variation in velocity being observed with progressive supercooling. This variation is illustrated by curves exhibiting well-marked maxima. As a rule needle-shaped crystals were formed, and the maximum velocity was observed at temperatures 20°—30° C. below those at which the commencement of crystallisation occurred; the greatest velocities were recorded with metasilicates (bronzite and hypersthene). Thin sections of a number of artificially prepared silicates, which had been cooled under identical conditions, were also examined. It was found that, as a rule, silicates solidify, when rapidly cooled, either wholly in the crystalline or wholly in the vitreous form. The alkali ortho- and metasilicates, excepting lithium silicate which may be made to crystallise by slow cooling, form a group which solidify without any sign of crystallisation; the ortho- and simple metasilicates of magnesium, calcium, ferrous iron, and manganese, on the other hand, show a general tendency to crystallise. The crystals obtained with orthosilicates were comparatively small, and the number of nuclei correspondingly large, whereas the metasilisate crystals were large and the number of nuclei appeared to be small. The complex silicates examined were found to solidify as glasses, with a few exceptions, such as anorthite which showed traces of crystals, and, among the polysilicates, those of simpler composition showed the greatest tendency to crystallise. —F. Sodn.

Water and carbon dioxide in minerals and rocks; Determination of ——. M. Dittrich and W. Eitel. Z. anorg. Chem., 1912, **77**, 365—376.

Water and carbon dioxide are found to be completely expelled from minerals and rocks by heating to a sufficiently high temperature in a current of dry air, and apparatus is described by means of which, except in substances containing organic matter, graphite, or much fluorine, these constituents may be determined in a single operation. For temperatures below 1000° C., the heating is effected in a tube of quartz glass, the substance being contained in a platinum boat, and for higher temperatures, up to 1400° C., a tube and boat of platinum-iridium (10 per cent. of iridium) are employed. The heating, in either case, is effected by means of an electric resistance furnace, and the evolved water and carbon dioxide are collected in absorption apparatus in the usual way, the purifying and absorption apparatus being connected to the heating tube by ground joints. For the retention of sulphur and halogens, a roll of silver gauze, heated by a Bunsen flame, is placed in the forward part of the tube, or, with a quartz tube, a heated mixture of lead oxide and peroxide may be employed. The results obtained are in agreement with those given by the Ludwig and Sipöcz method for the determination of water in silicates, as modified by the authors (Z. anorg. Chem., 1912, **75**, 373).—F. Sodn.

Thorianite; Composition of ——. M. Kobayashi. Science Reports, Tôhoku Imp. Univ., Sendai, Japan, 1912, **1**, 201—206.

Examination of specimens of thorianite indicated that there are two varieties of the mineral, one containing about 78 per cent. of thorium oxide and 15 per cent. of uranium oxide (molecular ratio of ThO_2 to UO_2 = 6 : 1); and the other about 60 per cent. of thorium oxide and 33 per cent. of uranium oxide (molecular ratio of ThO_2 to UO_2= 2 : 1). Different results hitherto obtained may be explained by the assumption that mixtures of the two varieties in varying proportions were analysed. Dunstan and Jones (Proc. Roy. Soc., 1906, **77**A, 546) described a thorianite from Ceylon rich in uranium, and expressed the view that in thorianites the oxides of thorium and uranium are not in chemical combination but are present as isomorphous mixtures. Against this view the author points out that the simple molecular ratio of the two oxides can hardly be a coincidence; and that whilst ignited thorium oxide is nearly insoluble in nitric acid, thorianite dissolves fairly readily, even after ignition.—C. A. M.

Uranium mica; Valuation and technical working of ——. F. Glaser. Chem.-Zeit., 1912, **36**, 1166—1167.

The author discusses the possibility of using phosphatic uranium micas, such as autunite (phosphate of uranium and lime) and copper autunite, as sources of radium. The determination of the uranium content of such ores is accomplished by the separation of uranium from iron by means of ammonium carbonate. If dilute solutions are used, with a large excess of ammonium carbonate, there is no danger of uranium being carried down with the iron precipitate, while all the phosphoric acid will be combined with the iron. A little iron remains dissolved with the uranium and is subsequently precipitated with it. This is removed by fusing the ignited and weighed precipitate with potassium bisulphate, dissolving in water, filtering, and treating the filtrate with ammonia and ammonium sulphide. The iron is precipitated on standing, while the uranium remains in solution. The specimens of Portuguese rocks containing autunite examined by the author have yielded from 0·1 to 4·5 per cent. of U_3O_8. For separation of the uranium the autunite is extracted with hydrochloric acid, and the extract neutralised with lime, which precipitates uranium, copper, radium and iron. Another method of decomposing the mineral is to boil with sodium carbonate, when the uranium is dissolved and the radium retained. This process is slow for calcium autunite but more rapid for copper autunite, from which however some copper goes into solution with the uranium. It is found that appreciable quantities of sulphuric acid in the commercial hydrochloric acid used for extraction, do not greatly decrease the amount of radium extracted, in spite of the very low solubility of radium sulphate. Presumably this solubility is increased by the ferric salts, etc., which are also present. Although the processes of extraction are thus comparatively simple, the profitable working of calcium autunite is only possible where the percentage of uranium is exceptionally high. It is also to be noted that the ratio of radium to uranium in autunite is usually much less than that in pitchblende. (See this J., 1911, 807.)—W. H. P.

"Reversed" flames; Reductions and reactions in ——. *I. Reduction of chlorides in the chlorine-hydrogen flame.* F. Meyer. Ber., 1912, **45**, 2548—2554.

A stream of chlorine is passed over the chloride contained in a U-tube which can be heated, and then passes, with the vapour of the chloride which it has carried with it, through a quartz tube surrounded by an electric furnace, so that the whole can be superheated to prevent condensation; after this it issues at a narrow jet. Hydrogen issues around this jet through a concentric annulus, very narrow so as to secure a high speed of issue; and the chlorine having been ignited, and burning in the surrounding hydrogen, the burner is introduced into a double conical vessel of hydrogen, of which it forms the stopper of the orifice at the bottom. This conical vessel has two horizontal arms at the level of the jet, one closed by a flat glass plate to afford a view of the flame, the other communicating with another portion of the vessel, pear-shaped, with a hollow stopper at the top, on the lower end of which is fastened a filtering thimble. The surplus gas passes through this thimble, and then leaves the apparatus by a tube at the top of the stopper, whilst any solid products which have not settled on the walls of the vessel (the conical part is water-cooled) are stopped by the thimble. With this apparatus stannic chloride was quantitatively reduced to stannous chloride, arsenious chloride to pulverulent metallic arsenic, and titanium tetrachloride to the violet trichloride. The advantage of the method is that the whole of the reacting material reaches the temperature of the flame, so that the product is contaminated by the original substance only to the extent determined by the reaction-equilibrium at the temperature, whilst in Deville's method of a hot and a cold tube, much of the original material is condensed without ever having had an opportunity of reacting, and contaminates the product of the reaction of other portions. Further work is in progress.—J. T. D.

Neutral salt reaction; A new ——. M. Fort. J. Soc. Dyers and Col., 1912, **28**, 314—316.

Using alizarin as an indicator it was found that:—(*a*) sodium sulphate, potassium sulphate and sodium nitrate each give an alkaline reaction when their aqueous solutions are boiled; (*b*) sodium chloride, potassium chloride and potassium nitrate do not give an alkaline reaction under similar conditions; (*c*) weak bases such as aniline are able to liberate a small quantity of caustic alkali from neutral salts such as sodium sulphate or chloride.—P. F. C.

Adsorption by incandescent charcoal. K. Arndt and G. Schraube. Nernst-Festschrift, 1912, 46—52. Chem. Zentr., 1912, **2**, 989.

In an investigation of the equilibrium: $C+CO_2 \rightleftharpoons 2CO$, irregularities were observed, which may be attributed to unequal adsorption of the two gases by amorphous carbon. At the ordinary temperature charcoal adsorbs 3.4 times as much carbon dioxide as carbon monoxide, and at red heat the adsorption of carbon dioxide is still greater than that of carbon monoxide or of nitrogen. This latter result was unexpected, since it appeared probable that with the large surface of the charcoal, the chemical equilibrium would be established very rapidly at the high temperature in question. It is probable that the adsorbed gas-mixture is under high pressure, and hence that the equilibrium is displaced from right to left, *i.e.*, with formation of carbon dioxide. If the surface layer of the charcoal containing the adsorbed gases could be analysed, it would be possible to calculate the adsorption pressure from the degree of displacement of the equilibrium.—A. S.

Ozone; Solubility of —— *in dilute sulphuric acid.* V. Rothmund. Nernst-Festschrift, 1912, 391—394. Chem. Zentr., 1912, **2**, 1261.

The conflicting statements which have been made as to the solubility of ozone in water arise from the fact that the velocity of decomposition of the ozone is greater than that with which saturation is attained. The author has determined the solubility of ozone in dilute sulphuric acid, in which decomposition takes place much more slowly than in water. At 0° C. the absorption coefficient, β, for ozone in $N/10$ sulphuric acid is 0·487, from which by extrapolation the absorption coefficient for ozone in water at 0° C. is calculated to be 0·494. The results obtained with ozone at different concentrations show that it obeys

Henry's law and hence that it has the same molecular weight when dissolved as in the gaseous state. Schöne's statement that by the action of ozone no hydrogen peroxide is formed, but a solution is produced which exhibits all the properties of ozone, was confirmed. A. S.

Tartaric acid and cream of tartar. U.S. Treasury Decision. Oil, Paint, and Drug Rep., Oct. 14, 1912. [T.R.]

The U.S. Treasury Department has issued the following instructions to collectors of customs at ports where laboratories of the Dept. of Agriculture are established: "That refined tartaric acid and cream of tartar containing lead in excess of 20 mgrms. per kilogram shall be held as adulterated under Section 7, paragraph 5, under foods, in that they contain an added poisonous and deleterious ingredient which may render the product injurious to health."

New reactions of diphenylamine. Lutschinsky. *See* III.

Arsenic xanthate in chemical analysis. Tarugi and Sorbini. *See* XXIII.

Patents.

Nitric acid; Recovery and concentration of —— from kieselguhr or other absorbent. F. M. Hale, Catford. Eng. Pat. 21,724, Oct. 2, 1911.

Highly concentrated nitric acid is recovered from kieselguhr or other absorbent by mixing a heat conducting and dehydrating liquid, such as sulphuric acid, with the nitric acid, or absorbent material containing such, before or after placing it in the distilling plant. The residual sulphuric acid may be separated from the absorbent by means of water and re-concentrated. —F. Sodn.

Nitrogen pentoxide and ozone; Process for the preparation of —— from mixtures of nitrogen and oxygen. F. Russ and L. V. Ehrlich. Fr. Pat. 443,620, May 9, 1912. Under Int. Conv., May 10, 1911.

A mixture of nitrogen and oxygen is submitted to the electric discharge (*e.g.*, in a Siemens' tube), in the presence of ozone (formed by the discharge itself or introduced from an external source), in such a manner that the lower oxides of nitrogen, as produced, are oxidised by the ozone to nitrogen pentoxide. The action of the discharge may be allowed to continue until almost the whole of the ozone has been used up, in which case a maximum yield of nitrogen pentoxide is secured, or (for example, by increasing the rate of flow of the gas through the discharge chamber) the action may be less complete, so that, after absorbing the nitrogen pentoxide, a gas containing varying proportions of ozone is obtained. A high concentration of ozone is secured by continuously or intermittently withdrawing the nitrogen pentoxide from the mixture, so that the gas is repeatedly submitted to the electric discharge after being rendered free from oxides of nitrogen.—F. Sodn.

Sulphur dioxide; Process of producing ——. E. Rossiter, Port Edwards, Wis. U.S. Pat. 1,039,812, Oct. 1, 1912. (See also U.S. Pat. 1,038,442 of 1912; this J., 1912, 983).

Sulphur is burnt in a substantially closed compartment, whilst being thoroughly agitated in contact with air, and the gas, as formed, is withdrawn. Practically all the heat radiated by the walls of the compartment and that generated by the combustion is utilised in further heating the withdrawn gas, and an amount of air sufficient to completely burn all the vapourised sulphur contained in the gas is supplied during this further heating.—F. Sodn.

Sodium hydroxide; Manufacture of ——. L. P. Basset. Fr. Pat. 443,810, July 22, 1911.

The process is based upon the fact that when a mixture obtained by treating sodium silicate solution with lime is allowed to stand, the gelatinous calcium silicate produced passes into a non-gelatinous form, from which sodium hydroxide is readily separated by lixiviation. It is preferably carried out by adding a slight excess of quicklime, in small portions, to a concentrated solution of sodium silicate (30—45° B.), well stirring the magma produced, allowing to stand for 24 hours, and then lixiviating the hardened mass with hot water. The sodium silicate required is best prepared in a rotary kiln by the interaction, at a red heat, of sodium chloride (100 kilos.) and sand which has been ground to an impalpable powder (60—80 kilos.), in the presence of steam; it is thus obtained in a readily soluble form and containing a relatively small proportion of silica. F. Sodn.

Ammonia; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pats. 21,151, Sept. 25, 1911, and 3245, Feb. 9, 1912.

(1) A mixture of nitrogen and hydrogen is passed over a catalytic mixture which contains a metal or metallic compound having a considerable power of taking up nitrogen and also a metal or metallic compound having a considerable power of taking up hydrogen. For example, ammonium molybdate is heated so that a part of the ammonia is expelled, and the porous grains, thus produced, are soaked in a concentrated solution of palladium nitrate (which may contain 2 per cent. of uranium nitrate). 20 per cent. of the salt, relative to the ammonium molybdate, being employed. The mixture is calcined until the nitrate is decomposed, and the mass is then reduced with hydrogen and introduced into a contact tube or the like, a current of pure dry hydrogen and nitrogen, in molecular proportions, being passed over the mass, at a temperature of 550° C., and under a pressure of 200 atmos. (2) Nitrogen and hydrogen are passed alternately over an agent which contains two or more metals (or compounds giving rise to the metals during the reaction), this agent being capable of taking up nitrogen or hydrogen, or both. Instead of metals, a nitrogen or hydrogen compound of a metal, or a compound giving rise to such may be employed, and a "promoter" may be added, if desired. For example, a current of nitrogen, which may contain small quantities of hydrogen, is passed into a vessel containing lithium-manganese nitride, at 450°—550° C., until a pressure of about 50 atmos. is attained. Absorption is allowed to proceed until the pressure has been reduced to say 30 atmos., and the nitrogen is then removed and hydrogen is passed over the mixture, preferably at about 50 atmos. and at the same temperature as before.—F. Sodn.

Ammonium sulphate; Process of preparation of —— [from distillery vinasse]. H. Gouthière et Cie and P. Ducancel. Fr. Pat. 442,923, July 1, 1911.

An intimate mixture of distillery vinasse (concentrated to a pasty consistence) and a portion of the residue from a previous operation is submitted to destructive distillation in the presence of steam, so as to liberate most of the nitrogen present in the form of ammonia which is converted into sulphate by a known method. The combustible gases produced by the distillation serve to heat the retorts or ovens employed, and part of the residue is treated for the extraction of potassium salts.—F. Sodn.

Phosphate ores; Treatment of —— and the obtaining of nitrogen or other products thereby and/or therefrom. R. W. Wallace and E. Wassmer, London. Eng. Pat. 14,631, June 20, 1911.

Crushed phosphate ores, mixed with charcoal or other suitable reducing agent, are heated in a closed furnace, so as to distil off the phosphorus, and this is then oxidised in a "phosphorus burner" or blowpipe, placed directly after the furnace, into which is introduced a quantity of air calculated to convert the phosphorus completely into phosphoric anhydride and, at the same time, to oxidise as much as possible of the accompanying carbon monoxide. Finally, the mixture of phosphoric anhydride, nitrogen, carbon monoxide, and carbon dioxide obtained is treated so as to separate the nitrogen.—F. Sodn.

Tetrachloride of tin; Process of making anhydrous —— from dioxide of tin. F. Bräunlich, Brünn, Austria-Hungary. U.S. Pat. 1,039,356, Sept. 24, 1912.

Tin dioxide is exposed to the action of acetylene and of chlorine alternately, at a high temperature. A. S.

Nickel salts [nickel ammonium sulphate from matte]; Process of making —— and recovering the acid used. H. L. Wells, New Haven, Conn., Assignor to M. H. King, East Orange, N.J. U.S Pat. 1,039,861, Oct. 1, 1912.

A matte, containing nickel, iron, and other metals, is treated, in the pulverised state and preferably hot, with hydrochloric acid, and (if desired, after treating the solution thus obtained with fresh matte and hydrogen sulphide, and boiling to expel hydrogen sulphide) an oxidising agent, such as black oxide of nickel, is added and the iron is precipitated in any suitable manner (for example, by adding calcium carbonate); sufficient sulphuric acid is then added to react with the chloride present, and sufficient ammonium sulphate to form nickel ammonium sulphate, which is recovered in the crystallised state. The mother-liquor may be utilised in dissolving fresh matte.—F. Sodn.

Borax and boric acid; Preparation of ——. E. L. Fleming and T. L. Miller. Fr. Pat. 442,820, April 22, 1912. Under Int. Conv., Feb. 26, 1912.

Natural calcium borate or double borate of calcium and sodium is boiled and agitated with a solution of sodium sesquicarbonate, until decomposition is complete, and the calcium carbonate produced is separated centrifugally and the solution cooled, so as to bring about crystallisation of the borax. Boric acid is obtained by concentrating the mother-liquor and treating it with chlorine (obtained electrolytically from brine), the boric acid being made to crystallise by cooling the solution, and sodium chlorate may be recovered from the mother liquor. Both the borax and boric acid are separated and dried in centrifugal apparatus. The sesquicarbonate required may be prepared by carbonating the sodium hydroxide obtained by electrolysis.—F. Sodn.

Salt similar to that from salt-works; Process for obtaining fine and serviceable kitchen ——. J. Trischkan. Fr. Pat. 442,933, April 20, 1912.

Brine of good quality is allowed to evaporate under the influence of sun and wind, and at the same time, by repeated renewal of the brine or by introducing fresh brine, care is taken that the density of the solution does not reach the point (about 27° B.) at which impure salt is deposited. There is thus secured a separation of fine salt which, accumulating against barriers provided for the purpose, is removed at frequent intervals and washed with a solution of salt. The product is much more readily dried than ordinary sea-salt.—F. Sodn.

Zinc compounds [zinc oxide]; Manufacture of ——. C. Ranson. Fr. Pat. 443,442, May 6, 1912. Under Int. Conv., May 12, 1911.

A solution of a zinc salt is treated with an alkali sulphite, and the precipitated zinc sulphite is separated and calcined to oxide, the liberated sulphur dioxide being utilised in regenerating the alkali sulphite. An alternative plan is to employ an alkali or alkaline-earth bisulphite, in which case the bisulphite obtained is converted into monosulphite by removing the excess of sulphur dioxide in known manner. For example, a solution of 215 kilos. of anhydrous sodium sulphite in 950 litres of water is agitated for 15 minutes with a solution of 400 kilos. of crystallised zinc sulphate in 350 litres of water, both solutions being cold, and, after allowing the precipitate to settle, the supernatant liquid is separated and boiled to complete the precipitation of the sulphite. The mother liquor is utilised for dissolving a fresh quantity of zinc salt and partly for regenerating the alkali sulphite, which latter is effected by heating with an equivalent quantity of calcium bisulphite or by treating with calcium or barium hydroxide or carbonate and sulphur dioxide, or, in the case of ammonia, by distilling with lime and treating the evolved gas with sulphur dioxide. The zinc oxide produced is pure and specially suitable for the preparation of alkali zincates (being readily soluble in caustic alkalis) or the production of metallic zinc, and the process may be applied to the utilisation of poor zinc-bearing materials of little value.—F. Sodn.

Nitrogen from the air; Apparatus for extracting ——. O. Frank and O. Fincke, Berlin. Eng. Pat. 10,718, Jan. 22, 1912.

A tank in which air is compressed is connected by pipes with two alternately working chambers fitted with gas-directing baffle-plates and filled with copper, preferably in the form of gauze (which may be heated to 800°—900° C.). The connecting pipes are provided with inlets for the supply of steam, for assisting in the process of oxygen absorption, and other inlets for the introduction of reducing agents for regenerating metallic copper.—F. Sodn.

Nitride; Process of manufacture of —— in the electric furnace. G. Coutagne. First Addition, dated June 29, 1911, to Fr. Pat. 437,504, Feb. 20, 1911 (this J., 1912, 535).

Instead of using a cylindrical carbon core, as in the principal patent, the raw materials are mixed with pieces of coke and pass down a vertical shaft, the middle zone of which constitutes the electric furnace proper. A fresh charge is introduced at the top of the furnace, whenever a charge of finished products, mixed with coke fragments, is drawn from the bottom, the pieces of coke being then screened from the nitrides and used again. The additional sawdust or sodium chloride, specified in the main patent to increase the porosity of the mixture, may be omitted, since the desired result is obtained by the employment of fragmentary coke.—O. R.

Nitric acid; Process of treating —— by electrolysis. M. Moest and R. Müller von Berneck, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,040,379, Oct. 8, 1912.

See Eng. Pat. 10,522 of 1911; this J., 1911, 955.—T. F. B.

Zinc-sodium hydrosulphite; Manufacture of ——. G. W. Johnson, London. From Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. Eng. Pat. 21,359, Sept. 27, 1911.

See Fr. Pat. 434,511 of 1911; this J., 1912, 335.—T. F. B.

Sulphur and alkali containing compound; Process for the production of a ——. C. G. Lewit, Ingweiler, Germany. Eng. Pat. 21,988, Oct. 5, 1911.

See Fr. Pat. 434,914 of 1911; this J., 1912, 282.—T. F. B.

Sodium sulphite and bisulphite; Process of making ——. E. H. Strickler, New York. Eng. Pat. 4273, Feb. 20, 1912.

See U.S. Pat. 1,023,179 of 1912; this J., 1912, 489.—T. F. B.

Radium and other radio-active substances; Process for the manufacture, isolation, and enrichment of ——. E. Ebler, Heidelberg, Germany. Eng. Pat. 2155, Jan. 26, 1912. Under Int. Conv., March 6, 1911.

See Fr. Pat. 440,236 of 1912; this J., 1912, 723.—T. F. B.

Nitrites; Process for the production of pure —— from nitrous gases containing air or oxygen. Elektrochemische Werke G. m. b. H., Berlin. Eng. Pat. 10,479, May 2, 1912. Under Int. Conv., May 17, 1911.

See Fr. Pat. 441,706 of 1912; this J., 1912, 922.—T. F. B.

Tartaric salts from solutions derived from tartar, wine lees, grape skins, and the like; Process for the extraction and separation of ——. G. Vigneaux, Paris. Eng. Pat. 11,558, May 15, 1912. Under Int. Conv., June 12, 1911.

See Fr. Pat. 430,883 of 1911; this J., 1911, 1382.—T. F. B.

Hydrogen; Process for the preparation of —— *by auto-combustion.* G. F. Jaubert, Paris. U.S. Pat. 1,040,201, Oct. 1, 1912.

See Fr. Pat. 427,191 of 1910; this J., 1911, 1058. T. F. B.

Gas [hydrogen]; Process of purifying crude ——. H. Lane, Birmingham, Assignor to Internationale Wasserstoff Akt Ges., Frankfort on Maine, Germany. U.S Pat. 1,040,218, Oct. 1, 1912.

See Eng. Pat. 11,878 of 1910; this J., 1911, 362. T. F. B.

VIII.—GLASS; CERAMICS.

Selenium as colouring matter in soda-lime silicate glass. P. Fenaroli. Chem.-Zeit., 1912, **36**, 1149—1150.

The use of selenium as a colouring matter or "stain" in glass, dates from 1891, when Welz patented the use of selenium alone or with cadmium sulphide for producing a red or orange "stain." In 1894, Spitzer used selenites or selenates in conjunction with sulphites or arsenites, the latter acting as reducing agents. A year later, selenium in combination with gold was employed for red colours and as a decolouriser in white glass. For discharging the green colour due to iron selenium is a valuable agent. In order to study the physical and chemical condition of selenium in glass, the author used a glass of the formula: $6SiO_2,CaO.2Na_2O$, which was heated for 24—30 hours at 1400° C. He finds that the element selenium can only produce a red under strongly reducing conditions. The pigment is in a condition of true solution, but if by insufficient reduction the "stain" is not fully developed it is not all dissolved. The colouration depends on the reduction and not on temperature nor length of firing. There may also exist in solution, in a colloidal state, selenides of the type, M_2Se, and compounds less oxidised than selenites, of a type similar to thiosulphates. These colloidal solutions are sometimes coloured, sometimes not.—H. H. S.

Clays; Odour of ——. P. Rohland. Z. physiol. Chem., 1912, **81**, 200—201. (See also this J., 1909, 546, 1250.)

The peculiar taste and odour of clays can be communicated to other substances with which the clays come in contact, whether such substances are colloids, as solutions of ferric saccharate (see this J., 1909, 983), or substances which might be looked upon as crystalloids, like solutions of ammonia. Very often the odour of kaolin becomes perceptible only after moistening with water, or still better with an alkaline solution. In the formation of clays found to possess the characteristic odour and taste, minute organisms, probably bacteria, may have played some part; and the remains of these organisms would account for the characters mentioned. The fact that many kaolins contain organic matter accords with this view. Such kaolins, on account of their very plastic nature, and their capacity for taking up colloidal solutions and substances in the solid state, might be applied to therapeutic purposes.—J. H. L.

Crystallisation velocity and crystallisation power of silicates. *See* VII.

Patents.

Kilns [for ceramic ware]; Gas-fired continuous ——. J. G. Waterfield, Upper Gornal, Staffs. Eng. Pat. 27,864, Dec. 12, 1911.

In a gas-fired continuous kiln of the tunnel type, having wagons for supporting the goods to be fired, the wagons are constructed with a large number of ducts in the top, which are put into communication with air and gas supply flues when the wagon reaches the hottest zone of the kiln, so that combustion takes place at points all over the top of the wagon and uniform heating is thereby ensured. A large number of air and gas ducts are arranged in the walls of the kiln in the central heating zone, so that flames impinge upon the exterior of the goods stacked upon the wagons. The air and gas supply pipes for the wagons are arranged beneath the tunnel at a distance apart equal to the length of a wagon, and communication is established with each wagon in turn by means of water-sealed sliding connecting-pipes operated by hand from a tunnel passing beneath the kiln. A drying chamber is arranged above the kiln and supplied with heated air.—H. H.

[Muffle] furnace with movable floor [for ceramic products]. M. Demongeot. Fr. Pat. 442,842, April 23, 1912.

In a muffle furnace, the walls and roof of which are of the ordinary type, a movable floor is composed of channelled, refractory masonry, which is supported by an iron structure on wheels. A number of such trolleys, with their tops dovetailed into one another, successively move into the furnace. The masonry channels of each trolley communicate with the flues from the furnace, so that the hot gases which circulate round the sides and roof of the permanent structure, have similar access under the floor, which is provided by each trolley when in position. To prevent any leakage of furnace gases into the kiln, the refractory top of each trolley and also the ironwork on which it rests, are provided with projections, running the whole length of the trolley, which fit closely into grooves filled with sand, the combination affording a gas-tight seal. The joints between the various trolleys are made gas-tight by means of asbestos plates.—O. R.

Glass, porcelain, stoneware and the like; Method of uniting adhesively —— *with similar materials or with articles made of metal.* A. Spichtin and R. Knoebel, Basel, Switzerland. Eng. Pat. 5106, Feb. 29, 1912.

For the purpose described claim is made for a metallic cement consisting of 666 parts by weight of lead, 333 of chemically pure tin and 200 of bismuth; the m. pt. of the alloy is given as 170° C. W. E. F. P.

Glass plates; Process for the continuous production of transparent ——. R. W. James, London. From Ges. f. Elektrotechnische Industrie m. b. H., Berlin. Eng. Pat. 25,925, Nov. 20, 1911.

See Fr. Pat. 433,740 of 1911; this J., 1912, 231.—T. F. B.

Glass plates; Process for manufacturing ——. P. T. Sievert, Dresden, Germany. U.S. Pat. 1,039,829, Oct. 1, 1912.

See Eng. Pat. 25,042 of 1908; this J., 1909, 601. T. F. B.

Facilitating the filtration of materials difficult to filter. Fr. Pat. 443,397. *See* I.

IX.—BUILDING MATERIALS.

Refractory ware; Resistance of —— *against abrupt changes of temperature.* P. Windszus. Tonind. Zeit., 1912, **36**, 1205.

Investigations carried out at comparatively low temperatures indicate that by increasing the size of the grog particles and decreasing the percentage of binding clay in the mixture, the resisting capacity of firebricks was essentially increased. In No. 1 test the air dry bricks were heated in a muffle to 850°—900° C. and cooled down in the open air. In No. 2 test, the bricks which had remained unaffected after the first test were heated to 900°—950° C. for 20 minutes, then a jet of cold air was blown upon them for 3 minutes, and they were finally allowed to cool down in the open air. The results were as follows:—

Composition of brick.	Size of grog particles.	No. 1 test.	No. 2 test.
Five parts of binding clay to five parts of grog	0·75 mm. to 6 mm.	No cracks	Small cracks
	0·75 mm. to 4 mm.	,, ,,	,, ,,
	0·75 mm. to 1 mm.	Numerous big cracks	——
	0·00 mm. to 0·75 mm.	Parts of brick blown off	——
Three parts of binding clay to seven of grog..........	0·75 mm. to 6 mm.	No cracks	No cracks
	0·75 mm. to 4 mm.	,, ,,	Small cracks
	0·75 mm. to 1 mm.	,, ,,	Numerous small cracks
	0·00 mm. to 1 mm.	Small cracks	,, ,, ,,

—W. H. P.

Silica stone for Martin [open-hearth] furnaces. O. Lange. Stahl u. Eisen, 1912, **32**, 1729—1737.

THE essential qualities of a good silicious material for use as a lining for open-hearth furnaces are discussed *in extenso*, and the results of analyses of a large number of samples of quartzite sand from different regions are tabulated, giving the percentage of silica, alumina, iron oxide, and lime as well as refractoriness (Seger cones). The property of not shrinking on heating is stated to depend upon the physical condition of the particles rather than upon the chemical composition. Details are also given of the methods employed for grinding the quartzite, and for mixing, forming, drying and burning the bricks.—A. H. C.

Portland cement manufacture; Control of dust in —— by the Cottrell precipitation process. W. A. Schmidt. J. Ind. Eng. Chem., 1912, **4**, 719—723.

THE author describes the application of the Cottrell electrical dust precipitation process (this J., 1911, 1037) to the removal of dust from the gases escaping from cement kilns. The volume of stack gases from an oil-fired rotary kiln, 100 ft. long and 7 ft. diam., may be taken as 50,000 cb. ft. per minute; above the combustion zone in the stack the gases have a temperature of about 450° C. and carry an amount of dust equivalent to 4—5 tons per 24 hours. The gases are treated at about 450° C., and it has been found possible by installation of pyrometers in the stacks to prevent abnormal variations of temperature without interfering with the satisfactory working of the kiln. The treating apparatus (two for each stack) is placed on a platform erected at the same level as the top of the stack (80 ft.), and is itself supplied with a short outlet stack (20 ft.). Each treating apparatus has a cross-section of 12 by 16 ft., and a length of 20 ft. The electrodes are spaced 6 ins. apart, and there are twenty rows of discharge electrodes in series. The collecting electrodes are cleaned every 3 or 4 hours by mechanical rapping, the dust falling into hoppers, from which it is led to the bins feeding the rotary kilns. A complete treating apparatus of the size described consumes about 7½ kilowatt-hours, including electrical energy for all motors. For a works with a capacity of 5000 barrels, the power consumption would be 75 kilowatt-hours.—A. S.

Portland cement; Study of the temperature gradients of setting ——. A. S. Cushman. J. Ind. Eng. Chem., 1912, **4**, 728—731.

IN the author's experiments 1 kilo. of the neat cement was mixed with 250 c.c. of water to a homogeneous plastic paste which was packed into a No. 2 tin can, and the latter placed on a stand in a double-walled wooden box. The thermometer consisted of a copper-plated steel tapered mercury-filled bulb, 9 cm. long by about 2 cm. maximum diameter, connected with a recording dial by a flexible steel capillary tube. When the primary heat effect always developed when cement is mixed with water was over, the bulb of the thermometer, smeared with vaseline and wrapped with several folds of tinfoil, was pushed into the cement paste and the temperature gradient taken during 24 hours. The indications on the recording dial were then plotted, with temperature in centigrade degrees as ordinates and time in hours as abscissæ. Thirty-two curves obtained in this way are given, but no conclusions can be drawn from them as to what the ideal temperature gradient curve should be. The curves obtained with four cements which failed to pass the standard tests, however, were obviously of an abnormal character. Some of the curves given show the effect of the addition of certain salts to the water. When a saturated solution of calcium sulphate was used, the temperature rose above the scale of the recording device (50° C.) and the test-piece became uncomfortably hot to the hand. (See also this J., 1909, 983.)—A. S.

PATENTS.

Wood; Method of protecting ——, in salt water. G. Schumacher, Vancouver, B.C. U.S. Pat. 1,039,824, Oct. 1, 1912.

A MIXTURE of chlorine and compressed air is delivered around the lower end of the immersed wood.—W. E. F. P.

Portland cement slurry; Process of separating centrifugally the [excess of] water contained in ——. H. Verschaffel. Fr. Pat. 442,943, April 25, 1912.

PORTLAND cement slurry is continuously introduced into a rapidly rotating, vertical hydro-extractor, which is provided with openings at the bottom of the drum, for the delivery of the hydro-extracted material, and with an internal tube near the top and a short distance from the side of the machine, for the escape of the extracted water. It is claimed that slurry containing 40 per cent. of water and upwards may thus be centrifuged to a plastic consistence, in which it carries only 25 to 30 per cent. of water, thereby effecting a great saving of fuel in the rotary kiln, increased production, and increased life of the refractory lining.—O. R.

Dolomite; Process of calcining ——. W. Happe. Fr. Pat. 443,667, May 10, 1912. Under Int. Conv., May 10, 1911.

DOLOMITE, to which has been added about 2 per cent. of a flux, such as clay, sand, cinders, silica, or ferric oxide, is calcined in a rotary furnace using powdered coal, gas, or oil fuel, the regulation of air and draught being preferably such as to produce a reducing atmosphere.
—O. R.

Lime, cement, etc.; Kiln for burning ——. A. Anker. Fr. Pat. 443,745, May 13, 1912.

IN a vertical, shaft kiln, a refractory brick cylinder, which constitutes the burning zone, is carried by iron pillars resting on solid foundations, and itself carries a roofed-over charging platform. A cooling chamber, situated immediately below the hot zone, is composed of a sheet iron cylinder provided near its periphery with vertical gratings, which form air spaces between the periphery and the descending material. Some distance below the cooling chamber a series of inclined grates are so arranged as to catch the material, which has been burnt near the periphery, whilst deflecting the central column of descending material into a delivery hopper underneath. It is thus possible to draw burnt material in equal proportions from the centre and from the periphery of the kiln. A system of perforated pipes, embedded in the material in the burning chamber, provides for the elimination of furnace gases and for the better circulation of the air required for the combustion of the fuel.—O. R.

Limestone or limestone chippings; Rotary furnace for the calcination of ——. A. Negro. Fr. Pat. 443,783, May 14, 1912.

CONTINUOUS forward, turning, and stirring movements are imparted to materials travelling down a rotary kiln, by building on to the internal periphery of the latter, parallel or helicoidal lines of refractory bricks, the individual bricks being set apart at regular intervals, and the lines of bricks preferably dividing the periphery of the kiln into four equal parts.—O. R.

"Stone-wood" [artificial stone]; Process for utilisation of waste of ——. Deutsche Xylolith-(Steinholz-) Fabrik O. Sening und Co., Ges. m. b. H. Ger. Pat. 247,396, Oct. 29, 1911.

"STONE-WOOD" and similar products consist of a mixture of calcined magnesia with magnesium chloride and water, with the addition of fibrous substances such as wood (sawdust, shavings), paper pulp, flax fibres, hemp, asbestos, cork, etc., and of colouring and filling materials. In order to utilise the waste produced in manufacture and use, this is heated with access of air, and with or without injection of steam, in order to expel hydrochloric acid and burn the organic constituents of the material. The residue consists essentially of magnesia, suitable for use in the manufacture of fresh artificial stone ("stone wood").—A. S.

Mortar (rough casting): Manufacture of —— *from porous mineral waste and binding agents.* C. Ehemann. Ger. Pat. 247,671, Aug. 19, 1910.

THE mineral waste is mixed with oil or fatty substances before being incorporated with the binding agent. It is stated that by this process, mortar made with waste from the preparation of china clay is rendered weather-resistant.—A. S.

Lime-sand blocks; Process for the hardening of ——. Ver. Technische Bureaux Ges. m. b. H. Ger. Pat. 247,938, Feb. 19, 1911.

IN the hardening of lime-sand blocks by the high-pressure process, the preheating of the blocks and of the hardening chamber up to 100° C. is effected by means of exhaust steam, after which fresh superheated steam is used to produce the high temperature and pressure necessary in the second stage of the hardening process, whilst when this high temperature and pressure are once attained, they are maintained by direct or indirect heating by means of the waste gases from the steam boiler. For instance the waste gases may be circulated around the hardening chamber or they may be used to superheat fresh or exhaust steam which is then injected into the chamber.—A. S.

Portland cement; Means of separating the water from the slurry in the manufacture of ——. H. Verschaffel, Haino St. Pierre, Belgium. Eng. Pat. 9823, April 25, 1912.

SEE Fr. Pat. 442,943 of 1912; preceding.—T. F. B.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Mineral output of South Africa in 1911. Board of Trade J., Oct. 24, 1912. [T.R.]

ACCORDING to the report of the South African Mines Department for 1911, the total value of the mineral output of the Union for the year was £47,679,294, as compared with £43,674,249 in 1910. The following table shows the production of the chief minerals during 1911, the 1910 figures being added for purposes of comparison:—

	1910.	1911
	£	£
Gold . . .	31,991,295	35,049,041
Silver .	90,790	98,507
Diamonds .	8,189,197	8,716,721
Coal	1,867,220	1,935,153
Coke	4,610	7,544
Copper	477,381	552,145
Tin	326,352	411,871
Asbestos	25,778	20,839
Graphite	1,376	1,308
Magnesite	1,683	856
Zinc	3,020	291
Lead	669	344
Salt	54,803	61,160
Lime	123,535	135,193

Mineral production of Western Australia. Board of Trade J., Oct. 31, 1912. [T.R.]

THE following table, showing the quantity and value of all the minerals produced in Western Australia during the years 1910 and 1911, is taken from the Report of the Department of Mines of that State for the year 1911:—

	1910.		1911.	
	Quantity.	Value.	Quantity.	Value.
		£		£
Coal* . . . . tons	262,166	113,699	249,890	111,154
Copper ore† . . . ,,	6,309	27,271	9,825	33,709
Copper, ingot, matte, etc.† . . ,,	1,281	68,657	828	44,409
Gold‡ . . . . . . fine oz.	1,470,632	6,246,848	1,370,868	5,823,075
Ironstone* . . . . tons	10	12	—	—
Silver† . . . . . . fine oz.	176,139	18,777	169,043	18,333
Lead ore† . . . . . . tons	248	1,433	1,549	15,002
Pyritic ore*	—		9,939	3,529
Tin ore and ingot† . .	500	45,129	495	55,220
Wolfram† . . . . . ,,	2	190	9	826
Zinc, spelter, etc.† . .	12	147	12	189
Unenumerated‡		100	—	407
Total values		6,522,263	—	6,105,853

* Raised. † Exported. ‡ Exported and minted locally.

Blast-furnace gases; Purification of ——. A. Gouvy. Rev. Métall., 1912, 9, 771—798.

A DESCRIPTIVE account of the general methods employed, together with details of some of the more important plants at present in operation. After preliminary "dry" treatment to effect the deposition of the coarser particles of dust by decreasing the velocity of the gaseous current, further purification of the gas is generally effected in two stages by "wet" processes. Gas thus purified "to the first degree" contains as a maximum 0·5 grm. of dust per cub. m. and is suitable for use as fuel for boilers and air-heating apparatus; when required for motive power purposes the gas is purified "to the second degree," the maximum amount of dust retained being then 0·025 grm. per cub. m. Direct purification of the crude gas to the second degree by "wet" means is not economically possible. For purification to the first degree the gas is first cooled to a temperature of 35°—40° C. by being subjected, in an ascending stream, to the action of a limited quantity of water, the latter descending as a fine spray; this method is stated to be more efficient than that involving the use of a scrubber of the ordinary type. The gas is then passed through a rapidly rotating fan into which water is simultaneously injected, apparatus of the types devised by Schiele, Zschokke and Dinnendahl being generally employed for this purpose. Subsequent purification of the gas to the second degree is effected by means of a second fan, preferably of the type devised by Theisen, although one of those employed in the preceding stage may also be used if operated at a much greater velocity. Within recent years "dry" purification of crude blast furnace gas (equivalent to that of the second degree by wet processes) has been economically effected—in a single stage—by means of the Halberg-Beth system. In this process the gas from the preliminary dust-collector is cooled to a temperature (70°—80° C.) below its dew-point and passed, at a temperature about 10° higher, through a series of shaking filters, the latter being enclosed in a metal casing and consisting of vertical tubes composed of a special flexible tissue. Obstruction of the pores of the tissue is prevented by momentarily reversing the direction of the gaseous current, this being effected by the periodical admission of back-draughts of purified gas into the upper or discharge end of the chamber. Upon the basis of the daily treatment of the gas produced by three blast furnaces, each consuming 100 metric tons of coke per 24 hours, the estimated cost of "wet" purification to the second degree is given as 311 fr. (£12 1s.) per 24 hours, of which 200 fr. (£7 19s.) represents the cost of purification to the first degree; the cost of treatment by the direct "dry" process is given as 163 fr. (£6 9s.) per 24 hours. (This assumes that £1 = 25.5 frs.)—W. E. F. P.

Iron—iron sulphide; The system ——. R. Loebe and E. Becker. Z. anorg. Chem., 1912, **77**, 301—319.

A THERMAL study of the system, iron-iron sulphide, has shown that the freezing-point curve is of a far simpler type than has been hitherto supposed, exhibiting all the characters of the type *Va* of Roozeboom; the minimum on the curve corresponds to a eutectic containing 85 per cent. of iron sulphide and melting at 985° C. On the iron side the system is practically free from "mixed crystals." The ferrous sulphide exerts no influence on the transformation points in the iron, the transformation, γ to β, being recognisable up to a content of 81 per cent. of iron sulphide and that for β to α, up to 52 per cent. Transformation of the iron sulphide has also been observed at 298° and 138° C., that at 298° C. being accompanied on cooling by a considerable contraction and that at 138° C. by an expansion. Microscopic investigation of melts which had been heated under oxidising conditions has led to the belief that red-shortness in iron containing sulphur is due to the entry of oxygen into the binary eutectic, Fe—FeS.—F. Sodn.

Iron; Passivity of —— under boiler conditions. H. G. Byers and F. T. Voris. J. Amer. Chem. Soc., 1912, **34**, 1368—1379.

EXPERIMENTS made with an iron anode in bichromate solutions of various strengths have shown that, at temperatures ranging from that of the room up to those approximating boiler conditions, concentrations as low as 0·125 per cent. are sufficient to render iron passive and that passivity is maintained even when the anodic current is very small. In the presence of moderate quantities of common salt, the anode is passive if the concentration of bichromate is approximately 40 times that of the sodium chloride, this minimum concentration ratio being 25 at 93° C. and, at 125°—150° C., again 40. With sodium sulphate solution of moderate concentration, an equal concentration of bichromate is sufficient to insure passivity, and a still smaller proportion is usually effective, even at 150° C. The presence of carbonates and bicarbonates seems to have no disturbing effect on the passivity induced by bichromate. The extent to which these results are due to the influence of the anodic current has not yet been determined, but they are considered to lend support to the proposal to use sodium bichromate in boilers to prevent pitting, and the authors suggest the addition of an amount equal to 40 times that of the chloride present, plus that needed to precipitate the scale-forming substances.—F. Sodn.

Iron; Action of oxygen on —— at high temperature and pressure. J. Milbauer. Chem.-Zeit., 1912, **36**, 1170—1171.

A PIECE of bright iron remains unchanged in weight and appearance when heated in dry oxygen up to 550° C. at 12 atmospheres pressure. An iron reaction tube has been used for more than 100 experiments under these conditions, and only shows a very slight oxidation layer on its inner surface.—W. H. P.

Low-carbon steel; Course crystallisation produced by annealing ——. R. H. Sherry. Met. and Chem. Ind., 1912, **10**, 666—667.

THE author has investigated the effect of cold mechanical working and subsequent annealing on the granular structure of low-carbon steel (see Charpy, this J., 1910, 1013). He has not been able to obtain such large grains as Charpy observed. Starting with steel which would crystallise between 690° C. and 775° C., the size of grain increasing from 0·02 to about 0·52 mm., various forging and cold drawing tests were made. When the piece was heated to 800°—1200° and then forged above 700° C., no crystallisation occurred, but if the forging was continued below 700° C., it was found that an increase in size of grain took place near the circumference on annealing at 700° C. The effect of cold drawing showed that in order to get a large increase in size of grain, only light mechanical work need be done; in general the smaller the degree of force exerted the larger tho grain, although there was a lower limit (about 7 per cent. reduction of area) below which no effect was produced. On the other hand where more mechanical work had been done, the crystallisation (although not so marked in size of grain) would proceed at higher temperatures up to 850° C. Similar results were obtained with cold rolling.—W. H. P.

Iron; Volumetric determination of —— in iron alloys by titration with permanganate in phosphoric acid solution. Wunder and A. Stoicoff. Ann. Chim. Analyt., 1912, **17**, 361—363. (See also this J., 1911, 899.)

THE sample of iron or iron alloy is dissolved by warming with phosphoric acid solution containing 1 c.c. of concentrated sulphuric acid per litre. The sulphuric acid prevents oxidation of ferrous iron and increases the rapidity of solution. Samples of pure iron dissolve more slowly than samples rich in carbon. The titration with permanganate gives correct results in the presence of phosphoric acid, no matter whether the iron is rich or poor in carbon, but when sulphuric acid only is present, titration with permanganate is not accurate when the sample of iron is rich in carbon. The method may also be applied to the estimation of iron in magnetite, ferrochrome, and ferrosilicon.—G. M.

Platinum ore; Analysis of ——. E. V. Koukline. Rev. Mét., 1912, **9**, 815—824.

IN a criticism of the methods devised by Wöhler, Deville and Debray, Duparc and Holtz, Deville and Stass, and Leidié and Quennessen for the analysis of platinum ore and alloys, it is stated (among other points raised) that in none of the processes mentioned is complete separation of the platinum from the common metals effected, a portion of the latter—notably iron—being generally occluded by the precipitated ammonium chloroplatinate. As the result of investigation the following method is recommended:—2 grms. of the ore, contained in a small crucible previously glazed with borax, are heated with a known weight (7—10 grms.) of pure granulated silver and 10 grms. of fused borax; a small piece of charcoal is placed upon the charge which is then maintained at a temperature just above the m. pt. of silver until the gangue of the ore is dissolved by the borax, and the metallic particles are enclosed by the molten silver. When cold, the metal is separated from the borax, heated with dilute hydrofluoric acid to detach the last particles of the latter, washed with water, calcined at a low temperature, and weighed, the difference between this weight and that of the ore plus silver representing the gangue originally present. The silver having been removed from the metallic "button" by treatment with nitric acid, the insoluble residue (clean ore) is treated with *aqua regia*, at 70° C., in a tubulated retort until no further action occurs, the solution is then evaporated practically to dryness, the distillate—which may contain osmium—

being collected in a well cooled receiver. The dry residue having been extracted with hydrochloric acid (sp. gr. 1·12), the insoluble portion is re-treated with *aqua regia*, etc., as described, the process being repeated until the hydrochloric acid extract of the residue in the retort is no longer coloured. The combined hydrochloric acid solutions plus the final insoluble residue are several times evaporated nearly to dryness with strong hydrochloric acid to expel the last traces of nitric acid, the concentrated solution being finally diluted with hydrochloric acid (sp. gr. 1·12) and filtered through a weighed filter; the insoluble residue—consisting of osmiridium and a portion of the iridium originally alloyed with the platinum—is washed with hydrochloric acid and then with alcohol, after which it is dried and weighed. Through the filtrate, heated nearly to boiling, a current of pure acetylene is passed for 45 minutes to effect a preliminary separation of palladium; the precipitate is filtered off, washed and (the filter having been moistened with ammonium nitrate solution) ignited; the precipitate is dissolved in *aqua regia*, the solution evaporated just to dryness, the residue taken up with a little water containing one drop of hydrochloric acid, and the palladium re-precipitated from the solution by the addition of mercuric cyanide; the resulting precipitate is successively washed, dried, strongly ignited in air, heated to redness in hydrogen, cooled in carbon dioxide and weighed as palladium. The filtrate from the mercuric cyanide precipitation having been evaporated to dryness, ignited, re-dissolved in *aqua regia*, evaporated with hydrochloric acid and added to the filtrate from the acetylene treatment, the latter is evaporated nearly to dryness, diluted with water and heated to about 70° C. A concentrated solution of sodium nitrite (sufficient to form double nitrites with the metals of the platinum group present) is then added, followed by a solution of sodium carbonate, and the liquid boiled for 45 minutes; the gold is thus precipitated as metal together with the carbonates or oxides of copper, iron and other common metals present. After filtration the precipitate is treated upon the filter with cold hydrochloric acid, the residue of metallic gold being subsequently ignited and weighed. To the filtrate from the sodium nitrite and carbonate treatment (now containing only the metals of the platinum group) sodium hydroxide is added, the solution is placed in a retort and heated to 70°—80° C., whilst a current of chlorine is passed through it to expel the ruthenium (as anhydride) which is collected in hydrochloric acid contained in the receiver. The ruthenium is determined by evaporating the latter solution to a syrup, diluting with water and precipitating with metallic magnesium which is added a little at a time: the resulting precipitate is washed first with water, then with 5 per cent. sulphuric acid and again with water, the filter and contents being finally dried and burned in air at the lowest possible temperature. The residue is subsequently heated to redness in hydrogen, cooled in carbon dioxide and weighed. The solution from which the ruthenium has been distilled is neutralised with hydrochloric acid and evaporated somewhat, when sufficient sodium nitrite is added to reconvert the double chlorides into nitrites; rhodium and iridium are then precipitated by the addition of nitrite and chloride of potassium, and the precipitate filtered off and washed with a 5 per cent. solution of potassium nitrite. The solution obtained by dissolving this precipitate in *aqua regia* is evaporated several times with hydrochloric acid to eliminate nitric acid, and a slight excess of magnesium is added; the precipitated metals (mixed with the excess of magnesium) are washed with water containing hydrochloric acid and subsequently calcined in hydrogen; the magnesium is then removed by treatment with dilute sulphuric acid, the residue is washed with water, and the filter and contents incinerated; the residue is finally heated to incipient redness in hydrogen, cooled in carbon dioxide and weighed as rhodium plus iridium. The latter are separated by fusing the residue with 50 times its weight of pure lead in a porcelain crucible; the fusion is continued for 2 hours, the charge being covered with potassium cyanide and stirred occasionally with a glass rod. After removal of the cyanide by solution in water, the lead is dissolved in nitric acid and the insoluble residue treated with boiling *aqua regia* which dissolves the rhodium. The insoluble iridium is filtered off, and after incineration of the filter paper, is ignited in hydrogen, cooled in carbon dioxide and weighed; the rhodium is obtained by difference. The filtrate from the precipitation by potassium nitrite, containing only platinum, is evaporated to dryness with hydrochloric acid, the residue taken up with boiling water, the solution rendered slightly alkaline with sodium hydroxide and then boiled with formaldehyde to precipitate the platinum (as metal) which is finally ignited and weighed. W. E. F. P.

[*Gold and silver.*] *Precious metals; Collection of ——, as speiss in the smelting of antimonial concentrates.* G. C. McMurtry. Inst. of Min. and Met., Oct. 17, 1912. [Advance proof.]

THE products treated were (1) raw concentrates containing 13—33 per cent. of silica, 30 of iron, 26—30 of sulphur, 14—20 of arsenic, 1·4—3·7 of antimony and 3—5 oz. of gold per ton, (2) roasted concentrates and slimes, from a previous method of treatment, containing 40—49 per cent. of silica, 29 of iron, 0·31 of sulphur, 1·4 of arsenic, 1·4—2·7 of antimony and 1·0—1·5 oz. of gold per ton: other materials employed in the smelting operation were copper ore containing about 15 per cent. of silica, 39 of iron, 25 of sulphur, 8 of copper and 5 of magnesia; limestone (little more than self-fluxing) containing 7—19 per cent. of silica; and coal containing 25 per cent. of ash. A mixture of the two concentrates was roasted and charged, with small amounts of raw copper ore and limestone, on to a bath of molten matte (either the treated product or freshly prepared from the copper ore), the operation being continued until the gold content of the matte was increased to 40—60 oz. per ton, when the furnace was tapped. The molten matte was caused to flow over scrap wrought iron contained in the tapping bed, antimonial speiss being thus produced which separated out with the excess of iron at the bottom of the pigs of matte and was subsequently detached from the latter. With a matte containing about 32 per cent. of copper and 57 oz. of gold per ton, the speiss produced contained about 42 per cent. of antimony, 5 of arsenic, 22½ of copper, 5½ of iron, 10 of nickel, 9½ of lead, 2 of sulphur and 3½ per cent. of gold and silver together (mainly gold); the treated matte contained less than 19 oz. of gold per ton. After purification by remelting and casting, the speiss was granulated, subjected to a sintering roast in a crucible and remelted with an equal weight of raw copper ore (iron pyrites not being available) for the production of an enriched speiss (containing in the above case 10 per cent. of precious metals, less than 5 of copper and less than 1 of iron) from which the precious metals were finally extracted by cupellation with lead.—W. E. F. P.

Copper ore; The flotation process as applied to the concentration of —— at the Kylor Copper Mine, N.S.W. J. W. Ashcroft. Inst. of Min. and Met., Oct. 17, 1912. [Advance proof.]

AN account of the adaptation of an oil-flotation process to the concentration of an ore consisting of quartz with copper pyrites and small amounts of bornite and iron pyrites. The ore as milled contains 6·5 per cent. of iron, 4·7 of copper, 5·2 of sulphur, 3·4 of lime and 79·4 of silicious matter. The ore pulp remaining after the removal of a portion of the concentrates by jigging is ground and screened and then passed to a flotation machine comprising a series of six square boxes each provided with a rotatory stirrer or impeller and connected with an exterior chamber in which the actual separation of the metallic sulphides from the gangue is effected. From the bottom of the first flotation chamber the pulp is drawn into the second chamber by the action of the second impeller, and so on throughout the series, the gangue being finally discharged from the bottom of the last chamber. The operation is conducted at ordinary temperature and without the use of acid, the oil employed being crude eucalyptus oil (manufactured locally) containing a large percentage of phellandrene. The capacity of the whole mill is 60 tons per day and a total extraction of over 86 per cent. of the copper (as concentrates containing about 22·5 per cent. of this metal) is obtained at a cost of 8s. per ton including transport of the ore to the mill. The actual recovery in the flotation section of the plant (apart from the jig) is approximately 80 per cent. on a 3·5 per cent. copper feed; the assay of the flotation concentrate exceeds 25 per cent. of copper, the working costs of the flotation section being 3s. 6·1d. per ton of ore milled. It has been proved that by lowering the grade of the concentrates the total extraction could be increased to 92 per cent., but owing to the high transport charges prevailing, the production of the higher grade of concentrates is more economical.—W. E. F. P.

Bronze; Influence of heat treatment on the mechanical properties of drawn ——. P. Goerens and J. Dumont. Ferrum, 1912, 10, 21—27.

A BRONZE containing 96 per cent. of copper and 4 per cent. of tin was drawn down to wires of different diameters, the percentage diminution of sectional area of the original wire in the different wires (36·0, 43·7, 64·0, 68·4, 78·7, 84·1, 92·1) being taken as the measure of cold work done on the wires. The breaking stress and the elongation were then measured for each wire, in its original state and after having been heated to various temperatures for various periods of time. The results of the determinations are summarised as follows:—1. The tensile strength of the original wires was approximately proportional to the amount of work done on them. 2. In regard to the temperature of heating, four zones are distinguishable—(*a*) From 0° to 315° C. The tensile strength diminishes, and the elongation increases, but slightly. Even long-continued heating fails to annul the effect of the cold work. (*b*) From 315° to 400° C. Tensile strength diminishes, elongation increases, very considerably. A few minutes' heating completely annuls the effect of the cold work. (*c*) From 400° to 750° C. Tensile strength but slightly diminishes further, whilst elongation goes on increasing and reaches a maximum at 750° C. (*d*) Above 750° C. Both tensile strength and elongation diminish, first gradually, then rapidly. The material is overheated. 3. The duration of heating has an effect in the first zone: but at higher temperatures the changes effected in the first few minutes are not sensibly increased or altered by further heating. 4. The speed of cooling has no influence on the effects of heating.—J. T. D.

Lead; Influence of colloids on the electrolytic deposition of ——. H. Freundlich and J. Fischer. Z. Elektrochem., 1912, **18**, 885—891.

THE effect of a number of colloids (gelatin, agar-agar, casein, dextrin, gum tragacanth) on the electrolysis of lead silicofluoride and perchlorate has been studied by the authors. These two salts are the ones which under normal conditions give rise to the most satisfactory deposits of the metal. In each case conditions were chosen where the deposit was decidedly loose and then the minimum concentration of the colloid which produced a definitely smooth deposit was determined. These concentrations were compared with the protective action of the substances upon colloidal gold. The following figures show that for the authors' experimental conditions there is no parallel between the behaviour of the colloid in these two cases:—

Colloid.	Minimum concentration in grms. per litre to give a good deposit with:		Gold number in mgrms. per litre.
	Lead silico fluoride (0·8 amp.).	Lead perchlorate (2 amp.).	
Agar-agar	0·3		0·6
Gelatin	0·6	0·2	0·15
Dextrin	1·0	0·3	1200
Gum tragacanth	1·2	0·4	300
Casein	1·2		0·6

The general conclusion, however, is that in electrolysis the colloid is adsorbed by the metal, causing a reduction in the velocity of crystallisation, which in turn leads to a dense compact deposit. This assumption is supported by the observation that a similar influence on the form of separation is observed when lead is deposited from its salts by means of metallic zinc.—W. H. P.

Arsenic and antimony; Determination of ——. H. E. Hooper. Eng. and Min. J., 1912, 94, 706—707.

WHEN applied to arsenical concentrates, speisses, slags, and mattes, the author has found that Pearce's original fusion method is unsuitable, owing to the formation of gelatinous silica, and that the usual methods of fritting with zinc oxide and sodium carbonate give low results, due to losses by volatilisation. A wet method which has been found to give accurate results is carried out as follows: from 0·5 to 2 grms. of the material is treated with 10—15 c.c. of concentrated nitric acid, taken slowly to dryness, and 15 c.c. of concentrated hydrochloric acid added. The whole is transferred to a 300 c.c. flask (hydrochloric acid is used for this, but no water). The solution is made up to 50 c.c., heated to 65° C., and after passing hydrogen sulphide till all the arsenic is precipitated, filtered through a hardened filter, and the precipitate washed with hydrochloric acid, first strong, then weak, and finally with water. The precipitate is treated for arsenic, and the filtrate for antimony. The precipitate is washed into a beaker with as little water as possible, evaporated nearly to dryness, and a few c.c. of fuming nitric acid added. Red fumes and excess of acid are driven off on a water-bath, any precipitate is dissolved in a little warm water, diluted to 100 c.c., phenolphthalein added, and then sodium hydroxide till two drops past neutral, followed by glacial acetic acid until the red colour is discharged. Silver arsenate is now precipitated by adding silver nitrate solution, a little at a time and stirring, allowing to stand before filtering. When filtered, the precipitate is washed, dissolved on the filter with dilute warm nitric acid, and titrated with a standard solution of ammonium thiocyanate, using iron alum solution as an indicator. The thiocyanate solution is standardised either with pure silver or recrystallised silver nitrate. In the filtrate the antimony is precipitated by adding a large amount of boiling water. Hydrogen sulphide is passed to complete precipitation, and filtration is effected on hardened paper, washing with water containing hydrogen sulphide. The precipitate is washed off the paper with strong hydrochloric acid, and warmed till all the antimony sulphide is dissolved. After dilution, the solution is freed from hydrogen sulphide by boiling or drawing air through it, after adding 1 grm. of tartaric acid. The bulk is then made up to 200 c.c., excess of sodium carbonate added, and titration effected with iodine solution, using starch as indicator. Copper if present in quantities under 10 per cent. may be held in solution by using a larger amount of hydrochloric acid in the first treatment with hydrogen sulphide, keeping the solution warm: it is then precipitated with the antimony on adding water, and best separated by digesting the mixed precipitate in sodium hydroxide solution, and filtering off the copper sulphide.—R. W. N.

Thallium and tellurium; Alloys of ——. M. Chikashigé. Z. anorg. Chem., 1912, **78**, 68—74.

THE author refers to the only previous investigation of the alloys of thallium and tellurium and shows that the compound, $TeTl_2$, does not exist. A series of twenty-one alloys of thallium and tellurium were prepared containing from 2·5 to 97·0 per cent. of tellurium, and an equilibrium diagram derived from their cooling curves is given. It is concluded that:—(1) Two compounds exist, Te_2Tl_3 and TeTl. (2) Te_2Tl_3 melts at 428° C. and is very brittle. This compound dissolves thallium and forms mixed-crystals with it. (3) The mixed-crystals when saturated in the melted state contain 5·5 per cent. of thallium, which is insoluble on solidification, and therefore at concentrations between 100 and 76 per cent. of thallium, two layers are obtained, the saturated mixed-crystals and thallium.

(4) Te_2Tl_3 reacts with melted tellurium at a temperature of 305° C. to form the compound, TeTl, which crystallises in long needles. (5) TeTl does not mix with either Te_2Tl_3 or with tellurium, but with the latter forms a eutectic melting at 200° C.—A. H. C.

Metals; Changes in the properties of —— produced by mechanical treatment. G. Tammann. Z. physik. Chem., 1912, **80**, 687—700.

The work is complementary to that of Tammann and Faust (Z. physik. Chem., 1910, **75**, 108) the two papers being summarised in the following conclusions. The improvement in the mechanical properties of a metal by means of mechanical treatment (hammering, drawing, rolling, etc.) is accompanied by a division of the crystallites into elementary crystals. This division is due to the formation of "slip bands." A large hydrostatic pressure on the metal does not lead to the formation of the sliding planes, and therefore produces no improvement in mechanical properties. Although this improvement is generally described as "hardening," there is no increase in hardness as determined by the sclerometer. The "hardness" disappears on heating the metal to a sufficiently high temperature owing to the re-formation of larger crystals. If a crystallising metal is rapidly cooled, the crystals formed will be relatively small, and the mechanical properties correspondingly good. The alloys of two metals of about the same elasticity are found to be much stronger than either of the metals, on account of the smaller size of their crystallites. An eutectic alloy in particular is very much stronger than its weakest component. The view that the size of the crystals is diminished under strain by the formation of sliding planes readily accounts for the modifications in elastic properties, for the orientation of the lamellæ in wire drawing, and for the large increase in electrical conductivity which is frequently observed. It also indicates the possibility of changes in other vectorial properties accompanying the orientation, while it is in agreement with the observations of properties such as density and energy content (as measured by E.M.F.) not notably changed by mechanical working.—W. H. P.

Reaction of certain elements with fused potassium hydroxide. Le Blanc and Weyl. *See* VII.

Silica stone for Martin [open-hearth] furnaces. Lange. *See* IX.

Chemical reactions taking place at the cathode and anode during the electrolysis of simple salt solutions. Paterson. *See* XI.

Determination of manganese as sulphate and by the sodium bismuthate method. Blum. *See* XXIII.

Patents.

Iron or steel; Preparation and use of solutions for the treatment of —— for the prevention of oxidation or rust. Rudge-Whitworth, Ltd., and L. Heathcote, Coventry. Eng. Pat. 20,798, Sept. 20, 1911.

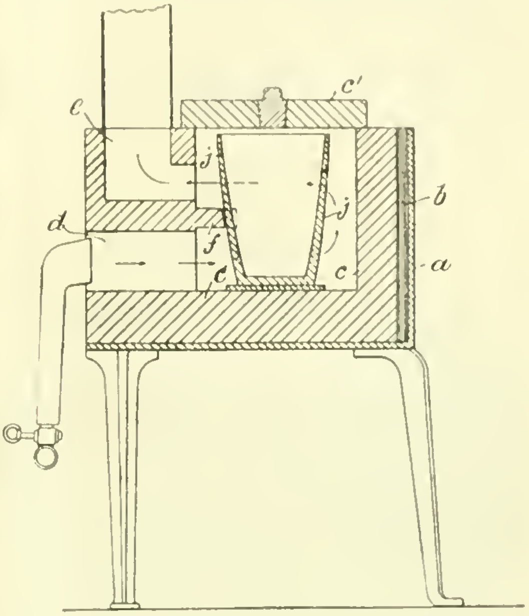
The patent relates to solutions of hydric phosphate (or phosphates) of iron for use as described in Eng. Pats. 490 of 1908 (this J., 1909, 206) and 29,504 of 1910 (this J., 1912, 135). When solutions prepared from impure forms of iron and phosphoric acid are employed, the efficiency of the protective coating produced upon the article is impaired, mainly, it is stated, by the presence or development of hydrogen sulphide or ferric salts in the liquid. With the object of destroying or preventing the formation of these deleterious substances, sulphurous acid or sodium bisulphite is introduced into the solution at any desired stage of its preparation, storage or use.
—W. E. F. P.

Iron and steel articles; Permeating protective for ——. H. J. Lohmann, Jersey City, N.J., Assignor to H. J. Lohmann and Co. U.S. Pat. 1,039,978, Oct. 1, 1912.

The iron or steel article (*e.g.*, boiler tube) is coated with an alloy of lead, zinc, and tin in such a manner that the iron is permeated to a measurable depth.—W. E. F. P.

Crucible furnace; Gas-heated ——. Fletcher, Russell and Co., Ltd., and T. W. Fletcher, Warrington. Eng. Pat. 12,102, May 25, 1912.

In a furnace (see fig.) consisting of a suitably lined, metal casing, *a*, *b*, *c*, a horizontal baffle, *f*, is provided between the gas inlet, *d*, and the outlet, *e*. The furnace being also provided with a cover, *c'*, the gas flame is thus caused to pass first around the bottom, and then around the top, of the crucible, *j*, before entering the chimney.—W. E. F. P.



Furnace; Metallurgical ——. U. Wedge, Ardmore, Pa., Assignor to Furnace Patent Co., Philadelphia, Pa. U.S. Pat. 1,040,071, Oct. 1, 1912.

The furnace consists of a number of superposed treating chambers, each provided with a separate heating chamber above it. The heating chambers are fired from a common fireplace, the products of combustion from each passing downwards through the treating chamber below it.
—W. E. F. P.

Electric furnaces [for the extraction of zinc]. A. L. J. Queneau, Philadelphia, U.S.A. Eng. Pat. 19,305, Aug. 29, 1911.

See U.S. Pat. 1,006,877 of 1911; this J., 1911, 1319.—T. F. B.

Furnace; Electric ——. E. A. A. Grönwall, A. R. Lindblad, and O. Stålhane, Ludvika, Sweden. U.S. Pat. 1,039,732, Oct. 1, 1912.

See Fr. Pat. 400,244 of 1909; this J., 1909, 1047.—T. F. B.

Metal or metallic compounds; Process of applying deposits of —— to surfaces. M. U. Schoop, Hongg, Switzerland. Eng. Pat. 21,066, Sept. 23, 1911. Under Int. Conv., Oct. 7, 1910.

See Fr. Pat. 426,882 of 1910; this J., 1911, 1068.—T. F. B.

Agglomerating fine ores, metalliferous residues, etc.; Method of and apparatus for ——. C. Dellwik, London. U.S. Pat. 1,039,706, Oct. 1, 1912.

See Eng. Pat. 13,073 of 1909; this J., 1910, 884.—T. F. B.

Alloys of copper and zinc. A. Schmid, Zurich, Switzerland. U.S. Pat. 1,040,027, Oct. 1, 1912.

See Fr. Pat. 432,260 of 1911; this J., 1912, 32.—T. F. B.

Classifying or grading crushed ore and the like: Apparatus for ——. G. H. Stanley. Assignor to Sands, Ltd., Johannesburg. U.S. Pat. 1,040,804, Oct. 8, 1912.

See Eng. Pat. 25,746 of 1910; this J., 1911, 1020.—T. F. B.

Process of making nickel salts [nickel ammonium sulphate from matte] and recovering the acid used. U.S. Pat. 1,039,861. *See* VII.

Method of uniting adhesively glass, porcelain, stoneware and the like with similar materials or with articles made of metal. Eng. Pat. 5106. *See* VIII.

XI.—ELECTRO-CHEMISTRY.

Electrolysis of simple salt solutions; Chemical reactions taking place at the cathode and anode during the ——. J. H. Paterson. Proc. Univ. Durham Phil. Soc., 1912, 4, 187—220.

The author electrolysed solutions of simple salts (sulphates, nitrates and chlorides) of cobalt, nickel, iron, zinc, cadmium, manganese and lead, in a small electrolytic cell which could be kept under observation on the stage of a microscope. Thin platinum wires were used as electrodes. In all cases, with the doubtful exception of lead, it was found possible to obtain either the pure metal or, with lower concentrations of salts and lower current densities, the hydroxide deposited on the cathode. The limits of concentration and of current density necessary for the production of metallic hydroxide, become lower on passing from one metal to the next in the series as given above. The hydroxide is not produced by a secondary reaction of the deposited metal, but is a precipitate from the electrolyte in the cathode area. Solutions of ferrous and ferric salts, for example, give the corresponding hydroxides. For the production of hydroxides, a concentration of hydroxyl ions at the cathode is necessary, and this necessitates the liberation of hydrogen, for the ionisation of water itself is small. The conditions under which hydrogen is liberated at the cathode will therefore determine in part the production of hydroxides. For the deposition of each of the metals studied, a higher potential is necessary than for the liberation of hydrogen (at a reversible electrode at least); and with very dilute solutions, in which the concentration of metal ions approaches that of hydrogen ions, the tendency will be in all cases to produce the hydroxide, since hydroxyl ions will be liberated at a rate approaching that of the metal. The hydroxides may however be produced over a greatly varying range of current density. This appears to be due to the excess voltage (between electrode and electrolyte) necessary to liberate hydrogen on a surface of the particular metal, over that necessary to liberate it at a reversible electrode. The authors were unable to make any satisfactory determinations of potential at the cathode, owing to the formation of the hydroxide in patches on the surface of the electrode, and to the alterations in current density which occurred. The simultaneous production of metal and hydroxide on a larger electrode, which occurs continually during the electrolysis of simple salts of the metals when the current density rises too high, is readily explained. Those parts of the electrode which become coated with hydroxide (it is probably formed all over at first and then blown off by escape of hydrogen) are practically insulated, and a rise of current strength takes place at the exposed parts, with the result that a mixture of the dendritic metal and the hydroxide is precipitated at these points. It is generally assumed, without experimental proof, that spongy or dendritic deposits, produced by too high current densities, contain hydrides of the metals as impurities, but it appears much more probable, that if impurities are present at all, they consist of metallic hydroxides.—J. H. L.

Patents.

Cadmium electrodes for secondary batteries with alkaline electrolyte. R. Pörscke and E. Achenbach. Ger. Pat. 250,385, July 13, 1910.

Finely divided cadmium produced by the action of zinc dust on a solution of a cadmium salt, is mixed with finely-divided zinc produced by the action of magnesium powder on a solution of a zinc salt; the mixture is introduced into the frames or supports, and the zinc removed in the known manner by anodic electrolysis. A very porous cadmium electrode is thus obtained, which is used in an electrolyte of pure sodium or potassium hydroxide solution, with a positive electrode of nickel.—A. S.

Electro-osmosis; Anode for ——. Ges. für Elektroosmose m.b.H. Ger. Pat. 251,098, Sept. 7, 1911.

Claim is made for the use of an alloy of lead and antimony as anode in electro-osmotic processes. In use the anode becomes coated with a hard and solid layer of lead peroxide. —A. S.

Furnace; Electric ——. G. Mettler, Berlin. Eng. Pat. 25,890, Nov. 20, 1911.

See Fr. Pat. 436,947 of 1911; this J., 1912, 499.—T. F. B.

Furnace; Electric ——. O. Vogel, Wilmersdorf, Germany. U.S. Pat. 1,040,818, Oct. 8, 1912.

See Fr. Pat. 411,437 of 1910; this J., 1910, 961.—T. F. B.

Gas reactions; Method and apparatus for the carrying out of —— by means of an electric arc. G. Wagener, Schlebusch-Manfort, Germany, Assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pats. 1,039,851 and 1,039,852, Oct. 1, 1912.

See Ger. Pat. 242,210 of 1911; this J., 1912, 344.—T. F. B.

Manufacture of nitrides in the electric furnace. Addition to Fr. Pat. 437,504. *See* VII.

XII.—FATS; OILS; WAXES.

Natural fats; Synthesis of —— from the standpoint of the phase rule. I. The ternary system: tristearin-tripalmitin-triolein. R. Kremann and R. Schoulz. Monatsh. Chem., 1912, 33, 1063—1075.

The author has investigated by the cooling curve method the melting points in the three binary systems and the one ternary system to be obtained from tripalmitin (m. pt. 62·6° C.), triolein (m. pt. = −7·0° C.) and tristearin (m. pt. 56·0° C.). In all three binary systems there is complete formation of mixed crystals at all concentrations; the tristearin-tripalmitin curve shows a maximum and a minimum; the tristearin-triolein curve shows a single maximum and the triolein-tripalmitin neither maximum nor minimum. The data for the ternary system are given in a triangular diagram projected from the space model.—W. H. P.

Jatropha mahafalensis; Characters and composition of an oil from ——. H. Bimar. Bull. Soc. Chim., 1912, 11, 914—915.

The seeds of *Jatropha mahafalensis*, a plant growing in Madagascar, contain about 75 per cent. of kernels, which yield 60 per cent. of their weight to carbon bisulphide. On expression the kernels yielded 44·5 per cent. of an amber-coloured slightly fluorescent oil. The characters were: sp. gr. at 15° C. 0·9213; refractive index at 20° C. 1·4648; solidifying point of fatty acids (titer test), 21° C.; saponification value 194; acid value 17·6; iodine value, 111·8; iodine value of liquid acids, 140; acetyl value, 17; drying test, 26 hours at 50° C. No acid of a molecular weight less than that of palmitic acid appears to be present, and the oil contains a fair proportion of linolic acid. It has similar properties to those of the oil of *Jatropha curcas* (curcas oil).—F. Shdn.

Linseed oil; U.S. Government specifications for ——. Oil, Paint, and Drug Rep., Oct. 21, 1912. [T.R.]

Specifications 5201 for raw linseed oil, issued by the Navy Department, August 15, 1912, superseding "Specifications 520l," issued February 1, 1911, are as follows:—

1. Must be strictly pure, well settled linseed oil, perfectly clear, and not show any deposits of foots or a loss of more than 0·2 per cent. when heated for one half hour to a temperature of from 103° C. to 105° C.

2. To be acceptable the oil must show on examination:—

	Max.	Min.
Specific gravity at 15·5° C.	0·936	0·932
Specific gravity at 25° C.	0·931	0·927
Iodine No. (Hanus)	190	178
Saponification No.	192	189
Acid No.	3	—
Refractive index at 25° C.	1·4805	1·479
Unsaponifiable matter .... per cent.	1·5	—

The oil, when poured on a glass plate and allowed to drain and dry in a vertical position, guarded from dust and exposure to weather, must dry free from tackiness in less than 75 hours at a temperature of from 15·5° C. to 26·5° C.

3. To be purchased by the commercial gallon and inspected by weight, the weight and the number of gallons to be determined at the rate of 7½ lb. of oil to the gallon.

4. Inspection and Delivery.—Before acceptance the oil will be inspected. Samples of each lot will be taken at random, the samples well mixed together in a clean vessel, and the sample for test taken from this mixture. Should the mixture be found to contain any impurities or adulterations the whole delivery of oil it represents will be rejected and is to be removed by the contractor at his own expense.

5. To be delivered in shipping cans and cases which shall conform to the latest specifications for the same issued by the Navy Department, or if specifically stated in the contract in strong, tight, well-seasoned, well-made white oak barrels, not painted, hooped with eight iron hoops; the chine hoops to be about 1¾ inches wide; the bilge hoops to be about 1½ inches wide; each cask to have a capacity of about 50 gallons.

6. Barrels to be marked with gross and net weight, and these weights will be verified by the inspecting officers as may be deemed necessary.

7. Barrels to remain the property of the contractor; those barrels in good condition to be returned by the government at the contractor's expense within six months after date of delivery; all barrels not returned within this period will be paid for at a rate of $1 per barrel, chargeable to the appropriation under which the material was purchased or used.

8. The quantity of oil delivered in five-gallon shipping cans will be determined by taking the gross weight of 10 per cent. of the total number of cans, selected at random, from which the average gross weight of the delivery will be determined. A sufficient number of these cans will be emptied to determine the average tare, and the net weight of the oil will be taken from the figures thus obtained.

9. Each delivery will be considered a lot by itself, and each lot will be inspected and accepted or rejected as it passes or fails to pass the test required. No second test of any lot rejected will be permitted.

Patent.

Hydrocarbon soap and process of making same. P. G. List, Tübingen, and G. Schmidt, Assignors to I. Simon und Dürkheim, Offenbach on Maine, Germany. U.S. Pat. 1,040,708, Oct. 8, 1912.

See Fr. Pat. 422,953 of 1910; this J., 1911, 610.—T. F. B.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Artists' colours; Purity of ——. II. Blue iron-cyanogen colours. A. Eibner and L. Gerstacker. Farbenzeit., 1912, **17**, 2272–2273, 2310–2313, 2420–2423. Chem. Zentr., 1912, **2**, 1076.

The potassium and combined water in commercial iron-cyanogen colours are not to be regarded as impurities but as integral constituents of the colours, having an important influence on the properties of the latter; the potassium is most probably present partly combined with the iron cyanogen molecule and partly adsorbed by the colloidal pigment. The products richest in potassium have the typical greenish tinge considered desirable technically, whilst the products poor in potassium and rich in water are dull and have a violet tinge. The colouring power stands in inverse proportion to the water-content. The products rich in potassium when mixed with zinc white are faster to light than those poor in potassium. Colours dried at 110° C. are less resistant to the action of zinc white than those still containing water. Of the commercial products "steel blue" and "bronze blue" contain about 12 per cent. of potassium and about 5·5 per cent. of water; Paris blue contains about 9 per cent. of potassium and about 10·5 per cent. of water. The lowest potassium content observed by the authors is about 1·5 per cent., corresponding with a water content of about 24 per cent.—A. S.

Linseed oil; Effect of pigments upon the constants of ——. H. A. Gardner. J. Franklin Inst., 1912, **174**, 415–423. (See also this J., 1911, 1170.)

A series of paints of approximately equal viscosity, prepared by grinding various pigments with pure linseed oil, were allowed to remain in air-tight containers for nearly two years, the vessels being occasionally agitated during the first part of the time and finally allowed to remain undisturbed for nearly a year before examination. The oil was subsequently extracted in each case by mixing the paint with benzol and petroleum ether, allowing the pigment to subside, siphoning off the clear liquid and removing the solvent from the latter by distillation at a low temperature. The sp. gr., iodine value and acid value of the original oil were 0·932, 181 and 2·5 respectively, the ash being 0·19 per cent.; the results of the experiments are shown in the following table:—

Test No.	Pigment employed.	Extracted oil.			
		Sp. gr.	Ash (per cent.).	Iodine value.	Acid value.
1	Zinc oxide	0·9237	0·36	161	3·5
2	Basic carbonate white lead	0·9372	1·149	157·5	8·6
3	"Leaded zinc"	0·9389	0·922	157·4	5·7
4	Basic carbonate white lead 50 per cent. Zinc oxide 40 ,, Barytes 10 ,,	——	0·674	154·1	6·7
5	Basic sulphate white lead 60 per cent. Zinc oxide 40 ,,	0·9334	0·626	157·8	5·6
6	Barytes	0·9325	0·212	160·6	3·5
7	Silica	0·9465	0·204	149·2	8·7
8	Basic chromate of lead	0·939	1·271	156·7	8·3
9	Red lead	——	15·56	135·4	19·2
10	Iron oxide	0·9457	0·456	156·8	8·8
11	Carbon black	0·9356	0·195	163	10·5
12	Graphite	——	0·201	158·5	13·3

The presence of free acid in the paint vehicles was found to be a most active cause of the hardening of paints during storage; in a series of experiments with paints composed of white zinc and/or lead pigments and pure, raw linseed oil and showing no tendency to harden during three days, it was found that considerable hardening was caused in 24 hours by the addition of 10 per cent. of resin, and that by the addition of 5 per cent. of oleic acid the paints were converted into putty-like masses in 2 hours.
—W. E. F. P.

Russian oil of turpentine. E. J. Parry. Chem. and Drug., 1912, **81**, 75.

The following results were obtained by the examination of two authentic "virgin" Russian turpentines, the rectified sample (No. 1a) being obtained by removing the tarry and acid substances from sample No. 1:—

	No. 1 (crude).	No. 1a (rectified).	No. 2 (crude).
Sp. gr. at 15° C.	0·867	0·8646	0·865
Optical rotation	+7° 50′	+8°	+10°
Refractive index	1·4718	1·4890	1·4736
Absorbed by 5 per cent. potassium hydroxide	5 per cent.	none	6 per cent.
Distilled below 155° C..	traces	none	traces
,, 155°—160° C.	65 per cent.	68 per cent.	63 per cent.
,, 160°—165° C.	11 ,,	13 ,,	9 ,,
,, 165°—170° C.	13 ,,	10 ,,	15 ,,
,, 170°—180° C.	7·5 ,,	7 ,,	7 ,,
,, above 180° C.	3·5 ,,	2 ,,	6 ,,

It is stated that "virgin" Russian turpentine generally yields from 40 to 70 per cent. of distillate (mainly pinene) between 155° and 160° C., but that the natural product is not exported; the "virgin" oil is fractionated, and, the portions boiling at about the same temperature as American turpentine being largely removed for industrial use in Russia, the remaining low and high boiling fractions are mixed for exportation as "Russian turpentine." The proportion of the "middle runnings" thus removed being variable, exported Russian turpentine is of variable composition, some of the lower grades containing 3—8·5 per cent. of acid substances and yielding only 36—22 per cent. of distillate between 160° and 170° C., but 10—21·5 per cent. above 180° C. On the assumption that the oil as exported is to be regarded as Russian turpentine, the author is of opinion that to be of good merchantable quality this product should conform to the following specification:—sp. gr. at 15° C. 0·862—0·872; optical rotation +3° to +20°; refractive index at 20° C. 1·4700—1·4750; absorbed by 5 per cent. potassium hydroxide solution, not more than 3 per cent.; not more than 1, less than 75, or less than 95 per cent. should distil below 155°, 170° and 180° C., respectively.—W. E. F. P.

Patents.

[*Lead*] *Pigments; Manufacture of* ——. S. Pope, Manchester. Eng. Pats. 16,974, July 25, 1911, and 1520, Jan. 19, 1912.

Lead pigments, less harmful than ordinary white lead, are obtained without the aid of heat by adding a calculated quantity of sulphuric acid (according to the degree of basicity required in the product) to a solution of basic lead acetate preferably containing 2 to 3 per cent. of acetic acid, and separating the basic lead sulphate from the mother-liquor, which will still contain basic lead acetate. Or a solution of normal or basic lead acetate may be treated with sulphuric acid, the lead sulphate separated by filtration or decantation, and the residual solution further treated with sulphuric acid until the lead is precipitated. Lead oxide prepared by the methods described in Eng. Pats. 17,178 of 1898 (this J., 1899, 1033) and 11,526 of 1909 (this J., 1909, 1306) may also be used in the manufacture of these amorphous basic lead sulphates. Suitable apparatus for the process is claimed.
—C. A. M.

Lead pigments; Manufacture of ——. S. Pope, Manchester. Eng. Pat. 21,188, Sept. 26, 1911.

Amorphous lead sulphate is prepared without the aid of heat by treating a solution of basic lead acetate (preferably containing 2 to 3 per cent. of acetic acid) with sulphuric acid until only a small quantity of lead remains in solution, and separating the lead sulphate by filtration or decantation. Or the pigments may be obtained directly from lead oxide by mixing the latter with a solution of acetic acid or lead acetate, preferably containing 1 or 2 per cent. of acetic acid, then adding sulphuric acid with constant agitation until only a little lead remains in the mother liquor, removing any undissolved lead oxide or metallic lead if present, and finally separating the lead sulphate by filtration or decantation. Lead oxide made by the methods claimed in Eng. Pats. 17,178 of 1898 (this J., 1899, 1033) and 11,526 of 1909 (this J., 1909, 1306) may be used in the production of these amorphous lead sulphates. Special apparatus is also claimed.—C. A. M.

Condensation products from phenols with formic aldehyde; Processes for producing ——. A. Weindel, Leverkusen, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,039,858 and 1,039,859, Oct. 1, 1912.

(1). A monochlorhydrin or other chlorhydrin is mixed with the aldehyde and phenol and the mixture heated until the condensation product separates. (2). The reaction may be retarded or stopped by the addition of a salt of hydrosulphurous acid or other acid "containing sulphur in a lower state of oxidation than in sulphurous acid."—C. A. M.

Coating and impregnating purposes; Materials for ——. C. F. Boehringer und Söhne, Mannheim-Waldhof, Germany. Eng. Pat. 18,818, Aug. 21, 1911. Under Int. Conv., Aug. 22, 1910.

See Ger. Pat. 248,779 of 1910; this J., 1912, 886.—T.F.B.

Tar oil varnish; Process for the manufacture of ——. O. Sprenger, Bremen, Germany. Eng. Pat. 12,475, May 25, 1912. Under Int. Conv., Sept. 18, 1911.

See Fr. Pat. 442,618 of 1912; this J., 1912, 886.—T. F. B.

Condensates from casein, phenols, and formic aldehyde; Process of preparing —— *and the product obtained thereby.* L. Berend, Wiesbaden, Germany. U.S. Pat. 1,040,850, Oct. 8, 1912.

See Fr. Pat. 436,720 of 1911; this J., 1912, 445.—T. F. B.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Raw rubber; Determination of nitrogenous constituents in ——. A. Tschirch and W. Schmitz. Gummi-Zeit., 1912, **26**, 2079—2081.

Pentachloro-ethane (b. pt. 159° C.), tetrachloro-ethane and perchloro-ethylene are recommended as rubber solvents. 2·5 grms. of raw Para (not washed or deresinified) were dried for eight days *in vacuo*, and placed in a 500 c.c. Erlenmeyer flask with 40—60 c.c. of pentachloro-ethane; cotton-wool was placed in the neck. The flask was heated for 4—6 hrs. at 80° C. till all the rubber had dissolved. After cooling the liquid was highly diluted with chloroform (about 400 c.c.) and allowed to settle in a separating funnel. The precipitate was collected on an ordinary paper filter. Warning is given as to the use of a centrifuge. The residue on the filter was extracted with chloroform in a Soxhlet apparatus, dried *in vacuo* and weighed. The nitrogen was then determined by the Kjeldahl method. The protein contained 12—14 per cent. of nitrogen. Raw Para contained 2·9 to 3·1 per cent. of residue (11—12·6 per cent. of nitrogen). Nearly all this nitrogen was found in the insoluble residue, in which, allowing for ash, the nitrogen was from 14—15·6 per cent. Preliminary experiments on the nature of the protein are described; it does not appear to be a true protein.—H. E. P.

Caoutchouc ; Direct determination of —— by titration with bromine. F. Kirchhof. Gummi-Zeit., 1912, 27, 9.

The author refers to the results of Vaubel (this J., 1912, 887) and states that he had made similar experiments, both on acetone-extracted raw rubber and on vulcanised rubber, which did not give good results, and he doubts whether Vaubel's method will be reliable since it attempts to apply an ionic reaction to a colloid.—H. E. P.

Vulcanisation ; Apparatus for experimental study of hot ——. D. Spence and J. Young. Chem.-Zeit., 1912, **36**, 1162—1163.

An apparatus is described with which vulcanisation can be studied quantitatively. It is important to work with thin sheets of rubber and to avoid insulation by air. Sheets are calendered to ½ mm. (= 20 mils) and pressed between pure sheet tin 0·1 mm. (= 4 mils) thick. This is clamped in a warm mould of two concentric metal rings weighing about 200 grms. and the mould is inserted in a glycerin bath which is then stirred. Four glycerin baths are heated by the vapour of boiling xylene which is caused to circulate by guide plates. Very constant temperatures are attained. When the results obtained with this apparatus are plotted, perfectly smooth vulcanisation curves are obtained.—H. E. P.

Patents.

Caoutchouc ; Purification by osmosis of natural and regenerated —— and of other substances soluble in hydrocarbons. H. Debauge. Second Addition, dated April 13, 1912, to Fr. Pat. 426,457, Feb. 3, 1911 (this J., 1911, 968 and 1912, 35).

Colloidal substances are separated from other dissolved substances by allowing the latter to diffuse from the hot solution through porous walls. The method may be applied to the deresinification of raw rubber or the desulphurisation of vulcanised rubber; the latter may be treated in hot solution at once. An apparatus is claimed comprising annular troughs or channels connected by porous tubes, the whole being immersed in the heated liquid. A suitable solvent is caused to flow through the porous tubes and carries away the substances which diffuse through the porous wall. (See also this J., 1912, 888.) —H. E. P.

Caoutchouc ; Process for obtaining —— by the aid of vinyl chloride or bromide or analogues. I. Ostromislensky and Soc. pour la Production et la Vente des Articles en Caoutchouc "Bogatyr." Fr. Pat. 442,981, March 21, 1912.

The products of the polymerisation of vinyl chloride or bromide or analogues, or mixtures thereof, are submitted to the action of metals, water, alcoholic solutions of caustic potash or of aromatic amines; or they may be simply subjected to a high temperature in solution or in presence of any liquid.—H. E. P.

Caoutchouc ; Process for obtaining —— and its homologues or isomerides by the acid of isoprene and analogous bodies. I. Ostromislensky and Soc. pour la Production et la Vente des Articles en Caoutchouc "Bogatyr." Fr. Pat. 442,982, Mar. 21, 1912.

Isoprene or homologues, analogues or isomerides, in solution or in the free state, are exposed to ultra-violet rays, cathode rays, Röntgen rays or slow electric discharges, with or without the addition of contact substances. Any untransformed hydrocarbon is separated in the usual manner from the caoutchouc which results.—H. E. P.

Caoutchouc ; Process for manufacture of —— and analogous substances by the aid of halogen compounds of organic substances. I. Ostromislensky and Soc. pour la Production et la Vente des Articles en Caoutchouc "Bogatyr." Fr. Pat. 442,991, Mar. 30, 1912.

Halogen compounds of hydrocarbons of the divinyl series, in solution or in the free state, with or without contact substances, are submitted to the action of metals or metallic mixtures or amalgams; the operation may be effected at ordinary or at higher temperatures and may be accelerated by solar rays, ultraviolet rays or by slow electric discharges. —H. E. P.

Rubber, gum and guttapercha ; Use of bird lime from holly and carbon tetrachloride in the treatment of ——. M. M. J. Boutfort. Fr. Pat. 443,018, Apr. 19, 1912.

The raw bird-lime is emulsified or dissolved in carbon tetrachloride which dissolves the elastic principle. The solutions are said to strengthen perished rubber.—H. E. P.

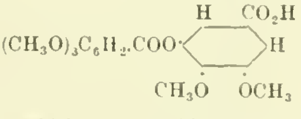
Caoutchouc substances ; Process of preventing —— from getting sticky and resinous. F. Hofmann and K. Delbrück, Elberfeld, and K. Meisenburg, Leverkusen, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,039,741, Oct. 1, 1912.

See Fr. Pat. 441,177 of 1912 ; this J., 1912, 829.—T. F. B.

XV.—LEATHER ; BONE ; HORN ; GLUE.

Tannin and the synthesis of similar substances. II. E. Fischer and K. Freudenburg. Ber., 1912, **45**, 2709—2726.

The results of the authors' previous work (this J., 1912, 503) indicated that the chief constituent of tannin is a pentadigalloylglucose, and in the present paper the authors reply to various criticisms and describe experiments designed to test by synthesis the correctness of this view. As the combination of digallic acid with glucose to form an ester-like compound presents considerable difficulties, the synthesis of methylotannin (this J., 1909, 1051) was first undertaken. Gallic acid was treated in alkaline solution with 1 mol. of chlorocarbonic acid methyl ester, and the resulting unsymmetrical 3-monocarbomethoxygallic acid was treated with diazomethane and the product hydrolysed, whereby the unsymmetrical 3.4-dimethyl ether of gallic acid was obtained. Trimethylgallic acid was prepared by the method of Graebe and Martz (Annalen, 1905, **340**, 219) and converted into the corresponding chloride as described by Perkin and Weizmann (Chem. Soc. Trans., 1906, **89**, 1655). By combining together the trimethylgalloyl chloride and the 3.4-dimethyl ether of gallic acid in alkaline solution, pentamethyl-*m*-digallic acid



$$(CH_3O)_3C_6H_2.COO\cdot C_6H(H)(CO_2H)(H)(OCH_3)(OCH_3)$$

was obtained, which was readily converted into the corresponding chloride by means of phosphorus pentachloride. The pentamethyl-*m*-digalloyl chloride was condensed with *α*-glucose and *β*-glucose respectively in presence of quinoline in the manner previously described (this J., 1912, 503). In both cases amorphous products were obtained, the composition of which corresponded with that of a penta-[pentamethyl-*m*-digalloyl]-glucose. The properties of these substances agreed closely with those of the methylotannin of Herzig. Their optical properties indicated that they are probably mixtures of stereoisomerides, the relative proportions of which vary according to whether the product is obtained from *α*- or *β*-glucose. The product from *α*-glucose had $[\alpha]_D = +28°$ in acetylene tetrachloride, and $[\alpha]_D = +14°$ after purification with hot alcohol or acetone and methyl alcohol. The product from *β*-glucose had $[\alpha]_D = +19·5°$ in acetylene tetrachloride and $[\alpha]_D = +8·7°$ after purification. Methylotannin prepared from carefully purified tannin from Chinese galls had $[\alpha]_D^{20} = +14°$ in acetylene tetrachloride and $[\alpha]_D^{21} = +10·6°$ after purification; in benzene the rotation was somewhat lower, viz., $[\alpha]_D^{21} = +9°$ for the purified product. A sample of tannin from Chinese galls carefully purified by the ethyl acetate method described previously had $[\alpha]_D^{20} = +73°$ (± 2°) in 1 per cent. aqueous solution

The preparation of pentabenzoyl and pentacinnamoyl derivatives of α- and β-glucose is also briefly described and it is stated that the chloride of tribenzoylgallic acid can be combined with glucose and mannitol without special difficulty, yielding products possessing probably a molecular weight of nearly 3000.—A. S.

Tannin from Chinese galls. K. Feist and H. Haun.
Chem.-Zeit., 1912 **36**, 1201—1202.

In all previous work on the constitution of tannin no distinction has been made between that derived from Turkish and Chinese galls. All earlier work was done on Turkish tannin as this was the only one on the market. Ischikawa showed in 1880 that Chinese galls contain 77 per cent. of tannin and are a convenient material from which to prepare pure tannin. In the preparation of glucogallic acid (see this J., 1912, 652) from Chinese galls, a crystalline substance was obtained which was identified as gallic acid, which was subsequently removed during the systematic treatment with various solvents. This difference between the Chinese and Turkish galls made it seem possible that the former contained a tannin as Nierenstein defines it (*i.e.*, glucose-free). The tannin was prepared in the same way as was the Turkish and hydrolysed in the same manner (Chem.-Zeit., 1908, 918). 10 grms. of the tannin were boiled for an hour under a reflux condenser with 12·5 c.c. of $N/1$ sulphuric acid and 40 c.c. of water, cooled, extracted with ether, and the aqueous portion, after removal of the ether, again treated in the same way. This operation was repeated 14 times. The sulphuric acid was carefully neutralised, with $N/5$ baryta and basic lead acetate solution added till there was no further precipitate. The liquid was filtered, the lead removed by hydrogen sulphide, and the clear solution evaporated to a syrup. The syrup contained glucose (about 5·5 per cent. on the weight of the tannin) which was identified by its reducing power, optical properties, its osazone and its fermentability. The ether extract by evaporation and drying at 100° C. left 9·35 grms. of gallic acid (93·5 per cent.). The products of hydrolysis are not completely estimated by this method, as the gallic acid is not completely split off and some glucose still combined with gallic acid is precipitated by the lead acetate; there is also loss by carbonisation during hydrolysis, and a slight decomposition of the glucose. It was seen that, like Turkish galls, the Chinese galls contained a tannin from which most of the gallic acid could be easily split off, while a small quantity was hydrolysed only with difficulty. In Chinese galls the only crystalline compound found was gallic acid and no glucogallic acid, as in the Turkish galls. The optical properties of the two tannins were compared with each other and also with the various pure tannins which are on the market. Great differences were found in the specific rotation which were probably due, in great part, to small quantities of impurities, as it is well-known that the concentration of hydrogen and hydroxyl ions has a great effect on optical rotation.—D. J. L.

Salting of hides and avoidance of salt-stains. C. Romana and G. Baldracco. Collegium, 1912, 533—534.

The authors have previously shown that the addition of 5 per cent. of borax to the salt used for preserving hides prevented the formation of true salt stains, a slight blue marking only being perceptible on the hides. Sodium fluoride and commercial vaseline oil were mixed with both cooking-salt and with salt denatured for use in the tannery and the effect of the various mixtures on hides was observed. The following quantities were used: (1) 10 per cent. of cooking salt plus 1 per cent. of sodium fluoride on the weight of salt; (2) 10 per cent. of denatured salt plus 1 per cent. of sodium fluoride; (3) 10 per cent. of cooking salt plus 3 per cent. of vaseline oil; (4) 10 per cent. of denatured salt plus 3 per cent. of vaseline oil. The hides were covered with the mixture and left in pile for 24 hours; they were then folded in the usual way and left for 15 days. After this time the skins were found to be perfectly preserved and the flesh sides perfectly clear; the hair was well preserved and in no case were there stains on the flesh side or any alterations on the hair side. The hides were then soaked for 24 hours and tumbled in running water and finally unhaired from a sulphide lime. They were then washed and delimed with "oropon" and lactic acid. They were then again carefully examined for stains with the following results: (1) grain and flesh white, some faint markings on the grain, but no stains; (2) some markings on the grain somewhat more distinct than in (1), but which disappeared in the early tan-liquors; (3), some unimportant faint yellowish and blue markings on the grain; (4), similar to (3). No appreciable differences were thus noticed between results obtained with cooking-salt and with denatured salt, which confirms the earlier statement of the authors that the natural salt itself contains impurities which may cause salt-stains. Sodium fluoride and vaseline oil are superior to borax in the prevention of salt stains, as the blue marks met with when the former were used were much less apparent than those seen after the use of borax. As a conclusion the authors propose the use of 1 per cent. of sodium fluoride on the weight of salt used for salting hides as a means of diminishing the formation of salt-stains.—D. J. L.

Drum furnace for wet spent tan. L. Pollak. Collegium, 1911, 537—540.

Numerous furnaces exist for the combustion of wet spent bark or wood (50—60 per cent. of moisture) which all act upon the same principle, namely the pre-drying of the material by its own flame followed by a distillation of the fuel. Except the chestnut-extract works there is scarcely one undertaking in the leather industry which relies solely on its spent tanning material for fuel without using more or less coal in admixture with it. The fineness of the spent material is of great importance in influencing its use as fuel; when too finely ground the fire-bars must lie very close together and difficulty is experienced in getting a sufficient supply of air through the mass. Since the finely-ground material is more easily extracted than the coarser, it becomes a question of calculation for the tanner and extract maker whether it is the more economical to extract the material less efficiently and use little coal or to extract thoroughly and use much coal to assist in its combustion. The drum furnace originally constructed for burning coal dust by Möller and Pfeiffer, has been found by the author suitable for the combustion of wet bark. The furnace consists of a cast-iron drum lined with fireclay and has a slow rotary movement. It is slightly inclined and the material is fed in at the upper end, the air necessary for combustion entering at the lower end in a regulated stream. The material is almost completely burnt by the time it reaches the lower end of the drum. The newly entering air, rich in oxygen, meeting the last unburnt portions completes the combustion and continuing its passage through the drum meets next the coked material and finally the freshly entered fuel which it immediately dries and cokes. The intimate mixing of fuel and air results in a very complete combustion, leaving a perfectly white ash. Figures are given of trials made with the furnace using, as fuel, spent quebracho wood alone and also mixed with various proportions of coal.—D. J. L.

Patents.

Leather; Treatment of ——. D. B. Macdonald, Leicester. Eng. Pat. 26,105, Nov. 22, 1911.

The enamelled surface of patent leather is rendered capable of withstanding abnormal strain and extreme variations of temperature, without cracking or fracture of the enamel, by treatment with grease, fat, or oil, whereby it is rendered permanently soft and pliable. The whole of the leather is also coated on one or both sides with grease, fat, or oil, which is allowed to remain until it has fully penetrated and the excess removed. The following is a suitable mixture:—*Paraffinum molle* 91 per cent., wool fat (B.P.) free from acid, 6; and birch tar oil ("*ol Rusci*") free from acetic acid, 3 per cent. A little vegetable charcoal may also be added.—D. J. L.

Tanning: Process and products for ——. Badische Anilin und Soda Fabrik. Fr. Pat. 443,730, May 11, 1912. Under Int. Conv., Sept. 7, 1911 and Jan. 26, 1912.

Condensation products soluble in water, containing one or more acid groups capable of esterification (beyond the hydroxyl groups), are obtained by causing a phenol to react with formaldehyde or substances capable of yielding it, preferably in presence of acids, then with sulphuric acid or other sulphonating agents to form a mass soluble in water, or by condensing phenolsulphonic acid (or mixtures with phenol) with formaldehyde or derivatives thereof so that products soluble in water are always obtained. Thus phenol or cresol may be treated with concentrated sulphuric acid, heated if desired, and treated with formaldehyde. The products are claimed as tanning agents.—H. E. P.

Leather; Production of ——. E. E. M. Payne, Aylesbury, Assignor to W. H. Staynes, J. H. Smith, and W. H. Sturges, Leicester. U.S. Pat. 1,040,400, Oct. 8, 1912.

See Fr. Pat. 346,106 of 1904; this J., 1905, 143.—T. F. B.

XVI.—SOILS; FERTILISERS.

Soil; Sickness in ——. *I. Sewage sickness.* E. J. Russell and J. Golding. J. Agric. Sci., 1912, 5, 27—47.

Two distinct sets of causes are at work in sewage-sick soils, physical causes that lead to retarded percolation, and a factor detrimental to bacteria. This latter factor is similar to that existing in ordinary soils: for example, it is put out of action by antiseptics and by heat; it is not bacterial nor is it a product of bacterial action; it is not carried by an aqueous extract of the soil. It can be transmitted to partially sterilised soils by inoculation with untreated soil. Aeration or liming of the soil does not put it out of action. Its effects are very pronounced in sewage-sick soil. In the untreated sick soil the bacteria rarely rise to 40 millions per gram, whereas, after partial sterilisation, they may rise to 400 millions per gram. The harmful factor in sewage-sick soil is especially favoured by the high amounts of moisture and organic matter present. All the evidence available points to protozoa as constituting the harmful factor. When these are killed the bacteria multiply rapidly, effecting more decomposition of the added sewage so that a purer effluent is obtained. The difficulties of the application of antiseptics to the soil on a large scale have not yet been overcome.—E. F. A.

Soil; Sickness in ——. *II. Sickness in glasshouse soils.* E. J. Russell and F. R. Petherbridge. J. Agric. Sci., 1912, 5, 86—111.

The phenomenon of soil sickness in tomato and cucumber house soils is described. It is conditioned by at least two factors: (*a*) an accumulation of insect and fungoid pests and (*b*) a lowered bacterial efficiency, due to the accumulation of a factor detrimental to bacteria. The sick soils examined did not contain any substance toxic to plants or to bacteria. The soils were well supplied with plant food and with calcium carbonate. The properties of the factor detrimental to bacteria agree with those of protozoa. The factor resembles in every way that present in arable soil: it is put out of action by heat or by antiseptics. Sickness is not due to an accumulation of bacteria acting unfavourably on the production of plant food. Bacterial actions are accelerated in partially sterilised soils, and soil sickness can be effectually treated by partial sterilisation. The commercial treatment involves heating the soil at 90°—100° C. and costs 1s. to 1s. 6d. per ton. Chemical treatment with antiseptics is cheaper, the two conditions which must be fulfilled in practice being (1) the antiseptic must be sufficiently soluble to diffuse easily in the soil, and (2) either it must be volatile or it must decompose with the formation of innocuous compounds, so that it shall not exert any harmful effect on the plant. Pure toluene is unsuitable, but such as contains thiotolenes is active. Formaldehyde gives good results and certain tar oils are also very promising.—E. F. A.

Manganese in soils; Solubility of ——. P. de Sornay. Bull. Assoc. Chim. Sucr., 1912, 30, 96—100.

The amount of manganese present in 37 soils from several different localities was in the mean from 0·15 to 0·2 per cent. Only traces of the total manganese in the soil are soluble in water; very weak nitric acid dissolves somewhat larger quantities. Most plants contain a considerable proportion of manganese in their ash; the proportion in the natural plant is usually less than 0·01 per cent., but it is universally present, indicating that plants assimilate it naturally. Manganese is present in leguminous seeds but not in the husks. Aspartic acid usually causes considerable quantities of the manganese in the soil to pass into solution.—E. F. A.

Potassium; Determination of —— *especially in fertilisers, soil extracts and plant ashes.* W. A. Davis. J. Agric. Sci., 1912, 5, 52—66.

Whereas the platinum chloride method of estimating potassium is uncertain and liable to give varying results, the perchlorate method is simpler and more uniform and exact in its results. An improvement consists in washing the precipitate of potassium perchlorate with 95 per cent. alcohol saturated at the temperature of working with potassium perchlorate. This allows thorough washing and obviates any error due to the solubility of the precipitate. The economy of the new method is a very real advantage. The presence of barium, magnesium and calcium chlorides and sodium phosphate is without prejudice and these salts need not be removed. With a sufficient excess of perchloric acid, potassium sulphate can be estimated directly without conversion into chloride; alternatively when the sulphate is converted into chloride by the Stassfurt method, the exact precipitation of the sulphate is not imperative. The method also avoids the uncertainty attaching to the atomic weight of platinum.
—E. F. A.

Plants; Chemical means of protecting —— *against freezing.* N. A. Maximow. Ber. Deuts. Botan. Ges., 1912, 30, 52—65, 293—305. Chem. Zentr., 1912, 2, 1130, 1294.

Following an observation that the resistance of *Aspergillus niger* to cold was greatly increased by introduction of glycerin or sugar into the cells, the author has experimented on higher plants (red cabbage and *Tradescantia discolor*) with the following results. The resistance to cold of plants accustomed to a temperate climate and also of tropical plants can be increased by introduction of organic substances of a neutral character (carbohydrates, alcohols, acetone) into the plant cells. The protective action bears no direct relation to the osmotic pressure; with increasing concentration of the protective agent, the resistance of the plant to cold increases more rapidly than the osmotic pressure as measured by the depression of the freezing point. Different substances exhibit the protective action in different degrees; the sugars are most effective, then glycerin, the monohydric alcohols and acetone; mannitol, the solutions of which have a high eutectic point, is a very weak protective agent. The resistance of the treated plants to cold can be restored to its original condition by removing from the plant cells the substances which have been introduced; and in a similar manner, plants naturally resistant to cold can be rendered less resistant by leaving them for a long time in contact with water.

The protective action of sugar, polyhydric alcohols, etc. cannot be due to the fact that these substances inhibit the injurious action of salts on the plant protoplasm, for salts themselves exert a protective action to an extent depending upon the position of the eutectic point of the saline solution. Salts which form solutions having very high eutectic points, *e.g.*, sodium and potassium sulphates and sodium oxalate, exhibit no protective action, but salts which form solutions having low eutectic points have a considerable protective effect. The effect is weakened if the salt used has an injurious action on the plant protoplasm, but in the case of sodium and potassium salts this can be avoided by addition of about 2 per cent. by volume of an equimolecular solution of a calcium salt having the same anion. Acids even at a concentration of $N/5000$ diminish the resistance of the plants to cold, but sodium hydroxide at low concentrations ($N/200$ to $N/1000$) exerts a protective action.—A. S.

Determination of potassium. (Potassium-sodium-cobalti-nitrite method.) Mitscherlich and Fischer. *See* XXIII.

Patents.

Monocalcic phosphate and the like; Method of drying ——. T. L. Willson and M. M. Haff, Ottawa, Canada. U.S. Pat. 1.040,081, Oct. 1, 1912.

A phosphate salt, prepared from natural phosphate rock by the addition of phosphoric acid, is converted and dried by the introduction of ammonia gas.—F. Sodn.

Composition for protecting plants, animals, etc. from animal pests. Ger. Pat. 249,469. *See* XIXb.

Use of alkali- or ammonia-soaps containing silver for protecting plants and destroying parasites. Ger. Pat. 250,101. *See* XIXb.

Compositions for destroying animal or vegetable pests on plants. Ger. Pat. 250.229. *See* XIXb.

XVII.—SUGARS; STARCHES; GUMS.

Steam consumption in sugar mills. H. G. Moll. Australian Sugar J., 1912, **3**, 696—702, and **4**, 137.

In most sugar-producing countries the bagasse provides all the necessary fuel for milling and manufacture, but in Queensland, although the calorific value of the bagasse is the same as in Java and the Hawaiian Islands, where no extra fuel is required, this is not so. With the object of ascertaining the conditions under which better results might be obtained, the author has made a study of the heat and power consumption of a modern sugar factory, in which the mill has 12 rollers and crushes 21·5 tons of cane per hour, and in which the steam units are reduced to two, as follows: (1) one crushing engine, driving all the rollers of the mill, and (2) one direct-coupled generating engine, supplying current to the various motors of the factory, the steam consumption of these engines being so balanced as to provide sufficient exhaust steam to supply the juice-heater and quadruple effect. Finally he makes a comparison between the cost of fuel required for such a factory, and an existing 12-roller factory, in which the supplementary fuel costs 4s. per ton of sugar manufactured. First, the actual heat consumption for juice heating and evaporation is calculated. Assuming the diluted juice to be 90 per cent. of the total weight of cane crushed, and the density to be 16° Brix, the initial and final temperatures to be 86° F. (30° C.) and 216° F. (102°·2 C.), it is calculated that the actual amount of heat used for heating, evaporation, and graining as well as that lost by radiation in these processes, is as follows:—

	Actual heat used in vessels.	Heat lost by radiation.	Total heat.
	B.T.U.	B.T.U.	B.T.U.
Juice-heater	5,033,972	5,086	5,039,058
Quadruple	9,832,763	46,163	9,878,926
Pan A	5,045,547	28,450	5,073,997
Pan B	1,302,218	10,854	1,313,072
Pan C	410,535	3,061	413,596
	21,625,035	93,614	21,718,649

Of this total quantity, 14,917,984 (5,039,058 + 9,878,926 units), that is the steam supplied to the heater and quadruple, are provided by the exhaust steam from the crushing and generating engines, leaving 6,800,665 to be supplied direct from the boilers. As to the actual horse-power required, diagrams taken by the author indicate this to be as follows: crushing engines, comprising 4 mill engines, 61·34+64·1+67·89+70·37=263·70 I.H.P.; vacuum pumps, comprising quadruple and 2 vacuum pan pumps, 16·30+20·46+21·78=58·54 I.H.P.; sundry engines, comprising centrifugal engine, cane conveyor engine, bagasse conveyor engine, electric light and repair shop, 28·25+8·0+6·5+12·0+10·0=64·75 I.H.P.; and steam pumps comprising main supply pump, two calandria pumps, and boiler feed pump, 18·2+5·0+5·5+10·0=38·7 I.H.P.; a total of 425·69 I.H.P. Of these 4 sets of engines the steam consumption per horse power hour is 40, 35, 35, and 90 lb. of steam respectively, and the corresponding heat consumption is 12,429,130·3; 2,415,125·6; 2,670,413·0; and 4,104.158·2 B.T.U., a total of 21,618,827·1 B.T.U., of which 6,700,843 must be debited to motive power. The bagasse resulting from 21·5 tons of cane per hour, containing 11 per cent. of fibre will be 5·11 tons or 11,446 lb. per hour; and as the calorific value of Queensland bagasse is 2440 B.T.U. per lb., the total available heat per hour from this source will be 27,928,240 B.T.U., a figure considerably in excess of the heat requirements of a modern two-engine factory. The author then calculates the amount of steam per horse power hour, and the total heat for motive power required, for the two engines in the modern system, making these 32·65 lb. of steam per horse power hour, and 1,604,332 B.T.U. respectively. The total heat required for the engines, heater, effect and pans is therefore 21,718,649+1,604,332 B.T.U., leaving a surplus of 4,605,261 B.T.U., equal to about 16·5 per cent. of the total available heat from the bagasse.* Since 1 lb. of bagasse is equal to 2440 B.T.U., this surplus heat corresponds to 1887 lb. of bagasse per hour, or to 377 lb. of coal valued at £1 per ton. Taking the ratio of 8 tons of cane to 1 ton of sugar, the comparison per 1000 tons of sugar manufactured between the two engine and existing mill (the extra fuel in the latter costing 4s. per ton of sugar made from bagasse fuel), is as follows: Modern mill, profit: £62 10s.;* and existing mill, loss: £200.

Sucrose; Method for the direct polarimetric determination of —— in presence of certain reducing sugars. P. Lemeland. Z. Ver. deut. Zuckerind., 1912, 1192—1196.

The optical rotatory and cupric-reducing powers of alkaline solutions of arabinose, dextrose, lævulose, galactose and lactose are destroyed completely by heating with hydrogen peroxide in presence of a little manganese dioxide. Sucrose and dextrins are not affected by this treatment. For the determination of sucrose in presence of any of the reducing sugars mentioned above, a solution of the sugars is heated in a boiling water-bath with 0·5 grm. of manganese dioxide, or with 2 grms. if the quantity of reducing sugar present exceeds 10 grms. For every grm. of reducing sugars present, a mixture of 2 c.c. of 36 per cent. sodium hydroxide solution and 30 c.c. of hydrogen peroxide (German Officinal preparation) is added little by little to the hot liquid: this operation may be completed in 35—45 minutes. The solution is then cooled, neutralised exactly with dilute acetic acid, decolourised with charcoal or basic lead acetate, made up to a convenient volume and polarised. The author cites a case in which a solution of 2 grms. of sucrose and 20 grms. of dextrose in 100 c.c. was treated with 2 grms. of manganese dioxide, 20 c.c. of sodium hydroxide and 600 c.c. of hydrogen peroxide, as described. After cooling, nearly neutralising, concentrating to 400 c.c. on a water-bath, decolourising, and filtering, a polarimetric reading of +42′ was obtained instead of +40′ (control solution of sucrose alone). In analysing mixtures containing a high proportion of reducing sugars to sucrose, advantage may be taken of the solubility of sucrose in 91 per cent. alcohol, as in the following example: A mixture of 1 grm. of sucrose with 25 grms. of dextrose was left for 24 hours in contact with 100 c.c. of 91 per cent. alcohol, and shaken frequently. The undissolved portion was separated by centrifuging, and washed twice with 50 c.c. of 91 per cent. alcohol. The combined alcoholic solutions were distilled, after addition of a trace of calcium carbonate, and the residual liquid was treated with the oxidising mixture as prescribed above. A polarimetric reading of +1°14′ was obtained instead of +1° 18′ (control solution of pure sucrose). The new method cannot be applied to mixtures containing maltose, for this sugar is not completely decomposed by the oxidising mixture. Dextrins can be determined in presence of sugars other than maltose, any sucrose present being first inverted. —J. H. L.

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* The author gives this sarplus as 18 per cent. and the profit from fuel as £68 3s. 5d., but has omitted to add in one item, 520,162 B.T.U., included in the heat required for the two engines, which reduces these figures to 16·5 and £62 10s. respectively.

Banana starch; Polarimetric determination of ——. G. Baumert. Z. Unters. Nahr. Genussm., 1912, 24, 449—452.

The starch may be determined by the polarimetric methods described by Lintner (this J., 1907, 281) and Ewers (this J., 1908, 238). Under the conditions of Lintner's method the specific rotation of the starch was found to be $[\alpha]_D = 209{\cdot}8°$, and of Ewer's method $[\alpha]_D = 196{\cdot}4°$. The determination is carried out on the finely-divided substance, after the latter has been washed with cold water, alcohol, and ether. The quantity of starch is calculated from the formula: $c = \frac{100a}{l[\alpha]_D}$, where c is the weight of starch in 100 c.c. of the solution, a the reading observed, l the length of the tube in dm. and $[\alpha]_D$ the specific rotation according to the method employed.—W. P. S.

The starch industry of Great Britain. J. Traquair. *See* Scottish Section, page 1016.

PATENTS.

Sugar direct from raw sugar juices; Process and apparatus for manufacturing white ——. A. Wijnberg and J. N. A. Sauer, Amsterdam, Holland. Eng. Pat. 21,204, Sept. 26, 1911.

Clear sugar juice, after the usual lime treatment, is treated with sulphur dioxide until the acidity of the juice is such that 100 c.c. require about 10 c.c. of N/10 alkali solution for neutralisation. The acidified juice is mixed with from 0·3 to 0·5 per cent. of its weight of "decolourising carbon" (an artificial vegetable product containing but little acid-soluble matter), the mixture is heated for about 15 minutes, and filtered, the filtrate being then subjected to the usual treatment for the production of "white crystals." The carbon may be removed from the filter, and regenerated by treating it successively with hot alkali carbonate solution, acid, and water. An apparatus for carrying out the process in a continuous manner is described.—W. P. S.

[*Sugar.*] *Diffusion process with return of the press-runnings to the diffusion battery.* C. Ulrich. Ger. Pat. 216,907, March 22, 1910.

The known methods of returning the press-runnings to the diffusion battery suffer from the disadvantages that the press-runnings have a strong tendency to froth and that fermentation is readily induced therein. These disadvantages are due to the fact that the press-runnings repeatedly come in contact with the atmosphere. According to the present patent the exhausted slices from the diffusion battery are treated with the requisite quantity of fresh water in an extraction apparatus working in the known manner by alternate pressing and diffusion, but with exclusion of air, and the thin juice produced is returned to the diffusion battery.—A. S.

Molasses; Process and apparatus for the desaccharification of —— *by the strontia process.* O. Venator. Ger. Pat. 246,823, Sept. 10, 1908.

The strontium bisaccharate is made into a homogeneous mass in the usual way and is then decomposed in a fixed vessel, without agitation, whilst being cooled by means of a cooling liquid not directly in contact with it. The cooling liquid circulates through a series of chambers, which are immersed in the bisaccharate somewhat after the fashion of a "pocket-cooler." The cooling chambers may be carried by a frame movable vertically, and suitable connections are provided for connecting the several chambers with one another and with the inlet and outlet for the cooling liquid.—A. S.

XVIII.—FERMENTATION INDUSTRIES.

Enzymes; Chemical composition and formation of ——. *VII. Growth of some yeasts in different nutrient solutions.* H. Euler and B. Palm. Z. physiol. Chem., 1912, 81, 59—70.

Experiments were made respecting the rate of growth of a pure culture of *S. cerevisiae* in 5 per cent. solutions of sucrose, dextrose, galactose and lactose, and of *S. apiculatus* and *S. marxianus* in 5 per cent. solutions of sucrose and galactose; the solutions contained also the necessary salts and asparagin. The results indicate that for these yeasts the rate of multiplication of the cells is substantially the same, whether growth takes place at the expense of a "non-fermentable" disaccharide or a fermentable hexose. The authors consider it unlikely that "non-fermentable" disaccharides (such *e.g.* as sucrose) are assimilated without first undergoing hydrolysis, and conclude that the yeasts probably contain enzymes capable of hydrolysing such disaccharides, although no fermentation can be detected by the usual methods. —J. H. L.

Alcoholic fermentation by living yeast and by pressed yeast juice; Influence of various compounds on ——. A. Dorner. Z. physiol. Chem., 1912, 81, 99—108.

From a study of the retardation of alcoholic fermentation effected by various organic compounds, including amyl and heptyl alcohols, methylpropyl- and methylphenyl-ketones, and a number of urethanes and substituted ureas, the authors conclude that a substance which inhibits fermentation by living yeast exerts a similar influence on fermentation by pressed yeast juice, but to produce the same degree of inhibition the substance must be present in the fermenting liquid at a higher concentration in the second case than in the first. The explanation of this difference may perhaps be that in fermentation by living yeast the concentration of the inhibiting substance in the cells is considerably higher than in the surrounding liquid, for it is known that many dissolved substances tend to accumulate at or in the cells. The effective concentration of the inhibiting substance at the seat of fermentative activity may accordingly be the same in both cases. The authors have further observed a general parallelism between the influence of the substances mentioned on fermentation by living yeast, and their influence on the respiration of living cells. Possibly the same cause underlies both effects.—J. H. L.

Fermentation; Rate of —— *as measured by difference of potential.* M. C. Potter. Proc. Univ. Durham Phil. Soc., 1912, 4, 230—231.

The E.M.F. produced during the fermentation of sugar solutions by yeast (see this J., 1911, 1188) is at any moment proportional to the rate of production of carbon dioxide, and therefore serves as a means of measuring the rate of fermentation. Alteration in the potential of a fermenting liquid does not affect the rate of fermentation. The carbon dioxide evolved from a fermenting sugar solution can be made to discharge a gold-leaf electroscope, and therefore must carry an electric charge.—J. H. L.

Cider sickness. B. T. P. Barker and V. F. Hillier. J. Agric. Sci., 1912, 5, 67—85.

Cider sickness is characterised by the development of a peculiar aroma and flavour, by the destruction of sugar, accompanied by a copious evolution of gas, and by the production of a more or less dense turbidity and deposit. The aroma and flavour of sick cider are probably due largely to substances formed from constituents present in apple juice and absent from sugar solutions. During the fermentation most of the gas evolved is carbon dioxide, but there is some hydrogen. The amount of ethyl alcohol and of glycerol produced is considerable; appreciable quantities of higher alcohols are produced, also a relatively large amount of aldehydes. The turbidity is due in part to the increase in the number of organisms present, but mainly to the formation of an insoluble substance from the tannins. Sweet and bittersweet varieties of apples are most susceptible. The higher the acidity of the cider the more resistant it is to the disorder. The sickness appears to be due to a bacterium which has been isolated in pure culture. It is widespread, and is believed to be introduced into the cider direct from the fruit. It is not known whether it is a soil organism or normally found on the surface of the ripened fruit. Methods for the prevention of the sickness are discussed: the most efficient consists in the production of a liquor unfavourable for bacterial development. Fermentation and storage at a low temperature are desirable, and the cider should be bottled early in the season.—E. F. A.

Beverage made from the juice of the sugar-cane; Basi, a ——. *Beverages made from fermented rice.* H. D. Gibbs and F. Agcaoili. Philippine J. Sci., 1912, 7, 97—103.

Nearly all the sugar-cane grown in the northern provinces of Luzon and in the Batanes Islands is used for making *basi*, an alcoholic beverage which is very popular amongst the natives. The process of manufacture is as follows:—About 53 litres of cane juice are heated to boiling and treated with bark of the *samak* tree (*Macaranga tanarius*) to intensify the red colour, and with the dried and powdered leaves of the same tree to coagulate the sediment or suspended matter. The liquid is stirred occasionally with a branch of *samak*, and skimmed, boiling being continued until the volume is reduced to about 45 litres. The liquid is then decanted into an earthen jar, and left to stand for at least 24 hours, after which it is treated with 3 litres of a ferment composed of 1 part of the dried and powdered leaves and 4 parts of the dried and powdered fruit of *samak*. The jar is then covered tightly with *samak* leaves and placed underground: the beverage may be drunk after 2 months' storage, but it improves on further keeping. Samples of *basi* were found to contain 11·6—16·2 per cent. of alcohol.

Beverages made from fermented rice are also consumed by the natives in various parts of the Philippines and Malaysia. Two samples of one of these beverages (*tapuy* or *bubud*) were found to contain 8·85 and 12·95 per cent. of alcohol respectively (see next abstract).—L. E.

Fermented rice drink in Northern Luzon; Report on the use of a ——. H. O. Beyer. Philippine J. Sci., 1912, 7, 103—106. (See preceding abstract.)

The details of manufacture of this beverage (*bubud*) differ slightly with different varieties of rice; the red rice known as dayákôt is treated as follows:—The threshed rice is roasted in an iron pan over a slow fire until the germ of the rice is killed. A mixture of equal parts of the roasted rice and water is evaporated to dryness: the product is spread out in a rattan winnowing tray, and, when partially cooled, sprinkled with "yeast" (a mixture of finely ground rice, certain vegetable ingredients, and water). The whole is mixed, and the surface of the rice is then smoothed and covered with banana leaves that have been softened by warming. After the lapse of about 2 days, the fermenting rice is transferred to jars, the latter then being tightly covered with banana leaves. During the three following days, part of the fermenting mass is converted into liquid (*bubud*) which is then sweet and only slightly intoxicating but becomes much more intoxicating during the next few days. The solid part of the product is highly esteemed as a food. The total quantity of *bubud* consumed by the native tribes in Luzon is estimated at 3,096,500 litres per year.—L. E.

Sulphites; Iodometric titration of —— *in presence of alcohol and sugars.* J. L. Baker and F. E. Day. Analyst, 1912, 37, 439—442.

It was found that sulphurous acid is oxidised readily by dissolved oxygen in dilute acid solution; the oxidation is greatly facilitated by the occurrence in the solution of a reaction between alkali and acid and this obviously affects the accuracy of the results obtained by the method for determining sulphites proposed by Farnsteiner (Z. Nahr. Genussm., 1902, 5, 1124), in which the solution or liquid containing sulphite is treated with alkali and then with acid before the titration is carried out. Commercial alcohols and alcoholic liquids contain substances capable of combining with sulphites and partially preventing the oxidation of sulphites by iodine. It was also found that dextrose combines with sulphites and causes an apparent loss of sulphite; this is probably due to the aldehydic nature of the sugar. Sucrose does not show any such effect. (See also this J., 1911, 915.)—W. P. S.

Methyl alcohol; Detection of —— *in ethyl alcohol and alcoholic beverages.* A. Bono. Chem.-Zeit., 1912, 36, 1171.

A 200 c.c. distilling flask is fitted with a stopper carrying respectively a tap-funnel, and an outlet tube which leads first into a flask charged with 50 c.c. of a cold saturated solution of potassium bichromate, containing also 60 c.c. of sulphuric acid per litre, and then to a condenser. 25 c.c. of the alcoholic liquid are allowed to flow into the distilling flask from the tap-funnel, followed by 50 c.c. of water. It is stated that when the alcoholic vapours come in contact with the bichromate solution, at first only the ethyl alcohol is oxidised to aldehyde, which distils over, the methyl alcohol being held back in the form of an intermediate oxidation product, which is later converted into formaldehyde. The first 25 c.c. of distillate are therefore rejected. Of the next 10 c.c., 2 c.c. are tested by the addition of 10 drops of a 0·5 per cent. aqueous solution of phenylhydrazine hydrochloride, 1 drop of a 0·5 per cent. solution of sodium nitroprusside, and 10 drops of a 10 per cent. solution of sodium hydroxide: the presence of formaldehyde is indicated by a blue colouration changing to greenish and then to yellowish-red. In the case of strong ethyl alcohol, 10 c.c. diluted with water to 75 c.c. are used, whilst with liquids rich in methyl alcohol, the first 35 c.c. of distillate are rejected, and the next 10 c.c. tested for formaldehyde.—A. S.

Patents.

Yeast: Process of maintaining the vitality of dried ——. P. D. H. Ohlhaver, Sande, Germany. U.S. Pat. 1,039,999, Oct. 1, 1912.

See Fr. Pat. 436,915 of 1911; this J., 1912, 454.—T. F. B.

Preparation of ammonium sulphate [from distillery vinasse]. Fr. Pat. 442,923. *See* VII.

XIXa.—FOODS

Butter fat; Composition of ——. M. Siegfeld. Z. Unters. Nahr. Genussm., 1912, 24, 453—463.

Results of analyses of 25 samples of butter fat are recorded. The ratio of the Reichert-Meissl value to the number of c.c. of $N/10$ alkali required to neutralise the total volatile soluble acids was found to be 1 : 1·17 (average): the ratio of the Polenske value to the volatile insoluble acids varied considerably, the average being 1 : 1·97. The Reichert-Meissl values varied from 23·80 to 31·7 and the quantity of total volatile soluble acids from 5·54 to 7·68 per cent., whilst the Polenske values ranged from 1·65 to 3·35 and the volatile insoluble acids from 0·95 to 3·28 per cent. The non-volatile acids varied from 84·72 to 88·24 per cent. The mean molecular weights of the various fatty acids were:—volatile soluble acids, 93·2 to 105·2; volatile insoluble acids, 189·4 to 207·1; non-volatile acids, 236·4 to 246·9. The author concludes that the non-volatile acids consist of oleic, palmitic, and myristic acids, a considerable quantity of the latter acid being present in some butter fats; stearic acid is absent. The proportions of butyric, caproic, and caprylic acids found in the distillate are very variable and it appears that the volatile insoluble acids either contain only very small quantities of caprylic and capric acids or that they contain myristic and palmitic acids.—W. P. S.

Hydrogen cyanide; Presence of —— in white or Dutch clover. M. Mirande. Comptes rend., 1912, **155**, 651—653.

Wild white clover gathered at the time of flowering contains a cyanogenetic glucoside which yields hydrogen cyanide on exposure to an anæsthetic. The quantity varies with the portion of the plant examined, being greatest in the leaves; none was found in the roots. The amount varies further with the nature of the soil, the age of the plant and its situation. Thus plants gathered from a meadow and from the neighbouring banks will differ considerably. White clover (*Trifolium repens*) is stated to be preferred by sheep to red clover (*Trifolium pratense*). The eating of too large quantities is stated sometimes to have fatal results.—E. F. A.

Fungi; Toxic nature of ——. Their haemolytic action. J. Parisot and Vernier. Comptes rend., 1912, **155**, 620—623.

Extracts of *Amanita phalloides* and many other fungi possess a marked hæmolytic action. Sometimes the young fungi are innocuous but the older fungi become poisonous. Heating for 20 minutes at 120° C. destroys the hæmolytic action, which is attributed to a glucoside, since reducing sugar is present after heating. The hæmolytic action is weakened by egg yolk and other materials containing cholesterol. The heated extract which is no longer hæmolytic has lost most of its toxity *in vivo*.—E. F. A.

Polarimetric determination of banana starch. Baumert. *See* XVII.

Interference of hydrogen peroxide with the milk tests for formaldehyde. Gibbs. *See* XXIII.

Patents.

Pulse; Process for treating decorticated ——. E. J. Lourdel, Reims, France. Eng. Pat. 5413, March 4, 1912. Under Int. Conv., March 4, 1911.

A concentrated aqueous extract, prepared from the skins of haricot beans, is added to the decorticated beans in order to improve the flavour of the latter. The process may be applied to other leguminous seeds such as lentils, peas, etc.—W. P. S.

Coffee; Process of decaffeinating ——. L. Klein, Strassburg, Germany. U.S. Pat. 1,039,961, Oct. 1, 1912.

See Addition of May 14, 1910, to Fr. Pat. 409,700 of 1909; this J., 1910, 1404.—T. F. B.

Grain; Process for the treatment of ——. J. G. F. Dombach, Amsterdam. U.S. Pat. 1,040,290, Oct. 8, 1912.

See Eng. Pat. 25,193 of 1908; this J., 1909, 1268.—T.F.B.

XIXb.—WATER PURIFICATION; SANITATION.

Sand filtration; Purification of potable water by means of rapid ——. K. Lemberg. J. Gasbeleucht., 1912, 55, 981—985, 1003—1007, 1023—1028.

This is a long paper giving detailed diagrams and descriptions of the mechanical appliances used, both formerly and at the present time, and the methods of construction of the filters, in the rapid sand filtration of water. The subject matter includes the following points:—Historical; materials formerly used and the filters of Bischof, Gerson and Andersen. Rapid filtration; the theory of the use of coagulants and the purification which has been obtained; the process as worked with chemical coagulants, including the cleaning of the filters (the author emphasises the fact that the ease with which the filter can be cleaned is a measure of its utility in practice); arrangement of plant; influence of temperature. The circumstances under which a rapid filter can be used with advantage are, in the author's opinion, as follow:—want of space and high price of materials; a severe climate; when filtration is required during a portion of the year only; in the purification of a very muddy water; when finely-divided clay is in suspension in the water; when the water does not form a skin on slow sand filters; when the water is coloured with humic substances.
—J. H. J.

London waters; Results of the chemical and bacteriological examination of the —— for the twelve months ended March 31, 1912. A. C. Houston. Metropolitan Water Board. Sixth Annual Report, April, 1912.

About 80 per cent. of the London water supply is derived from sewage-polluted rivers, the waters of which above the intakes are unsatisfactory in quality, particularly during the winter months, and the judicious selection of water is becoming increasingly difficult, as the consumption progressively increases while the volume of the rivers remains constant. Although the river water contains undesirable numbers of *B. coli*, fæcal streptococci are seldom to be detected in one c.c. As evidence of the favourable effect of storage of the unfiltered river water, it is mentioned that whilst 88 per cent. of the samples of raw water contain typical *B.coli* in 1 c.c., 33 per cent. of the samples of stored water contain no *B. coli* in 10 c.c. The "levelling" effect, also, of storage renders the possibility of any sudden dangerous pollution above the intakes a matter of less grave concern than would otherwise be the case. With adequately stored water it is permissible to use coarser sand and to filter rapidly. Although reservoirs and filters possess an immense reserve of purifying ability, it is unwise to abstract river water independently of its quality, and therefore the question of employing a new factor in the London water supply problem, namely, the occasional use of supplementary processes of purification, should be considered.
—J. H. J.

Carbon dioxide in water; Determination of free —— by titration with alkali and phenolphthalein. J. Tillmans and O. Heublein. Z. Nahr. Unters. Genussm., 1912, **24**, 429—449.

The authors discuss and criticise the statement by Noll (this J., 1912, 554) that bicarbonate solutions give a red colouration with much phenolphthalein and show an acid reaction when a small quantity of the indicator is added, and that the amount of acid or alkali, respectively, required to render such solutions neutral to the indicator depends on the concentration of the bicarbonate solution. This may be explained by the dissociation of the salt, but does not affect the results in the case of water, where the concentration is small.—W. P. S.

Carbon dioxide; Determination of small quantities of —— in water. O. Warburg. Z. physiol. Chem., 1912, **81**, 202.

The liquid containing dissolved carbon dioxide is placed in a 1—1½ litre flask, and acidified with about 50 c.c. of a 10 per cent. solution of phosphoric acid; if albumin is present about 20 c.c. of alcohol are added to prevent subsequent frothing. The carbon dioxide is driven out of the liquid at ordinary temperatures by a current of air (150 c.c. per min.), and absorbed in a solution of barium hydroxide contained in a Walter's gas absorption vessel, at 70°—80° C. Quantities of 10—15 mgrms. of carbon dioxide can thus be completely driven out, even from liquids containing albumin, and absorbed, in less than an hour. The Walter's absorption vessel is fitted with a rubber stopper through which pass two burettes, one for *N*/100 barium hydroxide, and the other for *N*/100 hydrochloric acid containing the indicator for the subsequent titration. The absorption vessel should be of Jena glass (better still of quartz) and before use it should be heated for several hours with a strong solution of barium hydroxide.—J. H. L.

Phenol; Investigation of the quantitative behaviour of —— in its action on bacteria. Küster and Bojakowsky. Desinfektion, 1912, 5, 193—217. Chem. Zentr., 1912, 2, 1301.

If a sufficiently large quantity of bacteria be introduced into an aqueous solution of phenol, the concentration of the solution is diminished to an appreciable extent, depending upon the quantity of bacteria, the time, and the quantity and concentration of the phenol. The phenol is not decomposed but becomes loosely combined with the bacteria-protoplasm. The curve representing the absorption of phenol by anthrax bacilli rises steeply at first, after which, up to the maximum, it is nearly flat. The absorption of phenol by bacteria is considerably increased by addition of sodium chloride, but when most of the bacteria are killed, the curve descends again nearly to the zero point.—A. S.

Sickness in soil. I. Sewage sickness. Russell and Golding. *See* XVI.

The acidity and alkalinity of natural waters. J. Walker and S. A. Kay. *See* Scottish Section, page 1013.

Patents.

Water purifier; Electrolytic ——. V. B. Hagg, Assignor to Continental Water Purifying Corporation, Los Angeles, Cal. U.S. Pat. 1,038,122, Sept. 10, 1912.

This patent is for improvements in the design of the vessels used for containing the electrodes and the filtering material in the electrolytic method of purifying water. The chamber containing the electrodes has a wall between the two electrodes with perforations through it for the passage of the electrolyte. The top of the chamber is clamped on and is provided with a flange forming part of the dividing wall, the inlet being inside and the outlet outside the flange. The electrodes consist of a central one and an outer annular one, with several insulating rings between them, converging downwards and having perforated ribs at their lower portions. Carbon is placed in the space between the rings and the outer electrode. The filter vessel is divided into an upper and a lower chamber by a perforated partition, and the upper chamber again into inner and outer compartments, the inner containing the water inlet, and the outer the water outlet. The lower chamber has a flange below the partition and also perforated insulating rings, which together form a wall dividing the chamber into inner and outer compartments in each of which is placed an electrode.—J. H. J.

Water; Purification of ——. J. Patten, Baltimore, Md. U.S. Pat. 1,039,586, Sept. 24, 1912.

The water is pumped into a closed chamber in which it is subjected to the action of live steam in order to remove "corroding gases" from it. The mixed steam and gases leave the chamber by a pipe at the top and after being utilised to perform work by means of the pump are discharged into the atmosphere.—A. S.

Tobacco-drying and nicotine-extracting process. R. G. Mewborne, Louisville, Ky., Assignor to The Kentucky Tobacco Product Co., N.J., U.S. Pat. 1,039,897, Oct. 1, 1912.

Tobacco is subjected to a high temperature in a chamber through which air is circulated; steam is admitted to the chamber during the drying process and the vapours passing from the chamber are condensed or otherwise treated.—W. P. S.

Plants, animals, etc.; Preparation of a composition for protecting —— from animal pests. R. Zimmermann. Ger. Pat. 249,469, Aug. 27, 1911.

A sulpho-chloride of an aromatic hydrocarbon, especially toluene-*p*-sulphochloride, is mixed with a solid or liquid diluent, and if desired with substances capable of combining with acids.—A. S.

Plants; Use of alkali- or ammonia-soaps containing silver for protecting —— and destroying parasites. Chem. Fabr. Flörsheim Dr. H. Noerdlinger. Ger. Pat. 250,101, Aug. 23, 1910.

It has been previously proposed to use for treating plants, silver soaps produced by treating solutions of alkali soaps with solutions of silver salts. According to the present patent, excess of ammonia is added to the mixture in order to keep the silver soaps in the form of a homogeneous solution or emulsion, and zinc or copper salts or other suitable substances are also added.—A. S.

Plants; Preparation of compositions for destroying animal and vegetable pests on ——. Elsässische Tabakmanufaktur vorm. J. Schaller und Bergmann. Ger. Pat. 250,229, Feb. 19, 1909. Addition to Ger. Pat. 220,023, Nov. 30, 1907 (this J., 1910, 514).

Iron or copper compounds are mixed with alkaloidal extracts, especially tobacco extract, in addition to the aluminium compounds mentioned in the original patent. —A. S.

Preparing nucleus-substituted mercury compounds of polysubstituted phenols. Ger. Pat. 250,746. *See* XX.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Angostura alkaloids. J. Tröger and W. Kroseberg. Arch. Pharm., 1912, 250, 494—531.

The extract of Angostura bark contains cuspareïne (this J., 1911, 152), galipine, and galipoidine, the latter being present in small amounts only. In addition there are oily bases. The alkaloids are best separated by means of oxalic acid, cuspareïne oxalate crystallising readily from water. When warmed with nitric acid, galipine yields nitrogalipine, $C_{20}H_{20}NO_3(NO_2)$, m.pt. 140° C., which is resistant to the action of oxidising agents. Galipine was oxidised by means of potassium permanganate, with the formation of veratric acid and a crystalline acid, $C_{11}H_9NO_3$, m.pt. 194° C. when anhydrous. The latter substance appears to be a methoxyquinoline-carboxylic acid. On heating to 190° C. it loses carbon dioxide with the formation of a methoxyquinoline. The methoxyl grouping can be removed by means of hydriodic acid, and the corresponding hydroxyquinoline-carboxylic acid, $C_9H_5(OH)COOH$, melts at 273° C. when rapidly heated. A formula for galipine is given, based on these facts.—F. Shdn.

Tyrosol; Synthesis of ——, and its conversion into hordenine. F. Ehrlich and P. Pistschimuka. Ber., 1912, 45, 2428—2437.

When *p*-hydroxyphenylethylamine is treated with nitrous acid, tyrosol can be obtained (this J., 1911, 231). ω-Phenylethylamine was nitrated in sulphuric acid solution with the production of *p*- and *m*-nitrophenylethylamine, the former being obtained in the larger quantity. The hydrochloride of the *meta*-compound melts at 160° C. The *para*-compound was treated with nitrous acid, and *p*-nitrophenylethyl alcohol, $C_8H_9NO_3$, was obtained, which crystallised from light petroleum and ether in yellowish needles, m.pt. 64° C. *p*-Aminophenylethyl alcohol, formed by reduction by means of tin and hydrochloric acid, gave a hydrochloride, $C_8H_{11}NO,HCl$, melting at 171° C. Tyrosol is obtained when this compound is treated with nitrous acid. Tyrosol is also obtained in somewhat small quantities by the action of nitrous acid

on *p*-amino-ω-phenylethylamine. The latter compound is obtained by the reduction of the corresponding nitro-compound, and forms a dihydrochloride, $C_8H_{12}N_2,2HCl$, melting at about 296 C. Tyrosol rapidly reduces an ammoniacal silver solution on warming, and it distils at 105° C. at 18 mm. without decomposition. When crystallised from water, rhombic needles are formed. *p*-Hydroxyphenylethyl chloride, C_8H_9OCl, is produced when tyrosol is heated with hydrochloric acid in a sealed tube. This substance distils without decomposition at 157° C. at 20 mm. Hordenine is produced when this compound is heated with excess of dimethylamine at 100° C. under pressure.
—F. Shdn.

Fatty aromatic series ; Syntheses in ——. VII. Phenol bases. J. v. Braun and H. Deutsch. Ber., 1912, **45**, 2504—2522.

Compounds of the type of hordenine have been synthesised in which the $N(CH_3)_2$-group is further removed from the benzene nucleus. The phenylalkyl chloride, $C_6H_5.(CH_2)_x.Cl$, in which *x* may have the value 3, 4, or 5, was carefully nitrated and the nitro-compound treated with dimethylamine. In all cases the nitro-group entered the *para* position. The nitro-base was then reduced, and the amino-group replaced by hydroxyl. The intermediate compounds obtained in these syntheses are all described. *o*-Hydroxyphenylpropyldimethylamine,

$$(HO).C_6H_4.(CH_2)_3.N(CH_3)_2,$$

was, however, prepared from *o*-γ-chloropropylbenzanilide as the starting point. It boils at 149°—150° C. at 16 mm., and the hydrochloride melts at 155°—156° C. In physiological action it resembles choline and causes a slight fall in the blood-pressure. Homohordenine, or *p*-hydroxyphenylpropyldimethylamine, boils at 150° C. at 17 mm., and can be crystallised from ether and light petroleum, when it forms short colourless crystals, m.pt. 105°—106° C. The hydrochloride melts at 142° C. It causes a pronounced diminution of the blood-pressure. *p*-Hydroxyphenylbutyldimethylamine, $(HO).C_6H_4.(CH_2)_4.N(CH_3)_2$, can be crystallised from water and melts at 97° C. The hydrochloride melts at 154° C. The physiological action is the same as that of homohordenine, but more pronounced. *p*-Hydroxyphenylamyldimethylamine, $(HO).C_6H_4.(CH_2)_5.N(CH_3)_2$, boils at 175°—183° C. at 9 mm., and after crystallising from ether and light petroleum melts at 99° C. The hydrochloride is oily, but the platinichloride can be obtained crystalline, and melts at 122° C. The physiological action is similar to that of the butyl compound, but slightly stronger.—F. Shdn.

Quebrachitol ; Presence of —— in the leaves of Grevillia robusta. E. Bourquelot and A. Fichtenholz. Comptes rend., 1912, **155**, 615—617.

Quebrachitol (methylinositol) discovered by Tanret in *Aspidosperma quebracho* has been obtained from the fresh leaves of *Grevillia robusta* in quantity amounting to 4 grms. per kilo. The leaf extracts had been previously treated to remove the arbutin present (this J., 1912, 510). The compound crystallises in voluminous transparent rhombs, $[\alpha]_D = -80°$, and is converted into *l*-inositol on removal of the methyl group.—E. F. A.

Arbutin and its synthesis. C. Mannich. Apoth.-Zeit., 1912, **27**, 751.

Pure arbutin has not hitherto been prepared. The commercial product contains varying proportions (from 5 to 40 per cent. in five samples examined) of methylarbutin, and by none of the methods which have been proposed can it be completely freed from the methyl-derivative. Pure arbutin can only be obtained by synthesis. By the condensation of quinol and acetobromoglucose in presence of alkali, tetra-acetylarbutin is formed, and this yields pure arbutin, $(HO)C_6H_4.O.C_6H_{11}O_5$, on hydrolysis by means of barium hydroxide solution.—A. S.

Hydrocyanic acid in plants ; Presence of free ——. III. C. Ravenna and G. Bosinelli. Atti R. Accad. dei Lincei, Roma, 1912, **21**, II., 355—358.

Further experiments have been made with cherry-laurel leaves, *Phaseolus lunatus* seeds and germinating almonds (sweet and bitter) in order to determine whether they contain any hydrocyanic acid in the free state. The method used was similar to that described previously (this J., 1910, 1176 ; 1912, 510), except that the boiling point of the dilute alkaline solution used to prevent enzyme action was raised to 110° C. by dissolving therein a salt such as calcium chloride or sodium nitrate or acetate. Working in this way no free hydrocyanic acid could be detected in germinating almonds by means of the alkaline picrate test-paper, and faint reactions obtained in some of the experiments with cherry-laurel leaves and *Phaseolus lunatus* seeds were probably due to a very slight hydrolysis of the cyanogenetic glucoside before the enzyme was destroyed.—A. S.

Cyanogenesis in plants ; Influence of some aromatic substances on ——. C. Ravenna and G. Bosinelli. Atti R. Accad. dei Lincei, Roma, 1912, **21**, II., 286—292.

Plants of *Sorghum vulgare* were inoculated with sodium benzoate, sodium salicylate, potassium phthalate, pyrocatechol, resorcinol, quinol, and pyrogallol respectively, the substance being introduced into a hole made in the stem of the plant, which was then closed and covered with paraffin. Control plants were also examined, which were treated in the same way except that no foreign substances were introduced. It was found that in all cases the inoculated plants contained less hydrocyanic acid than the others, the lowest figures being obtained in the case of sodium benzoate, potassium phthalate, and quinol, which can be introduced in relatively large quantities without injuring the plants. Similar results have been obtained by Ciamician and Ravenna (Mem. della R. Accad. delle Sci. dell'Istituto di Bologna, 1911—1912, **9**, 71) with regard to the influence of aromatic substances on the nicotine content of tobacco.—A. S.

Aesculin ; Proposed method of microsublimation for the detection of ——, and the identification of gelsemium. F. Tutin. Pharm. J., Feb. 10, 1912. Wellcome Chemical Research Laboratory Reports, No. 138.

In view of the microsublimation test proposed by Tunmann (this J., 1911, 829), the following experiments were carried out on æsculin, gelsemium and certain other substances. The materials were placed in small sealed tubes which were heated side by side in a metal bath. At 140° C. scopoletin just commenced to sublime, and at 150° C. a distinctly crystalline sublimate was obtained from it. The scopoletin sublimed fairly rapidly at 170° C., yielding colourless well-formed crystals. Gelsemium also yielded a small sublimate, composed for the most part of crystals of scopoletin. Aesculin gradually melted, and slowly yielded a slight tarry sublimate containing no crystals. Aesculetin remained unchanged at this temperature. Upon raising the temperature to 210° C., scopoletin fused and sublimed rapidly, gelsemium yielded a further sublimate, but of a tarry nature for the most part, aesculetin sublimed in pale yellow crystals, and æsculin suffered gradual decomposition, giving a further sublimate of tarry matter, together with crystals of æsculetin. When æsculin is heated fairly rapidly in the ordinary manner, fusion occurs at 200°—202° C. In place of the sublimation test, gelsemium may be identified by the following method : 0·5 grm. of the ground material is heated in a test-tube with chloroform, the mixture filtered and the filtrate shaken with water to which a few drops of ammonia have been added. The aqueous layer on separation will be found to show a distinct blue fluorescence, indicating the presence of scopoletin.—F. Shdn.

Jambul seeds ; Chemical examination of ——. F. B. Power and T. Callan. Pharm. J., March 30, 1912. Wellcome Chemical Research Laboratory Reports, No. 140.

The seeds of *Eugenia Jambolana* Lam. contain neither alkaloid nor enzyme. The alcoholic extract when distilled in steam yielded a small amount of a pale yellow oil with the following characters : sp. gr. 0·9258 at 20°/20° C., $\alpha_D = -2°31'$ in a 50 mm. tube. The portion of the alcoholic extract insoluble in water contained the following substances : a mixture of fatty acids, a small amount of a solid melting at 78°—80° C., and a new phenolic substance, styled *jambulol.* This can be crystallised from pyridine and forms brown needles containing solvent of crystallisation. It has the composition, $C_{16}H_8O_9$. The pentaacetyl derivative forms pale brown leaflets melting at about 335° C., whilst the pentabenzoyl derivative is colourless and melts at 333° C. No substance of a glucosidic nature was found in the seeds.—F. Shdn.

Anona muricata ; Chemical examination of the leaves of ——. T. Callan and F. Tutin. Pharm. J., Dec. 2, 1911. Wellcome Chemical Research Laboratory Reports, No. 135.

An alcoholic extract was prepared from the dried leaves of *Anona muricata* Linné, the material having been obtained from the West Indies. The extract was distilled with steam and the following definite substances were isolated from the residue insoluble in water: myricyl alcohol, m.pt., 84°—85° C. ; sitosterol, $C_{27}H_{46}O$, m.pt. 133° C. ; a mixture of fatty acids, and a new dihydric alcohol, *anonol*, $C_{23}H_{36}O_2(OH)_2$, m.pt. 294°—298° C. The diacetyl derivative of the alcohol melts at 166° C., and the dibenzoyl derivative at 197°—198° C.—F. Shdn.

Essential oils ; Constituents of ——. *Composition of vetiver oil.* F. W. Semmler, F. Risse, and F. Schröter. Ber., 1912, **45**, 2347—2357.

An oil distilled in Germany from the roots of *Andropogon muricatus* Retz. had the following characters : sp. gr. 1·0239 at 20° C., $n_D=1·52552$; $\alpha_D=+31°$. An ester was separated from the oil by fractional distillation, and was then saponified with the formation of an alcohol and an acid. The former, styled *vetivenol*, boils at 170°—174° C. at 13 mm., has the sp. gr. 1·0209 at 20° C., $n_D=1·52437$, and $\alpha_D=+34°30'$. The composition is $C_{15}H_{24}O$ and not $C_{15}H_{26}O$ as recorded by previous observers. It is trycyclic and primary, and has one double linkage. The *vetivenic acid* present in the ester boils at 202°—205° C. at 13 mm., has the composition, $C_{15}H_{23}O_2$, and is tricyclic. The alcohol was reduced by means of hydrogen in the presence of platinum black with the formation of dihydrovetivenol boiling at 176°—179° C. at 17 mm., sp. gr. 1·0055 at 20° C., $n_D=1·51354$, and $\alpha_D=+31°$. The original oil also contains bicyclic vetivenol, which boils at 168°—170° C. at 14 mm., has the sp. gr. 1·0095 at 20° C., $n_D=1·52058$, and $\alpha_D=+25°$. Two hydrocarbons, bicyclic and tricyclic *vetirene*, $C_{15}H_{24}$, were also separated.

Vetiver oil distilled in Réunion has much the same composition as that distilled in Germany, but the high-boiling ester of vetivenic acid is absent.—F. Shdn.

Citronella oils ; New method of analysis of ——. V. Boulez. Bull. Soc. Chim., 1912, **11**, 915—917.

The citronellal and geraniol in citronella oil can he separately determined by the following method : A solution of sodium bisulphite of 35°—37° Bé (sp. gr. 1·32—1·345) is saturated with sodium sulphite. 25—50 grms. of the oil are shaken with 100—200 grms. of this solution till combination is complete, when the mixture is allowed to stand for 2—3 hours. The mixture is treated with 100—200 grms. of water in a flask fitted with an air condenser and heated on the water-bath for several hours, with occasional shaking. When separation has taken place, the mixture is transferred to a separating funnel and the uncombined oil drawn off and weighed. The latter can be acetylated in order to determine the amount of geraniol.—F. Shdn.

Bergamot oil ; [Detection of] Glyceryl acetate in ——. M. S. Salamon and W. M. Seaber. Perfum. and Essent. Oil Rec., 1912, **3**, 275—276.

The authors' experiments show that even 5 per cent. of glyceryl acetate cannot be detected with certainty in bergamot oil by the method of evaporating the oil on the water-bath and determining the saponification value of the residue. Schimmel's method, depending upon the solubility of glyceryl acetate in 5 per cent. alcohol, gives better results, and 2 per cent. of glyceryl acetate can be detected by washing 10 c.c. of the oil five times in succession with 10 c.c. of 5 per cent. alcohol and determining the saponifiable matter in the alcoholic solution, and also comparing the saponification values of the original oil and the oil after washing with the dilute alcohol. It is stated that with genuine oils not more than about 0·2 per cent. of saponifiable matter is extracted by 5 per cent. alcohol, and the saponification value of the oil is not appreciably affected by the treatment.—A. S.

Cineol [eucalyptol] ; Determination of —— by the resorcinol method. C. T. Bennett. Perfum. and Essent. Oil Rec., 1912, **3**, 269.

The author has shown previously (this J., 1908, 90) that the resorcinol method gives misleading results, and he now gives further evidence showing that even in its modified form (using the fraction distilling between 170° and 190° C. ; see this J., 1908, 180), the method is unreliable. He concludes that until a more accurate method has been discovered, preference should be given to the phosphoric acid process, the oil being first fractionated if the proportion of cineol is low.—A. S.

Ichthyol ammonium and its substitutes ; Examination of the composition of ——. H. Beckurts and H. Frerichs. Arch. Pharm., 1912, **250**, 478—493.

A number of samples of commercial ichthyol as well as certain substitutes were examined with the following percentage results :—

Substance.	Dry residue.	Total sulphur.	Sulphate sulphur.	Sulphonic sulphur.	Sulphur as sulphide.	Total ammonia.	Ammonium sulphate.	Ash.
Ichthyol	56·84	11·27	1·515	2·65	7·105	3·02	6·25	0·074
,, ...	55·86	10·91	1·451	2·71	6·749	2·98	5·98	0·07
,, ...	55·98	11·055	1·50	2·69	6·865	3·02	6·19	0·07
,, ...	53·99	10·74	1·45	2·66	6·63	2·955	5·98	0·06
,, ...	55·53	10·855	1·511	2·54	6·804	2·95	6·23	0·05
,, ...	56·16	11·02	1·48	2·71	6·83	3·01	6·10	0·05
,, ...	56·16	11·32	1·465	2·76	7·095	3·02	6·01	0·06
Ichthammon	54·80	10·375	0·355	3·96	6·06	2·48	1·46	0·08
Ichthium	51·86	8·08	1·537	5·04	1·503	4·31	6·34	0·188
Ichthyanat	55·41	8·13	1·743	2·917	3·47	3·40	7·19	0·19
Isarol	52·24	7·49	1·251	2·98	3·259	2·915	5·16	0·08
Petrosulfol	57·45	9·22	traces	4·56	4·66	2·42	traces	0·236
Pisciol	51·10	8·04	0·925	4·18	2·935	3·21	3·82	—
,, ...	52·70	8·33	0·97	4·25	3·11	3·29	4·00	—
Subitol	54·35	8·43	1·35	3·14	3·94	3·10	5·57	0·09

F. Shdn.

Oxidation processes ; Mechanism of ——. H. Wieland. Ber., 1912, **45**, 2606—2615.

I. Oxidation of aldehydes.—The author has shown previously (this J., 1912, 276) that the oxidation of primary alcohols to aldehydes in presence of finely-divided platinum metals is essentially a process of dehydrogenation, and he has now found that except in cases of autoxidation, the oxidation of aldehydes to acids is due not to the introduction of oxygen into the molecule, but to dehydrogenation of the hydrate of the aldehyde. Experiments with acetaldehyde and benzaldehyde showed that the moist aldehyde when shaken with palladium black, with exclusion of air, yields the corresponding acid and hydrogen, the latter being fixed by the palladium:

$$R.HC(OH)_2 \rightarrow R.COOH + H_2.$$

The adsorbed hydrogen can be oxidised by means of air or by benzoquinone, Methylene Blue, or other quinonoid compounds, thus rendering the palladium free to dehydrogenise further quantities of the aldehyde-hydrate. Anhydrous acetaldehyde and chloral are not appreciably acted upon by dry silver oxide, but are vigorously oxidised in presence of water. Formaldehyde reacts readily with dry silver oxide, but yields carbon monoxide, not carbon dioxide or formic acid as would be expected from a true oxidation process. By palladium black also, dry formaldehyde is decomposed into carbon monoxide and hydrogen.

II. Autoxidation of aldehydes.—The results of comparative experiments on the velocity of oxidation of benzaldehyde, moist and dry, in presence and in absence of palladium, and of moist and dry acetaldehyde in presence of palladium are given.

III. The process of combustion.—The author has shown previously that formic acid is formed as an intermediate product in the combustion of carbon monoxide to carbon dioxide. Formic acid is also formed in the Bunsen flame and in the combustion of methane. Baker's statement (this J., 1885, 268, 668) that amorphous carbon will burn in dry oxygen is confirmed.—A. S.

Ether; Manufacture of —— from ethylene and sulphuric acid. P. Fritsche. Chem. Ind., 1912, **35**, 637—644.

The author gave an account some years ago (this J., 1897, 630, 631, 824) of experiments on the synthesis of ether from ethylene and sulphuric acid; and he now gives a description of a manufacturing plant erected in the United States in 1900—1901 for the production of ether in this way, using oil gas as source of ethylene. The cost of manufacturing ether by this process, including amortisation and general expenses amounts to 20—21 cents (10d.—10½d.) per lb., and hence the process became unremunerative when in 1907, the price of ether in the U.S.A. fell to about 14 cents (7d.) per lb., owing to the remission of the tax on alcohol used for industrial purposes.
—A. S.

Methyl alcohol; Action of sunlight upon ——. H. D. Gibbs. Philippine J. Sci., 1912, **7**, 57—74.

It is found that though a mixture of methyl alcohol and air yields no formaldehyde when kept in the dark at the ordinary temperature, and only a trace when kept in the dark at 100° C., it yields an appreciable quantity when exposed to sunlight; dilution of the methyl alcohol with water diminishes the speed of the reaction, whilst the presence of sulphuric acid increases it. It is also found that methyl alcohol is oxidised by hydrogen peroxide, yielding formaldehyde chiefly, and that hydrogen peroxide is almost certainly formed by the action of sunlight on water and oxygen.—L. E.

Sodium glycerophosphates of commerce. V. Paolini. Atti R. Accad. dei Lincei, Roma. 1912, **21**, II., 350—352.

The author has shown previously (this J., 1912, 203) that sodium glycerophosphate prepared by Poulenc's process consists mainly of the sodium salt of β-glycerophosphoric acid. Examination of samples of commercial sodium glycerophosphate from four different firms showed that these, like the salt prepared by Poulenc's process, contained 5½ mols. of water of crystallisation and also consisted mainly of sodium β-glycerophosphate. Brucine β-glycerophosphate can be obtained directly from the sodium salt by treating the latter with brucine sulphate in hot concentrated aqueous solution. The melting point, 157°—158° C., given by Tutin and Hann (Chem. Soc. Trans., 1906, **89**, 1749) for brucine β-glycerophosphate refers to the salt dried at 100° C.; the crystallised salt melts in its 11½ mols. of water of crystallisation at 122° C.
—A. S.

Tartaric acid and cream of tartar. United States Treasury decision. *See* VII.

Azo dyestuffs containing arsenic. Aromatic arsenic compound., II. Karrer. *See.* V.

Interference of hydrogen peroxide with the milk tests for formaldehyde. Gibbs. *See* XXIII.

Patents.

Pharmaceutical compound [calcium salt of acetylsalicylic acid]; Manufacture of a ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 4053, Feb. 17, 1912. Addition to Eng. Pat. 11,503, May 12, 1911. (See U.S. Pats. 1,020,121, 1,020,181, and 1,020,182 of 1912; this J., 1912, 409.)

The calcium salt of acetylsalicylic acid is obtained by allowing a calcium salt to act on acetylsalicylic acid (*a*) in alcoholic solution in presence of an organic base such as pyridine or aniline, or (*b*) in acetone solution.
—T. F. B.

Formic esters; Preparation of ——. A. Wolff, Cologne, Assignor to M. Steinkrüger, Cologne-Bickendorf, Germany. U.S. Pat. 1,039,875, Oct. 1, 1912.

Formic esters are obtained by heating mixtures of an alcohol with sodium formate and bisulphate and distilling the product. For example, a mixture of 88 parts of isoamyl alcohol, 68 parts of sodium formate, and 240 parts of sodium bisulphate is heated for about ten hours at a temperature of about 100° C.; the mixture is then cooled to about 50° C. and the amyl formate distilled off at that temperature by lowering the pressure to 40 or 50 mm.—T. F. B.

Tablets which can easily be broken; Production of —— for medicinal and other purposes. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 250,159, March 5, 1910.

Condensation products of starch or similar substances with formaldehyde are added to the mass which is to be formed into tablets. The compounds known under the name of "amyloform" are stated to be specially suitable.
—A. S.

Condensation of organic compounds with the aid of iodine; Process for the ——. Knoll und Co. Ger. Pat. 250,236, Aug. 3, 1910. Addition to Ger. Pat. 241,853, April 23, 1910 (see this J., 1912, 222).

Small quantities of iodine are used to effect the condensation of amino- or imino-compounds with alcohols or ketones, or for the condensation of organic compounds which do not contain nitrogen. Thus, free amines react with alcohols at about 220° C. in presence of iodine, water being eliminated. It is stated that the yields are much better than when high temperatures alone are used to effect the condensation, *e.g.*, of benzil with aniline.
—T. F. B.

Acetaldehyde and its condensation or polymerisation products; Process for preparing —— from acetylene. N. Grünstein. Ger. Pat. 250,356, Feb. 16, 1910.

Acetylene is passed into a solution of a mercury salt in sulphuric acid, the reaction being carried out at a low temperature, preferably about 15° to 25° C., and in any case not exceeding 50° C. The sulphuric acid may be replaced by another acid, in which case the acetylene is passed into the solution at a low temperature, the introduction of acetylene is then discontinued or materially diminished, the solution is heated and then cooled, and the acetylene again passed through. Further, an indifferent salt may be added to the mercury solution, which is capable of precipitating the aldehyde, in which case the process can proceed continuously; or a liquid which readily dissolves acetaldehyde, but which is insoluble in the mercury salt solution, may be added.—T. F. B.

Camphor from borneol or isoborneol ; Process for preparing ——. C. Ruder und Co. Ger. Pat. 250,743, Dec. 7, 1911.

In order to obtain pure camphor by the oxidation of borneol or isoborneol by means of chromic acid in presence of an indifferent solvent, it is necessary to use a sufficient quantity of the solvent to prevent local overheating due to the heat generated by the reaction. By regulating the amount of solvent used it is possible to accelerate or retard the oxidation to any desired extent.—T. F. B.

Mercury compounds of polysubstituted phenols ; Process for preparing nucleus-substituted ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 250,746, April 23, 1911. Addition to Ger. Pat. 234,851, March 25, 1910 (see this J., 1911, 919).

The process described in the principal patent is applied to the preparation of nucleus-substituted mercury compounds of xylenols or their halogen derivatives, di- or polyhydric phenols, their homologues and alkyl ethers, and other polysubstituted phenols, with the exception of thymol derivatives. The products are said to be more stable in aqueous solution and to be more powerful disinfecting agents than the mercury compounds previously described.—T. F. B.

Arbutin and hexamethylenetetramine ; Process for preparing an addition product of ——. C. Mannich. Ger. Pat. 250,884, Aug. 17, 1911.

An addition compound of arbutin and hexamethylenetetramine of the composition, $C_{12}H_{16}O_7.(CH_2)_6N_4$, and applicable to medicine, is obtained by allowing the components to interact in presence of a suitable solvent. For example, two parts of arbutin and one part of hexamethylenetetramine are dissolved in three parts of water, the solution is evaporated to dryness, and the residue is crystallised from methyl or ethyl alcohol. —T. F. B.

Sterile coating on the skin ; Means for producing a ——. H. Grauert. Ger. Pat. 251,126, Nov. 25, 1911. Addition to Ger. Pat. 250,095, May 3, 1911 (this J., 1912, 1007).

Blood serum is used instead of defibrinated blood.—A. S.

Alkyl and aryl esters of phthalic acid or mixtures of such esters as solvents ; The application of ——. A. Hesse. Ger. Pat. 251,237, May 19, 1911. Addition to Ger. Pat. 227,667, June 15, 1909 (see this J., 1910, 1398).

Phthalic acid alkyl or aryl esters, or mixtures of these esters, are used for the isolation of natural perfumes by extraction, maceration, or enfleurage, with or without the aid of heat. It is possible in this way to obtain pure solutions of the perfumes, completely soluble in alcohol ; although phthalic esters remove small quantities of wax from flower petals, this separates when the solutions are cooled.—T. F. B.

Barbituric acids ; Manufacture of new derivatives of the ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pats. 252 and 15,451, Jan. 3, 1912. Under Int. Conv., March 3, 1911.

See Ger. Pat. 247,952 of 1911 ; this J., 1912, 795.—T. F. B.

Homologues of pinacone ; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 3938, Feb. 16, 1912.

See Addition of Feb. 16, 1912, to Fr. Pat. 434,553 of 1911 ; this J., 1912, 843.—T. F. B.

Pinacones ; Process of producing ——. F. Hofmann, K. Delbrück, and K. Meisenburg, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,039,739 and 1,039,740, Oct. 1, 1912.

See Eng. Pat. 22,795 of 1911 and Addition to Fr. Pat. 434,553 of 1911 ; this J., 1912, 151, 843.—T. F. B.

2.5-Diaminobenzene-arsinic acid. L. Benda, Frankfort, Assignor to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,040,260, Oct. 8, 1912.

See Ger. Pat. 248,047 of 1911 ; this J., 1912, 797.—T. F. B.

Monochlorhydrin ; Process of purifying ——. F. C. Heyer, Schlebusch-Manfort, Germany, Assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,040,323, Oct. 8, 1912.

See Ger. Pat. 229,536 of 1910 ; this J., 1911, 307.—T. F. B.

Hydrogen peroxide and urea ; Manufacture of a stable preparation from ——. R. Grüter and H. Pohl, Charlottenburg, Germany. U.S. Pat. 1,040,665, Oct. 8, 1912.

See Eng. Pat. 20,242 of 1911 ; this J., 1912, 91.—T. F. B.

Erratum.

This Journal, page 1008, col. 1, line 26 from top, *for* "monoallylbarbituric" *read* "monoalkylbarbituric" ; and line 27 from top, *for* "monoalkyl-" *read* "monoallyl-."

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Patents.

Colour photography. A. Hamburger, London. Eng. Pat. 20,880, Sept. 21, 1911.

A silver chloro-bromide or other suitable print is bleached, *e.g.*, by means of ferricyanide, and the bleached image is toned by the use of mercuric iodide solutions. The yellow print on a "panchromatic" grey ground thus obtained is used as one of the component prints in colour photography. If a pure yellow print is required, it is bleached in a solution of potassium ferricyanide and bromide, or if a reddish-yellow tone is desired, the solution may contain potassium ferricyanide, lead nitrate, aluminium nitrate, and nitric and acetic acids.—T. F. B.

Polychrome screens from grains obtained by atomising solutions of resins or colloids ; Process for producing ——. K. Wiebking. Ger. Pat. 250,036, July 27, 1910.

The small drops obtained by atomising the solutions of resins or colloids are caused to solidify by allowing them to fall into a suitable liquid, *e.g.*, resin solutions into water and gelatin solutions into solutions of chrome alum, ferric chloride, or tannin, or into alcohol. The moist grains obtained in this manner are spread on an adhesive surface and subjected to pressure, the surplus grains being then removed. The grains unite together forming a continuous screen, thus obviating the necessity for melting or using a filling material.—T. F. B.

Light-sensitive surfaces ; Process for producing ——. Neue Photographische Ges. Ger. Pat. 250,183, Aug. 3, 1911.

In order to obtain surfaces on which normal reproductions of subjects of excessive contrasts can be obtained, it is proposed to prepare such surfaces from mixtures of substances possessing different sensitiveness for light of the same kind (colour), so that the same intensity of light would produce impressions of different gradations on the various substances.—T. F. B.

Photographic images ; Process for retouching and colouring ——. Chem. Fabr. auf Actien, vorm. E. Schering. Ger. Pat. 249,789, Feb. 19, 1911.

Colours prepared by the aid of copaiba balsam as a binding agent, are used for retouching or colouring photographic images.—T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Determination of sulphuric, nitric, and nitrous acids in waste and mixed acids. Finch. *See* VII.

Reaction of hydrogen peroxide with hexamethylenetetramine. Von Girsewald. *See* XXIV.

Patents.

Nitro bodies; Purification of ——. O. Silberrad, Buckhurst Hill. Eng. Pat. 799, Jan. 10, 1912.

For the purification of nitro-compounds, such as the nitro derivatives of solvent naphtha, burning naphtha, or of the heavy coal tar fractions described in Eng. Pat. 13,861 of 1911 (this J., 1912, 978), the compounds are heated with a dilute (*e.g.*, 5 per cent.) solution of soda ash at a temperature of 50° to 70° C., for about 12 to 24 hours. In place of soda ash, any of the alkali carbonates, bicarbonates, or hydroxides may be used. The above process may be replaced by or followed by a gentle boiling under a reflux condenser for 24 to 48 hours with water to which has been added a difficultly soluble substance, capable of taking up nitrous acid to form a compound inert with respect to the nitrated product; thus, marble, chalk, dolomite, magnesia, or any other alkaline earth hydroxide or carbonate may be used. This second treatment is continued until all unstable compounds are decomposed. It is stated that the heat test of the purified nitro-compounds mentioned above, is raised to beyond one hour, whereas, when purified in the ordinary manner, the products seldom show a heat test exceeding five minutes. The use of the purified compounds in the manufacture of explosives is claimed.—T. F. B.

Explosive; Chlorate ——. O. Silberrad, Buckhurst Hill. U.S. Pat. 1,040,793, Oct. 8, 1912.

See Eng. Pat. 13,443 of 1911; this J., 1912, 703.—T. F. B.

Explosive; Perchlorate ——. O. Silberrad, Buckhurst Hill. U.S. Pat. 1,040,794, Oct. 8, 1912.

See Eng. Pat. 13,442 of 1911; this J., 1912, 703.—T. F. B.

XXIII.—ANALYTICAL PROCESSES.

Potassium; Determination of ——. (*Potassium-sodium-cobaltinitrite method.*) E. A. Mitscherlich and H. Fischer. Landw. Vers.-Stat., 1912, **78**, 75—86. Chem. Zentr., 1912, 2, 1312.

The composition of the potassium-sodium-cobaltinitrite precipitate produced in the authors' method of determining potassium (this J., 1912, 350) varies according to the concentration of the precipitant (0·5 grm. of cobalt chloride plus 0·5 grm. of sodium nitrite), but approximates to a limiting value when a definite excess of the latter is used. If the excess used be such that at least 30 parts of sodium are present for each part of potassium, the variation of the composition of the precipitate falls within the limits of the experimental error in the determination of potassium, and the method then yields sufficiently accurate results. The factor for calculating the amount of potash (K_2O) from the number of c.c. of *N*/10 permanganate should be 0·000161, not 0·000157 as given previously. The concentration of the precipitant has an influence on the composition of the precipitate in a similar manner in Bowser's method (this J., 1911, 1282). The authors' method can be used for the determination of potassium in fertilisers. With quantities of from 0·002 grm. of potash (K_2O) upwards, the probable error is, on the average, less than ± 1 per cent. of the quantity determined. —A. S.

Copper; Rapid electrolytic separation of —— *from nickel or zinc.* R. Kremann. Monatsh. Chem., 1912, **33**, 1077—1079.

In separating copper from zinc or nickel, the electrolyte is acidified with nitric acid, which prevents the deposition of zinc or nickel. During the washing, after the copper has been completely deposited, the diminution of acidity leads to a slight deposition of nickel or zinc by the uninterrupted current. The author therefore recommends that the first washings should be made with a solution of nitric acid of the same concentration as the original electrolyte. —W. H. P.

Zinc and nickel; Gravimetric separation of ——. T. Cockburn, A. D. Gardiner, and J. W. Black. Analyst, 1912, **37**, 443—446.

The authors have investigated certain methods for the separation of zinc and nickel, special attention being directed to obtaining zinc sulphide in a form in which it could be filtered readily.

1. *Precipitation of zinc as zinc sulphide from an acetic acid solution.* This method yields satisfactory results under the following conditions, the average error in the weight of zinc found being 0·0001 grm. with quantities of zinc varying from 0·1 to 0·7 grm. and when the amount of nickel did not exceed 0·2 grm. The slightly acid solution of the two metals is treated with sodium carbonate until a faint turbidity is produced, 100 c.c. of glacial acetic acid are then added, the mixture is cooled, and hydrogen sulphide is passed through it at the rate of 2 bubbles per second for 1 hour (see this J., 1909, 587). After standing for a few hours, the zinc sulphide is collected on a filter, washed with hydrogen sulphide solution containing 2 per cent. of ammonium acetate dried, ignited, and weighed as oxide. The zinc oxide obtained does not yield a reaction for nickel when submitted to Tschugaeff's test (this J., 1905, 941).

2. *Precipitation of zinc as zinc sulphide in presence of formic acid.* The acid solution of the metals is rendered neutral to methyl orange by the addition of sodium hydroxide solution, a 50 per cent. formic acid solution is added drop by drop until the mixture is acid, 0·5 c.c. is added in excess, the whole is diluted with water until 100 c.c. contain not more than 0·2 grm. of zinc, then heated to 80° C., and treated with hydrogen sulphide. The zinc sulphide is collected on a filter, washed with hot water, and ignited to oxide. This method also yields accurate results when the proportion of nickel is not too high.

3. *Precipitation of zinc as sulphide from a solution faintly acid with hydrochloric acid, and Zimmermann's process* (Ann. Chem. Pharm., 1879, 3) yielded unsatisfactory results.

With a view to determining the nickel in the filtrate from the zinc sulphide, the authors investigated the process described by Dede (this J., 1911, 1232) but could not obtained trustworthy results owing to the occlusion of alkali by the precipitate. Accurate results were obtained by the dimethylglyoxime method of separating nickel from zinc (this J., 1907, 1217).—W. P. S.

Manganese; Determination of —— *as sulphate and by the sodium bismuthate method.* W. Blum. J. Amer. Chem. Soc., 1912, **34**, 1379—1398.

Experiments have shown that manganese can be weighed most accurately as normal anhydrous manganous sulphate, but that this salt can only be obtained pure by heating for a considerable time at 450°—500° C., direct heating over a flame leading to very uncertain results. The sodium bismuthate method for the determination of manganese has been found entirely satisfactory, yielding results of known accuracy, which are not closely dependent upon the exact conditions of operation. Sodium oxalate is recommended for standardising the permanganate employed, the results being found to agree, within the limits of experimental error (which in the bismuthate method may be reduced to about 1 part in 500), with those obtained with manganous sulphate and solid permanganate, as previously noticed (this J., 1911, 836). The conditions to be observed in standardising are those given by McBride, *viz.*, for 0·1*N* permanganate, a volume of 250 c.c. containing 2 per cent. by volume of sulphuric acid, an initial temperature of 80°—90° C., slow addition of permanganate, especially at the beginning and end of the titration, a final temperature of not less than 60° C., and an end-point correction by comparison with a blank; for 0·03*N* permanganate, an initial volume of 75 c.c. is employed. For rich ores and ferromanganese, 0·1*N* permanganate solution is used and an amount of material containing about 0·05 grm. of manganese, whilst for iron and steel, 0·03*N* solution is suitable. For the rapid solution of ores the following method, due to Blair, has been found convenient. One grm. is fused in a large platinum crucible with 10 grms. of potassium bisulphate, 1 grm. of sodium sulphite, and 0·5 grm. of sodium fluoride, the temperature being very slowly raised until effervescence ceases, and, after complete fusion, the product is cooled; it is then heated carefully with 10 c.c. of concentrated sulphuric acid, cooled, dissolved in water, and made up to a definite volume; the slight precipitate of barium sulphate, usually present, does not influence the manganese determination. The author confirms the observation of Gardner and North (this J., 1904, 899), that filtered solutions of permanganate are stable towards light, if protected from dust and reducing substances, and states that, even in the presence of the latter, decomposition is greatly retarded by adding a small amount of alkali to the solution.—F. Sodn.

Arsenic and antimony; New method for the detection of traces of ——. D. R. Staddon. Chem. News, 1912, **106**, 199.

The process depends upon the precipitation (in elementary form) of arsenic or antimony by sodium hydrosulphite (commercially known as "blankit"). To 5 c.c. of a neutral solution containing 0·5—2 grms. of the suspected substance, 0·5—2 grms. of sodium hydrosulphite are added and the solution warmed; a precipitate—varying in colour from light to dark brown according to the amount of arsenic or antimony present—is produced which, if due to arsenic, is soluble in a solution of sodium hypochlorite. It is stated that 1 part of sodium arsenite dissolved in 50,000 parts of water may thus be readily detected, and the process is recommended as a substitute for the more tedious Marsh test in qualitative analysis.
—W. E. F. P.

Uranium; New volumetric determination of ——. V. Auger. Comptes rend., 1912, **155**, 647—649.

Uranium may be estimated in presence of iron as follows: the substance is dissolved in hydrochloric or sulphuric acid, reduced with zinc amalgam, and air passed through the solution for a few minutes to convert trivalent uranium into the quadrivalent salt. A gram or so of ammonium thiocyanate is added and the liquid titrated with a standardised ferric solution until the rose colouration due to the formation of ferric thiocyanate persists. The oxidation is most rapid when the acidity is least; in 10 per cent. sulphuric acid the solution must be warmed to 45°—50° C. and in 15—20 per cent. acid it must be heated to 70°—75° C. When more than 5 parts of iron to 1 of uranium are present, too small a proportion of uranium is indicated. When titanium is also present, reduction must be effected by means of a titanous salt in presence of a large excess of a salt such as sodium tartrate which forms a complex salt with titanium dioxide. Azo-induline is used as indicator, and the titanous salt is added until the colour changes from a grey violet to yellow. Excess of mineral acid is now added and the titration continued with the standardised ferric salt as above. In presence of much iron too much uranium is indicated.—E. F. A.

Titanium; Behaviour of phenols, naphthols, and phenol-carboxylic acids towards quadrivalent ——. O. Hauser and A. Lewite. Ber., 1912, **45**, 2480—2484.

The so-called "Chromotropic acid" (1·8-dihydroxynaphthalene-3·6-disulphonic acid) was found by K. A. Hofmann to be an extremely delicate reagent for quadrivalent titanium, giving with acid solutions of titanium dioxide an intense red colouration. The authors find that all phenols, and especially polyhydric phenols with neighbouring hydroxy-groups, react similarly: phenol, o-, *m*-, and *p*-cresol, thymol, guaiacol, quinol, catechol, resorcinol, orcinol vanillin, phloroglucinol, pyrogallol, *α*-and *β*-naphthol, 1·5- and 2·7-dihydroxynaphthalene, naphthol- and dihydroxynaphthalene-sulphonic acids, all give red colourations in concentrated solutions of titanium dioxide in hydrochloric or sulphuric acid: catechol and pyrogallol, and the dihydroxynaphthalene-sulphonic acids even with very low concentrations of titanium. The reaction forms a very general means for the detection of hydroxy-groups. In the case of salicylic acid, it was found possible to isolate, not indeed the colouring substance itself, but its sodium or ammonium derivative: these were found by analysis to be salts of a complex titanium-salicylic acid, of formula $(COOH.C_6H_4.O)_3Ti.O.Ti(O.C_6H_4.COOH)_3$. They are yellow or yellow-red well crystallising salts, soluble in alcohol, less soluble in acetone, ether or chloroform. Water, alkalis, and mineral acids decompose them with separation of titanic acid.—J. T. D.

Arsenic xanthate in chemical analysis. N. Tarugi and F. Sorbini. Boll. Chim. Farm., 1912, **51**, 361—370. Chem. Zentr., 1912, 2, 1398—1399.

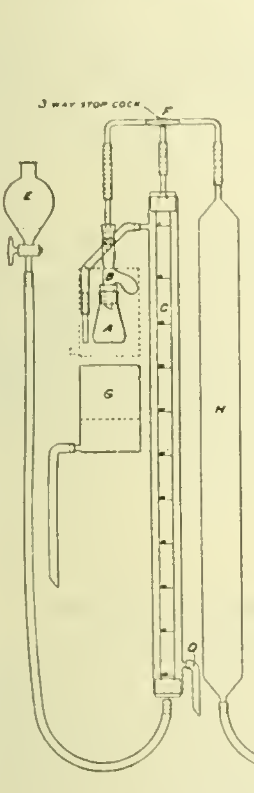
For the preparation of arsenic xanthate, $As(SCSOC_2H_5)_3$, a slightly alkaline solution of potassium arsenite is mixed with a solution of potassium xanthate, and after standing for ¼ hour is acidified with acetic acid. The crystalline precipitate is collected, washed with water, dried over sulphuric acid, and purified by crystallising from light petroleum spirit; or after acidifying with acetic acid, the mixture may be boiled, when the precipitate melts to form a light yellow upper layer, which is separated, allowed to solidify, and crystallised from petroleum spirit. Arsenic xanthate may also be prepared in a similar manner from an ammoniacal solution of arsenic trisulphide. It melts at 94·8 °C. (corr.), is insoluble in water, slightly soluble in cold, more readily in warm alcohol, easily soluble in benzene, carbon bisulphide, carbon tetrachloride, and chloroform, soluble in warm petroleum spirit and glycerin, and in vegetable oils, vaseline, and lanoline. On prolonged heating at its melting point, it is decomposed into arsenic trisulphide, ethylmercaptan, carbon bisulphide, and carbon dioxide; when the moist substance is heated, hydrogen sulphide is also formed. Arsenic xanthate is not volatile with steam and is not affected by cold mineral acids; it yields arsenic trisulphide on treatment with warm concentrated sulphuric acid, and arsenious oxide and ethyldihydroxythiocarbonate with warm concentrated nitric acid; it is dissolved unaltered by cold caustic alkalis, but yields sulpharsenites when the alkaline solutions are boiled. When heated with aniline it is converted quantitatively into arsenic trisulphide and diphenylthiourea.

Determination of arsenic or of potassium xanthate. For the determination of small quantities of arsenic, the latter is precipitated as xanthate, and the precipitate is heated with a few drops of aniline in a weighed beaker first on the water-bath, and then when reaction has ceased, in an air-bath at 150° C. until the weight is constant, when the arsenic trisulphide is weighed. With very small quantities the arsenic xanthate instead of being separated by filtration, is extracted with chloroform, and the chloroform solution evaporated. The method is also applicable to the determination of potassium xanthate. *Volumetric determination of xanthates with arsenite.* 10 c.c. of a standardised alkaline arsenite solution are shaken vigorously with 5 c.c. of the xanthate solution, and after ¼ hour, the mixture is acidified with acetic acid, the arsenic xanthate removed by extraction with benzene, the aqueous solution made up to 100 c.c., and in 10 c.c. the excess of arsenite is determined by titration with *N*/10 iodine, after neutralising with sodium bicarbonate: 1 c.c. of *N*/10 iodine = 0·024 grm. of potassium xanthate. *Gravimetric determination of carbon bisulphide with arsenite.* The liquid containing carbon bisulphide is added gradually to, or the air containing it is passed through, a solution of arsenious oxide in potassium hydroxide, to which some alcohol has been added; the solution is cooled during the operation. After ¼ hour the solution is acidified with acetic acid, allowed to stand for 12 hours, and the precipitated arsenic xanthate separated by filtration, or in the case of very small quantities, by extraction with chloroform.

Volumetric determination of carbon bisulphide with arsenite. The process is analogous to that described above for xanthates.—A. S.

Moisture; Calcium carbide method of determining ——. H. C. McNeil. U.S. Dept. Agric., Bureau of Chem., Circular 97, June 14, 1912.

A **weighed** quantity of the substance is placed in the flask, A, which has a capacity of about 25 c.c. The tube, B, has a side projection to take about 5 c.c. of the carbide, whilst a plug of cotton-wool is pushed down the vertical tube as far as the constriction. On this cotton is placed a little more powdered carbide, then another plug of cotton-wool, and so on alternately until the tube is loosely packed. The object of this is to prevent loss of moisture volatilised by the heat of the reaction. The liquid in C and E may be either mercury or a concentrated solution of sodium chloride, which has previously been saturated with acetylene. The burette, C, is surrounded by a water-jacket, from which the water runs into the vessel, G, which during a determination is raised to surround A, as shown by the dotted lines. After cooling the apparatus, and levelling the liquid in C to the zero mark, the tap, F. is closed to the air and turned to open the communication between A and C. A little carbide is then introduced into A, by tipping the tube, B, at intervals as required. The place of G is then taken by a vessel of water which is kept boiling until gas ceases to be generated, after which the vessel, G, is replaced, the apparatus again cooled to the initial temperature, and the volume of gas measured in the usual way. The tube, H, is an auxiliary container of about 1000 c.c. capacity for use with materials containing a high proportion of moisture. In such cases the tap, F, must be turned so as to connect both C and H with A, and subsequently the gas must be transferred in successive small portions from H into C for measurement, and expelled from the apparatus by manipulating the tap, F, and the levelling vessels, E and I. In practice about 580 c.c. of acetylene are obtained per grm. of water. Dry pigments could be readily mixed with the carbide and the moisture present accurately determined. In particular, white lead was not attacked by the calcium carbide, so that the method gave good results for hygroscopic moisture, whilst the water in combination was not affected. Gypsum did not react much below 100° C., and then not the whole of the two mols. of water was removed. The same results were obtained at 135° C. as at 100° C. Cylinder lubricating and similar mineral oils were found to be suitable liquids in which to suspend material for determination of the moisture. Toluene also gave good results as a vehicle for mixing with paints, etc., since although it volatilised readily it condensed on cooling the apparatus. Oleic acid was slowly attacked by calcium carbide at 100° C., but stearic acid was not affected and was a suitable solvent for some materials. Glycerin was attacked, yielding gas equivalent to 12 or 14 per cent. more water than was known to be present.—C. A. M.



"Active" hydrogen in organic compounds; Determination of —— *by means of magnesium-methyl-iodide.* Th. Zerewitinoff. Ber., 1912, **45**, 2384—2389.

Hibbert (this J., 1912, 259) found that the active hydrogen in the lower fatty alcohols is only obtained in part as methane by the action of magnesium-methyl-iodide, when phenetol is used as solvent, *e.g.*, methyl alcohol only evolved 45·5 per cent. of its active hydrogen as methane, ethyl and propyl alcohols 71 per cent. and 82·8 per cent. respectively. The author has repeated the experiments and finds that, using pyridine as a solvent, the active hydrogen is converted quantitatively into methane. The behaviour of magnesium-methyl-iodide with diamines and members of the fluorene series was also studied. The diamines investigated were of different types: ethylenediamine, *o*-, *m*-, and *p*-phenylenediamines, benzidine, *o*-diaminostilbene, etc. The solvents used were anisol and pyridine. At ordinary temperatures, the methane evolved corresponded with 2 atoms of hydrogen; on warming, a third atom was displaced, but it was found impossible to displace a fourth atom. Indene, fluorene and *a.a'*-dinaphthofluorene give no reaction at ordinary temperatures, but at 85° C. evolve one mol. of methane. Substituted fluorenes, such as phenylfluorene, and *a*-naphthyl[*a.a*-dinaphthofluorene] evolved one mol. of methane, as also did the fluorenols. The reaction was only found to hold for a $—CH_2—$ group, in compounds of the fluorene type; diphenylmethane and dinaphthyl-methane gave no reaction even on warming. (See also this J., 1904, 77; 1907, 646; 1911, 1233.)—A. C.

Formaldehyde; Interference of hydrogen peroxide with the milk tests for ——. H. D. Gibbs. Philippine J. Sci., 1912, 7, 77—78.

The Hehner and Leach tests for formaldehyde, which depend on the colour produced by this compound with milk proteins in presence of iron salts and sulphuric or hydrochloric acid (cp. Richmond and Boseley, this J., 1895, 772; 1896, 382), fail if hydrogen peroxide is present, although Rimini's reaction does not appear to be affected. Thus, a mixture of equal parts of a 0·01 per cent. solution of formaldehyde and milk, treated with 1 part of hydrogen peroxide per 350, 700, or 1000 parts of the mixture, gave, on applying the Hehner test, a yellow, brown, or red-brown colour instead of the characteristic violet or purple. Some of the mixtures which gave yellow and brown colours, were treated with sodium hydrogen sulphite and sulphur dioxide prior to the application of the Hehner test, and were then found to give positive results.—L. E.

New reactions of diphenylamine. Lutschinsky. *See* III.

Volumetric determination of azo dyestuffs by means of hydrosulphite. Grandmougin and Havas. *See* IV.

Colourimetric determination of acetanilide in celluloid. Barthélemy. *See* V.

Rapid determination of chromium in chrome mordants. Jakubowski. *See* VI.

Detection of nitric acid in sulphuric anhydride. Iwanow. *See* VII.

Determination of sulphuric, nitric, and nitrous acids in waste and mixed acids. Finch. *See* VII.

Volumetric determination of nitrites and separation of nitrous and nitric acids. Fischer and Steinbach. *See* VII.

Determination of water and carbon dioxide in minerals and rocks. Dittrich and Eitel. *See* VII.

Behaviour of iron salts towards certain reagents in the presence of proteins and other organic substances. Creighton. *See* VII.

Volumetric determination of iron in iron alloys by titration with permanganate in phosphoric acid solution. Wunder and Stoïcoff. *See* X.

Analysis of platinum ores. Koukline. *See* X.

Determination of arsenic and antimony. Hooper. *See* X.

Determination of potassium, especially in fertilisers, soil extracts, and plant ashes. Davis. *See* XVI.

Direct polarimetric determination of sucrose in presence of certain reducing sugars. Lemeland. *See* XVII.

Polarimetric determination of banana starch. Baumert. *See* XVII.

Iodometric titration of sulphites in presence of alcohol and sugars. Baker and Day. *See* XVIII.

Detection of methyl alcohol in ethyl alcohol and alcoholic beverages. Bono. *See* XVIII.

Determination of free carbon dioxide in water by titration with alkali and phenolphthalein. Tillmans and Heublein. *See* XIXB.

Determination of small quantities of carbon dioxide in water. Warburg. *See* XIXB.

Proposed method of microsublimation for the detection of aesculin, and the identification of gelsemium. Tutin. *See* XX.

New method of analysis of citronella oils. Boulez. *See* XX.

[*Detection of*] *Glyceryl acetate in bergamot oil.* Salamon and Seaber. *See* XX.

Determination of cineol [eucalyptol] by the resorcinol method. Bennett. *See* XX.

PATENT.

Filtering and condensing moisture from flue gases. Eng. Pat. 3661. *See* IIA.

XXIV.—MISCELLANEOUS ABSTRACTS.

Hydrogen peroxide; Reaction of —— with hexamethylene tetramine. C. v. Girsewald. Ber., 1912, **45**, 2571—2576.

WHEN hydrogen peroxide reacts with hexamethylenetetramine in aqueous solution, *hexamethylenetetramine-hydrogen peroxide*, $(CH_2)_6{\cdot}N_4{\cdot}H_2O_2$, is produced, a salt, soluble in water, alcohol, and most organic solvents. If, however, an organic salt (preferably citrate) of the tetramine, in concentrated solution, be treated with hydrogen peroxide, the hydrolysing tendency of the water is restrained, and there is formed *hexamethylenetriperoxide-diamine* $N{:}(CH_2{\cdot}O)_3.(O{\cdot}CH_2)_3{:}N$, identical with the substance produced in other ways by Legler and by Baeyer and Villiger. This substance is extremely unstable and explosive, and should be kept under water, by which it is neither dissolved nor acted on. Direct experiments showed its explosion by detonation to be more violent than that of mercury fulminate.—J. T. D.

Peroxydases; New properties of —— and their activity in the absence of peroxide. J. Wolff. Comptes rend., 1912, **155**, 618—620.

IN the plant world peroxydases occur as a rule without peroxide: it is suggested that the peroxydase can possibly function without peroxide under suitable conditions. It is demonstrated that peroxydase is capable of greatly accelerating oxidations brought about in presence of small quantities of alkali or alkaline salts. Using orcinol and small quantities of sodium hydroxide, the addition of a little active peroxydase leads to the absorption of five times as much oxygen in a given time. Resorcinol does not show the same differences.—E. F. A.

Books Received.

CERAMIC CHEMISTRY. By H. H. STEPHENSON. Davis Bros., 265, Strand, London, W.C. 1912. Price 6s.

8vo volume, containing 85 pages of subject matter, and indexes of names of authors, and subjects. The author points out in his preface that "New vitality has sprung from the foundation of the American and English Ceramic Societies and from the adoption of the science as a subject for degrees in many American Universities." The subject matter of this volume is classified as follows:—I. Geological origins. II. Clay. III. Clay analysis. IV. Raw materials. V. Bodies. VI. Glazes. VII. Enamels. VIII. The production of colour. IX. Firing of the ware. X. Loss in manufacture. XI. Industrial disease. XII. Testing of finished ware. XIII. Classification of pottery. XIV. Research. XV. Bibliography. Among the twelve works mentioned, is included the Journal of this Society with its Collective Indexes.

PRAKTIKUM DER ELEKTROCHEMIE. Von Professor Dr. FRANZ FISCHER, Vorsteher des elektrochemischen Laboratoriums der Kgl. Technischen Hochschule Berlin. Julius Springer's Verlag, Berlin, Wg. Linkstr. 23/24. 1912. Price M. 5.

8vo volume, containing 130 pages of subject matter with 40 illustrations, and an alphabetical index. This series of practical and illustrative problems and exercises is sub-divided and classified as follows:—I. Separation and migration (ions) in electrolysis. II. Ions as cause of conductivity. III. Osmotic theory of current production. IV. Further views in electrolysis. V. Current production and storage. VI. Electro-analysis. VII. Rapid electro-analysis. VIII. Electrometallurgy. IX. Electroplating. X. Electrolysis of the alkali chlorides, etc., including some organic compounds. XII. Electrolysis of fused masses. XIII. Electrothermic methods. XIV. Electric discharges in gases. After this follow a series of Tables, etc., pages 121—130.

Leather Chemists' Pocket-Book. A short compendium of Analytical Methods. Edited by Prof. H. R. Procter. Assisted by Ed. Stiasny, Ph.D., and H. Brumwell, of the University of Leeds. E. and F. N. Spon, Ltd., 57, Haymarket, London. Spon and Chamberlain, 123, Liberty Street, New York. 1912. Price 5s. net. (5s. 3d. post free in the United Kingdom.)

Bound in morocco leather, and of pocket-book size. It contains 215 pages of subject matter with four illustrations, and an alphabetical index. The subject-matter is subdivided and classified as follows:—I. Introduction. II. Alkalimetry. III. Water analysis. IV. Liming, de-liming and bating. V. Qualitative recognition of vegetable tannins. VI Sampling and grinding of tanning materials. VII. Estimation of tannins. VIII. Materials used in mineral tannages. IX. Analysis of formaldehyde. X. Analysis of soaps. XI. General chemistry of oils and fats, including dégras and sod-oil, and egg-yolks. XII. Glucose detection and estimation. XIII. Leather analysis. XIV. Use of the microscope. XV. Bacteriology and mycology.

Le Froid Industriel et ses Applications. 2nd Edition. Par l'Institut du "Mois Scientifique et Industriel." Office d'Ingenieurs Conseils. Bibliothèque Pratique du Mois Scientifique et Industriel, 8, rue Nouvelle, Paris-9e. 1912. Price 2 fr. 75.

8vo volume, containing 121 pages of subject matter, and an alphabetical index of subjects. There are 28 illustrations. The subject matter is arranged under the following heads:—I. Refrigerating machines. II. General applications of refrigeration and cold. III. Use of cold for preserving alimentary products. IV. Sites specially suitable for freezing stations. V. Cold in the fermentation industries. VI. Various applications of cold. Among the latter may be named horticulture; matches; sulphuric acid; artificial camphor; artificial silk; stearine, margarine, paraffin; perfumery; mortuaries; chocolate; caoutchouc, and mineral waters.

Die Elektrochemische Industrie Frankreichs. Von M. R. Pitavel. Ins Deutsche uebertragen von Dr. Max Huth. [Monographien über angewandte Elektrochemie. XLII Band.] Wilhelm Knapp's Verlag. Halle a. d. S. 1912. Price M. 9.

8vo volume, containing 137 pages of subject matter with 35 illustrations, and alphabetical indexes of names and subjects. The text is subdivided and classified as follows:—I. Elements. II. The electrolytic decomposition of water. III. Ozone. IV. Alkali chloride industry. V. Calcium carbide. VI. Utilisation of atmospheric nitrogen. VII. Electroplating, etc. VIII. Electrometallurgical extraction. IX. Electrosteel industry. X. Preparation of iron alloys.

The Carbonisation of Coal. A Scientific Review of the formation, composition and destructive distillation of coal for gas, coke and by-products. By Vivian B. Lewes. Professor of Chemistry, Royal Naval College, Greenwich, etc., etc. John Allan and Company, "The Gas World" Offices, 8, Bouverie Street, London, E.C. 1912. Price 7s. 6d. net.

8vo volume, containing 300 pages of subject matter, an Appendix with tabulated matter of 11 pages more, and an alphabetical index of subjects. There are 27 illustrations. The author's "Cantor Lectures" of 1911 have formed the basis of this work, with considerable additions, etc. The contents are classified as follows:—I. Formation and composition of coal. II. Its classification and distribution. III. Form of retorts used in gas manufacture. IV. Coke ovens and their development. V. Conditions existing in the destructive distillation of coal. VI. The primary gases as products of the destructive distillation of coal, and the bodies from which it has been formed. VII. Tar: its formation, use and decomposition. VIII. Coke. XI. The nitrogen and sulphur of coal and their recovery. X. Modern coal gas.

Landolt Börnstein Physikalisch Chemische Tabellen. Vierte umgearbeitete und vermehrte Auflage, unter Mitwirkung von Th. Albrecht, K. Arndt, K. Bädeker, O. Bauer, W. Bein, A. Blaschke, H. Bottger, W. Böttger, C. Bruni, A. Denizot, F. Dolezalek, F. Eisenlohr, E. Gehrcke, H. Greinacher, E. Gumlich, F. Henning, W. Herz, W. Heuse, A. Heydweiller, W. Hinrichsen, L. Holborn, E. Janecke, W. P. Jorissen, G. Just, J. Koppel, R. Kremann, G. Leithauser, H. Lundén, A. Mahlke, F. F. Martens, G. Meyer, H. Philipp, J. D. van der Plaats, Th. Posner, E. Regener, V. Rothmund, H. Rubens, O. Sackur, C. Sandonini, K. Scheel, A. Schmidt, O. Schönrock, H. v. Steinwehr, A. Stirm, K. Stöckl, H. Tertsek, S. Valentiner, H. v. Wartenberg, F. Weigert, H. F. Wiebe, und mit Unterstutzung der Königlich Preussischen Akademie der Wissenschaften. Herausgegeben von Dr. Richard Börnstein, Professor der Physik an der Landwirtschaftlichen Hochschule zu Berlin, und Dr. Walther A. Roth, a. o. Professor der physik.-Chemie an der Universität zu Greisswald. Julius Springer's Verlag. Berlin. 1912. Price M. 56.

Quarto volume, with frontispiece photolithograph of H. Landolt, and containing 1310 pages of subject matter and an alphabetical index. In the volume there are altogether 283 tables of physico-chemical interest, and among the journals to which references are given is that of the Society of Chemical Industry. The 283 tables are grouped under the following heads:—I. Atomic weights. II. Gravity constants at different places. Gravitation. Reduction of weighings to vacuum, etc. III. Atmospheric pressure. Volumes of gases. Reduction of pressures. IV. Density and volume of water and mercury. V. Elasticity. VI. Strength. Hardness. Friction. VII. Compressibility. VIII. Toughness. Tenacity. IX. Capillarity. X. Diffusion. XI. Gaseous molecules. XII. Density. Melting- and boiling-points. Polymorphism of elements and compounds. XIII. Density and expansion of solutions. XIV. Freezing mixtures and production of constant temperatures. XV. Thermometry. XVI. Expansion. XVII. Saturation and Reaction pressures. XVIII. Critical state. XIX. Chemical equilibrium (Solubility and absorption). XX. Melting and solidifying phenomena of binary mixtures. Alloys. XXI. Minerals. XXII. Conduction of heat. XXIII. Specific heat. XXIV. Molecular weight determinations. XXV. Thermochemistry. XXVI. Wave-lengths. Absorption and emission. Reflection. Refraction. XXVII. Optical rotation. XXVIII. Electrical conductivity. XXXI. Galvanic cells. XXX. Thermo-electric power. XXXI. Di-electrical constants. XXXII. Spark potentials. XXXIII. Radioactivity. XXXIV. Magnetism. XXXV. Velocity of sound. XXXVI. Mechanical equivalent of heat. Velocity of light. XXXVII. Units of mass and dimensions.

Bulletin of the Imperial Institute. Vol. X. No. 3, October. 1912. Price 2s. 6d.

This issue of the Bulletin contains the results of investigations in connection with the improvement of cotton in India; experiments with new materials for the manufacture of paper; rubber from Ceylon, the Gold Coast, North-Western Rhodesia, Papua, and British Guiana; minerals from the Falkland Islands; and soils from the East Africa Protectorate; also an article on the recent agricultural developments in Uganda; and notices respecting the coal resources of the British Crown Colonies and Protectorates, "Robusta" coffee, the cultivation of cigar tobacco, forestry developments in Southern Nigeria, planting and other industries in India and Ceylon, etc.

Chimie Légale. Guide de l'Expert-Chimiste. Par R. de Forcrand. H. Dunod et E. Pinat, 47 et 49, Quai des Grands-Augustins. 1912. Price 9 fr.

8vo volume, containing 387 pages of subject matter, and a table of contents. The work is one dealing with "Legal Chemistry: Its objects, and its relations with chemical analysis and toxicology."

New Books.

[The Roman numerals in thick type refer to the similar classification of abstracts under "Journal and Patent Literature" and in the "List of Patent Applications."

I. *Guillaume*, J., et A. *Turin*: La chaufferie moderne, alimentation des chaudières et tuyauteries de vapeur, 272 fig., in 8°. Dunod et Pinat. Paris. 1912. Bds., 11 fr. 50

Kroner, Dr. H.: Die Kreiselpumpe im Betrieb. [Aus: "Die Fördertechnik."] (13 S. m. 9 Fig.) 32×25 cm. Wittenberg, A. Ziemsen. 1912. M. 1.

IIA. *Brooke*, T.: Modern Retort Settings: Their Construction and Working. 8vo, pp. 212. J. Allan. London. 1912. Net 7s. 6d.

Seidl, K.: Die Naphtaindustrie v. Baku. [Aus: "Berg- u. hüttenmann. Rundschau."] (10 S.) gr. 8°. Kattowitz. Gebr. Böhm. 1912. 60 Pf.

V. *Beltzer*, F. J. G.: Industries des poils et fourrures, cheveux et plumes, 83 fig., in-8°. Dunod et Pinat. Paris. 1912. Br., 12 fr. 50; bds., 14 fr.

Palmer, W.: Dry Cleaning Made Easy. Cr. 8vo, bds., pp. 88. Laundry Journal. London. 1912. Net 1s.

Kirchner, Prof. E.: Die Holzschleiferei od. Holzstoff-Fabrikation. Mit 124 Abbildgn. (Darunter 4 Diagr. u. 24 Mikrophotographien vom Verf.) Auch als 2. Aufl. des Abschn. III. A. Holzschliff aus "E. Kirchner, Das Papier," neubearb. v. K. (VII, 264 S.) Lex. 8°. Biberach (Dorn). 1912. Cloth M. 12.

Masselon, Roberts, and *Cillard*: Celluloid: Its Manufacture, Applications and Substitutes. Translated by H. H. Hodgson. 8vo, pp. 376. C. Griffin. London. 1912. Net 25s.

VI. *Serre*, E.: La teinture du coton, préf. de H. Lagache, 62 fig., 9 pl., in-16. Dunod et Pinat. Paris. 1912. Bds., 5 fr.

Ermen, W. F. A.: The Materials Used in Sizing. Cr. 8vo. Constable. London. 1912. Net 5s.

VII. *Burgstaller*, Dr. S.: Formales u. Genetisches üb. die Bildung fester Lösungen bei der Dissoziation v. Oxyden. 2. Tl. (S. 239—259 u. 11 S.) Prag, J. G. Calve. 1912. M 1.50.

VIII. *Ebert*, Prof. Dr. H.: Anleitung zum Glasblasen. 4., umgearb. u. erweit. Aufl. (XII. 123 S. m. 75 Fig.) gr. 8°. Leipzig, J. A. Barth. 1912. Cloth M. 3.50.

Keramic Studio Publishing Co., Syracuse, N.Y.: The conventional decoration of Porcelain and Glass. Syracuse, N.Y., Keramic Studio Pub., 1911. c. 50 p. il. col. pls. Q. pap. 1912. $3 bxd.

IX. *Allitsch*, Prof. K.: Der Eisenbetonbau in Berechnung u. Ausführung. Ein Lehrbuch f. Schule u. Selbststudium, e. Hilfs- u. Nachschlagebuch f. die Praxis. Mit zahlreichen Abbildgn. u. Formeltab. 2., auf Grund der neuen österreich. Eisenbetonvorschrift f. Hochbauten vom 15. 6. 1911 umgearb. u. verm. Aufl. (IV, 214 S.) gr. 8°. Wien, F. Deuticke. 1912. M. 5.

Fruchthändler, Dr. A.: Beitrag zur Theorie des Eisenbetons. (III, 36 S. m. 40 Abbildgn.) Lex. 8°. Berlin, W. Ernst & Sohn. 1912. M. 2.

Hambloch, Dr. A.: Mikrographische Darstellung des Erhärtungsvorganges v. Trassmörteln. Nebst e. Nachtrag. [Aus: "Die rhein. Puzzolane: Der Trass."] (23 S. m. 5 Taf.) gr. 8°. Leipzig, Siegismund & Volkening. 1912. M. 1.60.

X. *Allen*, H.: Metallurgical manual of iron and steel; their structure, constitution and production: a practical treatise for the use of manufacturers, engineers, and students. N.Y., Van Nostrand. 8+365 p. D. 1912. $2.50.

Blair, A. A.: The Chemical Analysis of Iron. 7th Ed. 8vo, pp. 348. Lippincott. London. 1912. Net 18s.

Sexton, A., and J. S. G. *Primrose*: The principles of iron-founding and foundry metallography. N.Y., Van Nostrand. 8+330 p. D. 1912. $2.50.

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London Section.

Meeting held at Burlington House, on Monday, November 4th, 1912.

MR. G. T. HOLLOWAY IN THE CHAIR.

THE VISCOSITY OF LUBRICATING OILS.

BY A. E. DUNSTAN, D.SC., AND J. F. STREVENS.

(EAST HAM TECHNICAL COLLEGE, E.)

At the Seventh International Congress of Applied Chemistry, London, 1909, one of the present authors (Dunstan, Section 10, p. 163; see this J., 1909, 751) foreshadowed the more extensive application of viscosity as a valuable constitutive property, not only because of its specific suitability as a criterion of lubricating efficiency, but also as a means of determining adulteration, and checking purity. It is, indeed, a matter for astonishment, that a property which varies within such wide limits for individual substances and which, with properly designed apparatus, is so susceptible to accurate measurement, should have met with relatively little application in technical chemistry. In this communication, which deals more particularly with the connection between lubrication and viscosity, the authors desire to advance the proposition that the viscosity of a lubricating oil can only be satisfactorily dealt with in the form of a temperature curve, so that the behaviour of an oil can be approximately predicted if the working conditions are known. Further, they wish to point out that the viscosity of an oil should be expressed in absolute units of dynes per square centimetre, so that all oils may be directly compared, and lastly that the apparatus in which the bulk of the purely scientific work on viscosity has been carried out is eminently suitable for technical purposes. It is obvious, of course, that any standard oil may be taken for comparison purposes, and the results quoted as they are at present, in terms of such an oil.

Apparatus and Method.

The simple apparatus devised by Ostwald is, in point of fact, a modification of that used by Poiseulle a century ago in his classical investigations on viscosity. A reference to Figure I. will show the chief points of the viscometer.

Filtered oil is run into the viscometer to the marks *c d*. It is now suspended in a bath of paraffin wax or suitable clear high flash oil. It is adjusted quite vertically by reference to plumb lines suspended in the bath. A two-litre Jena beaker forms a convenient bath, and stirring may be carried out by means of a glass paddle, run off a hot air motor. A delicate thermometer is immersed in the bath. If the determinations are carried out in a suitable place, well shielded from draughts of air, surprisingly steady temperatures may be maintained for long intervals. It is advisable, however, to guard the apparatus with asbestos millboard as a protection against temperature fluctuations. After the viscometer has been immersed 15 minutes at constant temperature, the levels of the oil should be accurately adjusted to the marks *c—d*, by means of a warmed glass pipette. Rubber tubing is fixed to the top of bulb A, and the oil slowly sucked up above mark *a*. It is then allowed to flow down and when the meniscus passes *a*, a stop-watch reading to fifth seconds is started and the time of flow between *a* and *b* is taken. Four or five determinations are made and averaged. For ordinary oils the following dimensions will be found useful: Capillary, C, 6 cms. × 1 mm. bore; bulb A 4 c.c., bulb B, 8 c.c.; length over all 15 cms. The viscometers may be obtained from Messrs. Muller, Orme, & Co., High Holborn.

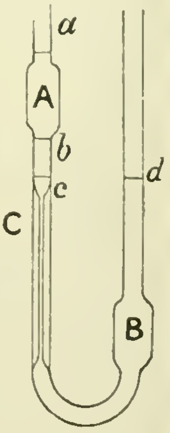


FIG. 1.

For lubricating oils it is advisable to take a series of readings between 70° C. and 200° C., when a curve may be plotted giving in a graphic form the variation of viscosity with temperature. The method of calculation is as follows:—The viscometer must be calibrated with a liquid whose viscosity is accurately known at a range of temperature; moreover this standard liquid must be very viscous. Phenol is very suitable for this purpose, since its viscosity has been determined independently by Scarpa, Dunstan, and Thole.

Viscosity of pure phenol.

Temp.	Observer.	Viscosity.
25	Scarpa	0·0850
45°	Thole	0·0401
50°	Dunstan	0·0337
60	Dunstan	0·0253
70°	Scarpa	0·0197

Suppose the time of flow of phenol in the given viscometer was t seconds. Then viscosity = K × time × density, where K is a constant for the particular instrument. It will be found that K only varies slightly with temperature, and the values for K lie evenly on a straight line which forms the calibration curve for the viscometer.

To take an actual example:—temp. = 73·5° C.; t = 130·5 secs; log K for viscometer = 3·0414; specific gravity of oil = 0·877.

Then viscosity = $K \times t \times d$ = 0·126.

EXPERIMENTAL RESULTS.

Medium spindle oil.

Temp. ° C.	Viscosity.
64	0·110
100	0·0348
150°	0·0123

Heavy Texas engine oil.

70	0·181
110	0·0454
150°	0·0175

Standard cylinder oil.

70°	0·951
100°	0·263
150°	0·0361
190°	0·0237
198°	0·0187

Medium gas engine oil.

70°	0·148
100	0·0550
150°	0·0157

Russian engine oil.

80°	0·122
100°	0·0535
150	0·0160

Locomotive cylinder oil.

80°	0·660
100°	0·279
150°	0·0574
180	0·0265

Elektrion rape oil.

120°	0·691
150	0·274
180°	0·111

Light marine engine oil.

Temp. ° C.	Viscosity.
70°	0·230
100°	0·0780
140°	0·0246
150°	0·0196

Ravison rape oil.

70°	0·146
100°	0·0673
130°	0·0327
150°	0·0219

Bayonne medium gas engine oil.

70°	0·148
100°	0·0550
150°	0·0157

Galician engine oil.

75°	0·198
100	0·0638
125°	0·0319

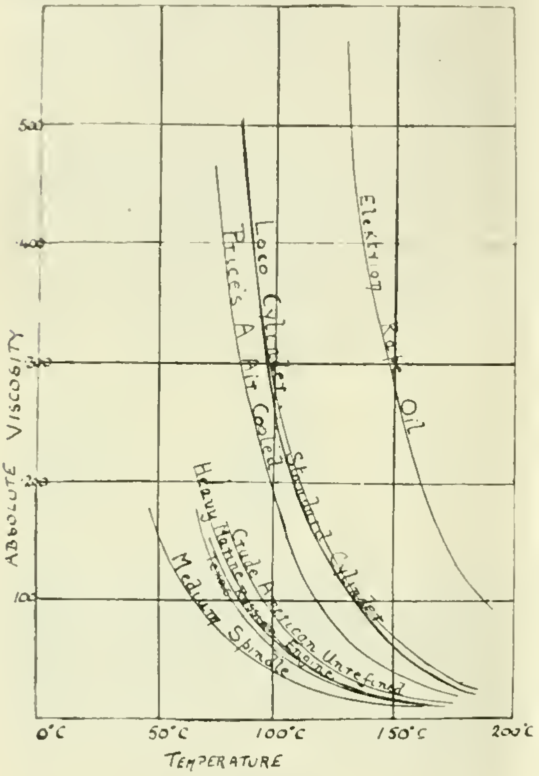
Price's A air-cooled motor oil.

80°	0·368
130°	0·0684
170°	0·0240

A crude American unrefined oil.

80°	0·162
115°	0·053
150°	0·0216
170°	0·0139

The specific gravities are best determined in a narrow-necked 10 c.c. flask, provided with an etched mark. The oil is adjusted to the mark with a fine pipette after 15 minutes' immersion. The temperature correction for expansion of glass may be determined by finding the weight of water contained in it at various temperatures and constructing a correction curve.



No viscosity determination can exactly reproduce the actual conditions under which the lubricating oil will be used and consequently the above results are of an arbitrary nature. Still, undoubtedly it would be of value, when dealing with a given oil, to plot its viscosity curve and compare it with one afforded by an oil of real merit. The more viscous the lubricant becomes, the stronger is the adhesion between it and the bearings, and the greater the pressure and temperature it will sustain, but excessive viscosity causes unnecessary friction, so that the ideal lubricant has just the correct viscosity to keep the moving surfaces apart under the working conditions. It follows then that some knowledge, at least approximate, must be had of the maximum temperature to which the oil will be subjected, and it is apparent from the curves that above 200° C. that although the viscosities tend to approximate they still are widely different for light engine oils and heavy cylinder oils. The authors are attempting to carry their method out at still greater temperatures, but consider that they have made out a good case for the study of viscosity temperature curves.

Discussion.

Mr. Grant Hooper suggested that no one examined lubricating oil nowadays without determining the viscosity, and usually the viscosity was taken at two or three temperatures. Thanks to a Past President of their Society, there was a well-known standardised viscometer, by means of which it was possible to compare oils under the same conditions.

Mr. Coste said he thought the authors were doing a distinct service in calling attention to the really highly suitable apparatus of Ostwald which determined the real viscosity, whereas the apparatus devised by Sir Boverton Redwood, which he admitted was almost universally used in this country and which had undoubtedly done great service, did not determine the true viscosity, and further, was not well standardised. He knew of instruments in the same laboratory which gave different results. The whole question should be taken over by the National Physical Laboratory as the body most capable of giving trustworthy certificates for such instruments. He agreed with Mr. Hooper that taking viscosities at different temperatures was a more or less obvious thing, and further he thought that as the temperature rose the viscosities of different liquids became so close that the viscosities at higher temperatures, in addition to being frequently difficult to take, were of very little value.

Mr. Grant Hooper said that, with reference to Mr. Coste's remark, he would like to emphasise the point that it was necessary to see that the viscometer used was really standardised and not simply taken from a manufacturer without examination. He did not find any difficulty with that instrument in getting and maintaining definite temperatures. In use everyone would agree that it was necessary to take at least two readings, preferably three, and one must of course take care that the oil was clean. If dealing with a cylinder oil, it was of special importance to be sure of this. He was satisfied that when different results were obtained the differences were in a large number of cases due to impurities in the oil which ought to have been removed.

FORMYLATED CELLULOSE.

BY EDWARD C. WORDEN, PH.C., M.A.

Nearly four-score years have elapsed since an ester of a carbohydrate was first prepared, Braconnot (1) having announced in 1833 the existence of a body obtainable by the action of concentrated nitric acid upon starch, and called by him "xyloidine." Subsequently Liebeg (2), Payen (3), Pelouze (4), Gladstone (5), Bechamp (6), and Bonijs-Ballot (7) investigated more completely the chemical and ballistic properties of "explosive starch meal," "nitramidine," "pyroxam," or "pyramidon"—names at that time embracing the various products obtained by the nitration of commercial starch. Schönbein in 1845 or 1846 (8) succeeded in nitrating fibrous cellulose (cotton), and made the (then fanciful) prediction that his "explosive cotton wool" would soon entirely supersede gunpowder in warfare—a prediction that is rapidly being realised.

The investigations on acetylation communicated by Paul Schützenberger in 1862 (9) were followed three (10) and eight (11) years later by the presentation of *Memoirs* to the French Academy upon the acetation of carbohydrates, in which is described the acetation of fibrous or normal cellulose. While it is evident that the produes obtained by Schützenberger showed serious degradation of the cellulose molecule coincident with acetylation, yet it nevertheless must be admitted that he thereby laid the foundation for the non-explosive and relatively non-inflammable esters of cellulose, as direct commercial competitors for the longer known inflammable nitrates. Girard (1), Liebermann (2), Franchimont (3), Vignon (4), Skraup (5), Cross and Bevan (6), Ost (7), Schwalbe (8), Eichengrun (9), and others, have elaborated the mechanics of the acylation process, and investigated the intimate relations of hydrocellulose formation in the presence of esterifying agents.

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(1) Ann. Chim. Phys., 1833, **52**, 290 ; Pogg. Ann., 1833, **29** 176 ; Ann. Pharm., 1833, **7**, 245.

(2) Ann. Pharm., 1833, **7**, 249.

(3) N. Ann. Sci. nat. bot., **10**, 161.

(4) Comptes rend., 1838, **7**, 713 ; J. prakt. Chem., 1838, **16**, 168 ; **40**, 200.

(5) Mem. Chem. Soc., **3**, 412 ; Pharm. J. Trans., **13**, 215.

(6) Ann. Chim. Phys., **46**, 338 ; Comptes rend., **41**, 817 ; J. prakt. Chem., **68**, 51.

(7) Scheik. Onderzoek. Utrecht, No. 3 ; J. prakt. Chem., **31**, 209 ; Ann. Pharm. **45**, 47.

(8) Pogg. Ann., 1847, **70**, 320 ; Comptes rend., 1846, **23**, 678.

(9) Comptes rend., 1862, **54**, 154—156, 1026—1029.

(10) Comptes rend., 1865, **61**, 485—486 ; abstracted and reproduced in Bull. Soc. Chim., 1866, (2) **5**, 290—291 ; Z. Chem., 1866, **9**, 16—17 ; Chem. Centr., 1865, **10**, 1036—1037 ; J. prakt. Chem., 1866, **97**, 250—251 ; J. Pharm. Chim., 1865, **4**, **11**, 376—378 ; Jahrsb. Chem., 1865, 594 ; Ber., 1869, **1**, 163, 556.

(11) Ann. Chim. Phys., 1870, (4), **21**, 235—264 ; abst. Chem. Centr., 1869, 11, 681 ; 1871, (3) **2**, 568. Reproduced in Ann. Chem. Pharm., 1871, **160**, 74—100, abst. Chem. Centr., 1871, (3), **2**, 740 ; J. Chem. Soc., 1872, **25**, 66. See also Schützenberger and Naudin, Comptes rend., 1869, **68**, 814—818 ; abst. Chem. Centr., 1869, **11**, 681 ; Zeitschr. Chem., 1869, **12**, 264—266 ; Bull. Soc. Chim., 1869, (2), **12**, 107—113 ; 1868, (2), **10**, 178 ; Jahrsb. Chem., 1869, 750.

The first patent for an acetylated derivative of cellulose was granted to Cross and Bevan in 1894 (10), since which time the art has ramified to a large number of industries, as attested by the nearly nine hundred patents the writer has collected, and which have been issued in the past eighteen years on this subject. From the first a serious drawback to advancement has been the cost of materials for production. Acetyl chloride was soon discarded on account of the cost, but the necessity for the presence of both glacial acetic acid and acetic anhydride in the acetylising mixture, has never brought the cost of the finished product to a point where it could successfully compete in price with the cellulose nitrates. Although the price of acetic anhydride has been materially reduced in the past few years, the cost of the production of cellulose acetates has still been in excess of that of the nitrates.

This fact undoubtedly influenced investigators in their search for other esters which, while at the same time noninflammable and non-explosive, could still be produced at a figure admitting of direct commercial competition with nitrocellulose. The propionates (11), butyrates (12), aceto-nitrates (13), and mixed esters of the acetic acid group, all required the use of relatively large amounts of the anhydride corresponding to the ester produced, and which was the most expensive constituent in the esterising mixture. The least expensive anhydride in comparison to the corresponding acid which is applicable is perhaps acetic anhydride, which is at present about twice as costly as acetic acid.

However, about ten years ago formic acid began to be produced in large quantities and at a (then considered) reasonable cost, and it is significant that coincident with the appearance of large quantities of concentrated formic acid as a commercial commodity, the industrial possibilities of formylated cellulose began to receive the serious attention of chemists. The fact that in the formylation of cellulose, no counterpart of acetic anhydride—the most expensive constituent of the acetating mixture—is required in their preparation, is, in the writer's judgment, the principal factor for the great activity displayed in this field at the present time. It appears quite probable that in the near future the cellulose formates may be produced in unlimited amounts commercially, at a cost at least not in advance of the present cost of nitrocellulose, starting with the same source of cellulose.

The cellulose formates may be prepared by many of the methods applicable to acetic ester formation, and from hydrocellulose or other modified cellulose without resort to esterifying agents, cellulose hydrate (14), and especially the waste from artificial silk manufacture (15). Denitrated nitrocellulose filaments and viscose silk waste have been found especially suitable. As with the corresponding acetates, much time and experimentation has been devoted to the selection of suitable hydrolysing agents, and the conditions under which they yield most dependable results. For the formylation of natural cellulose (cotton), the most important advocated have been sulphuric acid (16), zinc chloride and sulphuric acid (17), gaseous hydrochloric acid (18), the halogens (19), combination of hydrochloric and sulphuric acids in the form of sulphuryl chloride (20), pyrosulphuryl chloride (21), and chlorosulphonic acids (22). Ethyl sulphuric acid (23) may also be included. The cellulose, if desired, may be dyed before formylation (24). The phospho-formates of the Vereinigte Glanzstoff Fabriken (25) are claimed to be especially valuable when combined with certain plastic-inducing bodies as triphenyl phosphate.

Berl and Smith have shown (26) that cellulose monoformate may be prepared by the action of substantially absolute formic acid in the presence of five per cent. by weight of sulphuric acid, but they were unable to obtain technically useful esters. Woodbridge (27) found that when formic acid of specific gravity 1·20 is substituted for the anhydrous compound no formate results, while on the other hand, where the most concentrated acid is employed, filter paper dried at 100° C. is as efficient a starting material as the cellulose prepared according to the method of Girard (28). In his preferred method 18 parts of dried filter-paper is treated with 100 grms. of formic acid of specific gravity of 1·22, and 10 grms. sulphuric acid, the whole being kept at 30°–35° C. for 16 hours. After thinning with more formic acid and filtration of the viscous mass from unconverted cellulose, the mixture was precipitated in a large bulk of water, washed to neutralisation and dried at a low temperature. The product thus obtained was found to be soluble in formic acid or zinc chloride, insoluble in methyl, ethyl, or amyl alcohols, acetone, chloroform, carbon tetrachloride, ethyl acetate, amyl acetate, aniline, or dilute sulphuric, nitric, or hydrochloric acids. The insolubility of the formic ester in acetylene tetrachloride is a qualitative distinction and separation from cellulose acetate. Saponification yielded 23·1 per cent. of formic acid, the mono-formate requiring 24·2 per cent.

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(1) Comptes rend., 1875, **81**, 1105—1108 ; 1879, **89**, 170—173 ; 1879, **88**, 1322—1324 ; Ann. Chem. Phys., 1876, (5), **9**, 116—119 ; 1881, (5), **24**, 337—384.

(2) Ber., 1878, **11**, II, 1618—1622.

(3) Comptes rend., 1881, **92**, 1053—1054 ; 1881, **92**, 1054—1056 ; 1879, **89**, 711—712 ; Rec. Trav. Chim., 1899, (2), **18**, 472—476 ; 1883, **2**, 241 ; Ber. 1879, **12**, 1938—1942, 2059.

(4) Comptes rend., 1900, **131**, 530—532 ; 558—560. See also Vignon and Gérin, Comptes rend., 1900, **131**, 588—590.

(5) Monats., 1898, **19**, 458—460 ; Ber., 1899, **32**, 2413—2414 ; Monats., 1905, **26**, 1415—1472 ; Ber., 1901, **34**, 1115 ; Monats., 1901, **22**, 1011—1036 ; Z. angew. Chem., 1901, **14**, 371.

(6) Ber., 1901, **34**, 1514 ; J. Chem. Soc., 1890, **57**, 1—4 ; 1895, **67**, 433—451 ; Ber., 1891, **24**, 401 ; Chem. News, 1892, **65**, 77—78.

(7) Z. angew. Chem., 1906, **19**, 993—1000 ; 1911, **24**, 1304—1306, 1307.

(8) Z. angew. Chem., 1908, **21**, 2401—2405 ; 1909, **22**, 155—156 ; 1911, **24**, 1256—1260 ; 1260—1262.

(9) Chem. Zeit., 1908, **32**, 583 ; Phot. Wocht., 1908, **34**, 269—273 ; Oesterr. Chem. Z., 1911, **14**, 59—60 ; Apoth. Z., 1911, **26**, 206 ; Z. angew. Chem., 1911, **24**, 366, 1306—1307.

(10) E.P. 9676, 1894 ; U.S.P. 530,826, 1894 ; D.R.P. 85,329, 1894 ; F.P. 243,546, 1894 ; Belg. P. 113,156, 1894. D.R.P. 88,368, 1895, being addition to D.R.P. 85,329.

(11) U.S.P. 695,127, 1902, Reissue 11,997, 1902 ; E.P. 2264, 1902. U.S.P. 632,605, 1899 ; E.P. 22,029, 1898 ; Can. P. 63,101, 1899 ; D.R.P. 112,817 ; Russ. P. 3264, 1900 ; Belg. P. 137,577, 1898 ; Dan. P. 2558, 1899 ; Port. P. 2930, 1899. U.S.P. 999,236, 1911 ; E.P. 3103, 1907 ; F.P. 374,370, 1907. F.P. 385,179, 385,180, 1907. E.P. 14,255, 1906 ; F.P. 368,738, 1906 ; D.R.P. 198,482, 1905. U.S.P. 891,218, 1908 ; E.P. 2026—B, 1907 ; F.P. 373,994, 1907 ; D.R.P. 201,233, 203,178, 1906 ; Aust. P. 41,831. D.R.P. 224,450, 1908.

(12) U.S.P. 884,475. U.S.P. 695,127. F.P. 375,092. U.S.P. 632,605, 776,480, 779,553. E.P. 14,255, 1906 ; 12,406, 1910.

(13) E.P. 19,107, 1906 ; F.P. 368,766, 1906 ; D.R.P. 179,947, 1905 ; D.R.P. 200,149, 1905 ; 210,778, 1906 ; F.P. 402,072, 1909 ; U.S.P. 1,028,748, 1912.

(14) U.S.P. 955,082, 953,677, 1910 ; E.P. 17,036, 1909 ; F.P. 405,293, 1909. D.R.P. 219,162, 219,163, 1907 ; Aust. P. 45,765 ; Hung. Application N—952, 1909 ; Ital. P. 103,978, 1909.

(15) U.S.P. Appl. 575,518, 1910 ; E.P. 15,700, 1910 ; F.P. 420,856, 1910 ; D.R.P. 233,589, 1909 ; Belg. P. 234,433, 1911 ; Aust. P. A—5148, 1910 ; Swiss P. 53,585, 1910 ; Hung. Appl. G—3306, 1911 ; E.P. 6241, 1911 ; F.P. 420,856, First Add. dated Mar. 13, 1911.

(16) E.P. 2511, 1907 ; F.P. 376,262, 1907 ; D.R.P. 189,836, 189,837.

(17) U.S.P. 955,082, 1910 ; D.R.P. 219,163, 1907, describes the action of formic acid and zinc chloride on cellulose, while U.S.P. 953,677, 1910 ; D.R.P. 219,162, 1907, details the action of formic and sulphuric acids on cellulose.

(18) E.P. 2511, 1907 ; F.P. 376,262, 1907 ; D.R.P. 189,836, 189,837.

(19) E.P. 22,237, 1911 ; F.P. 435,507, 1911 ; Belg. P. 239,564, 1911.

(20) E.P. 21,382, 1910 ; F.P. 423,197, 1910 ; Swiss P. 54,497, 1910 ; Belg. P. 229,995, 1910.

(21) F.P. 423,197, 1910.

(22) D.R.P. 237,765, 1909, comprising zinc chloride and sulphuryl chloride. D.R.P. 237,766, 1909, zinc chloride and chlorosulphonic acid.

(23) F.P. 430,606, 1911.

(24) U.S.P. 994,738, 1911 ; E.P. 1556, 1911 ; F.P. 427,145, 1911 ; D.R.P. 237,210, 1910 ; Belg. P. 233,786, 1911. Aust. Appl. A—2376, 1911.

(25) E.P. 29,246, 1910 ; E.P. 309, 1911 ; F.P. 423,774, 1910 ; 424,621, 1911 ; D.R.P. Appl. 39b, V 9653, 1910 ; Aust. P. 39b, A—9872, 1910.

(26) Ber., 1907, **40**, 903—908 ; abst. this J., 1908, **27**, 534.

(27) Jour. Am. Chem. Soc., 1909, **31**, 1070 ; abst. this J., 1909, **28**, 1061. He was unable to prepare a fibrous cellulose formate, his experiments indicating that the addition of even a small amount of neutral solvent practically stops acetylation, while if the quantity of diluent is reduced to a point where some formylation takes place, the product then dissolves in the reacting mixture.

(28) Ann. Chim. Phys., 1881, (5), **24**, 337—384.

The recuperation of formic acid from a mixture with sulphuric or other mineral acid, presents difficulties, and the solution of the cellulose is subjected to sufficiently speedy decomposition owing to the presence of the comparatively large amounts of energetic mineral acid. Where the ultimate product is required to possess the maximum strength, as when the material is used for artificial silk filaments or continuous film formation, these objections have weight. The Nitritfabrik Akt. Ges. (1) have devised a process for rendering cellulose soluble in formic acid in order to obtain formylated cellulose solutions applicable for spinning, by first forming hydrocellulose, washing free from inorganic acid and drying, when the dry product may be directly formylated by solution in formic acid and zinc chloride, with the elimination, the patentees claim, of the decomposition phenomena referred to above.

Deming (2) prefers dry hydrochloric acid gas, his method being to saturate 3 grms. of filter paper in 100 c.c. of formic acid which has been previously saturated at room temperature with dry hydrochloric acid. The product after four hours is precipitated, and found to be slowly soluble in formic acid, slightly soluble in pyridine, and insoluble in the other reagents which dissolve the cellulose acetates. If allowed to remain in the acid liquid twenty-four hours before precipitation, the ester first formed is partially saponified to a modified cellulose. Instead of hydrochloric acid, the halogens among themselves have been found suitable in the hands of the Actien-Gesellschaft für Anilin Fabr. (3), chlorine, bromine, or (4) iodine monochloride, iodine trichloride, iodine monobromide, or bromine chloride being specified.

According to the patented process of the J. P. Bemberg Aktiengesellschaft (5), gaseous hydrochloric acid gas is preferable because the process takes a more regular course and less secondary products are formed, the method being to introduce 2—4 parts of dry hydrochloric acid into 100 parts of 98—100 per cent. formic acid, after which 20 to 30 parts of dry cellulose is gradually added to the mixture. After the lapse of several hours, assisted by repeated stirring, the cellulose passes substantially into solution, the temperature being kept between 15° and 18° C. meanwhile. At the completion of the formylating process the mass is precipitated in a large bulk of water, washed until neutral and air dried. Thus prepared, the formylcellulose forms a white powder soluble in formic acid, zinc chloride solution, and partially in dilute acetic, hydrochloric, and sulphuric acids.

The energetic action of sulphuric or hydrochloric acids may be considerably modified without materially decreasing their efficiency by combining the two, sulphuryl chloride with (6) or without (7) zinc chloride being used. In the latter method, chlorides of sulphuric acid such as $SO_2OH.Cl$, SO_2Cl_2, and $S_2O_5Cl_2$ are employed, as indicated in the following example (8). 100 parts by weight of cellulose—previously preferably rapidly dried artificially at 105°—are soaked with 500 parts or more of formic acid of 98—100 per cent. strength and 20—30 parts of sulphuryl chloride, solution being complete in one or two days. Where zinc chloride is used, either sulphuryl chloride (9) or chlorosulphonic acid (10) is specified in addition to formic acid. The white voluminous product obtained by precipitation of the formylated mass in a large volume of water, is soluble in formic acid and in zinc chloride solution, and is distinguished from the formylcellulose of the older art by being soluble in pyridine. The patentees state that upon evaporation of a solution of formylcellulose prepared in the above described manner, a translucent, flexible film remains.

In the method of Dreyfus (11) cellulose esters may be produced even in the cold by the action of formic acid on cellulose or its derivatives in the presence of a small quantity of an aliphatic or aromatic ester of sulphuric acid, as ethyl-sulphuric acid. Where the reaction is carried on in the absence of solvents, gelatinous products are obtained, whereas in the presence of solvents, viscous products result.

The Vereinigte Glanzstoff Fabriken have shown (12) that the cellulose hydrates, which may be obtained in large quantities and at a low price in a form, for example, of denitrated nitrocellulose threads, lustracellulose filaments (cuprammonium process), or viscose, as refuse from the cellulose artificial silk industry, are highly adapted for serving as raw material for formylcellulose manufacture. They merely introduce the refuse material into formic acid of 95—100 per cent. strength, and warm the mass gently until the cellulose passes into solution, when the fluid may be directly utilised by forcing through spinnerets into artificial filaments. The solution of the waste may be effected at the ordinary temperature, is accelerated by warming to 40—50° C., while at still higher temperatures formylation proceeds more rapidly with the formation of thinly viscous solutions of impaired strength, due probably to further hydrolysis of the cellulose hydrates and the formation of more highly and complexly hydrated formylcelluloses. The best criterion of the product which it is desired to obtain, is the gloss, transparency, and elasticity of the films prepared from the solutions (13).

If desired, the cellulose may be dyed before formylation, thus producing various shades, the algol, indanthrene, rosanthrene, helindon, katigen, immedial and similar classes of dyestuffs, being stable against the acid agents employed in the formylating process (14). For example, 200 parts of cotton dyed with Indanthrene RS are formylised with 100 parts of formic acid and 3—10 parts of sulphuric acid, a dark blue solution being obtained from which the deep blue formylcellulose can be precipitated out and washed in the usual manner with water without detriment to the colour. It is soluble in the usual solvents, and blue films may be produced from the solutions. The process may be carried out in an analogous manner by the use of other suitable dyestuffs.

A careful survey of the historical development of the cellulose nitrates, will show that the broadening of their technical utilization has occurred simultaneously with the discovery of new solvents, or the adaptation of known solvents to new uses. It was lack of suitable solvents which hindered Parkes (1), Spill (2), Barnwell and Rollason (3), Mennons (4), Cutting (5), Pierson (6), McClelland, Kendall and Trested (7) in the development of the nitrocellulose art, and the appreciation of the value of the solvent over the nitrocellulose that laid the basis of success of the thermoplastic cellulose nitrates typified by celluloid. An analogous condition is being found at the present time in attempts to perfect the cellulose acetate industry. Energy is being focussed on the discovery of suitable liquid and solid solvents, bodies which, like camphor, are thermoplastic and relatively non-hygroscopic. In this direction the cellulose ester art is at a standstill awaiting the advent of a solvent which will have the desirable properties imparted to the cellulose nitrates by camphor. Resorcinol diacetate (8), benzophenone (9), acetated castor oil (10), acetin (11), camphor (12), thymol (13), chloral hydrate (14), are solid or semi-solid bodies which have been proposed for this purpose, but their defects are many.

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(1) U.S.P. 955,082, 953,677, 1910; E.P. 17,036, 1909; F.P. 405,293, 1909; D.R.P. 219,162, 219,163, 1907; Aust. P. 45,765; Hung. Appl. N—952, 1909; Ital. P. 103,978, 1909.

(2) Jour. Am. Chem. Soc., 1911, **33**, 1519; abst. this J., 1911, **30**, 1111. He found that a mixture of 30 c.c. formic acid of sp. gr. 1·22, 70 c.c. hydrochloric acid, sp. gr. 1·40 and 10 grms. calcium chloride will dissolve 1·5 grms. cellulose within 15 minutes, while a mixture of the two acids alone will effect no solution in 24 hours.

(3) E.P. 22,237, 1911.

(4) F.P. 435,507, 1911; Belg. P. 239,564, 1911.

(5) E.P. 2511, 1907; F.P. 376,262, 1907; D.R.P. 189,836, 189,837, 1905.

(6) D.R.P. 237,765, 237,766, 1909; E.P. 24,980, 1910; F.P. 422,542, 1910; Aust. P. 8776, Nov. 11, 1910.

(7) E.P. 24,382, 1910; F.P. 423,197, 1910; Swiss P. 54,497, 1910; Belg. P. 229,995, 1910.

(8) Example 3, E.P. 24,382, 1910.

(9) D.R.P. 237,765, 1909, the method given being to make a mixture of 100 parts of 98—100 per cent. formic acid and 10 parts sulphuryl chloride, into which is immersed 20 parts of dry cotton. The reaction commences immediately and is facilitated by raising the temperature to 30° C. There is gradually formed a viscous solution of formylcellulose which may be precipitated by the addition of a large bulk of water; or a mixture of 100 parts of 95 per cent. formic acid, 5 parts of zinc chloride and 10 parts of sulphuryl chloride is made, and 20 parts of cotton immersed in the mixture. After standing for some hours, a highly viscous colourless solution of formylcellulose results. Hydrocellulose and oxycellulose, the patentees state, act in a similar manner. Where the formylating temperature is kept lower and the catalysing material reduced in quantity, higher formylated products are formed.

(10) D.R.P. 237,766, 1909.

(11) F.P. 430,606, 1911.

(12) U.S. Appl. 575,518, 1910; E.P. 15,700, 1910; E.P. 6241, 1911; F.P. 420,856, 1910; First Addition thereto, dated Mar. 13, 1911; D.R.P. 233,589, 1909; Belg. P. 234,433, 1911; Aust. P. A—5148, 1910; Swiss P. 53,585, 1910; Hung. Appl. G—3306, 1911.

(13) It is claimed to be preferable not to attempt to produce a solution of greater concentration than 6 per cent. at a temperature of about 25° C. From this excess of formic acid may be distilled off at reduced pressure, until the desired consistency is obtained. This method permits not only the economical recovery of much of the excess of formic acid employed, but also facilitates the incorporation with the formylcellulose of any other material which is soluble in formic acid, such as plastic-inducing bodies.

(14) U.S.P. 994,738, 1911; E.P. 1556, 1911; F.P. 427,425, 1911; D.R.P. 237,210, 1910; Belg. P. 233,786, 1911; Aust. Appl. A—2376, 1911.

The liquid solvents for cellulose acetate, such as acetylene tetrachloride alone (15) or with methyl alcohol (16), triphenyl phosphate in solution (17), benzyl benzoate (18), methyl formate (19), chloroform (20), acetone, chloral (21), chloranisol (22), chlorhydrins (23), chlorobenzyl alcohol (24), creosote (25), diacetone alcohol (26), epichlorhydrin (27), mannol (28), naphthyl acetate (29), nitrobenzene (30), nitromethane (31), pentachlorethane and alcohol (32), benzyldihydropulegone (33), chloral alcoholate (34), acetyl alkyl aniline (35), naphthol acetate (36), chlorpalmitic acid (37), ethylenechlorhydrin (38), acetodichlorhydrin and alcohol (39), ethylene chloride and alcohol (40), ethyleneacetochlorhydrin (41), are unsuitable solvents or gelatinising agents for the cellulose formates. The utilization of the formylated celluloses, therefore, is inhibited by too few solvents, or solvents whose field of usefulness is too narrow. It was with the hope to increase the number of useful solvents for formylated cellulose, that the descriptive and experimental work outlined in the latter portion of this paper was undertaken. If the known solvents and plastic-inducing bodies suitable for the cellulose acetates were equally applicable to the corresponding formates, the technical field for the latter esters would be materially widened.

The Vereinigte Glanzstoff Fabriken (42) have found lactic acid to be an excellent solvent for formylated cellulose, Waite (43) having previously discovered the action of this acid on the corresponding acetates. The Vereinigte dissolve 10 parts of artificial silk waste in about 100 parts of formic acid, then add about 50 parts by weight of 80 per cent. lactic acid, the excess of formic acid being recovered by distillation in a partial vacuum at a temperature not exceeding 40° C., and recovered for re-use. The viscous syrup which remains may be drawn into threads, or allowed to solidify into a flexible, transparent mass. If it is desired to remove the acid reaction, dialysis with water is resorted to. It is self-evident that inasmuch as cellulose dissolves in formic acid to form a formylated derivative, the latter after purification is soluble in formic acid. The Internationale Celluloseester Gesellschaft (44) have patented a similar process in which formylated cellulose is rendered plastic by the combined action of formic and lactic acids. Instead of lactic acid, use may be made of phosphoric acid, the commercial syrupy orthophosphoric acid having proved most suitable (45). Best results are said to be obtained by mixing 1 kilo. of approximately 99 per cent. formic acid with 1 kilo. commercial phosphoric acid of about 84 per cent. strength and 200 grms. of degreased, slightly bleached cotton stirred in. After remaining for a few hours the cellulose is converted into a slightly coloured viscous solution, which can be worked into fibres, threads, and films. In order to make this product plastic (46), a solution of the cellulose formate or cellulose phospho-formate in formic acid is diluted with amyl acetate, amyl formate, methyl alcohol, ethyl alcohol, or a mixture of hydrocarbon and alcohol, the ester immediately separating as a voluminous but coherent mass which falls to the bottom of the vessel. The supernatant liquid may now be withdrawn, the precipitate washed, there finally remaining a semi-solid, gelatinous coagulum, which is transparent and readily miscible with triphenyl phosphate to a hard, solid, plastic mass. Ellis (47) has described combinations of formylated cellulose with chloral, castor oil, amyl lactate, and methyl acetone as being commercially valuable.

George W. Miles, in his patented processes for the partial hydration of acetylated cellulose (48), greatly extended the usefulness of the cellulose acetates by the observation that in the acetylation process leading to the formation of substantially normal cellulose triacetates, if water be added to the acetylising mixture—or materials which would induce hydration—the acetated cellulose after a time lost its solubility in chloroform and arrived at that stage of hydration represented by incipient solubility in warm chloroform, at which time it would be found soluble in acetone of 99 per cent. or better, and at the same time be found soluble in a large number of fluids in which the normal acetated cellulose will not dissolve. It is the attempt to apply this same principal to the cellulose formates, which forms the subject matter of the experimental portion of this paper, and although the results were negative in character, they are recorded in detail in possible assistance to others.

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(1) E.P. 2359, 1855 ; 1123, 1125, 1856 ; 2675, 1864 ; 1313, 2733, 3163, 1865 ; 1561, 1592, 2709, 1866 ; 865, 1695, 1867 ; 1366, 1614, 1868 ; 983, 1881. F.P. 71,871, 1866.

(2) E.P. 1816, 1867 ; 2666, 1867 ; 3984, 1868 ; 3102, 1869 ; 180, 787, 1017, 1626, 2649, 1870 ; 1739, 1875 ; F.P. 85,369, 1869 ; 88,898, 1870 ; U.S.P. 91,377, 91,378, 97,454, 1869 ; 101,175, 1870.

(3) E.P. 945, 1859 ; 2249, 1860.

(4) E.P. 2775, 1860.

(5) E.P. 1636, 1854.

(6) U.S.P. 65,267, 1867.

(7) U.S.P. 86,841, 1869.

(8) E.P. 8945, 1909 ; F.P. 402,083, 1909.

(9) F.P. 432,264, 1911 ; Belg. P. 241,251, 1911.

(10) U.S.P. 712,200, 1902.

(11) F.P. 397,429, 1908.

(12) U.S.P. 738,533 ; 729,990 ; E.P. 26,657, 1909 ; D.R.P. 185,240, 185,241, 210,519.

(13) U.S.P. 774,713, 771,714, 712,200 ; D.R.P. 185,240, 185,241.

(14) E.P. 18,103, 1909 ; E.P. 11,354, 1909 ; E.P. 13,100, 1910 ; F.P. 408,370, 1910 ; First Addition thereto dated Apr. 13, 1910 ; Second Addition June 11, 1910 ; Aust. P. 29b, 1642, 1909 ; E.P. 27,258, 1910 ; F.P. 419,530, 1910 ; First Addition thereto No. 13,237, 1911. E.P. 27,258, 1910. F.P. 432,264, 1911 ; Belg. 241,251, 1911. E.P. 9537, 1907 ; F.P. 377,010, 1907 ; D.R.P. 189,703, 1902 ; D.R.P. 220,228, 1907 ; U.S.P. 774,677, 1904 ; E.P. 7088, 1902 ; F.P. 319,724, Addition 811, 1902 ; D.R.P. 145,106, 1902 ; D.R.P. 151,918, 1902 ; D.R.P. 152,111, 1902.

(15) U.S.P. 804,960, 1905 ; E.P. 6751, 1905 ; F.P. 352,897, 1905 ; D.R.P. 175,379, 1904 ; 188,542, 1905.

(16) U.S.P. 1,009,116, 1911 ; F.P. 417,319.

(17) E.P. 10,794, 1910 ; F.P. 415,517, 1910, without urea ; E.P. 10,795, 1910 ; F.P. 415,518, 1910, with urea.

(18) U.S.P. 1,027,619, 1912 ; F.P. 432,264, First Addition thereto dated July 7, 1911 ; Second Addition dated July 15, 1911 ; Third Addition dated Sept. 13, 1911 ; E.P. 20,978, 1911 ; Belg. P. 241,250 ; See also U.S.P. 961,360, 1910 ; E.P. 13,602, 1910.

(19) U.S.P. 972,464, 1910.

(20) D.R.P. 200,334. E.P. 14,255, 1906. E.P. 10,243, 1903. U.S.P. 530,826. E.P. 14,364, 1910. D.R.P. 210,519. U.S.P. 790,565, 530,286, 654,988.

(21) E.P. 9357, 1907 ; F.P. 377,010, 1907 ; D.R.P. 189,703, 1902, Addition to D.R.P. 152,111, 1902 ; D.R.P. 220,228, 1907. F.P. 432,264, 1911 ; Belg. P. 241,251, 1911. U.S.P. 774,677, 1904 ; E.P. 7088, 1902 ; F.P. 319,724, 1902 ; Addition No. 811, 1902 ; D.R.P. 145,106, 1902 ; D.R.P. 151,918, 1902 ; D.R.P. 152,111, 1902. E.P. 27,258, 1910 ; F.P. 419,530, 1910 ; Addition No. 13,237, 1911. E.P. 11,354, 18,189, 1909 ; E.P. 13,100, 1910 ; F.P. 408,370, 1910, First Addition No. 12,469, 1910 ; Second Addition dated June 11, 1910 ; Aust. Appr. 29b, 1642, 1909.

(22) F.P. 432,264, 1911 ; Belg. P. 241,251, 1911.

(23) U.S.P. 1,005,455, 1911 ; E.P. 476, 1910 ; F.P. 411,298, 1910 ; Aust. P. 50,656, 1910 ; Belg. P. 222,106, 1910 ; Hung. Appl. M—3691, 1909 ; Swiss P. 51,839, 1910.

(24) F.P. 432,264, 1911 ; Belg. P. 241,251, 1911.

(25) F.P. 354,942, 1905 ; First Addition thereto dated June 8, 1905 ; E.P. 12,277, 12,278, 1905 ; D.R.P. 185,240, 185,241, 1906. E.P. 12,976, 1909 ; F.P. 411,126, 1909 ; Aust. Appl. 9533, 1909 ; Hung. Appl. R—2398, 1909 ; Port. P. 7102, 1909.

(26) U.S.P. 1,003,438, 1911 ; E.P. 11, 728, 1911 ; F.P. 429,754, 1911 ; D.R.P. 246,967, 1910 ; Can. P. 136,538, 1911.

(27) U.S.P. 734,123, 1903 ; U.S.P. 790,565, 1905 ; E.P. 21,628, 1901 ; D.R.P. 153,350, 159,524, 1901 ; F.P. 317,007, 1901 ; Ital. P. 62,042, 1901 ; Aust. P. 31,391.

(28) F.P. 432,264, 1911 ; Belg. P. 241,251, 1911.

(29) U.S.P. 729,990, 1903 ; D.R.P. 162,239, 1902.

(30) U.S.P. 734,123, 1903 ; 790,565, 1905 ; E.P. 21,628, 1901 ; D.R.P. 153,350, 159,524, 1901 ; F.P. 317,007, 1901 ; Ital. P. 62,042, 1901 ; Aust. P. 31,391.

(31) D.R.P. 201,907, 1907.

(32) F.P. 432,047, 1911 ; Belg. P. 241,251, 1911 ; F.P. 432,261, 1911 ; Belg. P. 241,252, 1911.

(33) D.R.P. 202,720, 1907.

(34) E.P. 26,657, 1909 ; F.P. 421,010, 1910.

(35) F.P. 427,804, 1910.

(36) F.P. 432,264, 1911 ; Belg. P. 241,251, 1911.

(37) U.S.P. 855,556, 1907 ; U.S.P. 962,877, 1910.

(38) U.S.P. 1,027,614, 1912 ; See also U.S.P. 1,027,617, 1912.

(39) U.S.P. 1,027,486, 1912.

(40) U.S.P. 1,027,616, 1912.

(41) U.S.P. 1,027,615, 1912 ; See also U.S.P. 1,027,618, 1912.

(42) E.P. 8313, 1911 ; F.P. 428,069, 1911.

(43) U.S.P. 690,211, 1901.

(44) D.R.P. 239,701, 1910. See also Count Fürst Guido Donnersmarck'sche Kunstseiden- und Acetatwerke, D.R.P. 237,599, 1907 ; U.S.P. 922,340, 1909 ; E.P. 6554, 1909 ; F.P. 400,652, 1909.

(45) E.P. 29,246, 1910 ; E.P. 309, 1911 ; F.P. 423,774, 1910 ; F.P. 424,621, 1911 ; D.R.P. Appl. 39b, V—9653, 1910 ; Aust. P. 39b, A—9872, 1910 ; Hung. P. 3096, 1910 ; Swiss P. 53,777.

(46) U.S.P. 1,020,341, 1912 ; E.P. 8313, 1911 ; F.P. 428,069, 1911.

(47) U.S.P. 999,490, 1911.

(48) U.S.P. 838,350, 1906 ; Reissue 12,637, 1907 ; E.P. 19,330, 1905 ; F.P. 358,079, 1905 ; Hung. P. 35,866, 1905 ; Belg. P. 187,308, 1905 ; Aust. P. 41,461, 1909 ; Can. P. 103,045 ; Ital. P. No. 97, vol. 215, 1905 ; D.R.P. Appl. M—28,280, 1905.

Experimental Part.

Preparation of formylated cellulose. A grass-bleached tissue paper was converted into hydrocellulose by the method of Girard after extraction with hydrochloric and hydrofluoric acids to remove small amounts of iron and silica, the final ash being 0·0016 per cent. Thus prepared it was a white, rather soft, somewhat friable mass, which when extracted with boiling water, yielded no water-soluble residue. In the last series of experiments a denitrated nitrocellulose was used, being prepared by the nitration of the same grade of filter paper by a nitrating mixture containing 21 per cent. of nitric acid and 63 per cent. of sulphuric acid at a temperature of 42° C., the product being entirely soluble in acetone, ether-alcohol, amyl acetate, ethyl acetate, and in crude wood spirits. Denitration was effected with warm ammonium sulphide solution, the denitrated product giving no colour reaction with diphenylamine, and 0·0031 per cent. of nitrogen in a nitrometer. Two hundred grm. portions of modified cellulose were placed in convenient glass receptacles, and one kilo. of chemically pure formic acid of 99·1 per cent. strength added, both cellulose and acid being at room temperature. The mass was vigorously stirred for about one hour in order to thoroughly disintegrate the hydrocellulose in order that the subsequent formylation might occur with maximum uniformity. The hydrocellulose (modified cellulose) had then been broken up to an indistinguishable mass which was in no ways transparent, and without the evolution of appreciable heat. Sixty grms. of fused zinc chloride, previously powdered and ground to a paste in 100 cubic centimetres of absolute formic acid, was next added, and the mass stirred continuously during a period of four hours, the maximum temperature being 42° C. At the expiration of this period the modified cellulose had become partially transparent, very viscous and heavy and substantially homogeneous. The formylating mass was then left at rest 24 hours, during which time the mass became less viscous and nearly transparent, being of a straw-yellow colour. It was filtered in the cold through asbestos in a Gooch crucible to remove translucent pellicles of incompletely dissolved material. A portion precipitated by pouring in a thin stream into a large bulk of water and thoroughly washing to a neutral reaction and freedom from zinc salts, gave a practically white, voluminous, amorphous powder without odour or taste, insoluble in water, ethyl alcohol, amyl alcohol, ethyl acetate, amyl acetate, soluble 4 per cent. in acetylene tetrachloride at 45° C., readily soluble in formic acid, soluble 18 per cent. in glacial acetic acid at 45° C., soluble 48 per cent. in pyridine at room temperature which, however, continued to become opalescent and deposit, even after repeated filtrations through hardened filter paper. The above solubility determinations refer to one grm. formylated cellulose in 5 c.c. fluid. At room temperature, glycerin dissolved 1·3 per cent., acetin 3·7 per cent., quinoline 4·8 per cent., collodine 3·9 per cent., pentachlorethane 1·1 per cent., tetrachlorethane 5·3 per cent., dichlorethylene 1·1 per cent., and epichlorhydrin 2·2 per cent. From none of these solutions could flexible and tenuous films be obtained. The dissolved portion in each instance had the same formic acid content as the major undissolved portion, thus indicating no selective solvent action. The yield was 126 per cent. on the weight of the dried modified cellulose, saponification giving 27·1 per cent. formic acid, as against 24·22 per cent. for a cellulose monoformate.

A sample of 10 grms. extracted in a Soxhlet extractor with 99·5 per cent. acetone gave a solubility of 10·0 per cent., the major portion of which precipitated upon cooling and did not produce a flexible or coherent film.

Partial hydration of formylated cellulose.—After clarification of the solution containing formylated cellulose in the reacting mixture, by filtration under pressure, ten per cent. of the weight was withdrawn and precipitated, washed and dried as above stated. The remaining 90 per cent. by weight was divided into nine equal portions by weight, and to each was added varying amounts of water diluted with an equal volume of absolute formic acid added to minimise proneness to precipitation upon the addition of water. The containers were then kept at varying temperatures for different lengths of time, precipitated in water, washed to neutrality and dried. The fractions thus obtained were submitted to solubility determinations in order to see to what extent the partial hydrolysis (if any) had affected the solubility. In none of the fractions obtained could any physical difference be noted, except, perhaps, those submitted to higher temperatures, or longer contact with the water, were somewhat softer to the feel.

The subjoined table records the per cent. by weight of formylated cellulose which was dissolved in tetrachlorethane, chloroform, and acetone, all chemically pure and free from water, when one grm. of formylated cellulose is rotated for five hours with 5 cubic centimetres of solvent, the material filtered, and a measured portion evaporated to dryness. Usually 5 grms. of formylcellulose and 25 c.c. of solvent were used. Column I. shows the volume of water, which after dilution with an equal volume of concencentrated formic acid was slowly added with much stirring to one-tenth the weight of the formylating mixture of 200 grms. of modified cellulose, and is equivalent to approximately 20 grms. of modified cellulose. Five, ten, and twenty hours expresses the time which the containers were heated at 35° C. in a thermostat with the quantities of water stated in Column I.

Temperature 35° C.

Water added.	Sample number.	Tetrachlorethane solubility.			Chloroform solubility.			Acetone solubility.		
		5 hrs.	10 hrs.	20 hrs.	5 hrs.	10 hrs.	20 hrs.	5 hrs.	10 hrs.	20 hrs.
c.c.		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
0	b	3·2	4·1	5·7	2·2	2·1	2·8	1·9	4·4	6·2
2	c	2·8	3·9	6·1	2·0	3·1	2·2	3·9	4·8	5·4
4	d	3·1	3·8	5·8	2·9	3·3	1·9	2·8	4·7	6·2
6	e	5·1	7·2	7·7	4·0	4·2	6·0	3·0	3·8	5·9
8	f	5·1	6·4	7·0	4·2	4·8	5·7	3·5	4·1	5·4
10	g	6·2	6·0	7·4	4·0	4·5	5·5	3·9	4·2	5·3
12	h	7·4	8·9	8·7	5·0	7·7	7·2	4·4	6·0	6·2
14	i	7·7	9·2	9·5	6·8	6·6	7·4	5·3	6·6	6·3
16	j	7·9	7·8	9·2	7·9	10·1	10·4	6·7	8·9	9·7

The results obtained indicate, in general, an increase in solubility with the amount of hydrating water added, and the increase of time of the hydration period. The differences obtained are not sufficiently marked or concordant, in the majority of instances, to admit of profitable deductions.

Journal and Patent Literature.

Patent Specifications may be obtained by post by remitting as follows:—
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German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

Heavy oil engines. Howard Lectures. H. R. Sankey. J. Roy. Soc. Arts, 1912, **60**, 1031—1040, 1047—1058, 1065—1077, 1083—1098.

The lectures deal mainly with Diesel oil engines, a historical sketch of the development of these engines and a description of the construction and design of the various types being given. There is a section on fuel oils for heavy oil engines, including specifications of tar oils suitable for Diesel engines (see this J., 1912, 319). A brief description of some other heavy oil engines is given, and also two charts: one showing the principal fuel oils and the other the various types of light and heavy oil engines.—A. S.

Patents.

Heating and cooling gases and liquids and humidifying or drying gases; Rotary apparatus for use in ——. Heenan and Froude, Ltd., and J. Bliss, Manchester. Eng. Pat. 28,335, Dec. 16, 1911.

In a heat interchanging apparatus of the type in which a drum constructed of plates or windings of sheet metal, fibre, or other material, is rotated with the lower portion immersed in liquid and the upper portion presented to a stream of air or vapour, the drum is actuated by a friction wheel mounted thereon.—H. H.

Mixing liquids; Apparatus for ——. M. Deacon and W. Gore, London. Eng. Pat. 262, Jan. 3, 1912.

In an apparatus for mixing reagents with liquids in definite proportions, *e.g.*, for supplying a coagulant to water for filtering purposes, the reagent is supplied in a dense condition to a mixing vessel where it is automatically diluted to the required density for supplying to the liquid to be treated. The automatic mixing chamber consists of a tall cylindrical vessel containing a float which occupies nearly the whole of the enclosed space and carries needle valves at each end which respectively control inlet openings for the dense reagent at the top and for the diluting liquid at the bottom. The outlet for the diluted reagent is situated midway between the two inlets, and in accordance with the mean density of the liquid within the vessel, the float rises or falls so as to open one inlet and close the other, and thus maintain constant the density of the outflowing mixture.—H. H.

Desiccating; Method of ——. W. H. Allen, Cleveland, Ohio. U.S. Pat. 1,040,486, Oct. 8, 1912.

Organic substances are desiccated by subjecting them to the action of a magnetic field, either constant or alternating, in a chamber through which cool dry air is circulated.
—H. H.

Drying; Process of —— *and apparatus therefor.* G. W. McMullen, Chicago, Ill. U.S. Pat. 1,040,556, Oct. 8, 1912.

The material to be dried is arranged in thin layers upon a number of superimposed endless belts contained within a closed drying chamber. The belts are longitudinally off-set in relation to each other, so that the material passes downwards from belt to belt as they are rotated, and each belt is separately heated by hot pipes. The moisture-laden air is withdrawn from the space above each belt by means of perforated pipes connected with an exhaust pump.—H. H.

Moisture from air; Apparatus for removing ——. J. B. Miles, Philadelphia, Pa. U.S. Pat. 1,041,323, Oct. 15, 1912.

The air to be dried passes through a series of chambers in each of which it first passes through a compartment containing tubes through which cool dry air from the last chamber of the series is flowing, and then through an inner compartment where it meets a spray of liquid. The cool dry air from the last chamber is led successively through the heat-exchanging tubes of each of the chambers, so that it is finally delivered at a temperature intermediate between that of the air supplied and that of the air in the last chamber of the series.—H. H.

Kiln; Sectional ——. G. C. F. Vater, Assignor to The C. W. Raymond Co., Dayton, Ohio. U.S. Pat. 1,041,379, Oct. 15, 1912.

In a sectional kiln having parallel rows of kiln sections, each provided with a gas flue and burners, (1) the gas flues are provided with admission ports, communicating directly with the atmosphere, by means of which air may enter to reduce the temperature of the products of combustion; (2) the openings leading from the gas flues to the main draught flue are controlled by valves, so that when one kiln section is being fired, the flue of the other row of sections may be burned out; (3) a "water smoking" flue common to all the kiln sections is provided with dampers by means of which hot air passing from the cooling sections of the kiln may be caused to flow into other kiln sections to produce a preliminary heating thereof.—H. H.

Evaporating liquids, more particularly "celluloid"; Apparatus for ——. J. Buisson. Fr. Pat. 442,809, April 22, 1912.

An evaporating apparatus, designed more particularly for evaporating waste liquors resulting from the manufacture of wood pulp, is formed with three chambers arranged side by side, each divided by two horizontal partitions into three compartments, the upper and lower compartments in each chamber being connected together by a number of vertical tubes passing through the central compartment. The liquid to be evaporated is fed into the upper compartment of the outer chamber and is heated as it flows downwards through the vertical tubes. The heated liquid then passes into the lower compartment of the middle chamber and enters the tubes thereof where it evaporates. The lower compartment of the third chamber serves as a furnace, the hot gases from which are led first through the tubes immediately above and then over the tubes in the other chambers. The vapours given off in the evaporating chamber are forced by a fan through the compartment above the furnace, where they become superheated by contact with the hot tubes therein, and are then mixed with the flue gases to aid in heating the evaporating and heating tubes in the other chambers.—H. H.

Evaporating and drying apparatus. H. Kayser, Nürnberg, Germany. Eng. Pat. 22,326, Oct. 10, 1911.

See Fr. Pat. 437,302 of 1911; this J., 1912, 523.—T. F. B.

Liquids and powders; Apparatus for applying —— *to rotating drums for drying, sterilising, and other purposes.* M. Töpfer, Rittergut Grosszschocher, and P. Müller, Vilbel, Germany. Eng. Pat. 2969, Feb. 5, 1912.

See U.S. Pat. 1,033,609 of 1912; this J., 1912, 802.—T. F. B.

Liquids; Apparatus for fixation of ——. M. J. Talansier, Paris. U.S. Pat. 1,012,171, Oct. 22, 1912.

SEE Eng. Pat. 19,626 of 1909; this J., 1910, 997.—T. F. B.

Desiccation of liquids and apparatus therefor: Process for the ——. G. H. Kunick. Fr. Pats. 443,916 and 443,917, May 15, 1912. Under Int. Conv., May 18, 1911.

SEE Eng. Pats. 11,979 and 11,980 of 1911; this J., 1912, 522, 576.—T. F. B.

Evaporation, distillation, and similar operations; Processes of ——. Techno-Chemical Laboratories, Ltd. Fr. Pat. 444,109, May 22, 1912. Under Int. Conv., May 23, 1911.

SEE Eng. Pat. 12,462 of 1911; this J., 1912, 971.—T. F. B.

Evaporation, concentration, and distillation; Process and apparatus for ——. W. Anderson, J. Meikle, and C. W. Fulton. Fr. Pat. 444,551, June 3, 1912.

SEE Eng. Pat. 14,285 of 1911; this J., 1912, 909.—T. F. B.

Low temperatures; Method of producing —— *by means of methyl fluoride.* W. Lachmann, Schulau, Germany. Eng. Pat. 717, Jan. 9, 1912. Under Int. Conv., Jan. 11, 1911.

SEE Fr. Pat. 438,727 of 1912; this J., 1912, 628.—T. F. B.

Drying agent for gases. L. Edeleanu, Ploesti, Roumania. U.S. Pat. 1,041,608, Oct. 15, 1912.

SEE Eng. Pat. 13,990 of 1911; this J., 1911, 1313.—T. F. B.

Compressing precipitates in settling vessels; Apparatus for ——. F. Tiemann, Berlin. U.S. Pat. 1,042,293, Oct. 22, 1912.

SEE Eng. Pat. 29,581 of 1910; this J., 1911, 1038.—T.F.B.

Gas furnaces for reheating purposes; Regenerative ——. F. K. Siemens. Second Addition, dated May 18, 1912, to Fr. Pat. 409,650, Nov. 26, 1909.

SEE Eng. Pat. 10,824 of 1912; this J., 1912, 972.—T. F. B.

Absorbing dilute gases by means of liquids; Apparatus for ——. I. Moscicki. Fr. Pat. 444,024, July 28, 1911.

SEE Eng. Pat. 17,355 of 1911; this J., 1912, 801.—T. F. B.

Calorimeters for fluids. Eng. Pat. 17,222. *See* XXIII.

IIA.—FUEL; GAS; MINERAL OILS AND WAXES.

Gas liquor; Determination of cyanogen compounds in ——. F. Weisser. Chem.-Zeit., 1912, **36**, 1285—1287.

ANALYSIS of a series of gas-liquors from coking installations showed that on the average, 1 litre of liquor contained 0·125 grm. of hydrocyanic acid (HCN), 0·030 grm. of ferrocyanic acid ($H_4FeC_6N_6$), and 0·225 grm. of thiocyanic acid (HCNS). The analysis is carried out as follows:—*Ammonium cyanide* is determined by difference from the total cyanide, and the cyanide present as ferrocyanide. For total cyanide, 500 c.c. of gas liquor are shaken with 50 c.c. of caustic potash (1 : 1), and 50 c.c. of a 10 per cent. solution of ferrous sulphate, and heated for 1 to 2 hours on a water-bath, so as to convert the cyanide into ferrocyanide. The liquid is made up to 1 litre, and filtered, and 100 c.c. of filtrate are acidified with hydrochloric acid, and precipitated with ferric chloride. After standing for 12 to 24 hours, the precipitate is filtered off, treated with dilute potassium hydroxide, boiled, and the ferric hydroxide filtered off. The filtrate, containing potassium ferrocyanide, is evaporated to dryness with sulphuric acid, the residue dissolved in sulphuric acid, reduced with zinc and titrated with potassium permanganate. *Ammonium ferrocyanide* is decomposed if the liquor is concentrated by evaporation, but the determination is made by estimating the iron in the liquid, since in the presence of ammonia and hydrogen sulphide, all the iron in solution is present as ferrocyanide. 100 to 500 c.c. of the filtered gas liquor are evaporated to dryness, and the residue is heated to decompose organic compounds. The ignited residue is dissolved in strong hydrochloric acid with a few drops of nitric acid, 10 c.c. of sulphuric acid (1 : 1) are added, and the solution evaporated nearly to dryness. The residue is dissolved in 20 c.c. of sulphuric acid (1 : 1), reduced with zinc, and titrated with potassium permanganate. *Ammonium thiocyanate* is determined by comparing the colour produced by hydrochloric acid and ferric chloride, with that given by standard solutions of pure ammonium thiocyanate treated similarly. It is found that the colour is affected by the presence of ammonium salts, so that the free ammonia as well as ammonium sulphide must be removed before the test is made. 50 c.c. of liquor are diluted with 50 c.c. of water and evaporated to 30 c.c. on a water-bath. The solution is made up to 100 c.c. and 20 c.c. of this solution are mixed with 10 c.c. of a 6 per cent. solution of ferric chloride in 10 per cent. hydrochloric acid, diluted to 500 c.c. and 100 c.c. of this liquid taken for the colour comparison.—A. T. L.

Minerals from the Falkland Islands. Bull. Imp. Inst., 1912, **10**, 400—404.

"*Bitumen.*"—The sample consisted of a dull black compact material of sp. gr. 1·01, which was only very slightly soluble in chloroform or oil of turpentine. It contained 88 per cent. of volatile matter and moisture, 8·3 of fixed carbon, and 1·12 of sulphur, and yielded 3·7 per cent. of a reddish ash rich in silica; its calorific value was 9568 calories. When distilled at about 500° C. it yielded about 75 per cent. by weight of distillate which on fractionation gave 15·3 per cent. (11·5 per cent. on the "bitumen") of a light oil of sp. gr. 0·740 at 15·5° C., with a bromine absorption value of 90 per cent., and practically free from smell. The distillation residue (63·5 per cent. on the "bitumen") had sp. gr. 0·918 at 15·5° C.; flash point (Abel closed test), 74° C.; solidif. pt. 1° C.; sulphur, 0·14 per cent.; calorific value, 10,551 calories. It could be used as a liquid fuel or be separated into "kerosene" and "heavy oils" by further fractionation.

Iron ore.—The sample consisted of massive siderite and contained ferrous oxide, 46·93; ferric oxide, 12·02; alumina, 1·16; manganous oxide, 1·09; lime, 0·90; titanium dioxide, trace; silica, 4·30; phosphoric anhydride, 0·30; carbon dioxide, 28·73; moisture and combined water, 3·02; organic matter, 0·96 per cent.

Copper ore.—The sample consisted of a mixture of hydrated copper silicate and hydrated copper carbonate, and contained copper oxide, 51·70; silica, 21·80; carbon dioxide, 8·73; nickel oxide, 0·18; loss on ignition (including carbon dioxide), 24·0 per cent. In sufficient quantities, it would be a valuable source of copper.

Iron sulphate ("*copperas*").—The material was found amongst the wood of the buried forest on West Point Island. It differs from ordinary copperas in containing much less than the normal amount of combined water.
—A. S.

Petroleum discoveries in Siam. Oil, Paint, and Drug Rep., Oct. 28, 1912. [T.R.]

ADDITIONAL discoveries of petroleum have been made in Siam. The greatest petroleum find is said to be located above the Tachin River, in the district north of Korat. The discovery was first made by some Laos villagers about five years ago, and these men have been utilising the oil for their own needs and also selling it to neighbouring villages on a small scale. No attempt has been made to bring up the fluid in large quantities, the present method to draw the oil out being with long bamboos fixed together, and a depth of 60 feet is said to have been reached. The well is in an open glade of the forest, which thickly covers the whole of that part of the country. In its present crude state the oil smokes heavily when burned. The greatest drawback in development of this find seems to be the location of the well about 200 miles from the nearest railway station. Reports of oil discoveries in the Siamese districts bordering upon Burma are also current.

Carriage of petroleum spirit. Chem. Trade J., Nov. 9, 1912. [T.R.]

A committee appointed by the Port of London Authority has been for some time considering the subject of the carriage and storage of the petroleum and petroleum spirit imported into London. Representatives of the petroleum industry urge that the present restrictions imposed by the Port of London Authority, which do not permit vessels conveying petroleum spirit to proceed beyond Thames Haven, exercise an extremely detrimental effect upon an article rapidly increasing in importance. The committee ascertained that vessels are being built to carry 12,000 tons of spirit, and that the possible reduction in price to the public would not amount to more than one-sixteenth of a penny per gallon. The committee has now reported that in its judgment serious risk would be inseparable from the presence of such large vessels laden with petroleum spirit in the narrower and more crowded parts of the river, and that the Port Authority could not incur that risk with due regard to the interests of shipping generally and of the many industries situated on the river bank. The committee has, therefore, recommended that Thames Haven should be maintained as the limit for the vessels.

Regarding the request that the facilities for the conveyance of petroleum above Thames Haven in licensed barges should be extended, the committee have increased the maximum capacity of such barges from 150 tons to 250 tons, and in the case of specially constructed craft the maximum capacity has been fixed at 500 tons.

The viscosity of lubricating oils. Dunstan and Strevens. *See* London Section, p. 1063.

Heavy oil engines. Sankey. *See* I.

Patents.

Coal, coke, and other granular materials; Method of washing ——. R. S. Benson, Middleton-St.-George, Durham, and Head, Wrightson and Co., Ltd., Thornaby-on-Tees, Yorks. Eng. Pat. 22,813, Oct. 16, 1911.

The patent relates to washing machines such as are described in Eng. Pats. 21,253 of 1909 and 24,269 of 1910 (this J., 1911, 1004). The coal, etc., is fed on to an inclined trough which receives a motion such as will work the material towards the upper end, and water is caused to flow down the trough, the lighter components which are carried down the trough being further washed by a body of water which is retained in the lower end of the trough and which surges to and fro therein. In order to get the best surging effect, the lower end of the trough is hinged and can be adjusted. The water is delivered to the trough in a number of separate streams, by means of a shoot consisting of a corrugated plate pierced by a number of holes.—A. T. L.

Peat; Treatment of ——. T. Rigby, Dumfries, and N. Testrup, London. Eng. Pat. 22,501, Oct. 12, 1911.

Peat containing 50 per cent. or more of moisture suffers a marked decrease in calorific power if exposed to frost during storage. The claim is for reducing the moisture in wet carbonised peat to 30—35 per cent. before storage, whereby exposure to frost becomes harmless. The wet-carbonised peat pulp may be reduced to 70 per cent. moisture in a filter-press, and then dried by means of a current of hot gases in a rotary drier, or the preliminary removal of water by pressure may be carried as far as 50 per cent. by means of the process described in Eng. Pat. 4684 of 1911 (this J., 1912, 323).—A. T. L.

Coking or gas ovens. Soc. Anon. Burkheiser-Eloy, Liège, Belgium. Eng. Pat. 16,225, July 11, 1912. Under Int. Conv., July 13, 1911.

The gas and air for heating the ovens are introduced through channels in the alternate partition walls between the vertical flues, and enter the flues through holes in these partition walls. The products of combustion pass through holes in the opposite partition walls into similar channels, and thence to the regenerating chambers. —J. T. D.

Fuel-wastes; Method and means for utilising —— and generating power. J. M. W. Kitchen, East Orange, N.J. U.S. Pat. 1,041,810, Oct. 22, 1912.

Coal is distilled so as to produce coal-gas, coke, and "exhaust hot gases," and motive power is generated from the latter, for example by using them to superheat water. The coke is used for making producer gas or a mixture of producer gas and water-gas, and motive power is obtained from the gas thus generated, and the motive power from the two sources is united for useful work. The waste heat from the generation of motive power is used regeneratively in the distillation of the fuel, and the waste heat in the distillation of the fuel and in the making of producer gas from the coke may be used to generate steam.—A. T. L.

Gas producer. F. Merian, Assignor to Forter Miller Engineering Co., Pittsburgh, Pa. U.S. Pat. 1,040,723, Oct. 8, 1912.

There is claimed the combination of an annular shell with the two walls radially connected, forming the bottom portion of the producer chamber, with a stationary base having an annular projecting portion, and an annular rotating ash-bin extending inwardly beneath this projecting portion.—J. T. D.

Gas scrubber. W. B. Davidson, Birmingham, and A. J. Liversedge, Croydon, Surrey. Eng. Pat. 26,979, Dec. 2, 1911.

The patent relates to apparatus for removing suspended substances, especially tarry matter, from gas by causing the gas to rub past the edges or surfaces of solid materials, and the claim is for the construction of the scrubbing surfaces in the form of open sharp-edged spirals. These spirals may be made from strips or bars of iron and may be packed in a scrubber either systematically or indiscriminately, or they may be spaced apart and supported in any suitable way.—A. T. L.

Gas purifiers. R. J. Milbourne, Newport, Salop, and J. F. Bell, Derby. Eng. Pat. 28,153, Dec. 14, 1911.

A series of grids, composed of flat ledges or bars supported by battens, and arranged at any appropriate angle with the battens, are distributed over the floor of the chamber, so that the battens lean against one another, forming a series of V's or W's in cross-section of the chamber. The ends of the grids adjacent to the sides of the chamber are mitred or bevelled, and the spaces so formed are filled by grids of triangular shape, so that the gases have space to circulate all over the floor of the chamber. Two series of such grids may be arranged, one above the other; and the slope of the battens (and therefore of the bars) may be different in the upper and lower series.—J. T. D.

Oils and oil residues; Process for solidifying ——. G. Calvert, London. Eng. Pat. 14,656, June 22, 1912.

A soluble alkali, such as sodium carbonate, is added to the glue or other colloidal substance used for solidifying oil, whereby a much larger quantity of oil can be solidified. The process may be carried out, for example, by dissolving 74 lb. of glue in 18·5 pints of water in a steam-jacketed mixing pan, then adding 16 lb. of sodium carbonate and kneading the mixture whilst 1 ton of oil, previously heated, is added gradually in the form of spray. A weak solution of formalin or of sodium bichromate may be added to increase the solidifying power of the glue. The product may be mixed while hot with a dry fuel such as coal dust. —A. T. L.

[Mineral] Lubricating oils; Method of manufacturing ——. A. de Hemptinne, Gand, Belgium. Eng. Pat. 15,035, June 27, 1912. Addition to Eng. Pat. 15,748, July 6, 1909. (See Fr. Pat. 440,843, this J., 1910, 222.)

The process for polymerising oils by means of an electric discharge, described in the principal patent, was applicable to vegetable and animal oils, but with mineral oils polymerisation takes place too slowly. It has now been found that polymerisation of mineral oils takes place more rapidly in the presence of oil already polymerised, and the process according to this patent therefore consists in adding the fluid mineral oil in small quantities to a quantity of oil previously rendered viscous, exposing the whole under reduced pressure to an electric discharge, until the desired viscosity is attained, and then withdrawing a corresponding quantity of the viscous oil.—A. T. L.

Fuel; Impts. relating to ——. H. Clarke, London, and J. A. Campbell, Ilford. Eng. Pat. 15,837, July 7 1911.

SEE Fr. Pat. 436,948 of 1911; this J., 1912, 481.—T. F. B.

Coke-oven; Regenerative ——. A. Gohmann, Assignor to Stettiner Chamotte-Fabrik Act.-Ges. vorm. Didier, Stettin, Germany. U.S. Pat. 1,041,457, Oct. 15, 1912.

SEE Fr. Pat. 436,611 of 1911; this J., 1912, 423.—T. F. B.

Coke; Apparatus for utilising the residual heat of —— in vertical gas retorts. R. Dempster and Sons, Ltd. Fr. Pat. 444,671, June 6, 1912.

SEE Eng. Pat. 11,209 of 1912; this J., 1912, 805.—T. F. B.

Vertical gas retorts; Apparatus for discharging ——. R. Dempster and Sons, Ltd. Fr. Pat. 444,672, June 6, 1912.

SEE Eng. Pat. 17,616 of 1912; this J., 1912, 1021.—T.F.B.

Vertical gas retorts; Method and means for heating ——. R. Dempster and Sons, Ltd. Fr. Pat. 444,839, June 11, 1912.

SEE Eng. Pat. 16,825 of 1911; this J., 1912, 805.—T. F. B.

Producer-gas; Method of making hot ——. E. Fleischer, Dresden-Altstadt, Germany. U.S. Pat. 1,041,058, Oct. 15, 1912.

SEE Fr. Pat. 422,699 of 1910; this J., 1911, 529.—T. F. B.

Gas; Process and apparatus for making [carburetted] ——. Oxine Gas Manufacturing Co. Fr. Pat. 444,327, May 28, 1912. Under Int. Conv., Jan 22, 1912.

SEE U.S. Pat. 1,019,705 of 1912; this J., 1912, 377.—T.F.B.

Hydrocarbon oils; Solidification of ——. J. T. Armstrong, London, and J. Mordan, Hughenden. U.S. Pat. 1,041,564, Oct. 15, 1912.

SEE Eng. Pat. 869 of 1911; this J., 1912, 482.—T. F. B.

IIB.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

PATENTS.

Filaments [for incandescence electric lamps]; Plastic mass for metallic ——. K. Farkas, Assignor to G. V. Williams, New York. U.S. Pat. 1,041,262, Oct. 15, 1912.

THE plastic mass is prepared by rubbing together a black impalpable powder of chromous oxides and about 15 per cent. of molybdenum sulphate in the presence of a solution of india-rubber.—A. T. L.

Arc-light electrode and method of making the same. J. T. H. Dempster, Schenectady, Assignor to General Electric Co., New York. U.S. Pat. 1,041,752, Oct. 22, 1912.

SEE Eng. Pat. 7299 of 1904; this J. 1905, 491.—T. F. B.

III.—TAR AND TAR PRODUCTS.

PATENTS.

Coal tar; Process for separating the oils from ——. A. Carron. Fr. Pat. 441,622, June 5, 1912.

THE process consists in adding to the tar crude petroleum or turpentine calcium chloride, crude acetic acid, and, if necessary, sulphuric acid, in quantities depending on the nature of the tar. For example, a very fluid tar may be treated with 0·5 to 1·5 per cent. of crude acetic acid and 0·25 to 1 per cent of calcium chloride; after mixing thoroughly, about 10 to 25 per cent. of crude oil is added, the mixture is allowed to stand, and the oils separated by decantation.—T. F. B.

Cresols; Process for separating —— from phenol, and the three cresols from each other. H. Terrisse. Fr. Pat. 444,187, May 23, 1912. Under Int. Conv., May 18, 1912.

THIS process is based on the fact that the calcium salts of *o*-, *m*-, and *p*-cresol are decomposed by steam at temperatures of 75°, 95, and 105° C., respectively: the barium salt of *o*-cresol is decomposed in solution at 115° C., whilst the barium salts of the other isomerides require much higher temperatures; and the magnesium salts of the cresols are decomposed at 100° C., whilst the magnesium salt of phenol is stable. *Example:* Steam is passed into a solution or suspension of the calcium salts of phenol and the cresols, and the mixture of *o*- and *m*- cresols which distils over is converted into barium salts, which are treated with superheated steam at 130°—140° C. to separate the *o*-cresol. The mixture of calcium salts of phenol and *p*-cresol is converted into magnesium salts, which are also separated by steam. When separating the mixture of *m*- and *p*-cresol, their sodium salts may be partially separated by fractional precipitation with an acid, and the separation completed by aid of the alkaline earth salts; or the mixture may be partially converted into the calcium salts by adding an insufficient amount of lime for complete neutralisation, when the *m*-cresol is separated by treatment with steam.—T. F. B.

Coal-tar, mineral oils, and the like; Plant for the continuous distillation of ——. H. P. Hird, Norwood Green. U.S. Pat. 1,041,082, Oct. 15, 1912.

SEE Eng. Pat. 11,143 of 1911; this J., 1912, 578.—T. F. B.

Aromatic sulphonic acids; Production of —— by elimination of sulphonic groups from aromatic polysulphonic acids. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 28,172, Dec. 14, 1911.

SEE Fr. Pat. 439,012 of 1912; this J., 1912, 579.—T. F. B.

2-Halogen-5-acidylaminobenzoylbenzoic acids; Process for making ——. Act.-Ges. f. Anilinfabr. Fr. Pat. 444,107, May 22, 1912. Under Int. Conv., Nov. 1, 1911.

SEE Eng. Pat. 13,241 of 1912; this J., 1912, 866.—T. F. B.

2-Nitro-5-acidylaminobenzoylbenzoic acids; Process for making ——. Act.-Ges. f. Anilinfabr. Fr. Pat. 444,195, May 23, 1912. Under Int. Conv., Nov. 4, 1911.

SEE Eng. Pat. 12,920 of 1912; this J., 1912, 807.—T. F. B.

Aminoanthraquinones; Process for the production of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 444,175, May 13, 1912. Under Int. Conv., July 4, 1911.

SEE Eng. Pat. 21,710 of 1911; this J., 1912, 578.—T. F. B.

IV.—COLOURING MATTERS AND DYES.

Indigo; A red ——, *4,4′-dimethyl-5,5′-dichloroindigo.* F. Kunckell and R. Lillig. J. prakt. Chem., 1912, **86**, 517—518.

FIFTEEN grms. of aluminium chloride were allowed to react with 10 grms. of chloroacetyl chloride and 5 grms. of *o*-chloro-*p*-acet-toluide in carbon bisulphide. On decomposing the double compound produced, with dilute hydrochloric acid, *o*-chloro-*m*-chloroacetyl-*p*-acet-toluide was obtained, melting at 163° C. after crystallisation from alcohol. This substance was boiled with 5 per cent.

sodium hydroxide solution and exposed to atmospheric oxidation, when a dimethyldichloroindigo was produced the colour of which was red to reddish violet.—J. H. L.

Fluorescein. H. v. Liebig. J. prakt. Chem., 1912, **86**, 472—516.

The preparation of isomeric forms of fluorescein, and of a number of salts and derivatives, is described, and their probable constitutions are discussed at length. Ordinary red fluorescein is assumed to be polymolecular.—J. H. L.

Colour-bases of the triphenylmethane group. V. Villiger and E. Kopetschni. Ber., 1912, **45**, 2910—2922.

When ammonia is used to liberate the colour-base from dyestuffs of the triphenylmethane series (Benzal or Victoria Green, Crystal Violet, and Parafuchsine), the product obtained is not, as is usually believed, the carbinol, but, according to the experimental conditions, consists more or less exclusively of the corresponding amine: $ClR_3C+2NH_3=R_3C.NH_2+NH_4Cl$. By treating a chloroform solution of the hydrochloric acid salt of the dyestuff with gaseous ammonia, the amine-base can be obtained in a pure condition. Primary amines react in a similar manner to ammonia, aniline for example forming an anilide of the type, $R_3C.NH.C_6H_5$. The amine bases have chemical and physical properties similar to those of the corresponding carbinols, but they can be detected and determined in presence of the latter, by means of faintly acid methyl or ethyl alcohols, which on boiling expel ammonia quantitatively from the amine-base, with formation of the alkyl ether of the corresponding carbinol: $R_3C.NH_2+C_2H_5OH=R_3C.OC_2H_5+NH_3$. The amine-bases of the triphenylmethane dyestuffs are closely allied to the leuco-compound of Auramine, $[(CH_3)_2N.C_6H_4]_2CH.NH_2$, and it was found that the latter in like manner, yielded ammonia when boiled with faintly acid alcohol, being converted into the alkyl ether of Michler's carbinol. Attempts to obtain leuco-Auramine by the action of ammonia on a colour-salt of Michler's carbinol, however, failed, the product obtained being the imine,

$$\left.\begin{array}{l}[(CH_3)_2N.C_6H_4]_2CH\\ [(CH_3)_2N.C_6H_4]_2CH\end{array}\right>NH,$$

formed by the union of two mols. of leuco-Auramine, with elimination of 1 mol. of ammonia.

The pure carbinol base of Benzal Green (Victoria Green), prepared by the action of dilute caustic soda or sodium carbonate on the dyestuff, can be obtained in two forms, viz., crystalline crusts, melting at 120°—122° C., from petroleum spirit (ligroin), or microscopic cubes melting at 109°—110° C., from ether. The pure amine-base melts at 138° C. Mixtures of the carbinol- and amine-base melt at intermediate temperatures, and the so-called carbinols described by Fischer (Annalen, 1881, **206**, 130) and Doebner (Annalen, 1883, **217**, 251) evidently consisted of such mixtures.—A. S.

Fastness to light of pigments from coal tar colours. Krais. *See* XIII.

Patents.

Monoazo dyestuffs; Manufacture of mordant ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 2956, Feb. 5, 1912.

Mordant dyestuffs, which dye wool from acid baths violet shades, becoming blue or greenish blue by treatment with chromates, are obtained by combining the diazo compounds of *o*-aminophenolsulphonic acids or of their derivatives with acidyl-1-amino-7-naphthols.—T. F. B.

Disazo dyestuffs; Process for making basic ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 444,065, May 21, 1912. Under Int. Conv., June 2, 1911.

The diazo compounds of aminobenzylamines or their derivatives, such as aminobenzyldialkylamines, aminobenzylpyridines, or aromatic amino-ammonium bases, are combined with a suitable intermediate compound (*e.g.*, xylidine, naphthylamine, aminophenol), and the products are diazotised and combined with 1.3-dihydroxyquinoline. The products dye artificial silk directly in pure shades varying from orange-red to bluish-red, fast to light and to water.—T. F. B.

Basic [azo] dyestuffs from 1.3-dihydroxyquinoline; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 444,113, May 22, 1912. Under Int. Conv., June 9, 1911.

When the diazo derivatives of aminobenzylamines and their derivatives or of aromatic amino-ammonium bases are combined with 1.3-dihydroxyquinoline, basic dyestuffs are obtained, which dye artificial silk directly in greenish-yellow shades, very fast to light (compare preceding abstract).—T. F. B.

Indigo-white preparations; Manufacture of stable ——. Meister, Lucius, and Brüning, Ltd., Manchester. From Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 13,675, June 11, 1912. Addition to Eng. Pat. 4617, March 6, 1905 (this J., 1906, 174).

Instead of incorporating lactic acid or a lactate with indigo-white as described in Eng. Pat. 13,673 of 1912 (this J., 1912, 915), substances containing lactic acid or lactates may be used, such as the products obtained by the action of alkali hydroxides or carbonates or alkaline-earth hydroxides on glucose or other saccharine substances, or by the reduction of indigo with glucose and alkali hydroxide. Such preparations are obtained, for example, by heating 1 kilo. of 20 per cent. indigo paste with 200 parts of glucose and 250 parts of caustic soda lye of 40° B., at 60° C., and drying the product by evaporation *in vacuo*.—T. F. B.

Cotton [azo] dyestuffs; Manufacture of violet ——. A. G. Bloxam, London. From Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. Eng. Pat. 18,648, Aug. 14, 1912.

The tetrazo derivative of the *mm'*-disulphonic acid of *pp'*-diaminodiphenylurea (see Fr. Pat. 311,339 of 1901; this J., 1902, 41) is combined with two mols. of a 2-arylamino-5-naphthol-7-sulphonic acid in alkaline solution. The products dye cotton pure violet shades, fast to light, and bleeding only slightly on soaping.—T. F. B.

Vat dyestuffs of the anthracene series; Production of ——. Chem. Fabr. Griesheim-Elektron. Fr. Pat. 444,819, June 10, 1912.

The azo dyestuffs, obtained by combining diazo derivatives of 2-aminoanthraquinone or its derivatives with 2-aminoanthracene or its derivatives, are converted into yellow vat dyestuffs by treatment with oxidising agents. The azo compounds are at first converted into pseudo-azimino compounds, and by use of stronger oxidising agents or by prolonging the action, the anthracene residue may also be oxidised to anthraquinone. These dyestuffs may be nitrated and the nitro compounds reduced, when compounds which dye fast brown shades from the vat are obtained.—T. F. B.

Vat dyestuffs of the anthraquinone series; Manufacture of ——. F. Ullmann, Charlottenburg, Germany. Eng. Pat. 20,453, Sept. 15, 1911. Under Int. Conv., Oct. 17, 1910.

See Fr. Pat. 432,323 of 1911; this J., 1912, 22.—T. F. B.

Thiazine derivatives [dyestuffs] of the anthraquinone series; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 28,479, Dec. 18, 1911.

See Ger. Pat. 248,169 of 1911; this J., 1912, 767.—T.F.B.

Vat [anthracene] dyestuffs; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 16,499 of 1912, date of appl., Nov. 30, 1911.

See Ger. Pat. 248,655 of 1910; this J., 1912, 767.—T.F.B.

Anthracene dye. A. Jacobi, Leverkusen, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,038,589, Sept. 17, 1912.

See Eng. Pat. 26,944 of 1911; this J., 1912, 1025.—T.F.B.

Wool dyestuffs; Manufacture of yellow to brown ——. Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 13,672, June 11, 1912. Under Int. Conv., July 25, 1911.

See Fr. Pat. 443,809 of 1912; this J., 1912, 979.—T. F. B.

[Azo] dyestuff. C. O. Müller, Höchst, and A. Luther, Nied, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,041,146, Oct. 15, 1912.

See Fr. Pat. 435,932 of 1911; this J., 1912, 327.—T. F. B.

[Azo] dyestuffs and process of making same. H. Wagner and J. Erber, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,041,919, Oct. 22, 1912.

See Fr. Pat. 439,005 of 1912; this J., 1912, 635.—T. F. B.

Triphenylmethane dyestuffs; Process for making violet to blue chrome ——. Farbwerke vorm. Meister, Lucius, und Brüning. Second Addition, dated May 10, 1912, to Fr. Pat. 417,490, May 7, 1910. Under Int. Conv., July 25, 1911.

See Eng. Pat. 12,378 of 1912; this J., 1912, 809.—T.F.B.

Indigo; Process of preparing a new form of ——. Farbwerke vorm. Meister, Lucius, und Brüning. Second Addition, dated July 24, 1911, to Fr. Pat. 430,634, Aug. 17, 1910.

See Eng. Pat. 17,045 of 1911; this J., 1912, 808.—T. F. B.

Indigo; Process for preparing a new form of ——. Farbwerke vorm. Meister, Lucius, und Brüning. Third Addition, dated July 25, 1911, to Fr. Pat. 430,634, Aug. 17, 1910. Under Int. Conv., Aug. 1, 1910.

See Eng. Pat. 17,437 of 1911; this J., 1912, 125.—T. F. B.

Indigo; Process for preparing a new form of ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fourth Addition, dated Aug. 18, 1911, to Fr. Pat. 430,634, Aug. 17, 1910. Under Int. Conv., Sept. 3 and 20, 1910, and Feb. 4, 1911.

See Ger. Pats. 239,339, 242,532, and 246,580; this J., 1911, 1372; 1912, 278, 635.—T. F. B.

Indigo-white preparations; Process for making stable ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 444,120, May 22, 1912. Under Int. Conv., June 9, 1911.

See Eng. Pat. 13,673 of 1912; this J., 1912, 915.—T. F. B.

Disazo dye; Red ——. M. Cantor, Berlin-Friedenau, Assignor to Act.-Ges. f. Anilinfabr., Berlin. U.S. Pat. 1,042,198, Oct. 22, 1912.

See Fr. Pat. 430,962 of 1911; this J., 1911, 1372.—T.F.B.

Disazo dyes and process of making them. A. L. Laska, A. Zitscher, and F. Kunert, Offenbach, Assignors to Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. U.S. Pat. 1,042,356, Oct. 22, 1912.

See Eng. Pat. 13,766 of 1912; this J., 1912, 915.—T.F.B.

Disazo dyestuffs; Process for the production of ——. Chem. Fabr. Griesheim-Elektron. Fr. Pat. 444,608, June 4, 1912.

See Eng. Pat. 13,766 of 1912; this J., 1912, 915.—T. F. B.

Condensation products of the anthraquinone series and process for making them. Badische Anilin und Soda Fabrik. Fr. Pat. 444,454, May 30, 1912. Under Int. Conv., June 9, 1911.

See Eng. Pat. 17,137 of 1911; this J., 1912, 326.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

X-rays; Opacity to ——, *of fabrics appropriately loaded with lead salts.* L. G. Droit. Comptes rend., 1912, **155**, 706—708.

Silk fabrics were loaded with lead phosphostannate, by the processes ordinarily used for mordanting with metallic salts. One such fabric weighed 266 grms. per sq. metre, and 68 per cent. of its weight consisted of mineral matter (lead oxide 34, stannic oxide 24, phosphoric anhydride 8, lime and alkali 2). Two layers of this were found to be so slightly permeable by "soft" discharges, and six layers by medium or ordinary discharges, as to form an efficient protection against the injurious effect of X-rays on the skin. At the same time, the covering even with six layers was sufficiently flexible for work. The fabric just described had an opacity equivalent to a sheet of copper 0·044 mm. thick. —J. T. D.

Paper; Experiments with new materials for the manufacture of ——. Bull. Imp. Inst., 1912, **10**, 372—379.

The materials examined were: (1) papyrus from the Sudan and the East Africa Protectorate; (2) Spanish reed (*Arundo Donax*) from the Transvaal; (3) a species of *Aristida* from the Transvaal; (4) the petiole and fibre of the "Nipa" palm from the Federated Malay States; (5) *Borassus flabellifer* leaves from Mozambique; and (6) leaves of a species of *Bromelia* from Brazil. The results show that all the materials mentioned can be converted into pulp suitable for the manufacture of paper, but they give somewhat low yields of pulp, and the materials probably not be worth more than about £3 per ton in the United Kingdom and hence could not be profitably exported. They might however be converted into "half-stuff" for exportation, or used locally for the manufacture of paper.—A. S.

Formylated cellulose. Worden. *See* London Section, p. 1064.

Patents.

Filaments or threads from viscous liquids or solutions; Manufacture of ——. H. J. Ping, Manchester, and F. W. Schubert, Middleton. Eng. Pat. 22,635, Oct. 13, 1911.

The apparatus is desgined to produce filaments of reduced diameter by "drawing down" the issuing threads in a weak coagulating liquid superposed upon a more powerful coagulant which fixes the threads so drawn. The coagulating bath consists of a horizontal trough in which is supported a cylindrical spinning funnel, the spinning nozzle being attached to its upper end by an air-tight joint. The stronger coagulating liquid is supplied to the horizontal trough, whilst the weaker liquid enters the upper end of the cylinder at the level of the spinning nozzle. A connection, also at this level, with a suction pump causes a column of the second liquid to be drawn up into the vertical cylinder, whilst the adjustment of the supply of the weaker liquid produces a superposed layer of this liquid of any suitable height. The relative heights of the two columns of liquid are variable and determine the degree of fineness of the filaments, in conjunction with the speed of drawing and the adjustment of a tensioning device situated in the horizontal trough. The passage of the filaments through the column of liquid in the cylinder produces a circulation of the second liquid from the trough into the cylinder.—J. F. B.

Acetylcellulose; Solvent for ——. W. G. Lindsay, Assignor to The Celluloid Co., New York. U.S. Pats. 1,041,112 and 1,041,114, Oct. 15, 1912.

Acetylcellulose is dissolved (1) in a mixture of pentachloroethane and methyl alcohol in approximately equal volumes, or (2) in trichlorohydrin mixed with an equal volume of methyl or ethyl alcohol or a mixture of the two. In either case other solvents and inert substances may be added.—T. F. B.

Acetylcellulose plastics and solvents thereof; Process for making ——. W. G. Lindsay, Caldwell, N.J., Assignor to The Celluloid Co., New York. U.S. Pat. 1,041,113, Oct. 15, 1912.

Acetylcellulose soluble in acetone is mixed with triphenyl phosphate or tricresyl phosphate and one or more of the following:—Toluene sulphonamide, ethyl-*p*-toluidine sulphonamide, benzene sulphonamide, ethylacetanilide, methylacetanilide. Ethyl or methyl alcohol is then added, and the mixture is allowed to stand until it has become gelatinised, when it is worked on rollers or in a heated press, etc.—T. F. B.

Acetylcellulose; Compound of —— and process of making such compound. Process of converting acetylcellulose. W. G. Lindsay, Caldwell, N.J., Assignor to The Celluloid Co., New York. U.S. Pats. 1,041,115 and 1,041,116, Oct. 15, 1912.

Acetylcellulose, soluble in acetone, is mixed with camphor, triphenyl or tricresyl phosphate, methyl or ethyl alcohol, and "colouring matters or other inert substances."—T. F. B.

Acetylcellulose plastic compounds; Process for making ——. W. G. Lindsay, Caldwell, N.J., Assignor to The Celluloid Co., New York. U.S. Pats. 1,041,117 and 1,041,118, Oct. 15, 1912.

Acetylcellulose soluble in acetone is mixed with tetrachloroethylacetanilide or trichloromethylacetanilide, triphenyl or tricresyl phosphate, and (1) methyl alcohol or (2) ethyl alcohol with the application of heat.—T. F. B.

Cellulose ester; Process of producing dyed ——. B. Borzykowski, Charlottenburg, Germany. U.S. Pat. 1,041,587, Oct. 15, 1912.

Dyed cellulose esters are obtained by the simultaneous treatment of a cellulosic material with a suitable dyestuff and an acidylating agent. Thus, cellulose may be treated with a mixture of acetic acid, acetic anhydride, sulphuric acid, and a dyestuff soluble in acid.—T. F. B.

Paper, cardboard, pasteboard, and the like; Process of finishing ——. H. B. and H. S. Toone, Nottingham. Eng. Pat. 22,962, Oct. 18, 1911.

The process for finishing pasteboards or pulp-boards faced with paper consists in packing the freshly pasted boards, without drying, in wads, with the surface or surfaces to be glazed in contact with sheets of polished or enamelled metal or lacquered cardboard, pressing the wads in a press, which is heated whilst the pressure is applied, thus drying the boards whilst imparting a permanent glazed finish to the surfaces in contact with the polished plates. Paper also may be finished in the same manner by placing the sheets of paper between the finishing plates, before the paper is thoroughly dry or after it has been damped with a suitable proportion of moisture.—J. F. B.

Peat, wood-waste and other vegetable substances; Process for rendering —— suitable for the manufacture of paper pulp. W. Hellwig, Münstereifel, and F. Herrmann, Cöln-Bergenthal, Germany. Eng. Pat. 28,489, Dec. 18, 1911.

For the "opening" of peat and other fibrous materials, a bath is prepared in the following manner: 10 kilos. of 90 per cent. calcined soda are dissolved in 100 litres of boiling water; then 2 kilos. of bleaching powder made into a paste with water are added to the boiling solution. The mixture, after cooling, is treated with 3 kilos. of hydrochloric acid of 20° B. (sp. gr. 1·16). The fibrous materials are steeped in the resulting liquor for 24 hours, the liquor being preferably warmed. The material is then removed and treated in boiling milk of lime of about 5 per cent. strength for 2 hours. The treated mass is washed and is then ready for the manufacture of paper pulp.—J. F. B.

Waste papers; Process for recovering pulp from ——. J. M. Burby. Fr. Pat. 441,703, June 6, 1912.

See U.S. Pat. 1,029,848 of 1912; this J., 1912, 680. Instead of using a solution of borax, the paper may be treated with a 0·2 per cent. solution of caustic soda at 65° C., or with a solution of sodium bicarbonate at above 100° C.—T. F. B.

Alcohol from sulphite liquor; Method of manufacturing ——. P. G. Ekström, Harnäs, Sweden. Assignor to Aktiebolaget Ethyl, Falun, Sweden. U.S. Pat. 1,042,332, Oct. 22, 1912.

The waste liquor from the sulphite pulp process is treated with calcium carbonate (or similar material) and ammonium sulphate, to neutralise free sulphurous acid, to convert organic compounds loosely combined with sulphurous acid into compounds innocuous to the subsequent fermentation, and to increase the quantity of nitrogenous matter in the liquor.—J. H. L.

Wool, skins, textile substances, etc.; Process and apparatus for extracting fatty and other substances from ——. C. R. Mayo. Fr. Pat. 444,479, May 31, 1912. Under Int. Conv., June 2, 1911.

See Eng. Pat. 13,340 of 1910; this J., 1912, 636.—T. F. B.

Artificial threads from solutions of copper oxide ammonia cellulose; Manufacture of ——. E. de Haën Chemische Fabrik "List," Seelze, Germany. Eng. Pat. 4610, Feb. 23, 1912. Under Int. Conv., Aug. 12, 1911.

See U.S. Pat. 1,034,235 of 1912; this J., 1912, 811.—T.F.B.

Cellulose esters; Process for making dyed ——. B. Borzykowski. Fr. Pat. 444,588, June 4, 1912. Under Int. Conv., June 9, 1911.

See U.S. Pat. 1,041,587 of 1912; preceding.—T. F. B.

Fibre from peat; Method of and apparatus for recovering ——. B. Granville, New York. Eng. Pat. 6207, March 12, 1912.

See U.S. Pat. 1,038,565 of 1912; this J., 1912, 981.—T.F.B.

Textile belting; Manufacture of ——. W. G. Maxwell, Edinburgh, and E. J. C. Christie, Leith. U.S. Pat. 1,041,130, Oct. 15, 1912.

See Eng. Pat. 1300 of 1911; this J., 1912, 327.—T. F. B.

Vegetable and textile fibre, waste paper, wood waste, and the like; Process of treating —— for conversion into paper material. L. Herz, Nuremberg, Germany, Assignor to Papeterie de la Seine, Nanterre-sur-Seine, France. U.S. Pat. 1,041,791, Oct. 22, 1912.

See Fr. Pat. 422,490 of 1910; this J., 1911, 533.—T. F. B.

Paper pulp; Process for hydrating and pulping fibres for the manufacture of ——. H. Jackson. First Addition, dated May 15, 1912, to Fr. Pat. 435,090, Oct. 10, 1911. Under Int. Conv., May 30, 1911.

See Eng. Pat. 12,933 of 1911; this J., 1912, 636.—T. F. B.

Apparatus for evaporating liquids, more particularly "cellulide." Fr. Pat. 442,809. *See* I.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Tendering of unions. (*Neutral salt reaction in presence of animal fibres.*) L. L. Lloyd. J. Soc. Dyers and Col., 1912, **28**, 337—340.

By treating cotton with a 5 per cent. solution of formic or acetic acid and a 5 per cent. solution of Glauber's salt, the author has shown that a slight amount of hydracellulose is produced which may be detected by Fehling's solution, yet this amount does not appreciably decrease the tensile strength and is not sufficient to account for the high degree of tendering produced in some cases of cross-dyeing. Employing, however, woven material with a woollen warp and cotton weft, the author has shown that with a 2 per cent. solution of formic acid and a 5 per cent. solution of Glauber's salt, a high degree of tendering is obtained. This is stated to be due to the wool acting as a catalytic agent, forming first an additive compound with the organic acid, and then reacting with the sodium sulphate to form sulphuric acid which remains in combination with the wool. The free acid was also extracted and proved to be sulphuric acid. Similar results were obtained with acetic, lactic, glycollic, oxalic, succinic, tartaric, citric, benzoic and gallic acids, and also with alpaca, mohair, camel hair, fur, silk and leather. Experiments show that different grades of wool, alpaca and mohair have practically the same absorptive power for organic or inorganic acids, and by employing unions containing each of these materials with cotton, the author has proved that the tendering obtained in the dyeing and finishing of lustre goods is caused by insufficient washing, or by drying over cylinders before moisture is sufficiently removed by hydro-extraction. By successive extractions of the free acid with boiling water, the author shows that in the case of sulphuric acid, or acetic acid and sodium sulphate, only a small percentage is removed in the first extraction, the amount being a gradually decreasing one in each successive extraction. In the case of organic acids, a large percentage amount is removed in the first extraction, and very little in successive extractions. Employing other inorganic salts in place of sodium sulphate, hydrochloric, hydrobromic, hydriodic, nitric, phosphoric, chloric and perchloric acids were obtained. The free acid is in all cases partly dissolved from the fibre and transferred to the bath, thus accounting for the production of hydracellulose in union goods containing cotton.—B. N.

Prussian blue in dyed or weighted silk or other fibres; Determination of ——. H. E. Williams and W. P. Dreaper. J. Soc. Dyers and Col., 1912, **28**, 336—337.

The method of removing Prussian blue as a soluble ferrocyanide by dilute alkali, afterwards converting into Prussian blue again, with estimation of the latter by ignition to ferric oxide, is shown to be unsatisfactory. The presence of iron tannate or alkali salts leads to an error, as these may be carried down by the Prussian blue, and further the calculation as anhydrous Prussian blue is inaccurate, this substance when dried at 100° C. containing about 20 molecules of water of hydration. The method of Farrell and Goldsmith (this J., 1912, 679), is only reliable in the absence of nitrogenous dressing materials and silk gum, the removal of which is difficult. The authors recommend the application of a method described by Williams (this J., 1912, 468), for the estimation of Prussian blue in weighted silk. A weighed quantity of the material is distilled with a 10 per cent. solution of sulphuric acid and 0·1 grm. of pure cuprous chloride dissolved in a few drops of concentrated hydrochloric acid. The hydrocyanic acid is collected in dilute caustic soda solution, and titrated with standard silver nitrate solution. By removal of the dressing material with a 1 per cent. solution of sodium carbonate containing 1 per cent. of soap, which also removes Prussian blue, it is possible to obtain nitrogen estimations for the silk, the Prussian blue, and also possibly any nitrogenous dressing or silk gum present.—B. N.

Patents.

Dyeing machine. W. S. Duell, Assignor to Klauder-Weldon Dyeing Machine Co., Amsterdam, N.Y. U.S. Pat. 1,040,654, Oct. 8, 1912.

The apparatus consists of a cylindrical tank having a perforated false bottom and a number of perforated partitions, so disposed that they form, together with the false bottom and portions of the wall of the tank, a receptacle for holding the material to be dyed. The spaces between the perforated partitions and the wall of the tank communicate with the space below the false bottom, and means are provided for circulating dye-liquor through the apparatus. The cover of the tank has a number of discharge openings and is provided with a depending flange which can be adjusted so as to open or close the perforations in the partitions and thus regulate the flow of dye-liquor therethrough.—A. S.

Silk-printing machine. R. Tagliarne, Assignor to American Silk and Cotton Skeins Printing Co., Paterson, N.J. U.S. Pat. 1,042,029, Oct. 22, 1912.

The machine consists of a frame having spaced parallel grooves open above, a series of parallel skein-supporting rails, each having at each end a block received in one of the grooves, means for securing the rails in the frame, including opposed adjusting screws exerting side-pressure against the blocks in each groove and arranged in the frame in alignment with the grooves, a roller having dye-bands around it spaced to correspond with the rails, this roller running on guide rails disposed parallel to and extending beyond the skein-supporting rails and having depressions at the extended ends which allow the dye-roller to drop into a dye-holding bath.—J. F. B.

Dyeing skein yarn; Machines for ——. O. Kunz, Vienna. Eng. Pat. 28,483, Dec. 18, 1911. Under Int. Conv., Dec. 30, 1910. Addition to Eng. Pat. 1156, Jan. 20, 1905.

See Addition of Dec. 29, 1911, to Fr. Pat. 350,868 of 1905; this J., 1912, 638.—T. F. B.

Dyeing cotton or linen fabrics with vat dyestuffs; Process for ——. L. Cassella und Co. Fr. Pat. 444,846, Aug. 17, 1911.

See U.S. Pat. 1,029,066 and Eng. Pat. 18,877 of 1911; this J., 1912, 638, 813.—T. F. B.

Brown resists on vegetable fibres; Process of producing fast ——. C. Pilz, Liesing, Austria-Hungary. U.S. Pat. 1,041,510, Oct. 15, 1912.

See Ger. Pat. 242,611 of 1911; this J., 1912, 280.—T. F. B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Tungstic and silicic acids; Determination of ——. H. Hermann. Z. anal. Chem., 1912, **51**, 736—748.

In acid solutions containing a moderate excess of tungstic acid, it is found that silicic acid sol may be converted quantitatively into the complex, $SiO_2.12WO_3$, provided that the proportion of strong acids contained in the solution is not greater than corresponds to the formation of paratungstate; acetic and formic acids may be present in excess. Moreover, glass and porcelain vessels are attacked by solutions of paratungstate, so that low results are likely to be obtained by employing such vessels in the determination of tungstic acid. It has also been found that the mercurous salts of the complex silicotungstic acids are sufficiently soluble in hot water (faintly acid) to cause appreciable errors in the determination of tungsten by the mercury method. Hydrated silicic acid is completely transformed into complex tungstosilicic acids by prolonged heating with a solution of sodium tungstate, acidified with acetic acid, and advantage may be taken of this fact to ascertain the weight of silicic acid (SiO_2) contained in a solution; this is done by determining the excess of tungstic anhydride, subtracting from the total quantity present, and dividing the resulting number by 46·2, or the complex acid may be precipitated by a known method and the weight of mixed silicic and tungstic anhydrides divided by the factor 47·2.—F. Sodn.

Molybdic acid; Sensitive reaction for ——. P. Melikow. J. Russ. Phys.-Chem. Ges., 1912, **44**, 608—609. Chem. Zentr., 1912, **2**, 1579.

The reaction is based upon the formation of ammonium permolybdate, the aqueous solution of which is coloured red. The solution to be examined is evaporated to dryness on the water-bath, treated with concentrated ammonia solution and then with a 3—4 per cent. solution of hydrogen peroxide; in presence of molybdic acid a pink or red colouration is produced immediately. If the solution be now treated with sulphuric or nitric acid and evaporated, a yellow colouration due to permolybdic acid ($HMoO_4$) makes its appearance.—A. S.

Potassium in potassium silicate; Determination of ——. E. Wilke-Dörfurt. Z. anal. Chem., 1912, **51**, 755—760.

The well-known method of Lawrence-Smith is found to be most satisfactory, provided the dissolved calcium is removed from solution before proceeding to the precipitation of potassium; the modification of the process introduced by Verweij (Z. anal. Chem., 1909, **48**, 760), in which this step is omitted, leads to high results. Double precipitation of the calcium is advised, and loss of alkali chloride by volatilisation is avoided by fitting the platinum crucible, in which the heating is effected, into a circular hole cut in a stout sheet of asbestos, as recommended by Döring (Z. anal. Chem., 1910, **49**, 158).—F. Sodn.

Potash from silicate rocks; The extraction of ——. W. H. Ross. U.S. Dept. Agric., Bureau of Soils, Circular No. 71. July 16, 1912.

The value of potash alone does not pay for the cost of extracting it from silicates by any of the processes hitherto suggested, and any method to be economical must probably produce other products of commercial value at the same time. When a mixture of felspar, calcium phosphate and calcium carbonate was heated in a crucible to 1000° C., the amount of potash rendered soluble only amounted to about 2 per cent. of the felspar, which is approximately the same as that obtained when the phosphate is omitted. The use of the mixture with phosphate, after heating, as a fertiliser, has been suggested, but it is apparent from the above experiment that very little potash passes into a soluble form by the treatment. Further experiments have shown that when one part of felspar and 1·68 part of calcium oxide are heated to 1400° C. in an open dish, practically all the alkalis are volatilised in the form of oxides. The hardened residue amounting to about 2·5 parts, strongly resembles cement clinker, and all its constituents lie within the limits allowed for them in Portland cement. A residue of the same composition is obtained when part of the calcium oxide is replaced by sufficient calcium chloride to be equivalent to the potash and soda present in the felspar, and the volatilised alkalis are then obtained in the form of chlorides. The ratio of silica to alumina in felspar is 3·5 to 1, in clays suitable for the manufacture of cement 3 or 4 to 1, and in commercial samples of leucite-bearing rocks is usually greater than 4 to 1, so that on these grounds the substitution of felspar, etc., for clay in the manufacture of cement would be possible. Further, the presence of potash in a soluble form has actually been observed in dust from cement kilns, and large scale experiments are being undertaken to determine the feasibility of obtaining potash from felspar on the lines indicated. In 1910, 13,000,000 tons of Portland cement were manufactured in the United States, and if commercial felspar, containing say 8 per cent. of potash, were substituted for clay, 100,000 tons of potash would be obtained, amounting in value to $26,400,000 (£5,500,000) or three times the value of the potash salts used in that country in 1910.—W. C. H.

Nitroprusside; Complex iron-cyanogen compounds, with special consideration of the formation of ——. P. Schwarzkopf. Abhandl. des deuts. naturwiss.-medizin. Ver. fur Böhmen "Lotos" in Prag, 1911, **3**, 1—55. Chem. Zentr., 1912, **2**, 1536—1538.

By the interaction of cold aqueous solutions of potassium ferrocyanide and sodium nitrite, sodium nitroprusside is produced, together with hydrogen cyanide and hydroxyl ions, but a condition of equilibrium is attained both in cold and in warm solutions, when only a small proportion of the ferrocyanide is converted. If, however, the hydrogen cyanide and hydroxyl ions be removed as they are formed, the process can be carried to completion. Various means were tried and the most satisfactory process found was to allow calcium ferrocyanide and sodium nitrite to interact in hot aqueous solution, through which carbon dioxide was passed to neutralise the hydroxyl ions and remove hydrogen cyanide. Mixtures of sodium ferrocyanide with calcium chloride or barium chloride may be used instead of calcium ferrocyanide: precipitates of sodium-calcium or sodium-barium ferrocyanide are produced at first, but these dissolve gradually as the dissolved ferrocyanide is converted into nitroprusside. The reaction proceeds more slowly, the less soluble the double salt, and this precludes the use of potassium ferrocyanide in place of sodium ferrocyanide, as the potassium double salts are very sparingly soluble. —A. S.

Sulphites of the alkalis and mercury; Double ——. H. Baubigny. Comptes rend., 1912, **155**, 833—836.

Mercuric oxide forms double sulphites with the alkalis which are unstable, and the author investigated the point whether dithionic acid was formed during the decomposition. When a solution of mercuric chloride is poured into one of sodium sulphite, a clear liquid is obtained which deposits a fair crop of crystals; these crystals were found to be those of the double sulphite of sodium and mercury. The same formation of crystals takes place after the solution has been heated to 100° C., together with a deposit of mercury, but no dithionic acid was detected. In the cold, the double salt decomposes slowly, with deposition of mercury and evolution of sulphur dioxide, but without formation of dithionic acid. In this respect the mercury double salt differs strikingly from those of silver and copper (see this J., 1912, 333), which give large quantities of dithionic acid.—J. H. J.

Iron salts capable of absorbing and fixing carbon monoxide. W. Manchot. Ber., 1912, **45**, 2869—2879.

Trisodium-ferropentacyanammin, $Na_3FeCy_5NH_3.6H_2O$, produced by saturating a solution of sodium nitroprusside with ammonia, has the power, in dilute aqueous solution, and still more rapidly if to the aqueous solution be added acetic acid in quantity rather more than equivalent to the ammonia in the formula, of absorbing carbon monoxide. Under the most favourable circumstances, one molecule of carbon monoxide is absorbed for one atom of iron in the salt, and the ammonia is expelled, so that a compound, Na_3FeCy_5CO, is formed. The same salt absorbs in a similar way nitric oxide; the compound so formed does not evolve its nitric oxide in a stream of hydrogen, as is the case when nitric oxide is absorbed by solutions of ferrous salts. As ethylene and acetylene are not absorbed by this reagent, it can be used instead of cuprous chloride to absorb carbon monoxide from gaseous mixtures containing ethylene or acetylene. In absorbing carbon monoxide in the cold, this reagent shows a similarity to the hæmoglobin of the blood: but the carbon monoxide absorbed is not removable as it is from the hæmoglobin.—J. T. D.

Mineral [metallic] oxides; Method of preparing ——. M. Billy. Comptes rend., 1912, **155**, 777—779.

A development of Chenevix' method (Roy. Soc., 1801) of preparing a lower oxide by heating together a higher oxide and the corresponding metal. Titanic anhydride. for instance, is mixed with excess of metallic titanium. passed through a very fine sieve. and heated. either in a quartz tube *in vacuo*. or in a covered porcelain crucible. "brasqued" with rutile roughly reduced by magnesium and covered with powdered charcoal. At a temperature of 700° C. there is formed a dark blue crystalline powder of composition corresponding to Ti_2O_3: at 1500° C., the product is very dark brown, and agrees in composition with the formula, TiO. These substances are purified from excess of metal either by means of a strongly acid solution of titanium tetrachloride, or by highly concentrated potassium hydroxide solution. Similar reductions have been effected with oxides of tungsten, molybdenum. iron, and manganese.—J. T. D.

Bromine ; Delicate and characteristic reaction for free ——. G. Denigès. Comptes rend., 1912, **155**, 721—723.

The reaction depends on the formation of a purple or violet colouration in a solution of fuchsine decolourised by bisulphite, which is soluble in alcohols, acetone, acetic acid, chloroform or carbon tetrachloride. The mode of applying the test is as follows :—2 c.c. of the rosaniline solution (1 litre of 0·1 per cent. aqueous solution of rosaniline, 10 c.c. of sodium bisulphite solution of sp. gr. 1·25—1·29, and, after 5 minutes, 20 c.c. of hydrochloric acid of sp. gr. 1·18) are placed in a test-tube, 2 c.c. of hydrogen peroxide solution (2—10 vol.) added, and well shaken ; then 1 c.c. of chloroform is added, and a quantity (1 drop to several c.c., according to circumstances) of the solution to be tested. The whole is thoroughly shaken again, and the chloroform is tinted visibly, and sufficiently to show a characteristic absorption spectrum in the orange yellow, by as little as 0·01 mgrm. of bromine. A gas suspected to contain bromine is bubbled through the reagent with the chloroform. A colouration in the aqueous fluid is of no account as long as the chloroform is uncoloured. A test-paper can be made by soaking paper in the fuchsine solution, drying it, and preserving in well-stoppered bottles. For use, it is moistened with 1 per cent. hydrochloric acid, and exposed to the gas to be tested. If it becomes coloured, bromine is indicated, and may be confirmed by putting the paper in a test-tube with a drop or two of strong hydrochloric acid (which destroys the colour), diluting with water (which restores and dissolves it), and adding a drop of chloroform, in which the colour can be concentrated. The presence of chlorine, even ten or twenty times as much as the bromine present, does not prevent the bromine from reacting.

—J. T. D.

Phosphorus polysulphide, P_4S_{10} *; The preparation described as* —— *in Ger. Pat.* 239.162. A. Stock and K. Friederici. Z. angew. Chem., 1912, **25**, 2201—2203.

The authors conclude from their observations that the compound described in the above patent (see also Fr. Pat. 424,522, this J., 1911, 769) is not a compound, P_4S_{10}, but mainly a mixture of P_4S_3 (phosphorus sesquisulphide) with sulphur. Being probably an eutectic the mixture behaves on melting very like a pure compound. On account of the approximately equal solubilities of its components it is difficult to resolve by crystallisation.

—W. H. P.

Italian electro-chemical industry in 1911. *See* XI.

Patents.

Ammonia ; Process for the manufacture of —— *by means of aluminium nitride.* O. Serpek, Assignor to Soc. Generale des Nitrures, Paris. U.S. Pat. 1,040,439. Oct. 8, 1912.

Aluminium nitride is treated with a solution of an aluminate, the alkali content of which is less than that required to render soluble the resulting alumina.—F. Sodn.

Nitrogen compounds [*calcium cyanamide*]*; Process of manufacturing* ——. H. Pettibone, New Rochelle, and B. von Sholly, Flushing, N.Y. U.S. Pat. 1,042,141. Oct. 22, 1912.

Producer gas is burnt with about the theoretical proportion of air around a retort, the combustion gases are brought into contact with lime in order to remove carbon dioxide, and the resulting nearly pure nitrogen, after being reheated if necessary, is passed into the retort, where it combines with calcium carbide or other substance capable of absorbing nitrogen.—A. S.

Barium sulphate ; Process of making precipitated ——. J. P. Walker, Rolla, Mo. U.S. Pat. 1,040,594, Oct. 8, 1912.

Barytes is treated with strong sulphuric acid (preferably of a strength above 96 per cent.) and the solution, which may be heated and is suitably transferred to another vessel, so as to separate it from deposited foreign matter, is diluted with water to precipitate the barium sulphate.—F. Sodn.

Barium oxide from barium carbonate ; Process of obtaining porous and fairly pure ——. K. Bornemann, Aix-la-Chapelle, Assignor to Chem. Fabr. Coswig-Anhalt, G.m.b.H., Coswig-Anhalt, Germany. U.S. Pat. 1,041,583, Oct. 15, 1912.

A mixture of barium carbonate and a reducing agent is heated, under reduced pressure, to the reaction temperature of the mixture, the gases produced being constantly withdrawn.—F. Sodn.

Sodic silico-aluminate and hydrochloric acid ; Processes of manufacturing ——. (1) A. H. Cowles, Lockport, N.Y., and (2) A. H. Cowles, Sewaren, N.J., and A. Kayser, Lockport, N.Y., Assignors to The Electric Smelting and Aluminium Co., Lockport, N.Y. U.S. Pats. 1,041,598 and 1,041,599, Oct. 15, 1912.

(1) A mixture, preferably in lumps, of an alkali chloride, a carboniferous material, and a composition containing silica and alumina (for example, 30—55 per cent. of alkali chloride, 5—10 per cent. of carboniferous material, and 15—55 per cent. of alumina) is heated at a high temperature with steam and air, or with steam, in such a manner as to maintain an oxidising atmosphere in the reacting zone. (2) Segregated masses of the material to be treated, such as bricks containing alkali chloride and a compound containing alumina and silica, are arranged so that the mass of the charge per cubic unit decreases from top to bottom, and a stream of gaseous material adapted to react with the charge (for instance, steam and the flame from a gaseous fuel), is forced through the charge from top to bottom.—F. Sodn.

"Feldspar" ; Process of treating ——. A. W. Morse and L. W. Sargent, Cambridge, Mass. U.S. Pat. 1,041,327, Oct. 15, 1912.

An intimate mixture of finely powdered felspar and calcium sulphate is strongly heated, at a temperature below that of fusion, until evolution of oxides of sulphur ceases, and the non-volatilised residue is then strongly heated in intimate admixture with an alkali chloride such as sodium chloride. The residue is finally treated with water, whereby a soluble compound of potassium is extracted.—H. H.

Intumescent material [*alkali silicate*] *and process of making the same.* W. Arthur, Schenectady, N.Y., Assignor to General Electric Co. U.S. Pat. 1,041,565, Oct. 15, 1912.

Particles obtained by comminuting an alkali silicate containing combined water or, generally, of viscous material containing an easily vaporisable constituent are heated, preferably by contact with a heated surface, to a temperature at which the volatile constituent is rapidly vapourised, the particles being at the same time agitated, so as to cause them to swell without sticking to each other.—F. Sodn.

Deflocculated bodies [*graphite*]*; Methods of transferring* —— *from aqueous to non-aqueous media.* E. C. R. Marks, London. From Acheson Oildag Co., Port Huron, Mich., U.S.A. Eng. Pat. 4155, Feb. 19, 1912.

See U.S. Pat. 1,030,372 of 1912 ; this J., 1912, 722. The earlier stages of evaporation are performed at a temperature materially below 100° C., *e.g.*, at 60°—85° C.—T. F. B

Hydrogen ; Process for the generation of ——. A. Messerschmitt, Stolberg, Germany. Eng. Pat. 12,117, May 22, 1912. Under Int. Conv., July 8, 1911.

In the manufacture of hydrogen by the alternate oxidation of spongy iron by means of steam and reduction of the resulting iron oxide by means of reducing gases, compact iron (wrought iron or steel) is used as support for the spongy iron ; only the surface layers of the compact iron take part in the reaction. The spongy iron may, for example, be placed in the channels of a number of iron bars of U-shaped cross-section, or in perforated moulds, tubes, boxes, or troughs of compact iron.—A. S.

[*Hydrogen*] *Gas ; Method of generating* ——. H. Philipp, Perth Amboy, N.J., Assignor to The Roessler and Hasslacher Chemical Co., New York. U.S. Pat. 1,041,865, Oct. 22, 1912.

The patent relates to a method of generating hydrogen by the action of water on a mixture of metallic sodium and aluminium silicide. The action of water on this mixture does not proceed to completion, and the method consists in first treating the mixture with water, and then passing the hot hydrogen and steam through a similar mixture which has previously been partially decomposed by treatment with water.—A. T. L.

Cyanamides and cyanides of the alkali metals ; Production of ——. E. A. Ashcroft, London. U.S. Pat. 1,041,566, Oct. 15, 1912.

See Eng. Pat. 16,765 of 1910 ; this J., 1911, 1211.—T. F. B.

Alkali stannates ; Process of purifying ——. G. Spitz, Brünn, Austria-Hungary, Assignor to Goldschmidt Detinning Co., New York. U.S. Pat. 1,041,895, Oct. 22, 1912.

See Eng. Pat. 25,915 of 1909 ; this J., 1910, 1459.—T. F. B.

Separation of gaseous mixtures [*oxygen and nitrogen from air*]. J. E. Lilienfeld, Leipzig, Germany. Eng. Pat. 22,930, Oct. 17, 1911.

See Fr. Pat. 435,357 of 1911 ; this J., 1912, 385.—T. F. B.

Effervescent [*oxygen*] *baths ; Process of producing* ——. L. Sarason, Hirschgarten, and S. Haller, Grünau, Germany. U.S. Pat. 1,041,357, Oct. 15, 1912.

See Fr. Pat. 372,233 of 1906 ; this J., 1907, 527.—T. F. B.

VIII.—GLASS ; CERAMICS.

Kaolin suspensions ; Action of hydroxyl ions on ——. P. Rohland. Z. Chem. Ind. Kolloide, 1912, **11**, 193—195.

The action of certain salts and bases in causing kaolin suspensions to settle more rapidly, is due to the hydroxyl ions produced by electrolytic dissociation. The effect increases with the concentration of hydroxyl ions up to a maximum and then gradually decreases again, but is influenced also, by the cations present, to a small extent, and by the degree of fineness and the structure of the kaolin particles, and the temperature.—A. S.

IX.—BUILDING MATERIALS.

Extraction of potash from silica rocks. Ross. *See* VII.

Patents.

Fire-resisting bricks, quarries, tiles for fire-places and the like ; Composition for use in making ——. D. H. Brownfield, Llandudno, and F. Beech, Burslem. Eng. Pat. 17,230, July 28, 1911.

Eighty-eight parts of dry "Washerwall" or similar silica-stone and 7 of burnt and slaked Buxton lime are incorporated with an additional 5 parts of the water-ground silica-stone ; the mixture is ground—with addition of water—to the consistence of clay and then moulded. —W. E. F. P.

Cement ; Binding new —— to existing cement or like structures. A. J. Boult, London. From The Master Builders Co., Cleveland, Ohio, U.S.A. Eng. Pat. 28,857, Dec. 21, 1911.

In order to avoid breaking up the previous structure to which the new cement is to be bonded, it is coated with a plastic mass containing finely comminuted corrodible metallic particles, and the new structure is applied to the surface before hardening, so that the metallic particles may interlock with both structures. The recipe given for the plastic mass is : finely divided metallic iron 49—47, cement 49—47, sal ammoniac 2—6 per cent.—H. H. S.

Wood ; Method for impregnating ——. J. Hubert, London. From H. Bruning, Schöpfort, Germany. Eng. Pat. 2972, Feb. 5, 1912.

Insoluble bodies exert no antiseptic action, and soluble compounds that have been injected into wood are gradually washed out by natural processes. According to the present patent, chromic acid or its salts are added to the usual impregnating salts which include for instance zinc chloride and aluminium sulphate. The chromate is stated to fix the other metallic compounds in the wood, without destroying their antiseptic power.—H. H. S.

Wood ; Method of colouring ——. E. Wilhelm, New York. U.S. Pat. 1,042,182, Oct. 22, 1912.

Varnish and turpentine oil are added to a solution of aniline dyes in hot water, and the mixture is injected through the fibrous structure of a freshly felled trunk ; the parts of the fibres which become covered with turpentine oil and varnish remain uncoloured.—A. S.

Artificial wood ; Manufacture of ——. P. B. Lael, Vienna. Eng. Pat. 12,324, May 24, 1912.

Wood waste, such as sawdust or wood-flour, consists almost entirely of cellulose, and is converted into viscose by the action of concentrated caustic alkalis and exposure to carbon bisulphide vapour. Viscose is soluble in water, but aqueous solutions soon deposit cellulose again in a gelatinous form which can act as binding agent. The wood waste is therefore treated with sufficient soda lye to convert 1—5 per cent. of the cellulose into viscose. After exposure to carbon bisulphide, water is added, the whole intimately mixed, and the mass is then moulded under pressure.—H. H. S.

Wood ; Compositions of matter and methods for preserving and fireproofing ——. F. Seidenschnur, Charlottenburg, and J. Dehnst, Halensee, Germany. U.S. Pats. 1,041,681 and 1,041,682, Oct. 15, 1912.

See Ger. Pats. 247,694 and 248,065 of 1911 ; this J., 1912, 985.—T. F. B.

Stone, artificial ; Process of making ——. M. Hartung, Berlin. U.S. Pat. 1,042,113, Oct. 22, 1912.

See Fr. Pat. 437,662 of 1911 ; this J., 1912, 538.—T. F. B.

X.—METALS ; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Minerals and metals ; Output of certain —— in the world. Board of Trade J., Nov. 7, 1912. [T.R.]

The Colonial and Foreign Section of the Mines and Quarries Report for the year 1910 contains a table showing the output of certain minerals and metals (contained in or obtained from ore raised) in the British Empire and in Foreign countries during 1910, which may be summarised as follows:—

—	United Kingdom.	British Colonies, Dependencies, and Possessions.	Foreign Countries.	Total for the World.
Coal (metric tons)	268,676,528	42,936,982	852,406,107	1,164,019,677
Copper (metric tons)	456	78,458	853,349	932,463
Fine gold (kilogs.)	60	393,092	300,224	693,376
Iron (metric tons)	5,055,583	768,811	58,230,756	64,055,150
Lead (metric tons)	21,867	228,438	809,305	1,059,610
Petroleum (metric tons)	—	923,046	42,532,507	43,455,553
Salt (metric tons)	2,083,538	1,837,840	13,831,737	17,753,115
Fine silver (kilos.)	4,251	1,592,360	5,147,547	6,744,158
Tin (metric tons)	4,874	55,649	56,233	116,756
Zinc (metric tons)	4,235	190,107	730,880	925,222

The quantities of metals included in the above table, are those which are considered obtainable from the ores raised in the countries in question. The total value of the estimated output shown may be taken as representing about £910,000,000.

Iron; Cementation of —— *by gases.* F. Kurek. Stahl u. Eisen, 1912, **32**, 1780—1784.

Experiments were made using carbon monoxide, methane, and illuminating gas, and the same gases with an admixture of ammonia. The results showed that cementation with carbon monoxide at ordinary pressures cannot be advantageously employed, the carburisation being too slow, and that the addition of ammonia is not favourable to the formation of carbide. Methane at 800° C. had no action, but at 900° C. and 1000° C. caused considerable carburisation. Illuminating gas yielded markedly higher carbon in the outer layers than did methane. At 800° C. and 900° C. carburisation did not penetrate far into the iron, but at 1000 C., carbide was formed throughout. Admixture of ammonia was of no service.—T. St.

Case-hardened steel; Measurements and relations of hardness and carbonisation in ——. M. A. Ammon. Trans. Amer. Inst. Mining Eng., 1912, 1167—1174.

Steel discs 1 in. thick and $1\frac{7}{8}$ in. in diameter having been cut from a steel containing 0·233 per cent. of carbon, 0·011 of phosphorus, 0·019 of sulphur, and 0·53 of manganese, and from a steel containing 0·188 per cent. of carbon, 0·008 of phosphorus, 0·020 of sulphur, 0·53 of manganese and 3·30 of nickel, their smooth surfaces were carburised at 1650° F. (899° C.) and 1750° F. (954° C.) for 0·5, 1·0, 1·5 hrs., and by hour intervals up to 8·5 hrs. One piece of each was taken from the furnace and immediately quenched in water, afterwards receiving a second heat. Two others were allowed to cool in the carburising box and then quenched, one receiving a double quench and the other a single quench. After each operation the surfaces were smoothed with fine emery cloth, and the averages taken of three Brinell and ten scleroscopic tests. The Brinell test was modified by using a ball 0·25 in. in diameter, the depth of the indent measured to 0·0001 in. and the formula $B = \frac{44700}{D}$ (B = standard Brinell reading, D = depth of the indent) applied. The depth of carburisation was also measured by the microscope. The results are both tabulated and graphically illustrated, and show the depth of carburisation in relation to the Brinell and scleroscopic readings, and the time of treatment. The results are then discussed under the following headings. 1. *Depth of carburisation.* These curves show a characteristic flattening out with a subsequent rise after the initial carburisation. Under similar conditions of carburisation the rate of penetration in the carbon steel at 1750° F. (954° C.) was 1·48 times the rate at 1650° F. (899° C.), while for the nickel steel the rate was 1·41 times. 2. *Hardness after carburising and before quenching.* The sclerescope gave a higher reading after carburising than before, while the Brinell test was about the same. This is explained as being due to the fact that the sclerescope is influenced mainly by surface conditions and registers the hardness due to increased carbon at the surface. 3. *Hardness after quenching from the box.* In this case the sclerescopic readings show a gradual decrease in hardness with increased depth of carburisation, while the hardness shown by the Brinell test shows an increase up to from 4 to 6 hrs. treatment, and then remains stationary. These facts are explained by the statements that in the former the increased depth of the formation of austenite decreases the sclerescopic hardness, while in the latter the influence of the core diminishes and that of the case increases as the depth of carburisation becomes greater. 4. *Hardness after the first quench on double quenched specimens.* The curves of sclerescopic readings are practically horizontal and the hardness is greater than that of specimens quenched direct from the box, owing to the weaker austenite forming tendencies. 5. *Hardness after the second quench* (1400° F., 760° C.). The hardness in these specimens was lower than in the first quench, but rose with increasing depth of carburisation until at 1·1 in. deep the hardness of the second quench at 1400° F. (760° C.) was the same as that of the first quench at 1650° F. (899° C.). The foregoing results have formed the basis of a system of testing carburised parts for the depth of carburisation and the efficiency of heat treatment.—A. H. C.

Steel; Production of electric ——. Min. and Eng. World, Nov. 2, 1912. [T.R.]

The production of steel in electric furnaces during the last three years was, in tons:—

	1909.	1910.	1911.
Germany	17,773	36,188	66,654
United States	13,762	52,141	29,105
Austria-Hungary	9,046	20,028	22,867
France	6,456	11,739	13,850
Total	47,039	120,116	126,476

The United Kingdom had hardly commenced to produce for the general market. The predominating lead of Germany and the drop in the electric steel production of the United States are notable features of last year's figures. Activity in France lies more in the field of ferro-alloys. Of these, France made altogether, in 1904, 34,200 tons, which amount had increased to 60,200 tons by 1910; the figures for ferro-alloys made in electric furnaces were respectively 5756 and 23,800 tons; the electrically-produced alloys amounted in 1909 to 14,900 tons, and varied little in the years 1906 to 1909.

Iridium; Recovery of metallic ——. Eng. and Min. J., 1912, **94**, 802.

Metallic iridium is made from the iridium powder left in the wet processes of platinum refining. This powder cannot be smelted alone, but is converted into iridium phosphide by strongly heating in a silica crucible with stick phosphorus. This is then heated with lime to remove the phosphorus, leaving a brittle white mass of iridium, which cannot be filed or cut, but is broken into the small pieces necessary for pen points, which are ground by carborundum into shape. These pieces of iridium are said to be about the hardness of a ruby.

Iron, nickel, and manganese; Ternary alloys of ——. N. Parravano. Gaz. chim. ital., 1912, **42**, II., 367—379.

The binary mixtures, iron-nickel, iron-manganese, and nickel-manganese have been already studied (see this J., 1905, 1112; 1908, 77; 1910, 955). In all three cases the metals form a continuous series of mixed crystals; in the case of iron-nickel and nickel manganese alloys, the cooling curve passes through a minimum, whilst in the case of iron-manganese alloys, the curve falls continuously from the melting point of iron to that of manganese. The author gives two triangular diagrams showing the temperatures of initial and complete solidification of 36 ternary alloys. As was to be expected, in all cases solidification takes place over an interval of temperature, and photomicrographs show that the smaller this interval is, the less heterogeneous is the structure of the alloy cooled under ordinary conditions. The photomicrographs of the following alloys: (1) Fe 40, Ni 50, Mn 10, (2) Fe 30, Ni 60, Mn 10, (3) Fe 70, Ni 10, Mn 20, (4) Fe 60, Ni 20, Mn 20, and (5) Fe 50, Ni 30, and Mn 20 per cent. show the characteristic polygonal structure of high-percentage nickel-manganese steels (see Guillet, this J., 1905, 848). —A. S.

[*Gold*] *Zinc-box precipitate; Refining* ——. W. E. Darrow. Eng. and Min. J., 1912, **94**, 785.

The author formerly employed a blast of air at 10 to 15 lb. pressure, directed on to the surface of the molten impure bullion. Speiss and lead were thus removed, but the fumes were obnoxious, and the resulting slag corroded the plumbago crucibles and was rich in precious metals, containing about 4 per cent. of the gold and 10 per cent. of the silver present. Recently a chlorination method has been adopted. The acid-treated precipitate is allowed to remain in a strong chlorine solution for about twelve hours. The solution is then decanted off, and the precipitate washed with water to remove the dissolved gold. Ferrous sulphate solution is added to the decanted solution and wash water, and the resulting gold precipitate allowed to settle for forty-eight hours before the waste solution is siphoned off. The original residue from which the dissolved gold has been washed out is neutralised with sodium hydroxide solution, and cyanide solution added to recover the remainder of the gold and silver. Agitation is effected by means of an air-blast, and the solution siphoned off to small zinc-boxes. This latter treatment is repeated several times. The silver precipitate from the zinc-boxes and the gold precipitate are then cleaned up and melted together, resulting in bullion about 960 fine. About 99·5 per cent. of the gold and silver present in the original precipitate is thus recovered. The chlorine employed is generated by the action of sulphuric acid on salt and potassium permanganate. The recovery of the dissolved gold by electrolysis is suggested, thus eliminating the melting process.—R. W. N.

Copper on plaster; Galvanic deposition of —— [*and determination of aluminium*]. A. Dufay. Chem. News, 1912, **106**, 225.

The plaster cast is heated and introduced into a bath of paraffin at 50° to 60° C. After cooling, the surface is covered with a thin layer of collodion diluted with alcohol and ether, and then dried. The cast is coated with graphite, the conductors attached and a second coating of graphite given to the material. The whole is put into a 10 per cent. solution of aluminium sulphate for a few minutes, and the cast then made the cathode in a bath of copper sulphate containing 5 to 8 per cent. of sulphuric acid, using a copper anode, and employing a current of 1 ampère per sq. dcm. at an E.M.F. of 3 volts. It is mentioned that this method may be used for producing an alloy of aluminium and copper, or for the quantitative estimation of aluminium by employing a bath of aluminium sulphate containing nitric acid, and employing a platinum anode provided with a coating of a known weight of metallic copper.—B. N.

Metals; Generation of large granules in ——. F. Robin. Comptes rend., 1912, 155, 716—719.

Many authors have noticed that the operation of reheating steel developes in it a coarse granular structure which renders it fragile. The author finds that this is the case with other metals also, and that compression, hammering, or deformation tends to produce similar coarseness of grain. Moreover, in the case of local deformations, whilst in the region of deformation itself the granules developed mutually limit each other's growth, at the boundary of this region they develop considerably, extending gradually into the unchanged portions of the metal. If a metal initially annealed be hardened locally, by energetic deformation, punching, shearing, or bending, and re-annealed at various temperatures for about 30 minutes, then after five minutes the invasion of the unchanged material by the large granules generated by the deformation will be very noticeable. These granules follow much the same laws as those due to ordinary annealing (this J., 1912, 991), whilst their formation may extend as far as 7—12 mm. from the bend (for example) into the unaltered metal. A number of actual measurements for different metals are given in the paper. The industrial importance of this is evident, in view of the large number of objects manufactured from bent and perforated sheet metals. The remedies to be applied are heating above the transformation point (900° C.) in the case of iron, addition of other elements in the case of non-ferrous metals.—J. T. D.

Metal wool; Some characteristics of ——. O. Ohmann. Ber., 1912, **45**, 2973—2976.

Aluminium wool somewhat strongly resists oxidation and fusion, presumably on account of the oxide film on its surface. For many important uses such as organic analysis, combustion, sulphuration, solution in acids, etc., this form of finely divided metals is thought to offer considerable advantages.—W. H. P.

Separation and determination of copper by means of hydroxylamine hydrochloride. Bayer. *See* XXIII.

Minerals from the Falkland Islands. *See* IIa.

Patents.

Furnaces; Construction of smelting and fusing ——. A. A. Govan, Glasgow. Eng. Pat. 21,588, Sept. 30, 1911.

The (electric) furnace is provided with double walls and the space between the latter is maintained in a vacuous condition. (Reference is directed to Eng. Pats. 21,371 of 1903 and 8093 of 1908).—W. E. F. P.

Furnace; Regenerative ——. W. F. Taylor, Tacoma, Wash. U.S. Pat. 1,040,459, Oct. 8, 1912.

A regenerative furnace is formed with two hearths having a bullion well between and regenerative chambers containing refractory material at each side, with combustion chambers arranged above. The flues below the regenerative chambers are connected with the smoke stack by means of horizontal passages leading from the sides of the flues and fitted with valves, while a forced draught of air is supplied when desired through air flues of substantially the same width as the regenerator flues and leading into the latter from below.—H. H.

Fume arrester for regenerative matting-furnaces. W. F. Taylor, Tacoma, Wash. U.S. Pat. 1,040,460, Oct. 8, 1912.

A spray of water is injected into the passages leading from the regenerator chamber of a regenerative smelting furnace to the smoke stack for the purpose of precipitating volatilised metals contained in the flue gases. The precipitated metal collects in a well arranged in the floor of the passage. —H. H.

Furnace: Metallurgical. H. E. Smythe. Assignor to The S. R. Smythe Co., Pittsburgh, Pa. U.S. Pat. 1,042,047. Oct. 22, 1912.

With the object of removing suspended matter from the waste gases. the furnace structure is provided with an auxiliary, and a main, checker-chamber. The gases are conducted from the furnace into the lower part of the auxiliary chamber and thence into the upper part of the main chamber. the lower part of the latter being provided with a port which serves alternately as an outlet for the waste gases and an inlet for one of the gases to be burned. Means are provided for effecting the removal of the deposited material while the furnace is in operation.
—W. E. F. P.

Metals; Process of cleaning ——. in sea or salt water. G. Delius and C. P. Tatro, Seattle, Washington, U.S.A. Eng. Pat. 95, Jan. 1, 1912.

An electrical process for effecting the removal of barnacles, etc., from the metal hulls of ships. A moderate current (at 3—10 volts) is passed from the metal sheathing to an insoluble (carbon) electrode suspended in the open water adjacent to the ship's side, the direction of the current being frequently reversed during the treatment.
—W. E. F. P.

Zinc and other metals of a similar nature; Production of ——. H. Speeketer, Griesheim-on-the-Maine, Germany. Eng. Pat. 10,349, May 1, 1912. Under Int. Conv., June 10, 1911.

A mixture of the ore and reducing agent is heated in an electric furnace of the resistor type, consisting of a box-shaped (preferably angular) chamber adapted to be rotated or oscillated about a horizontal (or nearly horizontal) axis. The linings of the vertical ends of the chamber are formed by the two electrodes, and the temperature being regulated so as to avoid sintering of the charge, uniform heating of the latter is effected—it is claimed—by the slow rotation or oscillation of the chamber. Provision is made for charging and discharging the chamber and for conducting the volatilised metal to the condenser.—W. E. F. P.

Zinc-lead ores; Process for the treatment of refractory ——. A. G. French, Nelson, British Columbia. U.S. Pat. 1,041,060, Oct. 15, 1912.

The ore is roasted, and then mixed with from 5 to 15 per cent (on the original ore) of pulverised sodium bisulphate. The mixture is heated to dull redness in a reverberatory furnace, the temperature being kept below the sintering point in order to retain the mass in a loose powdery form, and then, after cooling, the soluble sulphates are recovered by lixiviation with water containing a small proportion of sodium bisulphate. The process is intended specially for the separation of zinc and manganese from complex ores.—A. S.

Zinc retort-furnace. C. A. H. de Saulles, Gas, Kans., Assignor to New Jersey Zinc Co., New York. U.S. Pat. 1,041,977, Oct. 22, 1912.

The combustion- or retort-chamber of the apparatus is divided into two compartments by a vertical downtake which communicates with a flue at one end of the chamber. Each compartment is adapted to contain several tiers of retorts and is fired from below by means of gas and air supplied from separately-controlled pressure mains.
—W. E. F. P.

Zinc; Process of recovering ——, from galvanised iron articles. E. Broemme, St. Petersburg, and R. Steinau, Nuremberg, Germany. U.S. Pat. 1,042,315, Oct. 22, 1912.

The articles are treated, in the presence of an excess of water, with a mixture of alkali bisulphate and alkali or alkaline-earth chloride.—W. E. F. P.

Alloys; Production of ——. C. A. Hansen, Schenectady, N.Y., Assignor to General Electric Co. U.S. Pat. 1,041,072, Oct. 15, 1912.

Boron oxide, "ferric material," such as iron oxide, and carbon are intimately mixed with a viscid binder, the mass being then heated to carbonise the binder and form a spongy mass of carbon supporting the compounds to be reduced. The mixture is next heated to a higher reaction temperature by means of an electric arc, the reduced product being supported on a carbon-free furnace lining.—B. N.

Flue-dust; Treatment [agglomeration] of ——. J. I. Souther, Westmont, Pa. U.S. Pat. 1,041,363, Oct. 15, 1912.

A mixture of combustible gas (blast-furnace gas) and air is burnt in a combustion chamber, in which the reaction gases are allowed to expand and mix thoroughly, and the intensely hot products of combustion are passed upwards through an inclined revolving cylinder, the lower end of which is connected with the combustion chamber. The flue-dust or fine ore is fed into the upper end of the cylinder, and is sintered and agglomerated by the combined effect of the gradually increasing temperature it meets in passing through the cylinder and the rolling action.—A. S.

Metals from ores; Art of extracting ——. J. B. de Alzugaray, Assignor to Midland Ores and Patents Co., New York. U.S. Pat. 1,041,407, Oct. 15, 1912.

The ore (*e.g.*, copper, gold, and silver ores) is pulverised and treated with a solution of an alkali chloride, such as sodium chloride, a chlorate or perchlorate, *e.g.*, sodium chlorate, and metallic chlorides, such as copper and iron chlorides, the whole acidulated with hydrochloric acid.
—A. S.

[Iron and titanium]. Alloy and process of producing the same. I. Ladoff, Cleveland, Ohio, Assignor to W. D. Edmonds, Boonville, N.Y. U.S. Pat. 1,040,699, Oct. 8, 1912.

An alloy of iron and titanium is prepared by heating a mixture of the metallic oxides in a reducing atmosphere, or with carbon, to a temperature sufficient to effect reduction without melting the resulting metals.—W.E.F.P.

Metals; Process for purification of ——. W. H. Kelly, Los Angeles, Cal. U.S. Pat. 1,041,801, Oct. 22, 1912.

During and after melting, the metal is subjected to the action of an air blast containing nascent hydrogen and oxygen produced by the dissociation of steam at a high temperature.—W. E. F. P.

Brass; Process for making ——. L. Addicks, Chrome, N.J. U.S. Pat. 1,041,940, Oct. 22, 1912.

A large quantity of copper is melted, and successive portions (about 2—3 tons each) of the molten metal are transferred to a separate receptacle, mixed with the requisite percentage of zinc, and the resulting brass cast.
—W. E. F. P.

Armour plates; Process for the manufacture of ——. Società Anon. Italiana Gio. Ansaldo Armstrong & Co., Genoa, Italy. Eng. Pat. 9512, April 22, 1912. Under Int. Conv., May 3, 1911.

See Fr. Pat. 442,299 of 1912; this J., 1912, 929.—T. F. B.

Copper and its alloys; Process for effecting the adherence of —— to the surfaces of iron and steel articles and for uniting iron and steel plates to one another. W. G. Clark, London. Eng. Pat. 22,982, Oct. 18, 1911.

See Fr. Pat. 435,605 of 1911; this J., 1912, 394.—T. F. B.

[Metallurgical] furnaces. T. S. Blair, jun., Elmhurst, Ill., U.S.A. Eng. Pat. 15,480, July 2, 1912. Under Int. Conv., July 10, 1911.

See U.S. Pat. 1,012,236 of 1911 ; this J., 1912, 78.—T.F.B.

Metallisation of silicious articles ; Process for the superficial ——. P. Marino, London. U.S. Pat. 1,041,126, Oct. 15, 1912.

See Eng. Pat. 14,033 of 1911 ; this J., 1911, 1453.—T.F.B.

Cleansing [metal wire, etc.]; Process for electrolytically ——. A. Herrmann, Leipzig, Germany. U.S. Pat. 1,041,790, Oct. 22, 1912.

See Eng. Pat. 9609 of 1912 ; this J., 1912, 781.—T. F. B.

Porous metals ; Method for producing so-called ——. H. I. Hannover, Copenhagen. U.S. Pat. 1,042,111, Oct. 22, 1912.

See Fr. Pat. 437,816 of 1911 ; this J., 1912, 543.—T. F. B.

Zinc and other similar metals ; Process for producing —— *and electric furnace for use therein.* H. Speeketer. Fr. Pat. 443,958, May 17, 1912.

See Eng. Pat. 10,349 of 1912 ; preceding.—T. F. B.

Ores ; Process and apparatus for treating ——. Murex Magnetic Co., Ltd. Fr. Pat. 444,185, May 23, 1912.

See Eng. Pat. 18,189 of 1911 ; this J., 1912, 930.—T. F. B.

Ores, especially iron ores ; Process for converting finely divided —— *into briquettes.* Maschinenbau-Anstalt Humboldt. Fr. Pat. 444,773, June 8, 1912. Under Int. Conv., June 8, 1911.

See Ger. Pat. 249,085 of 1911 ; this J., 1912, 931.—T. F. B.

Gases from blast-furnaces, etc. ; Process for purifying ——. F. Werndl. Fr. Pat. 444,880, June 12, 1912.

See Eng. Pat. 28,936 of 1911 ; this J., 1912, 542.—T. F. B.

Electrolytic process [deposition of nickel, cobalt, etc.]. C. J. Reed. Fr. Pat. 443,887, May 4, 1912.

See Eng. Pat. 9612 of 1912 ; this J., 1912, 781.—T. F. B.

XI.—ELECTRO-CHEMISTRY.

Italian electro-chemical industry in 1911. Chem. Trade J., Nov. 2, 1912.

The official statistics for 1911, published by the Italian Ministry of Industry and Commerce, show that the production of calcium carbide was less than that of the previous year, which in turn was less than in 1909, so that the year 1911 had the lowest production of late years. Cyanamide remained at a low figure, 4470 against 3715 metric tons in 1910. In the district of Rome the decrease in the production of carbide was 11,000 tons compared with 1910, and there were only four works in operation, instead of six in the previous year. Good results, however, were obtained from the sales by the Italian General Company for the carbide trade, production being limited to the needs of the markets, which are steadily developing owing to acetylene lighting and the manufacture of cyanamide and ammonium sulphate. At Collestate all the plant has been installed for the manufacture of cyanamide. The installation comprises 3 jaw crushers ; 3 ball mills ; a Linde machine for liquefaction of air and production of nitrogen ; 106 retorts, each with a capacity of 1500 kilos. to transform 3251 tons of carbide into 4000 tons of granular cyanamide, a part of which is utilised for the manufacture of ammonium sulphate by treatment with steam at 190° C. in three autoclaves, and subsequent combination of the sulphuric acid (produced in the autoclave) with the ammonia. In the district of Bologna the Ascoli Piceno Works commenced normal work at the beginning of 1911 to manufacture 8000 tons of carbide with three electric furnaces utilising 6000 H.P. The limestone is found in the vicinity. Portoferraio, in the Florence district, has recommenced the manufacture of carbide with Stassano furnaces. The Societa Ferriere, in Milan, has reduced manufacture from 4000 to 2633 tons. In 1911 the imports of calcium carbide into Italy were 70 tons, and exports 8400 tons, and in 1910 2708 tons and 2172 tons respectively.

Patents.

Gas reactions by means of an electrical discharge ; Method of carrying out chemical ——. H. Andriessens, Munich, and J. Scheidemandel, Berlin-Südende, Germany. Eng. Pat. 16,296, July 12, 1912.

The discharge between the electrodes is directed by separate means in a zig-zag path, the position of which relative to the direction of the lines of force of a magnetic field, brings about the drawing out of the discharge over an area which remains practically constant regardless of the direction of the current. The gases or gaseous mixtures for the reaction are conducted through this area or past it, either parallel with or at an angle to it. The zig-zag parts of the arc may be produced by mechanical blowing, or by the aid of a neutral intermediate electrode introduced in a suitable manner into the reaction chamber. The discharge may be blown by a current of air, vapour, or the like, the strength of which may be made to vary synchronously with the alternations of the current. The electrodes may be shaped for a short distance at one end like diverging horns, the latter being formed with sharp edges at the places where they most nearly approach one another.—B. N.

Gaseous reaction ; [Electrical] Apparatus for producing a ——. F. W. Peek, jun., Schenectady, N.Y., Assignor to General Electric Co. U.S. Pat. 1,041,340, Oct. 15, 1912.

A pair of electrodes are arranged concentrically so that a static discharge takes place between them, and a dielectric is disposed between them. A stationary conducting member engages one end of the dielectric, and a "yieldingly supported" conducting plate engages the other end of the dielectric for preventing the concentration of a static charge between the edges of the electrodes.—B. N.

Electrode-holder. F. T. Snyder, Oak Park, Ill. U.S. Pat. 1,041,689, Oct. 15, 1912.

The electrode passes through an opening in the furnace-wall which is composed of masonry with an external metallic shell. A metallic water-cooled electrode-holder is mounted about the opening in electrical contact with the shell, and an electrical conductor is also attached to the shell. The electrode-holder comprises two opposed hollow clamping jaws, with bolts at the opposite ends of the holder extending from the wall through the jaws, these engaging with suitable nuts so that the jaws may be adjustably mounted on the wall of the furnace without detaching the holder. A cooling fluid is circulated through the hollow jaws, by means of inlet and outlet pipes and a flexible pipe-coupling.—B. N.

Electrolysis of metallic salt solutions [; Diaphragm for the ——]. N. V. Hybinette, Kristianssand, Norway Eng. Pat. 771, Jan. 10, 1912. Under Int. Conv., Jan. 12, 1911.

See Fr. Pat. 438,846 of 1912 ; this J., 1912, 649.—T. F. B.

Anode for use by electrolysis of alkaline-salt solutions. A. T. K. Estelle, Stockholm. U.S. Pat. 1,041,261, Oct. 15, 1912.

See Fr. Pat. 427,127 of 1911 ; this J., 1911, 1070.—T.F.B.

Gas reactions ; Process and [electric] furnace for producing ——. O. H. and K. Weber, Griesheim, Assignors to Chem. Fabr. Griesheim-Elektron, Frankfort, Germany. U.S. Pat. 1,042,179, Oct. 22, 1912.

See Fr. Pat. 436,201 of 1911 ; this J., 1912, 432.—T. F. B.

XII.—FATS ; OILS ; WAXES.

"*Lipase powder*" ; *Preparation and technical application of* ——. Y. Tanaka. J. Coll. Eng., Imp. Univ. Tokyo, 1912, 5, 125—136.

In the preparation of the "lipase powder" previously described (this J., 1912, 884) the activity of the product depends upon the absolute amount of acid used to liberate the enzyme from its zymogen in the castor seeds and not upon the concentration of that acid. The duration of the digestion with the correct quantity of acid does not affect the activity of the liberated lipase. In practice from 3 to 4 per cent. of the "lipase powder" is added to the oil or fat (which has previously been melted and cooled to 40° C.), together with a quantity of water varying from 6 to 10 times the weight of the "lipase powder," and the mixture continuously agitated for 7 to 10 hours at 38° to 40° C., after which it is heated to a temperature at which it will remain fluid, and is allowed to stand. Heating the mass to too high a temperature or blowing steam through it causes the "lipase powder" to swell and gelatinise and renders the separation of the upper layer of fatty acids more difficult.—C. A. M.

Lipase ; Influence of the products of change on the action of ——. Y. Tanaka. J. Coll. Eng., Imp. Univ. Tokyo, 1912, 5, 137—141.

The enzymic decomposition of fats is retarded by the presence of glycerin but is not appreciably affected by fatty acids. For this reason it is advisable in practice to add as much water as is possible without interfering with the production of a good emulsion (see preceding abstract). Or, complete hydrolysis of an oil may be effected by repeating the treatment with lipase. For example, on hydrolysing 500 grms. of soya bean oil with 3 per cent. of "lipase powder," the resulting fatty acids contained 8·6 per cent. of neutral oil. The glycerin was then removed and the fatty acids again treated with 4 per cent. of "lipase powder" for 4 hours, after which all neutral oil had been hydrolysed.—C. A. M.

Pancreas lipase ; Influence of some inorganic salts on the action of ——. C. A. Pekelharing. Z. physiol. Chem., 1912, 81, 355—368.

The author's experiments were made with a lipase preparation freed so far as possible from electrolytes by washing with water. Rosenheim (Proc. Physiol. Soc., Feb. 19, 1910, XIV., J. of Physiol., Vol. 40) has shown previously that the lipolytic activity of such a lipase preparation is increased by addition of the concentrated wash-water. The author confirms this and shows that the lipolytic activity is increased in a similar manner by the addition of calcium, magnesium, barium, and sodium salts, and the nature of the results indicates that the effect of these salts is due to the fact that they cause the liberated fatty acids to separate in an insoluble form, thus disturbing the equilibrium, whereupon the lipase is able to decompose a further quantity of fat. The salts mentioned have an injurious effect on the synthesising action of lipase.—A. S.

Lipase ; Action of —— *on oxidised and polymerised oils.* Y. Tanaka. J. Coll. Eng., Imp. Univ. Tokyo, 1912, 5, 152—161.

Oxidised fatty oils prepared by exposure to air and light, or by blowing air through them, are hydrolysed more slowly by lipase than the original oils : the effect is most marked with drying oils and least with non-drying oils. Rancid oils are also hydrolysed less rapidly by lipase than fresh oils ; the effect in this case is probably due, at least partly, to the presence of aldehydic substances, which have been shown by Connstein to affect prejudicially the activity of lipase. Light alone has no effect on the chemical composition of an oil, for an oil (soya bean oil, linseed oil) which has been exposed for a long time to direct sunlight, with exclusion of air, is hydrolysed by lipase with the same rapidity as the original oil. Polymerised oils, *e.g.*, oils which have been heated in a current of nitrogen, are only slowly hydrolysed by lipase.—A. S.

Glycerides ; Direct synthesis of ——. I. Bellucci. Gaz. chim. ital., 1912, 42, II., 283—305. (See this J., 1911, 497, 634.)

Equimolecular proportions of palmitic, stearic, and oleic acids, respectively, and glycerin were heated for varying periods at 215°—220° C. under a pressure of 30—40 mm., and at intervals the reaction products were examined by determining the acid value and ester value ; in some cases also the product was treated with absolute alcohol and the ester value of the least soluble portion determined (test for triglyceride). Under the conditions described, palmitic acid is esterified with greater velocity than stearic acid and the latter with greater velocity than oleic acid. In all cases mixtures of mono-, di-, and triglycerides are formed at first, and the monoglyceride which is always obtained as the final product, is produced to a considerable extent by the subsequent action of glycerin on the di- and tri-glycerides first formed. The synthesis of glycerides by enzymic action has been shown to proceed in a similar manner (see Kransz, this J., 1911, 633).—A. S.

Soap ; Studies of the constitution of —— *in solution : sodium myristate and sodium laurate.* J. W. McBain, E. C. V. Cornish, and R. C. Bowden. Chem. Soc. Trans., 1912, 101, 2042—2056. (See also this J., 1910, 288 ; 1911, 222, 434.)

The authors determined the electrical conductivity of solutions of sodium myristate and laurate, of concentrations ranging from 0·01 *N* to 1·5 *N*, at 90° C. The results show that the conductivity-curve for sodium myristate is very similar to that for sodium palmitate (*loc. cit.*), although the palmitate solutions are viscid and gummy, whilst the myristate solutions are mobile. The curve for sodium laurate is much less anomalous, the maximum and minimum present in the palmitate and myristate curves, being obliterated, but only the degree, not the position, of the abnormality in the conductivity curves is altered in passing down the homologous series from stearate to laurate. The temperature-coefficient of conductivity for sodium myristate between 90° and 40° C. is very high (1·862 for *N*/20 solution), and is nearly uniform for all the concentrations used. Some observations bearing on the colloid theory of soap solutions are discussed, and it is pointed out that the coagulation of a suspensoid or gelatinisation of an emulsoid does not appear to be connected with a change in the degree of dispersion of the colloid in certain cases.—A. S.

Jellies. R. Zsigmondy and W. Bachmann. *Ultramicroscopic study of soap solutions and jellies.* W. Bachmann. Z. Chem. Ind. Kolloide, 1912, 11, 145—157.

A description is given, accompanied by photomicrographs, of the ultramicroscopic characters of solutions and jellies of sodium and potassium oleates, stearates, and palmitates. The results show that although the soap jellies are quite different in character from jellies of gelatin, agar, and silicic acid (this J., 1911, 1056 ; 1912, 82), to them also the honeycomb-structure theory of Bütschli is inapplicable.—A. S.

Soap lye and saponification crude glycerins ; British standard specifications for ——.

The following standard specifications were drawn up by the British Executive Committee on Crude Glycerine Analysis, and approved at a general meeting of crude glycerin makers, buyers, and brokers held in London on October 3, 1912.

Soap lyes crude glycerin.—Analysis to be made in accordance with the International Standard Methods, 1911 (see this J., 1911, 556). *Glycerol.*—The standard shall be 80 per cent. of glycerol. Any crude glycerin tendered which tests 81 per cent. of glycerol or over, shall be paid for at a *pro rata* increase, calculated as from the standard of 80 per cent. Any crude glycerin which tests under 80 per cent. of glycerol, but is 78 per cent. or over, shall be subject to a reduction of 1½ times the shortage, calculated at *pro rata* price as from 80 per cent. If the test falls below 78 per cent., the buyer shall have the right of rejection. *Ash.*—The standard shall be 10 per cent. In the event of the percentage of ash exceeding 10 per cent., but not exceeding 10·5 per cent., a percentage deduction shall be made for the excess calculated as from 10 per cent. at *pro rata* price, and if the percentage of ash exceeds 10·5 per cent., but does not exceed 11 per cent., an additional percentage deduction shall be made equal to double the amount in excess of 10·5 per cent. If the amount of ash exceeds 11 per cent. the buyer shall have the right to reject the parcel. *Organic residue.*—The standard shall be 3 per cent. A percentage deduction shall be made of three times the amount in excess of the standard of 3 per cent. calculated at *pro rata* price. The buyer shall have the right to reject any parcel which tests over 3·75 per cent.

Saponification crude glycerin.—Analysis to be made in accordance with the International Standard Methods, 1911 (*loc. cit.*). *Glycerol.*—The standard shall be 88 per cent. Any crude glycerin tendered which tests 89 per cent. or over, shall be paid for at a *pro rata* increase, calculated as from the standard of 88 per cent. Any crude glycerin which tests under 88 per cent., but is 86 per cent. or over, shall be subject to a reduction of 1½ times the shortage, calculated at *pro rata* price as from 88 per cent. If the test falls below 86 per cent., the buyer shall have the right of rejection. *Ash.*—The standard shall be 0·5 per cent. In the event of the percentage of ash exceeding 0·5 per cent., but not exceeding 2·0 per cent., a percentage deduction shall be made equal to double the amount in excess of 0·5 per cent. If the amount of ash exceeds 2·0 per cent., the buyer shall have the right to reject the parcel. *Organic residue.*—The standard shall be 1 per cent. A percentage deduction shall be made of twice the amount in excess of the standard of 1 per cent., calculated at *pro rata* price. The buyer shall have the right to reject any parcel which tests over 2 per cent.

Fatty acids of butter. Smedley. *See* XIXa.

Determination of oxalic acid in vegetable products. Grégoire and Carpiaux. *See* XXIII.

Patents.

Hydrogenation [*of oils*]; *Process of* ——. *Process of hydrogenating oily material.* C. Ellis, Montclair, N.J. U.S. Pats. 1,040,531 and 1,040,532, Oct. 8, 1912.

(1) A column of oily material heated to, say, 150° to 200° C., is made to travel in a liquid state through two or more beds of solid porous material containing a metallic or other catalytic agent. On its way it encounters a current of hydrogen passing in the opposite direction under a pressure of at least 10 lb. to the sq. inch. The excess of hydrogen may be recovered, purified and conducted into the current of gas again, whilst at least a portion of the oil is added to the column of oily material for further treatment. (2) A current of hydrogen is made to bubble repeatedly through a pool of the oily material which is heated to a suitable temperature for the absorption of the gas by unsaturated bodies and contains a catalytic agent. The unabsorbed portion of the gas is collected in a space above the oily material, whence it is rapidly withdrawn to prevent material increase of pressure, and is used again. After treatment the oily material is removed, whilst the bulk of the catalytic agent is left behind.—C. A. M.

Oil-seed and the like; Apparatus particularly suitable for treating ——. R. Scott, London. U.S. Pat. 1,040,782, Oct. 8, 1912.

The seed is treated in a kettle or container provided with an outlet at the bottom, beneath which is a mould box with a top slide. The bottom plates of the mould are brought into position successively by means of a frame, which can be raised, lowered or rotated by hydraulic power, the moulded cakes being then removed in turn automatically.—C. A. M.

Cotton seed or linseed meats; Device for cooking ——. C. H. Fulson, Memphis, Tenn., Assignor to J. W. Todd, New Orleans, La. U.S. Pat. 1,041,455, Oct. 15, 1912.

The device consists of a receptacle, or series of receptacles, having (each) a movable cover which is kept pressed down on the charge by means of a spring. The cover is provided with an inlet opening near one edge, and the bottom of the receptacle with an outlet opening on the opposite side. A series of rotary stirring arms, actuated by means of a vertical shaft passing through the cover, works within the receptacle, and a flexible conduit extends from the outlet of one receptacle of the series through the cover of the adjacent receptacle. Means are provided for preventing the escape of moisture from the receptacles during the cooking process. The cover rises or falls automatically as the charge is introduced or withdrawn.—E. W. L.

Marine animal oils and the fatty acids therefrom; Process for improving the odour of ——. F. Schmitt and H. Sonnenfeld. Ger. Pat. 250,305, Jan. 5, 1911.

The fat or mixture of fatty acids is well mixed with 20—50 per cent. of its weight of the sulphonic acids of benzene or its homologues in mineral acid solution. After allowing to stand for some hours, the product is washed with water and distilled either directly or with steam. The soaps prepared from fats treated in this way are stated to be quite devoid of fishy odour.—A. S.

Vulcanised oils [" *Faktis* "]; *Manufacture of products similar to* ——. Chem. Fabr. Flörsheim, Dr. H. Noerdlinger. Ger. Pat. 251,371, Aug. 7, 1910.

Drying oils are thickened by oxidation and then treated with a non-oxidising acid or a solution of an acid salt. The oil may be applied to a fibrous material before it is thickened by oxidation.—A. S.

Soap powders; Process of making ——. C. Ellis, Larchmont, N.Y., Assignor to Ellis-Foster Co. U.S. Pat 1,040,530, Oct. 8, 1912.

A free fatty acid (*e.g.*, 2 parts of " red oil ") is mixed with an alkaline composition capable of developing heat on hydration (*e.g.*, 5 parts of soda ash or dry sodium carbonate), and water (say 3 parts) is added in sufficient quantity to develop heat to effect saponification, but not sufficient to dissolve the carbonate. The resulting compound is allowed to cool and is then finely divided.
—C. A. M.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Coal-tar colours; Fastness to light of pigments from ——. P. Krais. Z. angew. Chem., 1912, 25, 2193—2196.

The comparison of water colour pigments obtained from the various coal-tar colours with those obtained from mineral colours, has been effected by exposure under comparable condition for five successive periods of 18, 18, 38, 37, and 221 days respectively. Data are given as to the amount of sunlight, as registered by the heliograph and the number of " bleaching hours," as measured by standard test papers (see this J., 1911, 947). There is no relation between the two for the various periods, since 100 " hours of sunshine " may be equivalent to as much as 124 or as little as 45 " bleaching hours." The pigments were obtained, in the case of each colouring matter, first from the pure material and then from various mixtures with *blanc fixe*. It is found that the colours which are not fast to light when mixed with *blanc fixe* are also not fast when mixed with other white or coloured substances. It is not necessary that fastness extending to the end of the author's fifth period should be required for pigments used in interior decoration. If the colour is not considerably affected at the end of the third period it is generally suitable for such work. As a result of the examination of 63 colours, about 40 may be classed as good, 11 of them being practically as fast as good mineral colours like Victoria Green, Chrome Yellow, etc. The good colours are the following, the 11 specially good ones being printed in italics. *Class A* (fast to light even when mixed with a chemically active white pigment).—Hansa Yellow 5G, G and *R*, Helindone Red 3B, Helio Fast Yellow *6GL, GL*, and RL, *Helio Chrome Yellow GL*, *Algol Red 5G*, *Helio Fast Rose RL*, Brilliant Alizarin Bordeaux R, *Algol Blue 3R*, Alumina Lake from Helio Fast Blue BL, Helio Fast Red 2GL, Sirius Yellow G, Lithol Fast Yellow GG extra and R, *Lithol Fast Orange R*, Lithol Fast Scarlet RN, Eglantine BBP, Indanthrene Olive G, Indanthrene Gray B, *Indanthrene Blue GGSZ and RZ*, Alizarin Lake from brand V1. extra, Alizarin Iron Lake from brand V2 bluish, Indanthrene Violet RR extra, *Permanent Red 2G extra*, 6B, and 4B extra. *Class B* (only fast as pure pigments). Pigment Chrome Yellow L, Alizarin 1B extra 12 per cent. Helindone Violet R, Helio Fast Red RL, Alizarin Red 1B extra, Tuscaline Orange GN, Green PLX. —W. H. P.

Varnish turbidities, Composition and examination of ——. H. Wolff. Farbenzeit., 1912, **17**, 2740—2741. Chem. Zentr., 1912, **2**, 1496.

Two deposits separated from samples of varnish proved to consist of the lead salts of organic acids. Two acids were isolated, one in the form of crystals which sintered at 97° C. and melted at 105°—106° C., and had the composition, $C_9H_{15}(OH)CO_2H$, the other in the form of a light yellow amorphous mass, m. pt. about 105° C., which from its composition, $C_{20}H_{30}O_4$, and properties may probably be characterised as a dihydroxyabietic acid or a transformation product of the same. The acid, $C_9H_{18}(OH)CO_2H$, is a resin acid formed probably from a lead-copal siccative. Precipitates of similar composition to the lead salt of the acid, $C_{20}H_{30}O_4$, form when varnish containing lead resinate is kept for a long time (2 months) in open vessels, whilst when kept in closed vessels, compounds of abietic acid appear to be formed.—A. S.

Phenol-formaldehyde condensation products. L. H. Baekeland. J. Ind. Eng. Chem., 1912, **4**, 737—743.

THE resinous condensation products obtained by the condensation of phenols with formaldehyde or other methylene-compounds are the result of the dehydration and polymerisation of phenol-alcohols first formed. A. H. Gotthelf (working under the author's direction) has succeeded in isolating crystals of hydroxybenzyl alcohol from the reaction mixture during the preparation of fusible condensation products from phenol and formaldehyde in presence of hydrochloric acid; and the author has succeeded in obtaining a fusible resinous condensation product by introducing a mixture of salicylic acid and an inorganic acid into the cathode compartment of a cell in which sodium chloride was electrolysed, a mercury cathode being used. The fusible products obtained by the condensation of phenols with restricted quantities of formaldehyde, and which under different names have been suggested as substitutes for natural resins, are varieties of saliretins, the melting point and fusibility of which vary according to the amount of uncombined phenol remaining in the product in a state of solid solution. By prolonged heating, these fusible products polymerise and are finally converted into infusible products; the polymerisation is facilitated by catalysers, such as hydrochloric acid, and retarded by free phenol. The infusible products obtained in this way, however, lack the mechanical strength and hardness and resistance to chemical and physical influences shown by the infusible products obtained by the treatment of the fusible condensation products with a further quantity of formaldehyde, or by using a larger proportion of formaldehyde in the original condensation process. The formation of the resistant infusible product is facilitated by the presence of small quantities of bases, and by suitably adjusting the proportion of base added, the condensation process can be easily controlled. The tendency to foam shown especially during the polymerisation of the initial condensation product is diminished by using sodium hydroxide as the base added to accelerate the reaction; and the final hardening is effected under sufficient pressure to prevent the evolution of gaseous products. The infusible condensation products, though very hard and resistant, are lacking in flexibility and elasticity, and hence are mixed with fibrous filling materials, preferably wood pulp or finely divided sawdust, before moulding.—A. S.

PATENT.

Paints; Process for the manufacture of ——. H. Friedmann, Berlin. Eng. Pat. 807, Jan. 10, 1912.

SEE Ger. Pat. 248,292 of 1910; this J., 1912, 939. Manganese carbonate may be added to the zinc chromate before heating with the oil.—T. F. B.

XIV.—INDIA-RUBBER ; GUTTA-PERCHA.

Rubber from Ceylon. Bull. Imp. Inst., 1912, **10**, 380—383.

SIX samples were examined. Nos. 1, 2, and 3 consisted of Para crêpe obtained by: (1), V- and half spiral cuts with the knife; (2), V- and half spiral cuts with the Bowman-Northway knife and pricker; (3), vertical cuts and use of Bamber's pricker. All three samples were rather dark in colour, and, with fine hard Para at 4s. 3d. per lb., were valued at: (1) and (2), 4s. 6d., and (3) 4s. 3d. per lb. respectively. Nos. 4 and 5 consisted of biscuits obtained from trees tapped with: (4) knife only, and (5) Bamber's pricker. They were both valued at about 4s. 11d. per lb., with fine hard Para at 4s. 8d. per lb. The results of the chemical examination of these five samples are shown in the following table:—

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
	per cent.	per cent.	per cent.	per cent.	per cent.
Loss on washing (moisture and impurities) ...	0·4	0·4	0·9	1·8	1·0
Composition of dry washed rubber					
Caoutchouc .	94·0	94·0	92·7	91·6	92·1
Resin	2·6	2·7	3·1	4·1	3·3
Protein	3·0	2·8	3·7	3·6	3·9
Ash	0·4	0·5	0·5	0·7	0·7

No. 6 was a sample of crêpe rubber from *Manihot dichotoma* trees, which are stated to thrive better than Ceara (*M. Glaziovii*) trees in Ceylon. The rubber was evidently from young trees. It contained 0·5 per cent. of moisture, 84·6 of caoutchouc, 4·9 of resin, 5·7 of protein, and 4·3 of insoluble matter, and yielded 2·9 per cent. of ash. Selected pieces from the sample were valued at about 4s. per lb., with fine hard Para at 4s. 3d. per lb.—A. S.

Chimeya rubber from North-Western Rhodesia. Bull. Imp. Inst., 1912, **10**, 385—386.

THE sample consisted of four cylindrical rolls (9 in. long by ¾ in. diam.) of reddish brown scrap rubber believed to have been derived from a vine. It gave a loss on washing (moisture and impurities) of 13·2 per cent., and the dry washed rubber contained 91·5 per cent. of caoutchouc, 6·6 of resin, 0·6 of protein, and 1·3 of ash. It was valued at 4s. 9d. to 5s. per lb., with fine hard Para at 6s. 11d. per lb.—A. S.

Funtumia rubber from the Gold Coast. Bull. Imp. Inst., 1912, **10**, 384—385.

Two samples were examined:—No. 1, biscuit rubber prepared by adding 1 per cent. of formol (formaldehyde) to the pure latex; No. 2, rubber prepared in biscuit form by natives. No. 1 was valued at 6s. 10d. to 7s. per lb., with fine hard Para at 6s. 11d. and fine plantation Para at 6s. 11d. to 7s. 10d. per lb. No. 2 was of very indifferent appearance and badly prepared but the elasticity and tenacity of the rubber were good. It was sold, after drying, at 3s. 6d. per lb., with fine hard Para at 4s. 9d. per lb., and Gold Coast lump at 1s. 8d. to 1s. 11d. per lb. The chemical composition of the samples is shown in the following table :—

	No. 1.	No. 2.
	per cent.	per cent.
Loss on washing (moisture and impurities)	3·3	—
Composition of dry washed rubber :—		
Caoutchouc	79·5	87·6
Resin	10·5	9·9
Protein	9·3	2·2
Ash	0·7	0·3

—A. S.

Rubber from Papua. Bull. Imp. Inst., 1912, **10**, 386—388.

Two samples of rubber were examined :—No. 1, from *Ficus Rigo*, F. M. Bailey, consisting of irregular lumps, slightly sticky in places; and No. 2, irregular balls, sticky externally and moist within. With fine hard Para at 4s. 10d. per lb., No. 1 was valued at 3s. 10d. per lb. and would realise a higher price if free from stickiness, whilst No. 2, if in good condition, would probably sell at 3s. 6d. per lb. The chemical composition of the two samples was as follows :—

	No. 1.	No. 2.
	per cent.	per cent.
Loss on washing (moisture and impurities)	3·6	12·4
Composition of dry washed rubber :—		
Caouchouc	91·1	86·8
Resin	4·9	11·1
Protein	3·1	1·4
Ash	0·9	0·7

—A. S.

Rubber of Hevea confusa from British Guiana. Bull. Imp. Inst., 1912, **10**, 388—389.

The rubber of *Hevea confusa*, a large tree indigenous to British Guiana, has been hitherto regarded as of little or no commercial value, but the present sample, though deficient in elasticity and tenacity, would undoubtedly be saleable; it was valued at about 4s. per lb., with fine hard Para at 4s. 8d. per lb. The sample consisted of biscuits of very dark rubber, and gave a loss on washing (moisture and impurities) of 1·4 per cent. The dry washed rubber contained 92·3 per cent. of caoutchouc, 1·8 of resin, 4·9 of protein, and 1·0 of ash.—A. S.

Rubber; Vulcanisation of ——. *I. Cold vulcanisation of rubber.* G. Bernstein. Z. Chem. Ind. Kolloide, 1912, **11**, 185—191.

I. Product obtained by C. O. Weber by the cold vulcanisation of rubber. The author repeated Weber's experiments, using, however, a solution of 50 grms. of carefully purified Para rubber in 1 litre of xylol (b.pt. 138° C.), to which was added a solution of 60 grms. of sulphur chloride in 200 c.c. of xylol. The products obtained contained varying proportions of chlorine and sulphur, owing to the facts that it was impossible to obtain a uniform reaction throughout the mixture and that decomposition took place during the extraction of the product with petroleum spirit and alcohol as described by Weber. By using dilute solutions (5 grms. of rubber in 1 litre of xylol and 6 grms. of sulphur chloride in 200 c.c. of xylol), a uniform reaction is obtained and after about 1 day a fine powder is deposited, the composition of which, after purification by extraction with carbon bisulphide, agrees with the formula, $(C_{10}H_{16})_2S_2Cl_2$ (see also this J., 1909, 843; 1910, 891).

II. Study of cold vulcanisation by viscosity determinations. The results of the experiments show that the viscosity of solutions of rubber in xylol decreases on addition of increasing quantities of sulphur chloride; this diminution of viscosity takes place suddenly with traces of sulphur chloride, and more slowly with larger quantities. The effect of quantities of sulphur chloride ranging from 0·1 to 0·3 per cent. (on the whole mixture, including solvent) is about the same, but becomes progressively greater with larger quantities of sulphur chloride.

III. Chemical control of the insoluble products of cold vulcanisation. Experiments were made with mixtures containing 0·455 per cent. of rubber and proportions of sulphur chloride ranging from 0·3 to 3 per cent. (65·85 to 658 per cent. referred to the rubber). After allowing to settle, the insoluble product was separated, washed with xylol and carbon bisulphide, extracted with carbon bisulphide at 30°—40° C., dried *in vacuo*, and the sulphur and chlorine determined. In all cases the results indicate that a definite compound, $(C_{10}H_{16})_2S_2Cl_2$, is formed.—A. S.

Rubber; Theory of the vulcanisation of ——. F. W. Hinrichsen and E. Kindscher. Z. Chem. Ind. Kolloide, 1912, **11**, 191—193.

The authors give a brief description of some experiments indicating that a definite compound is formed in the hot vulcanisation of rubber. Plantation Para rubber was dissolved in commercial cumene, and the solution divided into eight 100 c.c. portions, each containing 2 grms. of rubber. To each of these was added a quantity of pure sulphur (1, 2, 3, 4, 5, 6, 7, and 8 grms. respectively), and the mixtures were agitated by a current of carbon dioxide and heated at 170° C. in a thermostat. In all cases a dark brown pulverulent substance was formed, containing not more than 32 per cent. of combined sulphur, *i.e.*, corresponding in composition to Weber's compound, $C_{10}H_{16}S_2$. —A. S.

PATENTS.

India rubber; Machines for washing, macerating, crêpeing and similarly treating ——. R. Bridge, Castleton, Lancs. Eng. Pat. 28,781, Dec. 21, 1911.

The mechanism usually employed for adjusting the front, movable roller of rubber-washing, etc., machines—consisting of a shaft passing in front of the roller, actuated by hand wheels, and carrying worms gearing with wormwheels on the ends of the two adjusting screws—is inconvenient. The invention described consists in replacing this single shaft by two short shafts, which do not pass in front of the roller, and which are arranged to be actuated separately by means of hand wheels, or simultaneously by connecting them (by suitable gearing) with an intermediate shaft in a convenient position, below or behind the rollers. The intermediate shaft may be formed in two parts and provided with a suitable clutch.—E. W. L.

Rubber for industrial purposes; Preparation of ——. J. E. Pointon, Peterborough. Eng. Pat. 29,008, Dec. 23, 1911.

Washed rubber is "masticated" and incorporated with other ingredients by means of rotating blades (in the shape of a V or similar form) in a vessel with intercommunicating chambers.—C. A. M.

India-rubber; Process for the manufacture of artificial ——. G. Reynaud, Paris. Eng. Pat. 27,802, Dec. 11, 1911.

One part of unvulcanised india-rubber (either natural or manufactured) is immersed in a receptacle containing one or two parts of spirit of turpentine, and mixed with the latter until the whole of it is absorbed by the rubber. The mass is then mixed or kneaded with from 10 to 50 per cent. of its weight of chloride of lime or other material which "greedily absorbs water and contains chlorine," and the mixture is afterwards passed several times between calendering rollers in order to render it homogeneous. In order to promote "oxidation," 5 to 20 per cent. of sulphur may be added at the same time as the chloride of lime. The calendered sheet is treated with water and again calendered and, simultaneously, sprinkled; it is afterwards heated in water at about 100° C. until the desired degree of hardness is attained. The product is freed from excess of sulphur by heating it with caustic potash or soda solution, after which it is thoroughly washed in water and dried. Chlorine may also be introduced into the mass—where it is said to polymerise the particles of essence of turpentine—in any other convenient form, such as gas, chlorine water, etc.—E. W. L.

Rubber-like material; Process of manufacturing an elastic —— from animal substances. Naamlooze Vennootschap Algemeene Uitvinding Exploitatie Maatschappij, Amsterdam. Eng. Pat. 8523, April 10, 1912. Under Int. Conv., Dec. 20, 1911. (See also Eng. Pat. 9579 of 1910; this J., 1910, 1467.)

ONE HUNDRED kilos. of fresh- or sea-water fish are extracted with 400 litres of water for 2 hours at between 90° and 100° C., and the extract is filtered. The protein is then precipitated from the filtrate by the addition of the exact amount of dilute (25 per cent.) sulphuric acid, or of sulphur dioxide, required to bring about complete precipitation without any re-solution. This quantity is ascertained by testing small samples. The precipitate is filtered off and the filtrate is mixed with concentrated baryta water at 50° C., or with a dilute suspension of lime, until its reaction is faintly alkaline, and the excess of alkali is then removed by passing carbon dioxide until the reaction is faintly acid. The carbonate is now filtered off, and the filtrate evaporated *in vacuo* after adding formaldehyde, when the elastic material is obtained.—E. W. L.

Caoutchouc; Manufacture of substances resembling ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 22,454, Oct. 11, 1911.

SEE Fr. Pat. 440,173 of 1912; this J., 1912, 735.—T. F. B.

Rubber; Process for making products resembling ——. Chem. Fabr. Flörsheim Dr. H. Noerdlinger. Fr. Pat. 444,026, July 28, 1911.

SEE U.S. Pat. 1,031,837 of 1912; this J., 1912, 829.—T.F.B.

Rubber; Filling material for —— and process of manufacturing it. S. Blok and S. Benima. Fr. Pat. 444,062, May 21, 1912. Under Int. Conv., May 27, 1911.

SEE Eng. Pat. 12,233 of 1912; this J., 1912, 694.—T. F. B.

Plastic compositions and method of preparing the same. J. W. Aylsworth, East Orange, N.J., U.S.A. Eng. Pat. 24,124, Oct. 31, 1911. Under Int. Conv., Nov. 4, 1910.

SEE Fr. Pat. 435,944 of 1911; this J., 1912, 446.—T. F. B.

Manufacture of products similar to vulcanised oils [Faktis]. Ger. Pat. 251,371. *See* XII.

Process for producing aliphatic hydrocarbons with more than one double linkage [isoprene, etc.]. Addition to Fr. Pat. 433,322. *See* XX.

XVI.—SOILS; FERTILISERS.

Nitrate and nitrite assimilation IV. O. Baudisch. Ber., 1912, **45**, 2879—2883. (See this J., 1912, 706.)

LOEW in criticising the author's reduction of potassium nitrate to nitrite under the influence of light shows that the same effect is produced by heating nitrate with dextrose and platinum black at 60°—70° C. The presence of dextrose is necessary, pure platinum effecting no reduction. When potassium nitrite is heated with dextrose and neutral hydrogen peroxide at 60°—70° C., the solution soon becomes acid and, on the addition of an alkali, ammonia is liberated. A similar production of ammonia is observed with lead peroxide acting in presence of potassium carbonate. Under these conditions the dextrose is oxidised with the production of hydrogen, which immediately reduces the nitrite. Platinum black in an atmosphere of hydrogen reduces potassium nitrate to ammonia. There is thus little difference between the reducing action of platinum black and that of light; in the former case the active oxygen is added fixed to the platinum; in the latter it is split off from the nitrate by means of the energy of the light.—E. F. A.

Sand cultures; Presence of nitrifying bacteria in ——. J. Schulow. Russ. J. f. expt. Landwirtsch., 1912, 215; Biedermann's Zentr., 1912, **41**, 715.

SUITABLE media for nitrifying bacteria were inoculated with sand taken from ordinary sand cultures. Proof was obtained that the nitrogen became oxidised, thus showing the presence of nitrifying organisms in the sand. —E. F. A.

Mica as a source of potash for plants, and its weathering. E. Blanck. J. für Landw., 1912, 97; Biedermann's Zentr., 1912, **41**, 652—655.

ALTHOUGH felspar is more easily disintegrated on exposure than mica, there is evidence that the latter forms the better source of potash for plants. Pot cultures, made with oats in large zinc vessels to compare the efficiency of muscovite (potassium mica) and biotite (magnesium iron mica), both of which contain about the same proportion of potassium oxide, showed that biotite is markedly superior to muscovite as a fertiliser, but both minerals give up potash to the plant and are considerably superior to felspar in this respect. It is suggested that muscovite gives up its potassium on weathering, although it retains its external physical characters.—E. F. A.

Potash; Alunite as a source of ——. W. H. Waggaman. U.S. Dept. Agric., Bureau of Soils, Circular No. 70, July 31, 1912. Pp. 4.

ALUNITE, a double sulphate of potassium and aluminium, gives off water and sulphur trioxide when heated at 520° C. It is used for the manufacture of potash alum by heating at 400°—500° C., and leaching out the alum produced. The ignited alunite free from soluble aluminium compounds may be used directly as a fertiliser. The percentage of potash in the ignited residue is greater than in kainite.—E. F. A.

XVII.—SUGARS; STARCHES; GUMS.

Apparent dry substance; Determination of the —— [in beet sugar factory massecuites]. K. Urban. Z. Zuckerind. Böhm., 1912, **37**, 66—74. (Cf. also this J., 1912, 942.)

IN determining the apparent dry substance and apparent quotient of purity of beet sugar factory massecuites, the error due to sampling and to the contraction taking place on dilution, obtaining in the processes now generally employed for control purposes, are stated to be practically inappreciable if the following method be used: To 250 grms. of the well-mixed sample of massecuite, taken whilst "striking out," or else directly after the contents of the pan have been discharged into the coolers, 50—60 c.c. of hot water are added, and the mixture heated in a boiling water-bath. When complete solution has been effected, which generally requires 20—30 minutes, a syrup of about 75° Brix will be obtained, and this is weighed while still hot. Its density, preferably using the Kovář-Frič pycnometer, is taken; and its polarisation is determined in the ordinary way. By this method the figures for (a) the apparent dry substance are found to approach closely the values for (b) the true dry substance, obtained by desiccation, as the following results show: First massecuites, (a) 93·25, (b) 93·00 per cent.; after-product massecuites, (a) 92·00, (b) 91·36 per cent.; and refinery massecuites, (a) 92·05, (b) 91·27 per cent. These differences between apparent and true dry substance are smaller than in the ordinary dilution method, in which, owing to the impossibility of making any reliable correction for the contraction due to the varying amount and nature of the non-sugars present, the error is often considerable, especially in the case of low-grade products. —J. P. O.

Amylase of grains; Experiments on the separation of the starch-liquefying from the starch-saccharifying power, and demonstration of starch-dextrinising and starch-precipitating powers of —— . Chrzaszez and Terlikowski. *See* XVIII.

PATENTS.

Sugar-making product. G. W. McMullen, Picton, Ontario, Assignor to Z. G. Simmons, Kenosha, Wis., A. W. Preston, Swampscott, Mass., and B. W. Palmer, Boston. U.S. Pat. 1,040,561, Oct. 8, 1912.

THE product is a substantially weatherproof, dense block of disintegrated sugar-cane, sufficiently dry to be chemically stable, and containing the sugar in practically unaltered form. In the product, the bulk of the pith and of the woody part of the cane are structurally separate, and are in the form of small particles and fibres respectively (see Fr. Pat. 417,317 of 1910; this J., 1911, 43). —L. E.

Sugar-cane; Method of treating ——. J. H. Roberts, Chicago, Assignor to Z. G. Simmons, Kenosha, Wis., A. W. Preston, Swampscott, Mass., and B. W. Palmer, Boston. U.S. Pat. 1,040,562, Oct. 8, 1912.

THE cane is cut up in such a manner as to dissociate the bulk of the pith from the fibrous part, the commingled mass then being subjected to a tumbling operation in a current of heated gas, whereby it is dried. The current of gas is so controlled that the lighter portions of the disintegrated mass of cane are removed whilst they still contain sufficient moisture to "protect" the sugar in them. (See also Fr. Pat. 417,317 of 1910; this J., 1911, 43.)—L. E.

Sugar juice; Process for the purification of ——. A. Stutzer. Ger. Pat. 251,793, June 27, 1911.

AFTER carbonatation and saturation with sulphur dioxide in the usual way, the juice is treated with a quantity of ammonium carbonate (or its components) sufficient to convert the calcium sulphite present into calcium carbonate and ammonium sulphite, and the insoluble or precipitated substances are separated. When the treated juice is concentrated, ammonia and sulphur dioxide are evolved, and the objectionable deposition of calcium sulphite in the evaporating apparatus is avoided.—A. S.

Starch; Method of drying ——. L. P. Bauer, Pekin, Ill., Assignor to Corn Products Refining Co. U.S. Pat. 1,035,302, Aug. 13, 1912.

THE starch is disposed in thin vertical layers, arranged in parallel planes with intervening air spaces, for which purpose receptacles with perforated sides and fitted with vertical perforated partitions are preferably used. These receptacles are placed in a series so that the layers of starch in one receptacle are end to end with the layers in adjacent receptacles, and the air spaces form continuous channels. The series is advanced intermittently, in a direction parallel to the layers, through a tunnel, and encounters a current of hot air forced through the tunnel in the opposite direction.—L. E.

Gum or mucilage from locust beans (carob seeds); Process for manufacturing ——. A. Pinel, Le Houlme, France. Eng. Pat. 15,860, July 6, 1912. Under Int. Conv., Nov. 3, 1911. Addition to Eng. Pat. 15,783, July 5, 1912 (see Fr. Pat. 443,275 of 1911; this J., 1912, 1002).

THE preliminary operation of breaking the beans is avoided, or the treatment of the broken beans is facilitated by addition of a certain quantity of borax to the alkaline decorticating solution preferably employed at a temperature of 80°—100° C. A solution of caustic alkali of any desired concentration (*e.g.*, a 16—18 per cent. solution of potassium hydroxide), or an equivalent solution of an alkaline salt (*e.g.*, a 50 per cent. solution of sodium sulphide) or a mixture of both solutions, may be used as decorticating agent. The solution of borax subsequently used for soaking the beans may be replaced by a solution of another suitable borate. Before being rendered soluble, the washed material, in the form of a paste, may be neutralised by addition of organic or inorganic acids or both, or by addition of salts such as sulphate or acetate of zinc or aluminium.—L. E.

Sugar-producing product; Process of separating sugar-cane into its two chief structural parts. G. B. McMullen, Chicago, Assignor to Z. G. Simmons, Kenosha, Wis., A. W. Preston, Swampscott, Mass., and B. W. Palmer, Boston. U.S. Pats. 1,040,557 to 1,040,559, Oct. 8, 1912.

SEE Fr. Pat. 417,317 of 1910; this J., 1911, 43.—L. E.

Sugar and by-products from sugar-cane; Process of making ——. G. W. and G. B. McMullen, Picton, Ontario, Assignors to Z. G. Simmons, Kenosha, Wis., A. W. Preston, Swampscott, Mass., and B. W. Palmer, Boston. U.S. Pat. 1,040,560, Oct. 8, 1912.

SEE Fr. Pat. 417,317 of 1910; this J., 1911, 43.—L. E.

Betaine hydrochloride from vinasses, molasses, or other residue from sugar manufacture; Process for extracting ——. Melasse-Schlempe G.m.b.H. Fr. Pat. 443,909, May 14, 1912. Under Int. Conv., May 16, 1911.

SEE Ger. Pat. 243,332 of 1911; this J., 1912, 353.—T. F. B.

Gum or mucilage from locust beans; Process for manufacturing ——. A. Pinel, Le Houlme, France. Eng. Pat. 15,783, July 5, 1912. Under Int. Conv., July 10, 1911.

SEE Fr. Pat. 443,275 of 1911; this J., 1912, 1002.—T. F. B.

Improved sugar. Eng. Pat. 22,059. *See* XIXA.

XVIII.—FERMENTATION INDUSTRIES.

Amylase of grains; Experiments on the separation of the starch-liquefying from the starch-saccharifying power, and the demonstration of starch-dextrinising and starch-precipitating powers of ——. T. Chrzaszcz and K. Terlikowski. Woch. Brau., 1912, 29, 590—593, 607—610, 623—626, 636—639. (See also this J., 1910, 103, 583; 1911, 1401.)

THE amylases of barley, oats, millet, maize, wheat and rye were salted out from cold water extracts of the ground grains, by means of ammonium sulphate (35 or 40 per cent.). The precipitates obtained were dissolved in water and reprecipitated fractionally by treating the solutions with successive quantities of 5 per cent. of ammonium sulphate, up to 35 per cent. The ratio of liquefying power to saccharifying power varied widely in different fractions. In some cases the later fractions, possessing considerable saccharifying power, appeared to exert no liquefying action whatever. With barley, rye and wheat, the fractions of maximum liquefying power possessed also the maximum saccharifying power, but this was not so with maize and millet, and even in the former cases the increase or decrease of the two powers in successive fractions did not proceed *pari passu*. The measurement of the liquefying power (see this J., 1910, 583) was in some cases rendered difficult by coagulation of the starch, effected by an enzyme, amylo-coagulase (see Wolff and Fernbach, this J., 1903, 1302), present in different amounts in the various grains, and in greatest quantity in rye. The action of this enzyme was observed also in carrying out the saccharification tests, for it gave rise to turbidity when the amylase was added to the starch solution.

There was found to be no close correspondence between the saccharifying power of the different fractions and the iodine-reaction of the saccharified starch solutions obtained in determining this power. The authors conclude that the quantitative value of the liquefying power of the amylases of grains is independent of their saccharifying power, that their starch-dextrinising power is to some extent independent of both of the former, and that they possess also in varying degrees a starch-precipitating power due to amylo-coagulase.—J. H. L.

Industrial methylated spirit. Pharm. J., Nov. 16, 1912. [T.R.]

The following is a return of the quantities of industrial methylated spirit used in manufacturing operations and for other purposes in the United Kingdom during the years ended March 31, 1911 and 1912:—

Nature of Manufacturing Operations or other purposes for which the Industrial Methylated spirit is used.	Quantity used.	
	1911.	1912.
	Gallons.	Gallons.
Manufacture of finish for sale	369,283	419,080
Manufacture of varnishes, polishes, or lacquers for sale	940,186	1,030,262
Manufacture of stains, paints, enamels, etc., for sale	61,176	63,242
Manufacture of varnishes, finish, stains, polishes, lacquers, etc., or for polishing purposes in manufacturers' own workshops	294,343	316,863
Manufacture of felt and other hats	123,430	128,001
Manufacture of celluloid, xylonite, and similar substances	24,003	28,729
Manufacture of oil-cloths, leather-cloths, pegamoid, and similar substances	151,184	173,203
Manufacture of linoleum and similar substances	948	398
Manufacture of smokeless powders, fulminates, and other explosives	20,327	21,134
Manufacture of soap	144,884	160,166
Manufacture of electric lamp filaments	13,151	11,835
Manufacture of electric cables	4,762	1,832
Manufacture of incandescent mantles	18,176	33,169
Manufacture of ether	192,878	212,058
Manufacture of chloroform	9,627	7,912
Manufacture of ethyl chloride and bromide	747	652
Manufacture of solid medicinal extracts	56,720	58,438
Manufacture of alkaloids and fine chemicals	22,868	33,856
Manufacture of embrocations, liniments, and lotions	32,230	33,302
Manufacture of surgical dressings	8,461	7,400
Manufacture of capsules and other medicinal appliances	1,846	1,190
Manufacture of hair washes	19,770	26,787
Manufacture of cattle medicines	2,324	2,051
Manufacture of plant washes, insecticides, and sheep dips	9,630	10,763
Manufacture of aniline and other dyes—solids	874	1,515
Manufacture of aniline and other dyes—solutions	4,382	1,526
Manufacture of fireworks and matches	5,207	4,785
Manufacture of photographic plates and papers and other photographic purposes	42,294	43,425
Manufacture of steel pens	3,264	2,739
Manufacture of silk, crape, and embroidery	9,698	7,341
Manufacture of artificial flowers, etc.	4,435	4,695
Manufacture of rubber	1,223	921
Manufacture of artificial silk	—	—
Manufacture of ships' compasses, spirit levels, etc.	952	1,433
Manufacture of inks	2,558	438
Manufacture of collodion	8,302	5,331
Manufacture of disinfectants	220	1,866
For dyeing and cleaning operations in laundries and dye works	46,992	45,394
For textile printing	11,115	8,416
For preservation of specimens in museums and hospitals	6,850	6,562
For educational and scientific purposes in colleges and schools	6,150	6,435
For analytical and scientific purposes in the laboratories of analysts, works chemists, etc.	4,836	6,577
For hospitals, asylums, and infirmaries	43,662	47,216
For electrotyping and printing	553	1,450
For miscellaneous uses	8,573	7,671
For Admiralty dockyards and War Office arsenals and workshops, chiefly for varnishes and polishes	13,541	20,455
Total	2,748,635	3,008,514

Malt diastase, and the action of potassium phosphates thereon. R. C: son Heyl. J. prakt. Chem., 1912, **86**, 433—457.

From experiments on the velocity of saccharification of starch by malt extract, the author draws the following conclusions:—The earlier stages of saccharification proceed in accordance with the logarithmic (unimolecular) law, but as if only a part (varying according to the concentration of starch, enzyme, electrolytes and proteins) of the starch present underwent conversion. The later stages of saccharification proceed very slowly. Monopotassium phosphate accelerates diastatic action, and tends to preserve the enzyme. Dipotassium phosphate retards the saccharifying action of freshly prepared malt extracts, but accelerates that of extracts 24 hours old. The accelerating action of phosphates is influenced by the presence of proteins, for it was found that after partial removal of the latter from malt extract by kaolin, monopotassium phosphate produced less acceleration, and dipotassium phosphate greater inhibition, than when saccharification was carried out with extracts of normal protein-content.—J. H. L.

Glycogen and yeast-gum from yeast; Preparation of ——. A. Harden and W. J. Young. Chem. Soc. Trans., 1912, **101**, 1928—1930.

The yeast is ground with an equal weight of sand in the machine described by Rowland (J. Physiol., 1901, **27**, 53), then extracted by boiling with water, and the cooled and filtered solution treated with an equal volume of alcohol. The precipitate is collected, washed with 50 per cent. alcohol, digested with a 60 per cent. solution of potassium hydroxide for 2 hours on the water-bath, the liquid cooled, poured into an equal volume of water, filtered, and the filtrate treated with twice its volume of alcohol. The precipitate is collected, washed repeatedly with a mixture of 400 c.c. of water, 100 c.c. of 50 per cent. potassium hydroxide solution, and 500 c.c. of alcohol, and afterwards with 50 per cent. alcohol. It is then dissolved in water, the solution neutralised with acetic acid, and treated with an equal volume of alcohol. The precipitated glycogen is freed from yeast-gum (this J., 1894, 411, 1213) by dissolving in water and saturating the solution with ammonium sulphate; the glycogen is precipitated, whilst the yeast gum remains in solution. This operation is repeated three times, the precipitated glycogen being each time washed with a saturated solution of ammonium sulphate. The glycogen is then dissolved, the solution dialysed to remove ammonium sulphate, the glycogen precipitated with alcohol, further purified by repeatedly dissolving in water and re-precipitating with alcohol, and finally dehydrated with absolute alcohol and ether, and dried in air.

From the ammonium sulphate solution the yeast-gum may be obtained by dialysing and precipitating with alcohol. The precipitate is re-dissolved in a small volume of water, any trace of glycogen removed by again saturating with ammonium sulphate. The solution is then dialysed, and precipitated with alcohol, after which the precipitate is dehydrated with absolute alcohol and ether. Yeast-gum obtained in this way, after drying *in vacuo* at 100° C., yielded 4·9 per cent. of ash, and had $[\alpha]_D = +66{\cdot}76^\circ$. On hydrolysis it yields a reducing sugar, probably mannose.

Glycogen may also be prepared from yeast juice obtained by Buchner's method, the latter being boiled, filtered, precipitated by addition of alcohol, and the precipitate treated with potassium hydroxide and then as described above.—A. S.

Beer; Production of —— with de-carbonated water, and the results obtained under practical conditions. O. Elsässer. Z. ges. Brauw., 1912, **35**, 483—484.

The author confirms the view that de-carbonation of hard brewing water (cp. Roehlitzer, this J., 1911, 1402) improves the quality of the wort and beer. Thus, comparative experiments on the practical scale showed that whilst with the original water, saccharification of the mash was incomplete, the wort had a reddish tint, and the last runnings from the mash tun had an offensive odour, these difficulties were overcome by de-carbonating the water: moreover, the yield of extract was increased from 73·2 to 74·4 per cent., the latter value being practically equal to the laboratory yield. The de-carbonation of the water also caused an improvement in the fermentation; the wort yielded a more abundant head, and, unlike that prepared with the untreated water, showed no tendency to ferment too rapidly. The beers prepared with the de-carbonated water possessed a very fine flavour and hop aroma and good head-retaining power. In brewing dark beers also, the use of de-carbonated water was found to give very satisfactory results, the increase in the yield of extract being even greater than that obtained in brewing pale beers.—L. E.

Chinosol [quinosol], a disinfectant for bacteriological work. Zikes. *See* XIXb.

Patents.

Malting machine. J. Sleeman, Stonehouse, Gloucester. Eng. Pat. 22,204, Oct. 9, 1911.

A rotatable chamber is divided by a perforated partition into a rectangular grain chamber having a perforated wall opposite the partition, and an air chamber, or it is divided by perforated partitions into a grain chamber and air chambers on either side. The partition is made in sections, each separate and (1) capable of being drawn back close to, and parallel with, the wall of the air chamber, or (2) capable of being moved by sliding in guide frames, and adapted to be withdrawn from the chamber, or (3) hinged, and capable of being moved back against the wall of the air chamber. The grain chamber is charged with steeped grain and air is forced or drawn through the latter. When it is desired to loosen the mass of grain, the air- and grain chambers are converted into one chamber by moving or withdrawing the sections of the partition, and the whole is rotated.—L. E.

Malting; Process of ——. H. Heuser, Chicago. U.S. Pat. 1,041,282, Oct. 15, 1912.

The grain is steeped alternately in still water and in water descending upon the whole surface of, and passing with substantial uniformity through, the body of grain. —L. E.

Fermentation; Manufacture of products of ——. A. Fernbach, Paris, and E. H. Strange, London. Eng. Pat. 15,203, June 29, 1911.

The fermentation is conducted in a closed vessel connected with a condensing vessel, and, by means of a pump, such a high degree of rarefaction is maintained in the fermentation vessel that the chief products of fermentation (*e.g.* amyl, butyl and ethyl alcohols and butyric, propionic and acetic acids) are removed as they are formed. The fermentation is thus considerably accelerated, as the products of fermentation, which would otherwise impede the fermentation, are removed. The degree of rarefaction produced, must be such that the fermenting liquid will either boil, or, if gases be evolved, they will carry over a large proportion of vapour with them. If the fermentation vessel be provided with means for supplying sterilised water, the substances to be fermented, and any other material required, the fermentation may be carried on as a continuous process. To prevent the loss of volatile products, and to facilitate the production of a high degree of exhaustion in the fermentation vessel, means may be provided for absorbing the gases (as distinguished from the vapours) evolved; thus, carbon dioxide may be absorbed by soda lye or milk of lime, this absorption being effected before or when the vapours are condensed.—L. E.

Alcohols; Manufacture of higher ——. A. Fernbach, Paris, and E. H. Strange, London. Eng. Pat. 15,204, June 29, 1911.

Yeast, or a mixture of yeast and carbohydrate material is intimately mixed with water; the whole is sterilised and treated with a proteolytic bacterium such as *Tyrothrix tenuis* (or an enzyme prepared therefrom) and with the butylic bacillus of Fitz or like ferment. Thus, a mixture of 100 lb. of yeast, 10 lb. of maize meal and 1000 lb. of water, is treated with the above-mentioned ferments, aerated for 24 hours, and kept at a temperature of 30°—35° C. for 1—5 weeks, access of air being prevented during the last week of fermentation. The higher alcohols thus formed can be obtained by distillation.—L. E.

Brewing; Improvements in ——. M. Hessberg, London. Eng. Pat. 13,721, June 12, 1912.

The albuminous matter which separates from wort in the coolers, and which contains hop bitter substances, is added, with or without the spent hops, to the mash of the succeeding brew. The raw hops are preferably ground before use, and the wort may be turned out of the boiler into the coolers without straining from the spent hops. The advantages claimed are economy of hops, saving of the wort contained in the spent hops and in the cooler residue, and increased nutrient value of the spent grains owing to the albuminous matter added to the mash. —J. H. L.

Alcohol; Evaporating-pan for driving off —— *from malt liquors.* H. E. Deckebach, Cincinnati, Ohio. U.S. Pat. 1,040,287, Oct. 8, 1912.

A rotatable hollow shaft, working in combination with a receptacle for liquids, is provided throughout its length with a number of obstructing diaphragms. U-shaped tubes are mounted on the shaft, and each tube subtends one of the diaphragms and communicates with the interior of the shaft. A paddle is mounted on each tube, and means are provided for delivering fluid to the shaft and tubes.—L. E.

Alcohol; Process of making ——. K. Kiefer, Cincinnati, Ohio. U.S. Pat. 1,041,298, Oct. 15, 1912.

Wort is impregnated with carbon dioxide under pressure, and fermented under pressure with yeast accustomed to a large amount of carbon dioxide.—L. E.

Yeast; Process of maintaining the vitality of the active organisms in dried ——. P. D. H. Ohlhaver, Sande, Germany. Eng. Pat. 27,573, Dec. 8, 1911. Under Int. Conv., March 1, 1911.

See Fr. Pat. 436,915 of 1911; this J., 1912, 454.—T. F. B.

Method of manufacturing alcohol from sulphite liquor. U.S. Pat. 1,042,332. *See* V.

XIXa.—FOODS.

Butter; Fatty acids of ——. I. Smedley. Bio-Chem. J., 1912, 6, 451—461.

This paper is an account of an investigation into the acids present in butter fat. No evidence of the presence of acetic acid was obtained. The hexoic acid present, caproic acid, possesses the normal structure; the iso-form was absent. The proportion of stearic acid was 10—15 per cent. Evidence was obtained of the presence of lower members of the oleic acid series, the iodine value of the decoic ester fraction being appreciably greater than those of the fractions immediately preceding and following it. The sodium nitroprusside reaction characteristic of aceto-acetic acid was given by the butyric ester fraction in two out of five samples of butter, so that there is the possibility of that acid being present in butter-fat.—J. H. J.

Oleomargarine in Denmark. Oil, Paint, and Drug Rep., Oct. 28, 1912. [T.R.]

While Denmark is one of the largest producers of butter and her supplies of the best grades of butter are marketed in England, the Danish people have come to be the largest consumers of oleomargarine, preferring this product at the prevailing prices rather than the most costly butter. Denmark's production of margarine by the twenty-seven factories was 78,043,630 lb. in 1911, while importations were 3,306,930 lb. more than exportation, so that total consumption was 81,350,560 lb., or 29·32 lb. per capita. The Danish production and consumption of margarine have both been increasing during the last few years. A remarkable change in the use of raw materials has taken place in the margarine industry. While, for instance, in 1908 about 70 per cent. of the raw materials used in the manufacture of margarine in Denmark consisted of animal fat, and 30 per cent. of vegetable fat, the proportion is now the opposite, so that the vegetable fat used now amounts to about 70 per cent. This change appears to be a result of the high prices of cattle of late years. Most of the raw materials are imported from abroad, especially those of animals, while considerable quantities of copra and sesamé oils are pressed by the Danish mills.

Cocoa, tea, coffee, and their preparations; Determination of xanthine bases in ——. S. Camilla and C. Pertusi. Giorn. Farm. Chim., 1912, **61**, 337—344, 385—391. Chem. Zentr., 1912, **2**, 1581.

For the detection of small quantities of xanthine bases, the basic compounds, isolated from the substance under examination by any suitable method, are treated with a few drops of concentrated potassium hydroxide solution and then, gradually, with a saturated solution of permanganate. If xanthine bases be present, reduction of the permanganate and evolution of gas take place, and a characteristic odour of carbylamine becomes perceptible.

For the quantitative determination, 10 grms. of chocolate or cocoa are boiled for ½ hour with 150 c.c. of water and 50 c.c. of $N/1$ sulphuric acid, the mixture is made up to 500 c.c., and filtered hot. 250 c.c. of the cooled filtrate are neutralised with magnesia, concentrated to 80 c.c. on the water-bath, acidified with sulphuric acid, and extracted with carbon tetrachloride for 2—3 hours in a special apparatus. The carbon tetrachloride solution (containing the fat, caffeine, and a little theobromine) is treated with a small piece of paraffin and evaporated to dryness, and extracted several times with boiling water acidified with sulphuric acid. The filtered acid solution is mixed with the residual liquid from the extraction with carbon tetrachloride, evaporated to dryness with 5 grms. of magnesia and extracted four or five times, for 10 minutes each time, with separate portions of 100 c.c. of boiling chloroform. On evaporation of the chloroform solution, the xanthine bases are usually obtained in a sufficiently pure condition. If, however, the residue is coloured, it is purified by treatment with a 1 per cent. permanganate solution, and extracting the pink solution with chloroform. The method has been applied successfully to tea, raw and roasted coffee, and coffee substitutes, in addition to chocolate and cocoa.—A. S.

Hays and fodders; Composition and digestibility of the ether extract of ——. G. S. Fraps and J. B. Rather. Texas Agric. Expt. Stn., Bull. No. 150, Aug., 1912. Pp. 29.

Previous work had indicated that the ether extract of hays and fodders may contain substances other than fat. This has been confirmed, and the digestibility of the ether extract studied with sheep. In the case of hays, after saponification of the ether extract, it is not possible to extract the unsaponifiable matter from the soap solution by shaking with ether and a special procedure has been devised to effect this separation. The saponified material contains fatty acids, chlorophyll products and other substances. The unsaponifiable matter is composed largely of wax alcohols; a crystallised alcohol, probably myricyl alcohol, was isolated and alcohols of lower molecular weight are present in the mother liquors. The average amount of unsaponifiable matter in the fodders was 58 per cent. The average amount of lecithin was 1·25 per cent. if all the phosphoric acid was present as lecithin. The chlorophyll derivatives averaged 6·4 per cent., the figure being based on the nitrogen present. The average digestibility of the unsaponifiable matter was 29·1 per cent., and of the saponifiable, 66·4 per cent. The low digestibility is due to the presence of wax alcohols, waxes, chlorophyll, etc., in the ether extract, which is incorrectly designated by the term "fats or oils."—E. F. A.

Determination of oxalic acid in vegetable products. Grégoire and Carpiaux. *See* XXIII.

Patents.

Sugar; Improved ——. L. C. Reese, London. Eng. Pat. 22,059, Oct. 6, 1911.

Claim is made for a sugar containing (1) such a quantity of a vegetable extract (*e.g.* of bran) "rich in organic-mineral matter, or the latter in a more refined state, that the sugar when incinerated, yields about 1·5 per cent. of ash in consequence of such addition," or (2) such a quantity of glycerophosphates, mixed according to physiological requirements, that the sugar yields 0·75—1 per cent. of ash. The product, which is intended to supply the deficiency of "organic-mineral salts" in ordinary diet, is prepared by mixing the ingredients in the form of fine powders, or in concentrated solution.—L. E.

Edible products from bassia seeds; Manufacture of ——. M. Monhaupt, Altona-Ottensen, Germany. Eng. Pat. 23,595, Oct. 25, 1911.

See U.S. Pat. 1,030,674 of 1912; this J., 1912, 697. The solvent used may be methyl alcohol or another alcohol or mixtures of alcohols, or acetone.—T. F. B.

Waters; Process and apparatus for the manufacture of mineral ——. J. Bienz, Bern, Switzerland. Eng. Pat. 1735, Jan. 22, 1912.

Water, which may have been previously impregnated with carbon dioxide or the like, is passed through an apparatus in which tablets of one or more mineral salts are crushed by a special device. The water dissolves the salts and then passes into syphons or bottles.—L. E.

Coffee: Process of removing the toxic constituents from ——. H. de Pury, Neuchatel, Switzerland, Assignor to Atoxicafe S.A., Clarens, Switzerland. U.S. Pat. 1,041,160, Oct. 15, 1912.

The ligneous cells of the green coffee beans are caused to burst, and the beans are then roasted in presence of a current of hot air.—L. E.

Food products; Process of preserving ——. E. D. Schmitt, Assignor to The Pure Food Process Co., Baltimore. U.S. Pat. 1,041,518, Oct. 15, 1912.

See Eng. Pat. 23,357 of 1911; this J., 1912, 895.—T.F.B.

Grain, pulse, and the like: Process of treating ——. C. Jaquet, Assignor to Schneider, Jaquet, und Co., G. m. b. H., Königshofen, Germany. U.S. Pat. 1,041,629, Oct. 15, 1912.

See Eng. Pat. 7178 of 1911; this J., 1911, 1027.—T. F. B.

XIXb—WATER PURIFICATION; SANITATION.

Chalk waters; Influence of sodium chloride on the composition of ——. C. Gillet. Bull. Soc. Chim. Belg., 1912, **26**, 463—465.

Assuming that all solution is the result of chemical action, then the solution of calcium carbonate in water may be expressed as follows: $2CaCO_3+2H_2O \rightleftarrows Ca(OH)_2+CaH_2(CO_3)_2$. That this is so is proved by the fact that the solution reacts with alizarin red, giving a red precipitate and a yellow solution, showing the presence of a calcium salt. The solution is alkaline to phenolphthalein, proving the existence of calcium hydroxide, the colour disappearing on addition of ammonium chloride owing to the neutralisation of the free lime, while the ammonia liberated precipitates the calcium bicarbonate present. The presence of carbonic acid in waters charged with that gas increases the solubility of the chalk, for it removes one phase of the system, namely calcium hydroxide, and so allows more carbonate to dissolve. Further, if sodium chloride is added to the chalk solution, it reacts with the calcium hydroxide, producing sodium hydroxide, which reacts with the calcium bicarbonate forming the normal carbonate. The presence of sodium chloride causes a small quantity of calcium chloride to remain in solution as well as sodium carbonate; the solution ought therefore to be alkaline to alizarin red and to phenolphthalein, which was found to be the case. These reactions explain the change in the composition of certain chalk waters in Belgium in passing through beds containing salt. —J. H. J.

Ultra-violet rays; Powerful lamp for —— and its use in the sterilisation of large quantities of water. V. Henri, A. Helbronner, and M. de Recklinghausen. Comptes rend., 1912, **155**, 852—854.

The lamp consists of a quartz U-tube, the sides of which nearly touch one another; the diameter of the tubing is 14 mm. and the length of the sides 160 mm. The two mercury electrodes are side by side. The lamp takes a current of 500 volts, with a difference of potential between the electrodes of 375—390 volts, and with an intensity of 3 ampères. The illuminating power perpendicular to the axis is 8000 candles. Chemical reactions brought about by ultra-violet rays are very greatly accelerated by the use of the new lamp. Germicidal action on *B. coli* is sixty times as rapid as with a 110-volt lamp. For sterilising large quantities of water the lamp is placed in a cylinder of transparent quartz; this is placed in the centre of the tank through which the water passes, and, by a series of baffles, the water is made to circulate round the cylinder. In this way the lamp burns as in air, and the utilisation of the rays is complete. As to the life of the new lamp, the authors say that an installation of 8 lamps has been at work 1200 hours without change, the strength of the rays being tested each day by the rapidity of the blackening of silver citrate paper exposed to them.—J. H. J.

Disinfection; Mechanism of ——: relations of phenol and metacresol to proteins. E. A. Cooper. Bio-Chem. J., 1912, **6**, 362—387.

The depressing effect of separated milk upon the germicidal action of phenol was found to be due to the absorptive capacity of the casein for phenol. The superiority of *m*-cresol to phenol as a germicide arises from the fact that cresol precipitates proteins in lower concentration than phenol. The main conclusion of the paper is that the absorption of the phenols by bacteria is merely the initial stage in the process of disinfection. The germicidal action which follows the absorption is due to the precipitation of the proteins when a certain concentration of phenol is reached. In the case of egg-albumin the change is irreversible, and the precipitated protein does not again go into solution on removal of the phenol. Thus the germicidal action of phenol is similar in mechanism to that of heat.—J. H. J.

Chinosol (quinosol), a disinfectant for bacteriological work. H. Zikes. Allgem. Z. Bierbrau. u. Malzfabr., 1912, **40**, 599—600. (See also this J., 1891, 903; 1896, 609; 1909, 1166.)

This compound, a derivative of hydroxyquinoline ($C_9H_6NOSO_4K + H_2O$ or $\frac{1}{2}H_2O$), is a yellow crystalline, non-hygroscopic powder, very soluble in water, forming clear neutral solutions which can be kept indefinitely without undergoing change. At a concentration of 1 in 1000 its solutions possess as great a bactericidal action as mercuric chloride solutions of the same strength. It occurs in commerce in the form of pastilles (0·5 and 1 grm.), and for the same disinfectant action, it is much cheaper than mercuric chloride. The author has found it very suitable for disinfecting apparatus, benches, or the hands of operators.—J. H. L.

Patents.

Colloidal metals or colloidal salts of metals [for germicidal purposes]; Production of ——. H. Crookes and L. Stroud, London. Eng. Pats. 21,521 and 21,528, Sept. 29, 1911.

A very dilute solution of salts of such metals as have a germicidal action when in colloidal solution, of about the order of one in a thousand, is added (by preference, gradually and with stirring) to a cooled dilute mixture obtained, in known manner, by dissolving an organic substance such as peptone, gelatin, dextrin, or meat extract, in distilled water, with an addition of common salt. For example, 300 grains of peptone and 800 grains of common salt are boiled with 1 quart of distilled water until the peptone is completely dissolved, and, after cooling, the solution is filtered and made up to its original volume. The solution is mixed, in equal volume, with a solution obtained by dissolving 27·59 grains of silver nitrate in 1 quart of water, and the mixture is allowed to stand for 24 hours; it is then heated for 48 hours at about 100° F. (38° C.), and the supernatant liquid separated from any precipitate. As an alternative method of preparation, "organic salt solutions" are boiled in contact with the particular metal which it is desired to transform into colloid form. Metal colloids obtained by either method are said to be stable and not precipitated either by electrolytes or by weak electric currents, up to 100 milli-ampères, and claim is made for their use in the sterilisation of foods, drugs, and water.—F. Sodn.

Apparatus for mixing liquids. Eng. Pat. 262. *See* I

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Acids; A characteristic relation between the strength and action [on alkaloids, etc.] of ——. II. P. Rabe. Ber., 1912, **45**, 2927—2933.

Certain of the cinchona alkaloids were heated to about 98° C. with $N/1$ acetic or hydrochloric acids for about 10 hours. The liquid was made alkaline with sodium hydroxide solution and extracted with ether. The amount of basic substance left in the ether after drying with potassium carbonate, gave the measure of the conversion of the cinchona alkaloid into the corresponding toxine. The conversion takes place readily with acetic acid, but not with hydrochloric acid. The amount of toxine formed from cinchonine when heated with acetic acid is 57·6 per cent., and from quinine 51·2 per cent. The same isomerisation takes place to a very small extent when quinine and cinchonine are heated to 98° C. with benzene or 80 per cent. alcohol. When narcotine was heated in the same way with dilute acetic acid, gnoscopine, nor-narceine, cotarnine and meconine were formed. Using dilute sulphuric acid instead, traces of meconine only could be detected. Choline was heated similarly with acetic and hydrochloric acids, and about 66—70 per cent. was subsequently recovered unchanged. Trimethylamine was not found. Oleic acid suffers no change when heated with a little acetic acid to 98° C.—F. Shdn.

Saponin ; Methods of determination of ——. M. Korsakoff. Comptes rend., 1912, **155**, 844—846.

An examination of the baryta method showed that the results were inexact, because the baryta did not precipitate the whole of the saponin and precipitated other substances besides. The magnesia method gave low results owing to the saponin not being entirely insoluble in cold alcohol. The author recommends the following method. The plant is completely dried, pulverised finely and treated with boiling 60 per cent. alcohol. After filtration the alcohol is distilled off, and the residue is evaporated with calcined magnesia. The magnesia cake is pulverised, exhausted with boiling 80 per cent. alcohol, filtered, and the filtrate precipitated with ether. The precipitate is dissolved in dilute sulphuric acid and hydrolysed by heating in an autoclave at 105° C. for an hour. The liberated sapogenin is washed with water till neutral, dissolved in absolute alcohol, the solution evaporated to dryness, and the sapogenin weighed. From this weight the corresponding weight of saponin is calculated.—J. H. J.

Camphor dissolved in carbon tetrachloride ; Optical rotation of ——. M. A. Faucon. Bull. Soc. Chim., 1912, **11**, 928—931.

A solution of camphor in carbon tetrachloride does not show bi- or multirotation. From observations of the optical rotations of solutions of varying concentration at 15·2° to 15·4° C., the following formulæ are deduced : $[a]_D = 43 \cdot 56° + 0 \cdot 1148\,c$, where c represents the number of grms. of camphor in 100 c.c. of solution and lies between 25 and 55 ; and $[a]_D = 56 \cdot 65° - 0 \cdot 12631\,q$, the latter representing the number of grms. of solvent in 100 grms. of solution and having a value between 90 and 60. When c lies between 4 and 18, the equation becomes $[a]_D = 44 \cdot 56° + 0 \cdot 0134c - 0 \cdot 0003614c^2$. With q between 98 and 93, $[a]_D = 44 \cdot 95° - 0 \cdot 1168\,q + 0 \cdot 0006225\,q^2$. Observations were then made at temperatures between 12° and 39° C. With $c = 52 \cdot 073$, $[a]_D = 47 \cdot 29° + 0 \cdot 1353\,t$; $c = 18 \cdot 59$, $[a]_D = 42° \cdot 93 + 0 \cdot 1669\,t$; $c = 11 \cdot 158$, $[a]_D = 41 \cdot 43° + 0 \cdot 2126\,t$; $c = 7 \cdot 439$, $[a]_D = 41 \cdot 21° + 0 \cdot 2159\,t$.—F. Shdn.

Patents.

Emanations given off by radio-active substances ; Apparatus for absorbing and accumulating ——. C. Abel-Musgrave, Brighton. Eng. Pat. 21,462, Sept. 29, 1911.

The apparatus, which is intended for use in therapeutic treatment by means of radio-active emanations, consists of a box or container, formed with openings for the admission and escape of air or other gas, preferably under pressure, and containing an absorptive substance, such as porous carbon, charged with radio-active emanations. The absorptive substance may be suitably enclosed in an inner cage of open wire-work, and the box is made preferably of a dielectric substance, such as vulcanite, and is provided with terminals, in electrical connection with the cage, so that the substance may be charged electrically (a voltage of 1000 volts or more being used), since it is claimed that the absorption of radio-active emanations by carbon, gels, etc., is increased when these substances are subjected to a negative electric potential and that the liberation of the absorbed emanation is facilitated by subjecting the material to a positive electric potential. There may also be means, such as a mica slide in the lid of the box, for regulating the escape of the extracted emanations. —F. Sodn.

Aliphatic hydrocarbons with more than one double linkage [isoprene, etc.] ; Process for producing ——. Farbenfabr. vorm. F. Bayer und Co. First Addition, dated April 23, 1912, to Fr. Pat. 433,322, Aug. 16, 1911. Under Int. Conv., May 17, 1911.

In place of the "terpenes" used in the principal patent (this J., 1912, 151), dipentenes or products forming dipentenes when decomposed, are used. They are stated to give better yields of isoprene than turpentine oil.—T. F. B.

Phenylethylbarbituric acid. H. Hoerlein, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Reissue No. 13,477, Oct. 15, 1912, of U.S. Pat. 1,025,872, May 7, 1912.

See this J., 1912, 702.—T. F. B.

Allyl derivative of barbituric acid and process of making same. E. Preiswerk and E. Grether, Assignors to Soc. of Chem. Industry in Basle, Switzerland. U.S. Pat. 1,042,265, Oct. 22, 1912.

See Eng. Pat. 9078 of 1912 : this J., 1912, 795.—T. F. B.

Hydrocinchona alkaloids ; Manufacture of esters of the ——. H. Thron, Assignor to Verein. Chininfabr. Zimmer und Co., Frankfort-on-Maine, Germany. U.S. Pat. 1,041,528, Oct. 15, 1912.

See Eng. Pat. 27,952 of 1911 ; this J., 1912, 843.—T. F. B.

Solvents [; Use of phthalic esters as ——]. A. Hesse. First Addition, dated May 7, 1912, to Fr. Pat. 416,806, June 4, 1910. Under Int. Conv., May 19, 1911.

See Ger. Pat. 251,237 of 1911 ; this J., 1912, 1054.—T.F.B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photographic developers , Physico-chemical studies on ——. *I. Quinol-sulphite.* N. Schilow and S. Fedotoff. Z. Elektrochem., 1912, 18, 929—939.

The oxidation of quinol by oxygen is not only retarded, but is also rendered more regular by the addition of sulphite. It is probable that the reaction occurs in at least three stages, as indicated by the changes of colour and the rates of oxygen absorption. During the first stage the sulphite and the quinol are both oxidised ; the amount of sulphate formed does not correspond with the amount of sulphite removed as shown by titration with iodine, the difference corresponding to a ratio of two mols. of sulphite to one mol. of quinol. Cryoscopic determinations strengthen the view that the oxidation products of quinol form addition products with sodium sulphite. In order to produce its full effect, the sulphite must be added to the quinol before oxidation commences, since after a very short interval quinol is converted into oxidation products which cannot combine with sulphite.—T. F. B.

Photographic developers ; Physico-chemical studies on ——. *II. Oxidation of ferro-ions in presence of oxalate-ions.* N. Schilow and B. Berkenheim. Z. Elektrochem., 1912, **18**, 939—943.

When ferrous sulphate is oxidised in presence of increasing amounts of potassium oxalate, the oxygen absorption rises rapidly to a maximum and then becomes constant ; on the other hand, when the oxalate is kept constant and the amounts of ferrous sulphate are increased, the same maximum is reached, but the oxygen absorption immediately falls again. The maximum corresponds to the formation of the complex ion, $Fe(C_2O_4)''_2$, for the complete oxidation of which a certain concentration of oxalic acid, viz., 3 mols. of oxalate to one mol. of ferrous salt, is necessary. —T. F. B.

Opacity to X-rays of fabrics appropriately loaded with lead salts. Droit. *See* V.

Patent.

Photographic developers. Soc. Anon. des Mat. Col. et Prod. Chim. de Saint-Denis. Fr. Pat. 441,639, Aug. 12, 1911.

The sulphonic or carboxylic acids of quinonisable derivatives of diphenylamine, phenylnaphthylamine, and dinaphthylamine are claimed as photographic developers: they are preferable to the compounds mentioned in Fr. Pat. 429,380 (this J., 1911, 1232) on account of their greater solubility and of the absence of stain in the developed prints. The following are mentioned as especially suitable:—*p*-Hydroxydiphenylamine-*o*-sulphonic acid, *p*-aminodiphenylamine-*o*-sulphonic acid, *p*-amino-*p'*-hydroxydiphenylamine-*o*-sulphonic acid; *pp'*- and *op'*-diaminodiphenylamine-*o*-sulphonic acid, etc.—T. F. B.

XXII.—EXPLOSIVES; MATCHES.

Tetranitroaniline, a new high explosive. B. Flürscheim. Eighth Int. Cong. Appl. Chem., 1912. Sect. IIIb, Orig. Comm., 4, 31—33. (See also this J., 1911, 275, 385; 1912, 66).

Tetranitroaniline, obtained by the nitration of *m*-nitraniline, is stated to have an explosive power, as measured by the lead block test, greater than that of any other solid compound, though inferior to that of nitroglycerin. It gives Abel heat tests of over 1 hour, and under the falling hammer, detonates with 5 kilos. at 35 cm.; it can be compressed at high pressures, either alone or with nitrates, without losing its capacity of being easily detonated. W. Macnab has obtained the following results on firing (by means of No. 8 fulminate detonators) tetranitroaniline and some mixtures in a large calorimetric bomb from which the air had been pumped out:—

Charge.	Calories per grm.:		Permanent gas per grm.	Composition of permanent gas:				
	Water liquid.	Water gaseous.		Carbon dioxide.	Carbon monoxide.	Methane.	Hydrogen.	Nitrogen.
			c.c.	per cent.	per cent.	per cent.	per cent.	per cent.
Tetranitroaniline, 55 grm. charge...	1017	—	827	21·5	38·3	1·2	15·1	23·9
,, 100 grm. charge ..	1018	—	—	25·0	33·1	0·6	18·5	22·8
Mixture of 86 per cent. of ammonium nitrate, 8 of trinitrotoluene and 6 of charcoal	1131	903	411	26·3	3·3	—	8·5	61·9
Mixture of 81 per cent. of ammonium nitrate, 13 of tetranitroaniline and 6 of charcoal	1160	933	443	37·7	3·5	—	4·1	54·7
Mixture of 87 per cent. of ammonium nitrate, 7 of 23 per cent. of "tetra" and 77 per cent. of dinitrobenzene, and 6 of charcoal	1154	913	416	26·5	4·1	—	8·5	60·9

—A. S.

The preparation described as P_4S_{10} in Ger. Pat. 239,162. Stock and Friederici. *See* VII.

Patents.

Explosives. A. T. Cocking and Kynoch, Ltd., Birmingham. Eng. Pat. 22,311, Oct. 10, 1911.

Pulped nitrocotton, in water, is agitated with steam and compressed air to a temperature near the boiling point of water. An emulsion of liquid trinitrotoluene and hot water is then injected into the mass. The water is removed by pressure and the lightly compressed material is dried. Nitroglycerin is then added and, on incorporation, a jelly is formed. An example of a high explosive, so manufactured, is trinitrotoluene (9 parts), nitrocotton (4), nitroglycerin (73½), and sodium nitrate (13 parts). Trinitrobenzene may be employed in place of trinitrotoluene. —G. W. McD.

Explosives; Manufacture of ——. P. E. C. Corbin, Assignor to Soc. Universelle d'Explosifs (ancien. Bergès, Corbin, et Cie.), Paris. U.S. Pat. 1,041,745, Oct. 22, 1912.

The grains of an explosive inflammable with difficulty and not easily detonated are coated with a layer of an explosive (*e.g.*, black powder), which is difficult to detonate but is readily inflammable. For example, the explosive inflammable with difficulty is introduced into a cask, to which are then added the desired quantity of the easily inflammable explosive and the necessary quantity of a liquid containing an adhesive in suspension, after which the cask is rotated and the grains of explosive dried by causing the liquid to evaporate slowly. —A. S.

[*Explosives*] *Process for rendering stable gelatinised powders, explosives having a nitroglycerin base, and all other powders obtained by the action of a mixture of nitric and sulphuric acids.* P. Allyre. Fr. Pat. 443,555, Mar. 25, 1912.

In the case of gelatinised powders, such as French B powder, the guncotton employed in the manufacture is boiled with a concentrated solution of ammonium chloride for half an hour, and then dried in the sun. Other explosives are treated in a similar manner, and in the case of nitroglycerin powders such as cordite, the guncotton and the nitroglycerin used in the manufacture are treated separately.—H. H.

Explosives. O. Silberrad. Fr. Pat. 444,725, June 7, 1912. Under Int. Conv., June 10, 1911.

See Eng. Pat. 13,860 of 1911; this J., 1912, 1009.—T. F. B.

XXIII.—ANALYTICAL PROCESSES.

Copper; Quantitative separation and determination of —— *by means of hydroxylamine hydrochloride.* A. Bayer. Z. anal. Chem., 1912, 51, 731—735.

Copper salts may be accurately determined by reduction, in boiling alkaline solution containing alkali tartrate, by means of hydroxylamine, the precipitated cuprous oxide being subsequently converted into cupric oxide in the usual way. Silver salts should be first removed, but the accuracy of the determination is not affected by the presence of antimony, zinc, bismuth, lead, iron, arsenic, tin, ammonium salts, or nitrates, and an excess of the reagent does not interfere with the determination of other metals. In the case of minerals, alloys, etc., especially in the suspected presence of manganese, cobalt, or nickel, it is recommended that the solution, free from nitric acid, be precipitated with hydrogen sulphide, the precipitate oxidised with nitric acid, and the solution evaporated with sulphuric acid, before proceeding to the reduction. Mercury is liable to be precipitated with the copper, but is volatilised on ignition without affecting the result. —F. SODN.

Beryllium; Gravimetric determination of ——. B. Bleyer and K. Boshart. Z. anal. Chem., 1912, **51**, 748—755.

COMPARATIVE experiments on the precipitation of beryllium as hydroxide by means of ammonia, ammonium sulphide, and a mixture of potassium iodide and iodate (Glassmann; Ber., **39**, 3368) respectively have led the authors to recommend the following method for the determination of this element. The solution, contained in a platinum or porcelain dish, is treated in the cold with ammonium chloride and a slight excess of ammonia, and the precipitate formed is allowed to settle, after which it is washed, by decantation and suction successively, with hot water containing ammonium nitrate and a little ammonia, until free from chloride, the precipitate clinging to the dish being wiped off with a piece of filter paper. Finally, the moist filter and precipitate are introduced into a platinum crucible and ignited to constant weight.—F. SODN.

Oxalic acid in vegetable products; Determination of ——. A. Grégoire and E. Carpiaux. Bull. Soc. Chim. Belg., 1912, **26**, 431—434.

THE method is suitable for substances of diverse constitution, such as oil-cakes. 5 grms. of the powdered substance, preferably free from fat, are digested with 20 c.c. of 4 per cent. hydrochloric acid on the water-bath for an hour. Then a small quantity of dry sodium sulphate is added to precipitate calcium, and, after cooling, about 100 c.c. of alcohol. After deposition, the liquid is poured through a filter and the deposit is washed with alcohol; this ensures that most of the nitrogenous matter is left on the filter. To the filtrate is added a slight excess of ammonia, the alcohol boiled off, and the residue taken up in water acidified with hydrochloric acid and then filtered. To the solution obtained is added an acetic acid solution of calcium acetate to precipitate the oxalic acid, which is filtered off, washed and re-dissolved in hydrochloric acid. The solution is then evaporated, a little 25 per cent. sulphuric acid added, and also sufficient sodium sulphate to produce a dry mass. This is then extracted five or six times with ether, the extract rendered slightly ammoniacal and evaporated, the residue dissolved in water, and the oxalic acid precipitated by calcium acetate in acetic acid solution. The precipitate is collected, ignited and weighed. The precipitate of calcium oxalate obtained is very pure and the results are very concordant.—J. H. J.

Aceto-acetic acid; Detection of —— by sodium nitroprusside and ammonia. V. J. Harding and R. F. Ruttan. Bio-Chem. J., 1912, **6**, 445—450.

THE use of sodium nitroprusside and ammonia followed by the addition of an acid insufficient in amount to neutralise all the ammonia is the Le Nobel test employed to detect small quantities of acetone, *e.g.*, in urine. The authors found, however, that the violet colouration is due to aceto-acetic acid, and not to acetone. The delicacy of the test was compared with that of the ferric chloride test, and it was found that the limit of detection occurred at the dilution of one part of aceto-acetic acid in 30,000 parts for the Le Nobel test, and one part in 7000 for the ferric chloride test.—J. H. J.

Determination of cyanogen compounds in gas liquor. Weisser. *See* IIA.

Determination of Prussian blue in dyed or weighted silk or other fibres. Williams and Dreaper. *See* VI.

Analysis of fuming sulphuric acid. Knorr. *See* VII.

Determination of tungstic and silicic acids. Hermann. *See* VII.

Sensitive reaction for molybdic acid. Melikow. *See* VII.

Determination of potassium in potassium silicate. Wilke-Dörfurt. *See* VII.

Delicate and characteristic reaction for free bromine. Denigès. *See* VII.

Determination of the apparent dry substance [in beet sugar factory massecuites]. Urban. *See* XVII.

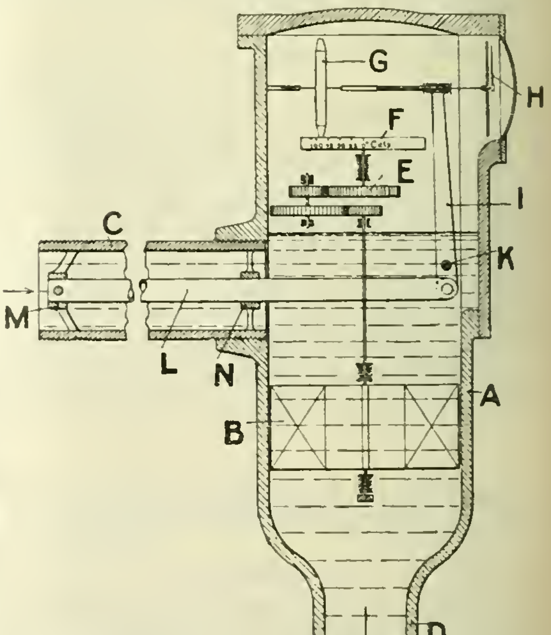
Determination of xanthine bases in cocoa, tea, coffee, and their preparations. Camilla and Pertusi. *See* XIXA.

Determination of saponin. Korsakoff. *See* XX.

PATENT.

Calorimeters for fluids. B. E. D. Kilburn, London. From Gebr. Sulzer, Winterthur, Germany. Eng. Pat. 17,222, July 24, 1912.

THE invention relates to calorimeters for measuring and indicating the heat of a flowing liquid or gas, and capable of being utilised for indicating in hot water heating installations the quantity of heat given off. The casing, A, contains a liquid measuring device, B, through which flows the medium whose quantity of heat is to be measured on its way from the flow, C, to the return pipe, D. The rotation of the water measuring wheel is transmitted by means of gearing, E, to the disc, F. This disc engages a friction wheel, G, whereby its motion is transmitted to



indicating mechanism, H. The friction wheel, G, can be shifted on the disc, F, by means of a lever, I, pivoted at K to the casing, and connected with the lever is a rod, L, secured at M, and passing through the guide, N. The rod, L, expands with the increase of the temperature of the heating medium passing through the apparatus, and shifts the friction wheel, G, over the disc, F, away from the axis of the latter. When the temperature falls the friction wheel is brought nearer to the axis. As the speed of the disc, F, depends upon the quantity of water passing through, the pointer, H, indicates directly the quantity of heat corresponding to the product of the quantity of water and the temperature.—G. W. McD.

XXIV.—MISCELLANEOUS ABSTRACTS.

Alcohols of the fatty series; Absorption of ultra-violet light by saturated ——. Massol and Faucon. Bull. Soc. Chim., 1912, **11**, 931—935.

Determinations of the absorption of ultraviolet light by saturated fatty alcohols were made by means of a quartz spectrograph. The light was supplied by an electric arc between a brass terminal and an iron one covered with an alloy of tin, lead, and cadmium. Impressions on a photographic plate were obtained of wave-lengths lying between 5015 (green) and 2100 Angström units. The liquids were enclosed in a glass vessel with quartz ends, and the thicknesses varied between 1 and 100 mm. Methyl and ethyl alcohols proved very transparent up to a thickness of 10 cm. Propyl alcohol is slightly less transparent and the transparency diminishes slowly with an increase of the thickness. With other normal alcohols, such as butylic, amylic, hexylic, heptylic and melissic, the absorption increases very rapidly with the thickness. The transparency diminishes with the increase of the number of carbon atoms. The secondary alcohols behave in much the same way as the primary alcohols, but a secondary alcohol is slightly more transparent than the corresponding primary one. Tertiary alcohols are much more transparent for the same thicknesses. Methylpropanol, methylbutanol-1·2 (optically active), and methylbutanol-1·3 (optically inactive) are less transparent than the corresponding primary alcohols. They show, with thicknesses of less than 10 mm., two absorption bands, one at the wave-length of 2500—2600, the other at the wave-length of 3100 Angström units. These bands disappear when the thickness is increased above 10 mm., because at that point all waves of a length less than 3100 units are absorbed.

—F. Shdn.

Books Received.

Der Kautschuk. Eine Kolloidchemische Monographie. Von Dr. Rudolf Ditmar. Julius Springer's Verlag, Berlin. 1912. Price M. 6. Bound M. 6.80.

8vo volume, containing 140 pages of subject matter, with 21 illustrations, and one photolithograph plate. The text is classified according to the following plan:—I. The caoutchouc hydrocarbon in the light of colloid chemistry. II. The constituents, and the coagulation of the latex. III. Molecular weight of caoutchouc. IV. The caoutchouc resin as adsorbed substance in the caoutchouc colloid, and the adsorption-isothermal as a characteristic for the different varieties of caoutchouc. V. The Brown-Zsigmondy movement of the globuloids of the latex. VI. Structure of the caoutchouc molecule in the light of colloid chemistry. VII. Acquirement of a tacky or sticky condition by caoutchouc. VIII. Viscosity determinations. IX. Adsorption and diffusion of gases through caoutchouc. X. The caoutchouc colloid a dialytical membrane. XI. Spontaneous ignition of caoutchouc cuttings and refuse. XII. Vulcanisation. XIII. Regeneration of caoutchouc. XIV. Blotches in vulcanised rubber. XV. Para spots ("Parafleckeu"). XVI. The "previous history" of the caoutchouc colloid, and its ageing. XVII. Caoutchouc structures.

A Manual of Modern Steam Laundry Work. For the use of Practical Launderers, Finishers, Manufacturers, Students, and all interested in Chemico-Textile Industries. By Ellis Clayton, Lecturer on Bleaching, Dyeing, and Finishing at the Municipal Technical Institute, Belfast, &c. Simpkin, Marshall, Hamilton, Kent and Co., Limited, London. 1912. Price 12s. 6d. net.

8vo volume, containing 358 pages of subject matter, with 139 illustrations, and including also an Appendix with 6 pages of tables of constants, strengths, etc. There is an alphabetical index of subjects. The subject matter is arranged and classified as follows:—I. The Textile Fibres, and the Materials, Water, and Machinery used in Laundry Work. (i.) Varieties and technology of the textile fibres. (ii.) Materials used in laundry work. (iii.) Water. (iv.) Mechanical appliances of the laundering industry. II. Principles and Practice of Modern Laundry Work. (i.) Work of trading domestic laundries. (ii.) Removal of stains. (iii.) Trade laundry work. (iv.) Institution laundry work. Each of the foregoing subheadings is again classified. Thus, the last, (iv.) is grouped under (*a*) Introductory. (*b*) Foul linen washing. (*c*) Finishing. (*d*) Disinfection.

Brewing. By A. Chaston Chapman, President of the Institute of Brewing, etc. Cambridge: at the University Press. 1912. Price 1s. net.

Small 8vo volume, containing 126 pages of subject matter, with frontispiece, and 13 illustrations, a bibliographic list, classified as "Historical" and "Scientific and General," and an alphabetical index. The subject matter is grouped under the following heads:—I. Early references to brewing, etc. II. Materials used in brewing. III. Mashing. IV. Boiling. V. Cooling. VI. Fermentation. VII. Distribution, including bottling.

Analyse Matières Colorantes Organiques. Par Frédéric Reverdin, Dr. ès Sci. Librairie Georg and Co. Genève, et Bale. [Congrès International de Chimie Appliquée. New York, 1912. International Commission of Analyses. Sub-Commission No. XI.]. (Genève, 10, Corraterie). 1912.

This Report fills 56 pages, and its object is to endeavour to bring about "a unification of analytical methods" for the detection and determination of organic colouring matters. The report sets forth the principal methods for the qualitative analysis of organic dyestuffs as individual substances. Thus, (i.) Rota's method. (ii.) Rota Buzzi's method. (iii.) Formanek's method. Then follow reports collated by the author, and received from the following countries:—Germany (Heermann and Schultz). England (Knecht and Rawson). Austria (Suida, Erban and Schneider). Belgium (Gillet). Spain (Prats-Aymerick). United States (Mulliken, Olney, and Bernhard C. Hesse). France (Halphen and Ehrmann). Italy (Lepetit, Buzzi and Tagliani). Portugal (Ferreira da Silva). Russia (Schaposchnikoff and Porai Koschitz). Switzerland (Böniger). In these reports are stated the leading features of the methods chiefly followed in the countries in question. A chapter of "Conclusions and Proposals by the Reporter" ends the work. The following resolutions were officially adopted by the Congress of Applied Chemistry in New York, in Sept., 1912. (1) "That Sub-Committee XI., of the International Committee on Analyses shall continue its work of inquiry" into the best means of unifying analytical methods for organic colouring matters. (2) That the International Committee shall suggest that all Governments adopt identical regulations concerning the use of organic colouring matters in foodstuffs, etc., and that it shall propose the adoption of uniform analytical methods. (3) A small committee to be appointed to secure with the help of manufacturers, information as to the reactions and analysis of recently introduced organic colouring matters. After compilation of results to bring a Report of the same before the next Congress.

Modern Inorganic Chemistry. By J. W. Mellor, D.Sc. Longmans, Green and Co., 39, Paternoster Row, London. New York, Bombay, and Calcutta. 1912. Price 7s. 6d.

8vo volume, containing 848 pages of subject matter, with 316 illustrations, and an alphabetical index. On the inside cover is a table of atomic weights. The subject matter is planned out as follows:—I. Introduction. II. Combination by weight. III. Water and hydrogen. IV. Combination by volume. V. Physical properties of gases. VI. Hydrogen. VII. Kinetic theory of atoms and molecules. VIII. Oxygen. IX. Water. X. Crystals and crystallisation. XI. Ozone and hydrogen peroxide. XII. Osmotic pressure and related phenomena. XIII. Chlorine and hydrogen chloride. XIV. Relations of chlorine—iodine, bromine, and fluorine. XV. Oxides and oxy-acids of chlorine, bromine, and iodine. XVI. Electrolysis and the ionic hypothesis. XVII. The alkaline earths. XVIII. Beryllium, magnesium, zinc, cadmium, and mercury. XIX. Alkali metals. XX. Electrical energy. XXI. Copper, silver and gold. XXII. Sulphur, etc. XXIII. Sulphur and oxygen. XXIV. Chromium group. XXV. Manganese. XXVI. Iron group. XXVII. Nitrogen and oxygen. XXVIII. Nitrogen and hydrogen. XXIX. Nitrogen and air. XXX. Phosphorus. XXXI. Phosphorus and oxygen. XXXII. Arsenic group. XXXIII. Boron group. XXXIV. Platinum group. XXXV. Oxides of carbon. XXXVI. Hydrocarbons. XXXVII. Allotropic forms of carbon. XXXVIII. Combustion and flame. XXXIX. Carbon and nitrogen compounds. XL. Silicon. XLI. Tin group. XLII. Classification of the elements. XLIII. Radioactivity.

A Dictionary of Applied Chemistry. By Sir Edward Thorpe, C.B., LL.D., F.R.S., Emeritus Professor of Chemistry, Imperial College of Science and Technology, South Kensington, London; etc., etc. Assisted by emminent contributors. Revised and enlarged Edition. In five volumes. Vol. III. Longmans, Green, and Co., 39, Paternoster Row, London. 1912. Price £2 5s. net.

Large 8vo volume, containing 789 pages of subject matter, with 134 illustrations. It commences with a table of abbreviations of the titles of journals and books, and a list of the contributors. The first subject treated of in Vol. III. is Granite, and amongst the articles described in considerable detail, are "Gums," "Gum resins," and "Gutta Percha": Hydrogen: Indigo: Iodine: Iron: Lead: Leather: Madder: Magnesium: Matches: Mercury: Metallography: Milk: Naphthalene: Nitrogen (including nitric acid): Essential Oils, and Oils (fixed) and Fats. The latter five pages of the volume are filled with tables referring to: (I). Vegetable Oils: (II). Vegetable Fats: (III). Animal Oils; and (IV). Animal Fats, and all their chief constants under the general heads of "Characteristics" and "Variables," with "Characteristics" also of the respective Fatty acids. (See also this J., 1912, 561 and 155.)

Industrial and Manufacturing Chemistry. Organic. A practical Treatise. By Geoffrey Martin, Ph.D., M.Sc., etc., Lecturer on Chemistry at Birkbeck College, London, etc. Assisted by the following Specialists:—Wm. Barbour, T. Beacall, A. J. Carrier, Dr. F. Challenger, E. A. Dancaster, Dr. J. Newton Friend, Dr. W. Goodwin, C. H. Griffiths, Dr. G. D. Lauder, D. J. Law, C. A. Mitchell, Dr. H. J. S. Sand, Dr. A. Slator, W. H. Stephens. Crosby, Lockwood and Son, 7, Stationers' Hall Court, Ludgate Hill, London, E.C.; and 5, Broadway, Westminster, S.W. 1912 Price 21s.

Large 8vo volume, containing 662 pages of subject matter, with an additional 4 pages of Appendix devoted to tables. There are alphabetical indexes of names and subjects, and interspersed with the text are 250 illustrations. The subjects treated of are as follows: I. The Oil, Fat, Varnish, and Soap Industry. II. The Sugar Industry. III. The Starch Industry. IV. The cellulose Industry. V. Fermentation Industries. VI. The Charcoal and Wood-Distilling Industries. VII. The Turpentine and Rosin Industry. VIII. Industrial Gums and Resins. IX. The Rubber Industry. X. The Industry of Aliphatic Chemicals. XI. Illuminating Gas Industry. XII. Industry of Coal-Tar and Coal-Tar Products. XIII. Industry of the Synthetic Colouring Matters. XIV. Industry of Natural Dyestuffs. XV. The Ink Industry. XVI. Paints and Pigments. XVII. Textile Fibres; Bleaching and Water-proofing. XVIII. Dyeing and Colour-Printing. XIX. The Leather and Tanning Industry. XX. Glue, Gelatin and Albumin. XXI. Industry of Modern Synthetic and other Drugs. XXII. Modern Explosives. XXIII. Photographic Chemicals.

Report on the Utilisation of Peat Fuel for the Production of Power. By B. F. Haanel. Canada Dept. of Mines. Mines Branch, Ottawa. Bulletin No. 154.

Large 8vo volume containing 140 pages devoted to a description of a series of tests with peat fuel in a Körting gas producer, as carried out at the Fuel Testing Station, Ottawa, in the years 1910 and 1911.

Notes on Mineral Wastes. By C. L. Parsons. U.S. Bureau of Mines, Washington. Bulletin 47.

Contains 44 8vo. pages (see this J., 1912, 881).

Mines and Quarries: General Report and Statistics for 1910. Part IV. Colonial and Foreign Statistics. [Cd. 6160.] Wyman and Sons, Fetter Lane, London, E.C. Price 1s. 6d.

This part of the Report includes statistics relating to persons employed, output, and accidents at mines and quarries in the British colonies and in foreign countries during 1910. (See under X., p. 1079)

Journal of the Society of Chemical Industry.

No. 23, Vol. XXXI. DECEMBER 16, 1912. No. 23, Vol. XXXI.

London Section.

Meeting held at Burlington House, on Monday, November 4th, 1912.

MR. G. T. HOLLOWAY IN THE CHAIR.

THE NITROGENOUS CONSTITUENT OF PARA RUBBER AND ITS BEARING ON THE NATURE OF SYNTHETIC RUBBER.

BY CLAYTON BEADLE AND HENRY P. STEVENS, M.A., PH.D., F.I.C.

In a recent issue of Kolloid-Zeitschrift we published an account of some investigations on the nature of that part of Para rubbers (that is, rubbers derived from the *Hevea Braziliensis*) which is insoluble in the ordinary organic solvents used for the production of a colloidal solution of the hydrocarbon (see this J., 1912, 999). Gladstone and Hibbert were the first to indicate the nitrogenous nature of the insoluble matter. They state that chloroform "slowly dissolves the whole of the hydrocarbon, leaving a sort of network of the nitrogenous body." (Journal of Chem. Soc., 1888, p. 680.) The nitrogen content was subsequently lost sight of (Weber, Chemistry of India Rubber) until its presence in fine hard Para rubber was definitely proved by Spence (Journal of Liverpool Univ., Institute of Commercial Research in the Tropics, No. 13, 1907).

We have shown (Z. Chem. Ind. Kolloide, 1912, 11, 61) that the insoluble matter derived from Para rubbers of various sources is highly nitrogenous in all cases, and contains up to 7 per cent. of nitrogen, and that the presence of nitrogen in the soluble portion only occurs in rubbers which have been mechanically treated at some stage of or subsequent to their preparation. This treatment so disintegrates the network referred to by Gladstone and Hibbert that it only partially settles out from a solution. Thus with plantation sheet or biscuit whether smoked or air dried, it is possible to prepare a solution in benzene free from nitrogen. On the other hand, plantation crepe rubbers or any Para rubber which has been "worked" on rolls or otherwise masticated give benzene solutions from which the nitrogenous matter separates slowly and imperfectly.

Using sheet rubber it is possible to separate the upper half of the solution which is free or almost free from nitrogen from the lower half which contains the great bulk. In the Kolloid Zeitschrift we give the results of some tests on smoked sheet rubbers separated in this manner. It is important, for various reasons, to extend the range of the experiments to non-smoked rubbers and rubbers from other botanical sources. We now give the results of tests on unsmoked sheet.

We worked with a yellowish-brown specimen, quite typical of this class of plantation rubber. The sheet was cut up into pieces about one inch square and allowed to soak in twenty-five times its weight of benzene. In the course of a few days the rubber had swollen and absorbed most of the benzene. It then gradually shrank down till it occupied less than half the volume of the solvent. The upper layer was carefully decanted and replaced by fresh benzene, and very gently agitated by swirling round so as not to break up the films. After standing a week or two longer the clear upper layer of solution was decanted and added to the first portion, the rubber being recovered in solid form by allowing the benzene to evaporate spontaneously in shallow dishes. The rubber so obtained was of a fine pale golden colour. The lower portion of the solution containing the dark coloured nitrogenous insoluble matter was similarly allowed to evaporate spontaneously and yielded a dark coloured rubber. It therefore appears that most of the colouring matter in dark rubber is due to the insoluble matter. As the dark colour is brought about by the action of oxydases it is probably the non-caoutchouc constituents which are oxidised rather than the caoutchouc itself.

For comparative purposes a sample of the original sheet was taken, and also a further sample which had been swollen in benzene and was recovered by spontaneous evaporation without separating the insoluble matter. This sample enabled us to ascertain what effect, if any, was produced by allowing the rubber merely to swell in benzene. The following four specimens were therefore subjected to tests:—

(1) The rubber not treated in any way.

(2) Another portion merely allowed to swell in benzene and the rubber recovered by spontaneous evaporation.

(3) The lower half of a solution of the rubber in benzene in which the dark insoluble matter had separated out.

(4) The upper pale coloured solution free from insoluble matter.

Table I.

Analyses of the unvulcanised rubbers.

	(1)	(2)	(3)	(4)
Acetone extract per cent.	2·48	2·52	2·32	3·04
Nitrogen ,, ,,	0·475	0·462	0·840	0·070
Calculated as protein ,,	2·97	2·89	5·25	0·44

The specimens were masticated and mixed under uniform conditions so as to contain seven per cent. of sulphur. The sheeted compounds were then cured alongside one another in steam for three hours at various pressures, *viz.*, 35, 45, 55, and 65 lb. per square in.* The second of these cures was ample for fully vulcanizing (1), (2) and (3); the two higher cures were made in order to find, if possible, suitable conditions for curing specimen (4). For these higher cures specimens (1) and (4) only were taken.

Table II.

Analyses of vulcanised rubbers.

	(1)	(2)	(3)	(4)
Cure 3 hours at 35 lb. pressure.				
Aceton extract per cent.	2·47	2·67	2·28	2·55
Free sulphur ,,	4·5	4·7	3·8	6·1
Combined sulphur (by difference)	2·5	2·3	3·2	0·9
Cure 3 hours at 45 lb. pressure.				
Acetone extract per cent.	2·50	2·32	1·90	1·70
Free sulphur ,,	2·4	2·9	1·8	6·2
Combined sulphur (by difference)	4·6	4·1	5·2	0·8

	(1)	(4)
Cure 3 hours at 55 lb. pressure.		
Aceton extract per cent.	3·60	3·40
Free sulphur ,, ...	0·6	3·4
Combined sulphur (by differerence)	6·4	3·6
Cure 3 hours at 65 lb. pressure.		
Acetone extract per cent.	2·83	4·05
Free sulphur ,, ...	0·4	0·9
Combined sulphur (by difference)	6·6	6·1

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* Read from a gauge of the ordinary type, that is to say, giving readings exclusive of atmospheric pressure.

The figures for acetone extract represent the percentage total extraction (8 hours extraction with acetone in a Soxhlet) less the percentage of free sulphur.

The vulcanised rubbers were tested in the Schwartz hysteresis machine and the results are given in the same diagrammatic form as in a previous paper (this J., 1911, 30, 1421).

The remainder of the vulcanised specimens were utilised for determination of breaking strain and elongation in the manner described in a previous issue of this Journal (1909, 28, 1111) with the following result :—

TABLE III.

Mechanical tests on vulcanised rubbers.

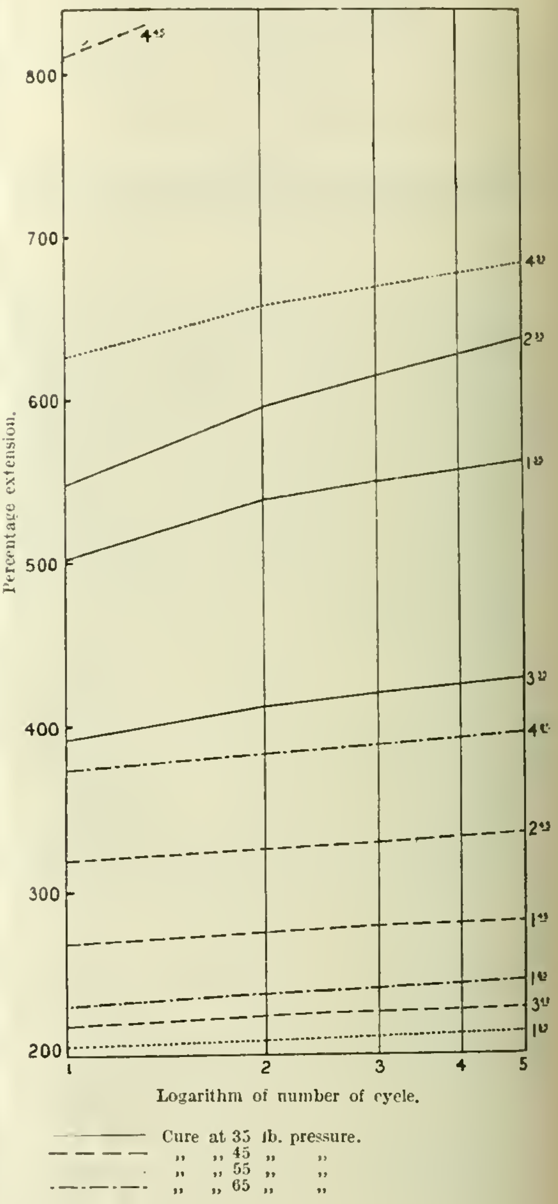
	(1)	(2)	(3)	(4)
Cure 3 hours at 35 lb. pressure.				
Tensile strength	59	53	75	13
Elongation, per cent. ..	910	950	840	710
Cure 3 hours at 45 lb. pressure.				
Tensile strength	100	100	95	33
Elongation, per cent. ..	740	780	600	1140
	(1)			(4)
Cure 3 hours at 55 lb. pressure.				
Tensile strength	50			41
Elongation, per cent.	470			960
Cure 3 hours at 65 lb. pressure.				
Tensile strength	40			30
Elongation, per cent.	380			400

The tensile strength figures are expressed as percentages of the strongest specimens. It is important to note that (3) was almost fully cured at 35 lb. and over-cured at 45 lb. Nos. (1) and (2) were distinctly under-cured at 35 lb., fully cured at 45 lb. and over-cured at 55 lb. No. (4) was under-cured at 45 lb. and gave better figures at 55 lb., while at 65 lb. it was over-cured. The elongation of (4) when cured at 45 lb. pressure was remarkably high.

Taking the results in order, it will be noted that the separation of insoluble matter from the raw rubber was fairly complete. Taking Table I., it is seen that (3) contained almost twice as much nitrogen as (1) or (2), while (4) contained an almost negligible amount. By very careful working even lower figures have been obtained for rubber freed from insoluble matter. Thus in one case 0·03 was found, and in others the amount was too small to be estimated by the Kjeldahl process. Turning now to Table II., it is seen that the amount of "combined sulphur" and degree of vulcanisation effect for any cure was dependent on the proportion of insoluble matter as measured by the percentage of nitrogen contained in the rubber. Thus, taking the cure at 35 lb., the combined sulphur was highest for (3) where the nitrogen figure was also the highest; similarly for (1) and (2) where the nitrogen figure was about the same, and lowest for (4) when the nitrogen was also lowest. This sequence was to be noted for all cures.

The mechanical tests (Table III. and Diagram) accorded generally with the proportion of combined sulphur. (3) attained the maximum vulcanisation effect at a lower cure than (1) and (2), while (4) gave the highest figures at a still higher cure. The very similar behaviour throughout of (1) and (2) shows that treatment with a solvent and recovery by spontaneous evaporation has very little effect on the quality of the rubber. The high figures obtained for (3) and the increased speed of vulcanisation showed that additional insoluble matter tended in some respects to improve the quality of the rubber. The tensile strength of (3) never quite reached the maximum given by (1) and (2) but neither of the cures was quite suitable for (3), 35 lb. being probably a trifle too low and 45 lb. too high. It should be noted that (3) was less distensible than (1) and (2) while (4) was the most distensible, a result which might have been anticipated from the incorporation of a relatively non-distensible body such as the insoluble matter with the highly distensible caoutchouc.

Diagram illustrating the hysteresis curves of the four specimens at different cures.



While it is open to question how far the quality of the rubber was improved by the presence of more than a certain proportion of insoluble matter, there would appear to be little doubt that its removal resulted in deterioration. No. (4) is undoubtedly an inferior rubber and would be classed as such by anyone handling it. Although ten or twenty per cent. more distensible than the untreated rubber, its tensile strength and other physical qualities were strikingly inferior. The maximum tensile strength attained was only 40 per cent. of that of the untreated rubber. We are repeating this work with larger quantities of rubber so as to enable a larger number of cures to be obtained and we are also working with rubbers from other botanical sources. We are separating the insoluble matter in

Rambong and Ceara, both of which appear to behave similarly to the Para rubber, although the former contains a much smaller percentage of nitrogen and the latter a much larger.

The behaviour of the specimen of caoutchouc freed from insoluble matter has a bearing on the synthetic rubber problem. It is obvious that synthetic rubber cannot contain any insoluble nitrogenous matter of the character of that found in natural rubbers. Such matter might be added in one form or another to the synthetic product at some stage of its manufacture, but it would be very difficult if not impossible to give such insoluble matter the characteristic reticulated structure found in natural rubber. We should therefore expect synthetic rubber to be inferior to natural rubber and to resemble the latter freed from insoluble matter. It would show greater distensibility than natural rubber but would be much softer and weaker. The nature and feel of synthetic rubbers rather confirm this view.

On the other hand, the influence of the insoluble nitrogenous matter may not be dependent on its structural distribution throughout the rubber. The figures given for combined sulphur seem to indicate that the insoluble matter plays the part of a sulphur carrier and the behaviour of the rubbers can be explained on this assumption. Thus (3) cures quicker than (1) and (2) possibly because (3) contains a larger proportion of matter acting as a sulphur carrier, and again, (4) cures more slowly because it contains less. It may be argued that the high temperature necessary to cause the usual proportion of sulphur to combine with the rubber damages the rubber to such an extent that it never acquires the physical properties of the other specimens which were not heated to the same extent. Such a conclusion, however, is not in accordance with the results obtained by Seidl (Gummi-Zeit., 1911, 25, 710 and 748; this J., 1911, 374), who showed that the action of a sulphur carrier such as litharge is due to the rise in temperature brought about by the reaction.

We have also carried out some experiments on the influence of the resins on the vulcanising properties of rubber and published in a paper before the Eighth International Congress of Applied Chemistry ("The Nature of the Resinous Constituent and its Influence on the Quality of the Rubber"). We have shown that the removal of the greater part of the resins from such rubbers as Para grades and Rambong results in a marked deterioration of the quality of the rubber as shown by the difficulty in vulcanising the rubbers and the lower figures yielded by the extracted rubbers. The resin was removed by soaking in acetone or alcohol in the cold and in the dark, without any mechanical action. It is possible to attribute this effect to some physical change but it is more reasonable to regard it as a result of the removal of the resins. The raw rubber extracted in the cold quickly perishes and resinifies in a manner reminiscent of some synthetic products. It will therefore be necessary to add resins to synthetic rubber but it does not follow that any kind of resinous matter will be found suitable. Seidl experimented with various resins and found that, whereas the resins extracted from Para rubber reacted efficiently as shown by the rise in temperature, resins from other sources such as Jelutong had no effect at all. To whatever we attribute these results, they demonstrate clearly the exceedingly sensitive character of caoutchouc and the great influence exerted by the insoluble constituent and resins on the quality of the rubber.

Note.—Since this paper was written there has appeared a communication by L. E. Weber to the Eighth International Congress of Applied Chemistry (this J., 1912, 888). It was shown that after removal of most of the resins from plantation Para rubber the rubber could not be vulcanised which confirms our own observations.

Discussion.

Dr. Schidrowitz said that perhaps the most interesting part of the paper was its bearing on the question of synthetic rubber. His view of synthetic rubber from a commercial standpoint was not a favourable one, but, nevertheless, if the chemist succeeded in building up commercially the main colloidal mass identical with natural rubber, then the difficulty of the "insoluble constituent" would be a small one. A number of patents had already been taken out with a view to getting a definite proteid network. He could not quite agree with Dr. Stevens as to the importance of the structure of the proteid matter from a practical point of view, because when the rubber was masticated the structure was broken up almost entirely. The addition of any material which hastened vulcanisation would probably have very much the same effect as the natural proteid constituent. Seidl, to whom Dr. Stevens had referred, appeared to show very clearly that the effect of litharge as a catalyst depended on its reaction heat with sulphuretted hydrogen, the latter being formed by the interaction of the proteids and the resins with the sulphur. Instead of giving the vulcanization conditions in pounds Dr. Stevens should tell them what the actual temperatures were, because in practice there were several ways of expressing "pounds" and these were apt to be misleading. Could Dr. Stevens give them the actual figures regarding tensile strength and elongation or tell them whether these corresponded to the "break" or were taken at some intermediate point? He raised the question because, in the authors' recent paper in the "Zeitschrift f. Kolloide" the tensile results were mainly based on the effect of repeated cycles on elongation at a constant load. In this connection the authors suggested that the difference between the cyclic remainders of the first and last cycles respectively over the logarithm of the number of cycles might be regarded as a measure of elastic fatigue, and that the smaller the quotient the better the rubber would be. He must demur to that suggestion, because it did not consider the work done, and was apparently not true in practice, or, at all events, only up to a certain point. Beyond this point it was probable that a decrease merely indicated overcuring. He gathered that the mixings referred to in the present paper consisted of rubber and sulphur only, but presumed this was not the case with the rubbers dealt with in the recent paper referred to, as the figures there given, if they applied to rubber and sulphur mixings, would indicate that all the samples were overcured.

Mr. E. **Grant Hooper** asked whether they could be quite certain of the tensile strengths shown. If they were going to determine tensile strength or breaking strain they had to be sure of the thicknesses of the rubber used. If they took the test pieces which the authors had passed round he would say from mere inspection that they were certainly not of the same thickness. Unless they could rely on the tensile strengths the comparisons in the paper were fallacious and the difficulty in obtaining reliable test pieces in connection with ordinary samples of manufactured rubber appeared to him to render the determination of tensile strength practically impossible. He thought Dr. Stevens had suggested there was a distinct advantage in the presence of resin. He did not know whether he would go so far as to suggest that the more resin the better the rubber, because if so that was not quite the position generally accepted. Possibly the authors would limit or qualify their remarks as to the influence of resin in rubber.

Mr. H. J. W. **Bliss** said that looking at the figures for vulcanization at 55 lb. it was clear that the rubber had not only been over vulcanized but probably also overheated. Therefore working at 55 lb. with No. 4 sample, the authors had been overheating the rubber in order to get a larger percentage of sulphur into combination. Had they tried a longer vulcanization run at 45 lb. because it seemed to him that the fault of No. 4 was that it vulcanised slowly? He did not think the figures showed that at a given stage of vulcanization No. 4 was weaker than No. 1. The question was, what would be the result of four or five hours of vulcanisation at 45 lb. or less?

Mr. H. **Rogers** said that some five years ago he had extracted very large quantities of rubber in crêped sheet, mostly Para, by immersion both in acetone and in alcohol. Mixing extracted rubber and vulcanising had been found advantageous, both with regard to the effect of heat on the vulcanised rubber and as regards the tensile strength. He had noticed that the rubber that was passed round as a sample taken from the upper layer of solution, free from protein matter, was distinctly sticky. Was that a characteristic of rubber freed from the protein constituent? If so perhaps slight *de* polymersation (or action other than direct oxidation) was taking place.

Mr. Hatschek said, it appeared to him that the nitrogenous matter was credited with two different functions which were entirely disconnected. One was that it acted as a sulphur carrier, and the other that it formed a reticulated structure. With regard to the former he was not competent to speak. The reticulated structure however was a matter which was very interesting to him. Rubber had some of the typical elastic properties of a gel; for instance, it was deformed without change of volume, and when stretched it had a negative coefficient of expansion on rapid heating. Exactly the same properties were possessed, for instance, by a gelatin gel. This was undoubtedly a system of two phases having what might be very roughly described as a reticulated structure, and it would be interesting to know whether the nitrogenous constituent in natural rubber was supposed to take the place of what was usually called the gel skeleton in the gelatin gel, *i.e.*, a very fine reticulated structure, the interstices of which enclosed the other phase. Of course he was aware that rubber had long been considered a system of two phases, possibly two different forms of rubber. He did not know if Dr. Stevens actually suggested that the nitrogenous matter did play some part similar to that of the gel skeleton: if so, Dr. Schidrowitz's answer seemed to him conclusive, that such a structure would not survive mastication. The structure of a silicic acid or gelatin gel would be destroyed by treatment which was mild compared with mastication.

Mr. G. N. Huntly, referring to the stickiness of one of the examples, asked whether Dr. Stevens had direct evidence that the sample was absolutely free from benzene. Some time ago he had to evaporate a benzene solution of rubber, and was struck with the great difficulty of getting rid of the last trace of benzene. After heating in a stream of CO_2 for 48 hours at varying temperatures, traces of benzene still came off. He was not certain that he got it entirely out, and he would like to know whether Dr. Stevens had direct evidence that the benzene had vanished.

Dr. Stevens, in reply, said he had no direct evidence as to the freedom of Specimen 4 from benzene. On the other hand there was no reason that he could see why a trace of benzene should make the rubber sticky. Moreover, the same considerations would also apply to Specimens 2 and 3, which were treated with benzene in exactly the same way as Specimen 4. Small quantities of benzene were very frequently used in compounding rubbers, but so far as he knew had no deteriorating effect on the rubber. Slight tackiness was rather characteristic of extracted rubbers, and they had referred to it in another paper, and explained how they had found some of their extracted rubbers became tacky and resinified. One of the speakers who had referred to this matter, had asked whether this was due to polymerisation. Rubber from which the protein matter had been removed did tend to resinify. The same applied to rubber from which the resin had been removed. He quite agreed with a great deal of what Dr. Schidrowitz had said in his introductory remarks. Of course, there were great differences between different commercial rubbers of different botanic origin and that matter was as yet wholly unexplained, but might be partly attributed to the protein matter. As to the actual conditions of the experiments, he failed to understand the difficulty in converting pounds per square inch into kilogrammes per square centimetre. The relation of pounds was very simple.

Dr. Schidrowitz said he quite agreed in theory, but if Dr. Stevens would take it in practice he would find that the figures he gave of the caoutchouc in pounds did not compare with the figures given there, and the Germans very often reckoned 35 lb. exclusive of atmosphere, while others reckoned it inclusive. Therefore it was a practical question and not a theoretical one.

Dr. Stevens said he understood the point raised to be whether the pressure of the atmosphere was included or not. These pressures were all read from an ordinary pressure gauge, and their figures were exclusive of atmospheric pressure.

Dr. Schidrowitz said he would give an illustration. Mr. Beadle and Dr. Stevens in their last paper had given a maximum pressure at which they worked as 2·6 kilogrammes. That corresponded to their practical method in this country of reckoning to 20 lb. It corresponded to a temperature of about 259° Fah. That was much too low for ordinary vulcanisation. He suggested that Dr. Stevens could give it to them in temperatures instead of pressures, then there could be no mistake whatever. He had raised the question because it was of great practical importance, and he had known very serious difficulties arise in works because of that very question.

Dr. Stevens said they would see to this. As regards the tensile strength, the figures were not standardised, because at present there was no accepted method of judging the tensile strength. Even if a particular machine were used results varying within wide limits might be obtained merely by cutting the test pieces of different thickness. If a ring test piece were cut a thickness of 4 millimeters, only half the tensile strength per square mm. cross sectional area would be obtained as with a ring test piece one millimeter thick. As regards the elongation, the maximum elongation obtained by them was just over 1100 per cent. With regard to the hysteresis tests, these included not merely the figures for the subpermanent set, but also for the resistance to stretching at different stages and after repeated stretching. In fact, they were under the impression that this series of physical tests was about as complete as they could be, as they not only gave the hysteresis tests, but the relative breaking strains and elongations at rupture. With regard to the point raised by Mr. Hooper as to the thickness of the test pieces, as he (Mr. Hooper) had remarked, they were not all of exactly the same thickness, but for this due allowance was made. It was quite impossible to calender small quantities of rubber to exactly the same thickness.

Mr. Grant Hooper asked whether the strength could be compared. That was what he wanted to make quite sure of.

Dr. Stevens said they could, because all the figures were calculated to the same sectional area.

Mr. Grant Hooper said he doubted whether it was reliable.

Dr. Stevens thought it had been proved that the resistance to stretching was proportional to the sectional area. The differences in thickness were not very great. He did not for a moment suggest that if more resin were added to rubber it would be thereby improved. He simply said a little resin appeared to be necessary. On the question of temperature a suggestion had been made that Specimen 4 was overheated at 55 lb. pressure. He quite agreed that this was possible and this had been referred to in the paper. They had not cured the rubber for a longer period at a lower pressure. It would no doubt be an interesting experiment to make.

Mr. Hatschek had pointed out that there were really two factors for consideration. There was the function of the insoluble matter acting as a sulphur carrier and the structure of the insoluble matter in the rubber. They (the authors) had not made any statement as to which of the two had the greatest influence on the results, or whether the effect was due to either of them singly. It was a very difficult question. Dr. Schidrowitz had remarked that the mastication on the rollers would destroy the structure and that was the view they had originally held, but from experience over a good many years they were beginning to question whether their original view was carried. Somehow or other the peculiar character of the insoluble material seemed to persist in the vulcanised rubber.

Manchester Section.

Meeting held at the Grand Hotel on Friday, November 1st, 1912.

DR. GILBERT J. FOWLER IN THE CHAIR.

THE ACTION OF GASEOUS OXYGEN ON INDIA-RUBBER.

BY STANLEY JOHN PEACHEY.

It is well known that on prolonged exposure to air, and especially in the presence of light, indiarubber tends to undergo a partial resinification which leads to the production of "tackiness." The change, which is generally regarded as being due to oxidation, occurs very slowly at the ordinary temperature, but becomes appreciably accelerated at temperatures approaching the boiling point of water.

Considering the importance of the subject, both from the purely chemical and from the technical standpoint, it is remarkable that so few chemists have attempted any systematic investigation of the reactions which take place during this "atmospheric oxidation" of rubber. Amongst the numerous researches on indiarubber which have been published during the last fifty years, there appear to be two only which are directly concerned with the action of air or oxygen on the rubber hydrocarbon, and with the chemistry of the products of such action.

As far back as 1865, Spiller (J.C.S., 18, 44) examined a shellac-like body extracted by benzene from a piece of rubber-coated fabric which had been exposed to the air for a period of six years. The substance was soluble in alcohol and in chloroform, and on analysis gave figures in approximate agreement with the formula, $C_{30}H_{48}O_{10}$.

More recently Herbst (Ber., 1906, 39, 523) has investigated the products obtained by passing a current of purified air for several days through a boiling solution of Para rubber in benzene, and subsequently evaporating the solvent. The syrupy residue thus obtained was dissolved in petroleum ether, when a small quantity of insoluble matter was precipitated, which, by repeated solution in benzene and precipitation with petroleum, yielded a greyish-yellow amorphous substance, having a composition agreeing with the formula, $C_{10}H_{16}O_3$; the yield was very small, amounting to 1·7 per cent. of the total weight of the oxidation product. The petroleum solution from which the insoluble substance originally separated, yielded by evaporation a clear brownish-red syrup, in quantity amounting to 86·4 per cent. of the total weight of the oxidation product. Analysis of this substance gave figures corresponding to the formula, $C_{10}H_{16}O$.

These results appear to indicate that the atmospheric oxidation of rubber involves no breaking down of the octadiene ring, but mainly consists in the addition of a single atom of oxygen to the $C_{10}H_{16}$ unit of the molecule.

The researches of Harries on the action of ozone upon solutions of indiarubber have had far-reaching results, in that they have given an insight into the nature and constitution of the rubber molecule, but they throw little or no light upon the subject of the atmospheric oxidation of rubber, except perhaps in suggesting that lævulinic aldehyde or lævulinic acid might be expected to appear amongst the final products of such oxidation.

The experiments described in the present communication were undertaken with a view to determine, by a direct method, the number of atoms of oxygen which are concerned in effecting the complete "atmospheric oxidation" of the $C_{10}H_{16}$ unit of the rubber molecule. No definite information on this point is available, and it seemed desirable to obtain such, in the hope that it might give some insight into the mechanism of the change and perhaps afford some clue as to the nature of the product or products.

At temperatures in the neighbourhood of 80° C., pure rubber is readily attacked by oxygen, and by presenting it to the action of the gas in the form of a thin film, it is not difficult to bring about complete oxidation, with the formation of a resinous product which is wholly soluble in alcohol. By employing a weighed amount of rubber and heating it in a measured excess of oxygen until no further absorption of the gas takes place, it becomes a simple matter to determine directly the relative proportions of rubber and oxygen taking part in the change.

The apparatus employed for the purpose was of a simple character, its form being shown in the accompanying figure. A thin film of purified rubber of known weight is deposited from solution on the interior surface of the flask, A, which is connected by a ground glass and mercury sealed joint to the measuring tube, B, previously filled with mercury to the tap, C. The volume of the flask and connecting tubes having been accurately determined, the apparatus is exhausted, rinsed several times with pure oxygen, and then filled with the gas, a convenient quantity of the latter being allowed also to enter the burette by opening the tap, C. The volume of the gas having been measured on the burette, the flask is heated in a water bath to a temperature of 85° C.* as long as absorption takes place. The diminution in volume represents the amount of oxygen which has entered into reaction with the known amount of rubber employed in the experiment.

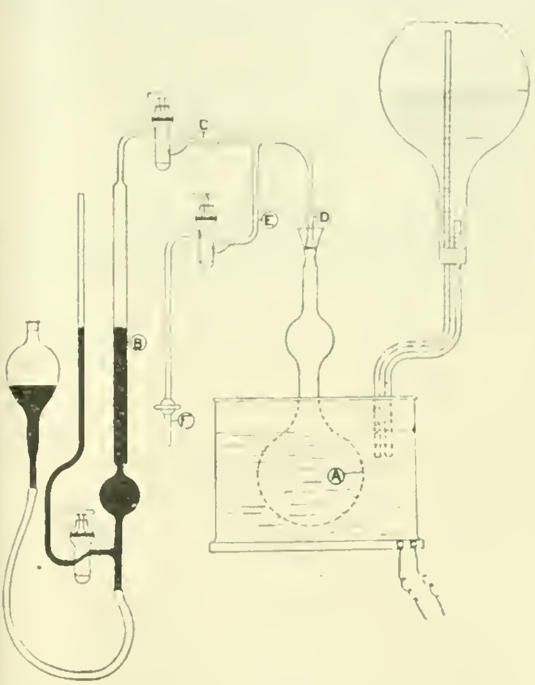


FIG. 1.

The rubber chosen for the purpose of these experiments was a pale plantation crêpe, which had been extracted with acetone to remove resins, dissolved in pure benzene, and freed from insoluble matters by filtering the solution through glass wool. A suitable quantity of the solution was introduced into the previously weighed flask and evaporated *in vacuo*, the flask being slowly rotated during the operation, so that a thin film of rubber remained evenly distributed over its inner surface when the removal of the solvent was complete. The weight of the film was then ascertained by re-weighing the flask. The latter having been attached to the rest of the apparatus the heating was commenced, the mercury reservoir being lowered in order to maintain a pressure inside the apparatus equal to that of the atmosphere. The progress of the oxidation was followed by periodically allowing the flask to cool and taking readings of the volume of gas absorbed. When no further diminution in volume could be detected, the heating was discontinued and the volume of residual oxygen measured.

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* This temperature was found to be most suitable, and was conveniently maintained constant by the use of an electrically heated water bath.

Experiments were also carried out with plantation crêpe which had not been extracted with acetone, but merely dissolved in benzene and freed from insoluble impurities. It was found that the presence of the resin (3·00 per cent.) exercised little influence upon the total volume of oxygen absorbed, but that it greatly retarded the progress of the oxidation. In the case of the purified rubber, the oxidation usually commenced after heating for a few hours, and then proceeded rapidly to completion; with the resinous rubber, however, a period from ten to twenty times longer was found to elapse before any appreciable amount of oxidation set in, after which the change proceeded steadily and somewhat slowly until the whole of the rubber was oxidised.

The different types of curve obtained in the two cases, by plotting the amount of oxygen absorbed (ordinates) against the time occupied (abscissae), are illustrated in Fig. 2.

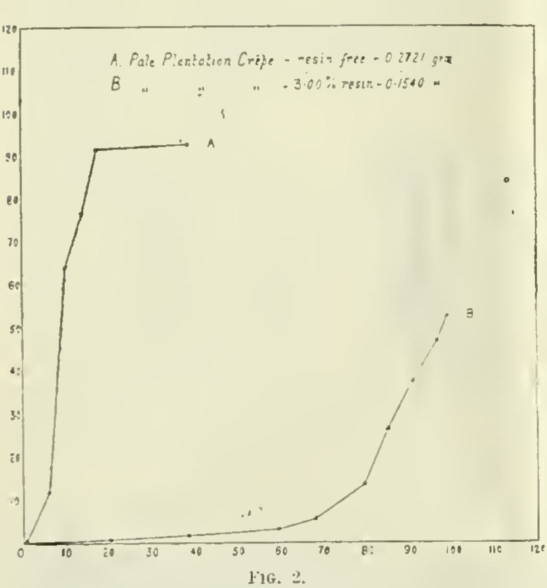

FIG. 2.

In every case the product of the oxidation dissolved freely in alcohol, leaving only the merest trace of insoluble residue.

The results of a series of experiments are tabulated below:—

	Wt. of rubber.	Vol. of oxygen (N.T.P.)	Wt. of oxygen.	No. of atoms of oxygen per $C_{10}H_{16}$.
	grms.	c.c.	grms.	
I.	0·2721	92·4	0·1320	4·12
II.	0·2037	69·8	0·0997	4·16
III.	0·1540	52·5	0·0750	4·14
IV.	0·2205	72·8	0·1049	4·01

The figures obtained are fairly concordant, the mean of those in the last column, representing the number of atoms of oxygen used up in oxidising the $C_{10}H_{16}$ unit of the rubber molecule being 4·10. The method being free from any serious source of error, it is safe to conclude that when Ceylon rubber undergoes atmospheric oxidation at a temperature of 85° C., each $C_{10}H_{16}$ unit of the molecule reacts with four atoms of oxygen.

This result is not in agreement with that obtained by Herbst, whose main product contained one atom of oxygen only, in combination with the $C_{10}H_{16}$ complex. It may therefore be assumed, that the reaction which takes place when rubber in benzene solution is oxidised by air, differs from that which occurs when rubber *per se* is oxidised by pure oxygen. The formation, in Herbst's experiments, of a small quantity of the substance, $C_{10}H_{16}O_3$, suggests that under favourable conditions the oxidation might have proceeded further, but there is nothing in his results to indicate that four atoms of oxygen would eventually have been taken up.

The composition of Spiller's resin approaches more nearly to that required for a compound produced by the addition of four atoms of oxygen to the $C_{10}H_{16}$ complex, the atomic proportions of carbon, hydrogen and oxygen calculated from Spiller's figures being represented by the formula $C_{10·00}H_{15·70}O_{3·22}$.

The possibility of the formation of volatile products during the oxidation has to be kept in sight, but there is reason to believe that if such products are formed, their vapour pressure is not sufficiently high to affect materially the results recorded in this paper.

An inspection of the structural formula assigned by Harries to Para rubber, *viz.*, that of a 1 : 5-dimethylcyclo-octadiene, suggests at once the probability that four atoms of oxygen would be concerned in the oxidation of a molecule of the hydrocarbon. In such a case, however, it might be expected that a rupture of the octadiene ring would occur, with the formation of two molecules of lævulinic aldehyde. The evidence recorded so far, however, favours the view that the oxidation results merely in the formation of addition products.

The investigation of the nature of the products is now proceeding and has already yielded a number of interesting results. These will be reserved for a future communication.

DISCUSSION.

Mr. H. L. TERRY said the rate of atmospheric oxidation was almost entirely a matter of tenuity. These experiments had been carried out on a thin film of rubber, but in manufacture these films were of extremely slight application. Very thin films of rubber were being largely used now in making aeroplanes and dirigible balloons, but in every case that rubber was vulcanised. In 1883 (see this J., Vol. 2, pp. 119—122), Dr. Burghardt described some experiments with vulcanised elastic thread, he (the speaker) had never quite accepted Dr. Burghardt's figures because his analysis showed a complete absence of oxygen in the raw rubber. He showed that 24 per cent. of oxygen was the final oxidation in elastic thread which was only five years old. He (the speaker) had examined elastic thread from time to time and the last time he examined the skein was, he thought, five years ago. It was then 14 years old. Dr. Burghardt laid down that the degree of oxidation could be almost accurately gauged for technical purposes by the amount of water the vulcanised rubber had taken up in the process of oxidation, and the figure for his elastic thread was about 9 per cent. So far, he (Mr. Terry) had never got beyond 8·2 per cent. When rubber contained that amount of water it could be easily powdered in a mortar, and the capacity to powder was in proportion to the amount of water present. But that amount of water was dependent, to some extent, on the quantity of free acid present. He had always found that the greater the amount of water present in entirely oxidised rubber the greater the amount of free acid, whereas rubber that had not got to that degree of hardness contained less acid. Indiarubber oxidised in two stages: the first was the sticky soft stage and if the rubber contained a good deal of resin the oxidation sometimes did not go beyond the soft stage; but if the rubber contained a comparatively small amount of resin the soft stage was succeeded by a stage in which it became harder and harder until it could be finally powdered. It would be interesting to see what effect pure oxygen would have on vulcanised rubber, especially on thin films. He did not think that rubber oxidised in air had ever been fully oxidised, there was always a certain amount of unaltered rubber left.

Prof. W. H. **Perkin** said that the actual conditions to which the rubber was exposed in such cases must be considered and he took it that the moisture in the air takes part in the changes. Therefore he asked whether, in his experiments with oxygen, the author had carefully dried his oxygen or used it moist. Much information might be obtained by using the oxygen in a moist condition. Also, had the author noticed any moisture being given off during the oxidation experiments, because it appeared to him, looking at the formula for the rubber nucleus, that at a temperature of 85° there might be a certain amount of water eliminated? Had it been experimentally determined if the oxygen which was left over in the course of the experiments was really pure oxygen or whether there might be other substances produced such as carbon dioxide or volatile hydrocarbons, even in small quantities?

Mr. W. F. A. **Ermen** said he hoped that in his next paper Mr. Peachey would deal to a certain extent with vulcanised rubbers because, in his opinion, to technologists they were really of more interest than the raw rubber. The effect produced by the presence of catalysts, such as copper, was also of importance from the point of view of chemists, and it would be interesting to know whether the various mineral matters employed produced any effect on the ultimate product.

Prof. E. **Knecht** suggested that possibly other catalysts more effective than copper might be tried on the rate of absorption of oxygen and interesting results might be obtained. Did Mr. Peachey intend to extend his investigations to the indiarubber substitutes so largely used now? Such results would be of considerable practical interest. In the course of his remarks, Mr. Terry said he had determined the depreciation of rubber by estimating the acidity due to free acid. He presumed that by free acid Mr. Terry meant sulphuric acid. (Mr. Terry answered in the affirmative.) In a paper read some years ago by Mr. Pilling before the Society of Dyers and Colorists on the tendering of cotton dyed with sulphide colours, the author divided up the causes of the formation of sulphuric acid into internal and external formation of sulphuric acid. The internal formation was due to the sulphur contained in the dyestuff and the external formation was due to the sulphurous acid from the atmosphere which he maintained was oxidised catalytically by the dyestuff molecule. In making the tests, was Mr. Terry sure that no sulphuric acid had come from the atmosphere?

Mr. **Terry**: I should say certainly not.

The **Chairman** said it had occurred to him, as a possibility, that the oxidation of rubber might be accelerated, not only by catalysts as had been suggested, and by the presence of moisture, but also by the presence of living organisms. He had already mentioned before the Society the oxidation of phenol by a particular organism and they had recently succeeded in finding out what that organism did after long continued oxidation. One carbon atom was split off as carbon dioxide and the rest of the ring was oxidised to a hydroxy-carboxylic acid. As to its constitution they were not absolutely certain, and it would seem quite possible that a ring of that description would lend itself fairly readily to such oxidation. Of course at the temperature at which Mr. Peachey worked that would probably be out of the question but he would suggest that if he could conceive some suitable way of bringing the rubber into contact with an organism of that sort, he might get a more rapid oxidation at a lower temperature and in that way be able to break up the rubber molecule fairly easily. Such an experiment might perhaps lead to results of importance in further ascertaining the constituents of pure rubber.

Mr. **Peachey**, in reply, said that the oxygen employed in the experiments was saturated with moisture. So far he had made no experiments with dry oxygen, though he proposed to do so shortly. The paper was a preliminary communication, and he hoped to extend the work considerably in several directions. He quite recognised that the action of catalysts in accelerating the oxidation of rubber was an important matter for investigation. He was asked if any volatile products were observable in the flask during the heating of the rubber. In every case a small quantity of an oily condensate, or occasionally a sublimate appeared in the upper part of the flask, but he had reason to believe that its vapour pressure was not sufficiently high to affect materially the comparative accuracy of the results. In investigating the nature of the oxidation products, however, the substance would require attention. With regard to the purity of the residual oxygen, beyond washing the gas with solvents and examining the solutions, no elaborate tests were employed to prove that other gases were absent. So far he had been unable to detect the formation of any highly volatile product. In answer to Prof. Knecht, in the case of pure rubber, the time required for the oxidation of a given quantity did not vary much in different experiments, but wide variations were observed in the case of resinous rubber. In the particular case referred to the oxidation of the resinous plantation rubber took 99 hours, whilst the resin-free rubber was completely oxidised in 38·5 hours. But the interesting point about the curves which he had shown was the period of rest which elapsed before the resinous rubber commenced to oxidise appreciably. There was no noticeable rise in the curve until a period of 70 hours was reached, whilst with the resin-free rubber rapid oxidation set in after 6 hours' heating. The suggestion of the Chairman, that micro-organisms might accelerate the oxidation of rubber was of great interest and was worthy of attention. It had been suggested, he believed, that enzymes were concerned in the production of rubber resins, but it appeared to him to be fairly well established, that the natural resins found in rubber were quite different from the resinous substances produced by the oxidation of rubber.

The **Chairman**: They might act as antiseptics.

Mr. **Peachey**: Possibly that is so.

Nottingham Section.

Meeting held at Nottingham on Wednesday, October 30th, 1912.

MR. S. R. TROTMAN IN THE CHAIR.

SOME NOTES ON THE ENZYMES CONCERNED IN THE PUERING OR BATING PROCESS.

BY JOSEPH T. WOOD AND DOUGLAS J. LAW, B.SC., F.I.C.

In a recent work by one of us (The puering, bating, and drenching of skins, Spon, 1912) a short account is given of the enzymes concerned in the process of puering with dog dung. The origin of these enzymes is a matter of controversy, several authors endeavouring to show that the principal effect is produced by trypsin secreted by the animal. Eberle and Krall (Collegium, 1911, p. 201) conclude from experiments made with an antipancreatic serum on infusions of dog dung that the tryptic ferment in the dung is unchanged trypsin secreted by the pancreas. Röhm and Goldmann (Collegium, 1911, p. 265) criticise Eberle's work unfavourably, although they appear to hold a similar opinion as to the origin of the bating enzymes. They do not, however, bring forward any experimental evidence in support of their views, except the claim that active pancreatic juice will replace the dung enzymes. Röhm has applied this in practice by the introduction of an artificial bate (Oropon). So far as we are aware, the enzymes of dog dung were first separated and examined by one of us in 1897 (this J., 1898, 1010), and the opinion was expressed on the authority of Gamgee that the digestive enzymes of the animal are all destroyed before the fæcal matter is discharged, and that therefore the enzymes in the dung are not from this source. More recently Hammarsten (Physiol. Chem., p. 494) states that among the secretions which undergo putrefaction in the intestine, the pancreatic juice which putrefies most readily, takes place first.

In order to determine the nature and origin of the enzymes in the fæces, the contents of dogs' intestines were examined at all stages of the digestive process; infusions of the walls of the intestines, the pancreas, and gall bladder, were also examined, and their action compared with that of the enzymes obtained from puer as used in practice.

The dung enzymes prepared by precipitation with alcohol from a glycerin extract of the dung, as described in the above-mentioned work (p. 134), were in the form of a light brown powder, which was found to contain five distinct enzymes. These were demonstrated in the following manner:—

(1) 0·5 c.c. of a 1 per cent. solution of the powder was added to 5 c.c. gelatin solution (4 per cent.) to which three drops of $N/10$ hydrochloric acid had been added. This was heated to 38° C. for half an hour. The gelatin was completely peptonised in acid solution, indicating the presence of a peptic enzyme. A similar tube after heating to boiling and also a blank heated to 38° C., set hard on cooling like the original gelatin.

(2) A test made in the same way as No. 1, but made alkaline by the addition of one drop of dilute ammonia (1 : 3). The gelatin was peptonised, showing the presence of tryptic enzymes.

(3) When 0·5 c.c. was added to milk it coagulated it in a few minutes, although the clot was subsequently dissolved by the other enzymes. Presence of rennin was thus indicated.

(4) When 0·5 c.c. was added to starch solution heated to 35° C. for half an hour, the filtered liquid reduced Fehling solution. Presence of a diastase is indicated.

(5) When 0·5 c.c. of the enzyme solution was added to a little castor oil, emulsified by shaking with a solution of gum arabic, coloured blue with litmus solution, and allowed to stand over night, the litmus was reddened, showing the presence of a lipolytic enzyme.

The powder also digested boiled white of egg in the cold in 48 hours. It is of interest to note that the enzymes prepared in 1897 had retained their activity, apparently unimpaired, for a period of 15 years.

We propose to determine quantitatively the activity of the other enzymes present in the puer, and also the exact limits of hydrogen ion concentration, and the optimum temperature at which they are most effective.

Qualitative tests for tryptic enzymes in dogs' intestines.—The dogs had been killed in a lethal chamber by means of a mixture of chloroform and carbon dioxide. The whole of the intestines were removed shortly after death, ligatures being made at the pylorus at the end of the duodenum and at the ileum, any blood present being washed off with water, since it is known that serum inhibits the action of many enzymes. The pancreas was removed and placed in chloroform water, the gall bladder was also removed after tying the duct, the contents of the various parts of the intestine were then removed, and in some cases examined directly. In other cases they were mixed with an equal quantity of glycerin, and allowed to stand for varying lengths of time, then filtered. In dogs which had not been recently fed, we found the contents of the small intestine of a pink colour, of the consistency of thick cream, and of uniform substance. After a meal the contents are yellow, owing to the presence of bile, and particles of food can be easily distinguished. There is little or no smell, and no putrefaction. The contents of the large intestine are abruptly different, being much darker, and having a fæcal odour. The bile was inactive.

In order to get a definite answer to the question whether active tryptic enzymes were present or not, we made use of a test suggested by Bayliss.* The test was carried out in the following manner:—

A series of test tubes was prepared, each containing 5 c.c. of a 4 per cent. solution of Coignet's gelatin. Where the action of the enzyme in alkaline solution was to be observed, the solution was made slightly alkaline by adding one drop of dilute (1 : 3) ammonia solution. The acid tubes were given that reaction in most cases by the addition of three drops of decinormal hydrochloric acid. After adding the measured quantities of enzyme solution from a graduated pipette, the tubes were placed in a water bath at 38° C., and kept at that temperature for half an hour. They were then removed from the bath, allowed to stand for one hour, and the condition of the contents noted at the expiration of that time. A blank test containing the gelatin solution, with the addition of as much water as the greatest quantity of solution added to any of the tubes was put with each series. When the temperature of the air is high, it may be necessary to cool the tubes in running water until the blank test has set. The results obtained are given in the following table:—

TABLE 1.

+ = gelatin liquefied.
— = gelatin solid.

No. of experiment.	Description of extract.	Acid.	Alkaline.
1	Whole of small intestine alcoholic, 20 per cent.	—	+
2	Duodenum (alcoholic 20 per cent.)	—	—
3	Pancreas (alcoholic 20 per cent.)................	—	—
4	Contents of duodenum (glycerin)	—	+
5	Contents of ileum (glycerin)	—	+
6	Contents of large intestine (glycerin)	+	+
7	Gall from gall bladder ..	—	—
8	Mixture of pancreas and duodenum	—	+
9	Glycerin extract of puer	+	+

From these results, which have been confirmed by a large number of experiments, it will be seen first that the pancreas extract is inactive both in acid and alkaline solution, but that the addition of a small quantity of extract of the duodenum renders the pancreas extract active in alkaline solution, but not in acid solution. This result is in accordance with that of Bayliss and Starling (J. of Physiol., 1903, 30, 61), who showed that the pancreatic juice as secreted, does not contain any trypsin, but that it is rendered active by addition to it of another ferment, enterokinase. Enterokinase is a product of secretion of the small intestine, mainly of its upper end, but of no other parts of the body. Secondly, that while the contents of the whole of the small intestine are active in alkaline solution, but inactive in acid solution, the contents of the large intestine again become active in acid solution. Our explanation of this is that peptic enzymes are secreted by bacteria developing in the large intestine. These peptic enzymes from the large intestine differ from the pepsin of the stomach in that the proteolytic action is inhibited by a 0·2 per cent. solution of hydrochloric acid, whereas this is the optimum concentration of acid for the stomach pepsin.

Bayliss and Starling (*loc. cit.*) also found that the trypsin of the pancreas is extremely unstable, and is rapidly destroyed, especially in alkaline media, and at the body temperature. We find, however, very powerful tryptic enzymes in the large intestine, and we draw the same conclusion as for the peptic enzymes, *viz.*, that these tryptic enzymes also are produced by bacteria.

If the origin of these dung enzymes is other than bacterial, we have to suppose them to be excreted by the walls of the large intestine; and since there are several distinct enzymes, it seems difficult to accept this explanation of their origin.

A further argument in favour of the bacterial origin of the puer enzymes is that the puer, as used in the work is more powerful than the contents of the large intestine of dogs. This can only be due to an increase of enzymes by fermentation going on in the puer.

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* For a complete discussion of methods of testing proteolytic enzymes see paper by Claudio Fermi, Alte und neue Methode zum Nachweis der proteolytischen Enzyme, Centr. Blatt für Bakt., Bd. XVI. p. 176.

Quantitative determination of the activity of the enzymes found.—Of the methods proposed for the estimation of the products of enzymatic proteolysis the formaldehyde titration proposed and very thoroughly investigated by S. P. L. Sörensen (Etudes Enzymatiques, Compt. rend., Carlsberg, 1907, Vol. 7) has found extensive use. We have used the method to some extent for the study of the enzymes concerned in the puering process, but have not persisted with it, as we found that the titration differences with and without the addition of formaldehyde, though markedly increasing as hydrolysis proceeded, were not great. As an example, 100 c.c. of a 2 per cent. gelatin solution was kept at 40° C., with 5 c.c. Benger's pancreatin, and the following differences of titration were found between it and a blank 100 c.c. of 2 per cent. gelatin kept at the same temperature, 10 c.c. being taken in each case, and titrated with decinormal soda.

TABLE 2.

—	Test.			Blank.			
Time in minutes.	Without formalin.	With formalin.	Increase.	Without formalin.	With formalin.	Increase.	Difference.
0	0·2	1·2	1·0	0·2	0·9	0·7	0
15	0·6	1·9	1·3	0·2	0·9	0·7	0·3
30	0·9	3·0	2·1	0·2	1·0	0·8	1·0
60	1·0	4·0	3·0	0·2	1·0	0·8	1·9

The qualitative test with gelatin tubes described above can be made quantitative, and we have used it as the control method for determining the enzyme strength of artificial puering compounds. The aqueous infusion of the bate is allowed to act on the gelatin, and a series of tubes is put on containing each a diminishing quantity of the infusion. The last tube, which is just liquefied after the stated interval and treatment, will then contain the minimum quantity of the material capable of liquefying the given weight of the gelatin jelly under the standard conditions. It is obvious that this test is simply a comparison of the proteolytic activity of the enzymes in the puering compound, but as this is the most important effect in the puering process, the test will give a direct comparison of the puering effect of such enzymes. The following table is given as an example of the test used quantitatively :—

TABLE 3.

5 per cent. infusions of three samples of artificial bate, A., B., C.

Acting on 5 c.c. 4 per cent. gelatin solution for 30 minutes at 38° C. in alkaline solution.

Volume of infusion taken in c.c.	A.	B.	C.
1·0	+	+	+
0·5	+	+	+
0·2	+	+	+
0·1	+	+	+
0·05	+	+	+ (—)
0·03	— (+)	+	—
0·02	—	—	—
0·01	—	—	—

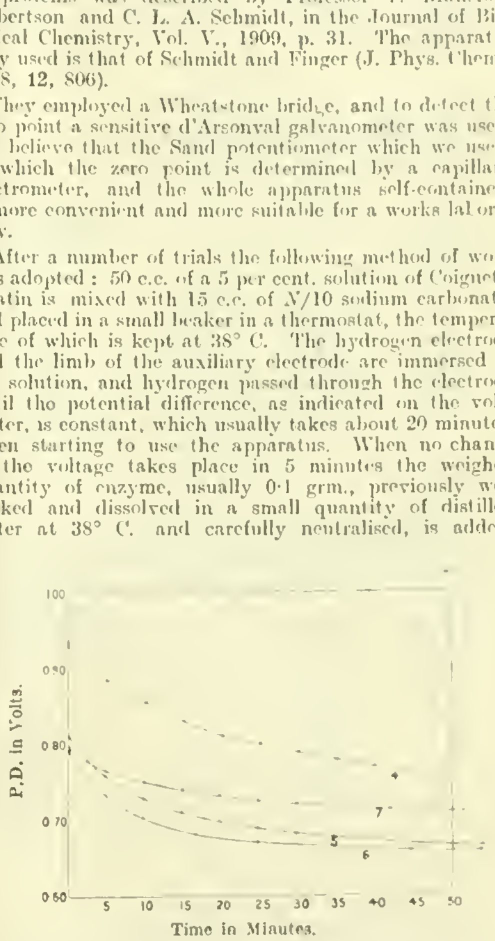
Thus the minimum weight in mgrms. of the bate required in each case is (A.) 2·5, (B.) 1·5, and (C.) 3·0, and the strength of the preparations in proteolytic activity is in inverse ratio to these figures.

Bayliss has shown that the course of tryptic digestion may be followed by observing the change of conductivity in the solution. The action of trypsin on protein solution is accompanied by a rise in conductivity, almost entirely due to the production of peptones, and amino acids, and in some degree to the splitting off of the inorganic constituents of the substrate molecules. (In the case of caseinogen the rise in conductivity is partly due to the conversion of organic phosphorus into inorganic phosphates.)

Now these amino acids, although they have not a large hydrogen ion concentration, require a definite amount of alkali for their neutralisation, and consequently their production may be observed in an alkaline solution by noting the fall of potential between a hydrogen electrode immersed in the solution, and a normal calomel electrode. We examined this method, using the arrangement described by Sand and Law (this J., 1911, 3), and Wood, Sand, and Law (this J., 1911, 872), for the determination of the acids in tan liquors, and obtained very promising results. Since our experiments with this method, Prof. W. M. Bayliss has called our attention to the fact that an electrometric method for following the course of hydrolysis of proteins was described by Professor T. Brailsford Robertson and C. L. A. Schmidt, in the Journal of Biological Chemistry, Vol. V., 1909, p. 31. The apparatus they used is that of Schmidt and Finger (J. Phys. Chem., 1908, 12, 806).

They employed a Wheatstone bridge, and to detect the zero point a sensitive d'Arsonval galvanometer was used. We believe that the Sand potentiometer which we used, in which the zero point is determined by a capillary electrometer, and the whole apparatus self-contained, is more convenient and more suitable for a works laboratory.

After a number of trials the following method of work was adopted : 50 c.c. of a 5 per cent. solution of Coignet's gelatin is mixed with 15 c.c. of $N/10$ sodium carbonate, and placed in a small beaker in a thermostat, the temperature of which is kept at 38° C. The hydrogen electrode and the limb of the auxiliary electrode are immersed in the solution, and hydrogen passed through the electrode until the potential difference, as indicated on the voltmeter, is constant, which usually takes about 20 minutes, when starting to use the apparatus. When no change in the voltage takes place in 5 minutes the weighed quantity of enzyme, usually 0·1 grm., previously well soaked and dissolved in a small quantity of distilled water at 38° C. and carefully neutralised, is added.



After the addition of the enzyme the potential difference is read off every 5 minutes, as the proteolytic action proceeds. Some of the results are given in the tables, and curves plotted from these tables are shown in the diagram, Fig. 1.

Benger's trypsin solution was used as a comparison. The concentration of $\overset{-}{\mathrm{OH}}$ ions is calculated from the H. concentration, taking the dissociation constant of water $(C_{\overset{+}{\mathrm{H}}} \times C_{\overset{-}{\mathrm{OH}}})$ at 18° C. to be $10^{-14\cdot14}$ (Sörensen, Etudes Enzymatiques, p. 31) and is expressed as the negative exponent of 10. Since the experiments were carried out under exactly similar conditions with equal weights of material, it may be assumed that the fall of potential represents the activity of the material used, the times being equal.

TABLE 4.

1 c.c. Benger's trypsin solution.
50 c.c. 5 per cent. gelatin solution.
15 c.c. $N/10$ caustic potash. Temperature 38° C.

Time in minutes.	P.D. in volts.	C_{OH}.	Percentage of hydrolysis on total during period.
0	0·930	2·9	0
5	0·884	3·7	21·0
10	0·855	4·2	34·2
15	0·830	4·63	45·5
20	0·810	4·98	54·6
25	0·800	5·15	59·2
30	0·790	5·32	63·8
35	0·780	5·5	68·2
40	0·770	5·67	73·0
100	0·720	6·54	95·5
130	0·710	6·71	100·0

TABLE 5.

1 c.c. Benger's trypsin solution.
50 c.c. 5 per cent. gelatin solution.
15 c.c. $N/10$ sodium carbonate. Temperature 38° C.

Time in minutes.	P.D. in volts.	$C_{\overline{OH}}$.	Percentage hydrolysis on total during period.
0	0·810	4·98	0
5	0·755	5·93	38·0
10	0·728	6·40	63·5
15	0·710	6·72	69·0
20	0·698	6·92	77·2
25	0·688	7·10	84·0
30	0·680	7·24	90·0
35	0·680	7·24	90·0
55	0·665	7·50	100·0

TABLE 6.

0·1 grm. enzymes from glycerin puer extract.
50 c.c. 5 per cent. gelatin solution.
15 c.c. $N/10$ sodium carbonate. Temperature 38° C.

Time in minutes.	P.D. in volts.	$C_{\overline{OH}}$.	Percentage hydrolysis on total during period.
0	0·790	5·32	0
5	0·730	6·37	45·5
10	0·700	6·89	68·2
17	0·680	7·24	83·5
25	0·670	7·41	91·0
35	0·666	7·49	93·5
45	0·660	7·58	98·5
55	0·658	7·62	100

TABLE 7.

0·1 grm. enzymes from aqueous puer extract.
50 c.c. 5 per cent. gelatin solution.
15 c.c. $N/10$ sodium carbonate. Temperature 38° C.

Time in minutes.	P.D. in volts.	$C_{\overline{OH}}$.	Percentage hydrolysis on total during period.
0	0·795	5·24	0
5	0·762	5·81	39·8
10	0·750	6·02	54·1
15	0·740	6·19	66·2
20	0·731	6·35	77·0
25	0·724	6·47	85·5
30	0·721	6·52	89·0
42	0·715	6·63	96·5
52	0·712	6·68	100

Of the various media and alkalis tried, it was found that gelatin solution made alkaline with sodium carbonate was the most suitable. If caustic potash is used at the same strength as the carbonate (15 c.c. $N/10$ to 50 c.c. 5 per cent. gelatin solution) there is a greater range between the upper and lower limits of the curve, but this is principally due to the liquid before the action of the enzyme having a higher OH ion concentration due to the stronger alkali. In this case the action at the commencement is not so vigorous as is the case when alkali carbonate is used, possibly owing to the fact that the OH ion concentration is too high for the enzyme to exhibit its optimum activity. The action of the puer enzymes was tried in a gelatin solution made in clear saturated lime water (50 c.c. of 5 per cent. gelatin lime water solution + 1 c.c. glycerin puer enzymes). In this case there was practically no fall of potential due to hydrolysis of the gelatin (0·020 volt in an hour). This seems to show that the OH ion concentration in this case (P.D. 0·980 v.) was so high as nearly to inhibit all enzyme action. It might be noted in this connection that this observation is borne out in practice, as a puer liquor which has become surcharged with lime from the quantity of goods which have been through it ceases to be active. The use of alkaline solutions with casein as medium as employed by Robertson and Schmidt (*loc. cit.*) appear to offer no advantages for our purposes over gelatin, while the latter has the advantage of being more closely allied to the natural hide substance, which is the medium on which the enzymes act in practice.

From the above research it would appear that until some method of separating the various enzymes, and distinguishing between pancreatic tryptase and bacterial tryptase is discovered, it is not possible to go further into the question of the origin of these enzymes existing in the puer.

We wish to thank Prof. W. M. Bayliss for his help and criticism. He agrees with our interpretation of the existence of a peptic enzyme in the large intestine being of bacterial origin, but points out to us that while the pepsin of the stomach is destroyed by alkali, the reaction in the small intestine is never strongly alkaline. We have, however, found no peptic ferments below the duodenum in the small intestine of the dogs examined by the method described, so that it is evident that in these cases the stomach pepsin is completely destroyed. Prof. Bayliss remarks with regard to the trypsin that, while it is unstable in pure, or fairly pure solution, in the presence of digestive products, it is much more stable, and that enterokinase is found in the fæces, so that our conclusions with regard to the origin of this ferment must be received with caution. There is, however, no evidence of the secretion of any enzymes from the large intestine itself.

We also wish to thank Dr. Rupert Snell for his help in the dissection of the dogs.

DISCUSSION.

Mr. S. R. TROTMAN said that in some experiments he had carried out he had found great differences between different pancreatic preparations on the market, and the present paper made it quite intelligible why this should be so.

Mr. R. F. INNES said he had tried the effect of "oropon" on goat skins with unsatisfactory results. Did the authors believe that "erodin" would yield better results? What is the approximate loss of hide-substance during the bating?

Mr. JAS. O'SULLIVAN (communicated) suggested that the paper pointed to the conclusion that a suitable plasma for the development in quantity of the organisms which produced the useful enzymes might ultimately be discovered. If it had been found in practice that the results obtained by the use of aged bate were better than from fresh, that would argue against the enzymes in the dung, being secretions of the animal. Had any advantage been found in practice in keeping the bates or drenches agitated? If that were so, it would indicate the indirect work of organisms.

Dr. H. SAND suggested that the curves representing the action of the enzymes on the gelatin would be made simpler from the theoretical point of view if the hydroxyl-ion concentration were kept constant by the addition of alkali, and the amount added, were plotted against the time. Was the normal calomel electrode kept at ordinary temperature or at 38° ?

Mr. J. H. **Dunford** emphasised the importance of the results from a medical point of view.

Mr. T. F. **Harvey** inquired whether the difference between the pepsin occurring in the stomach of dogs and that found in the large intestine might not be due to the presence of other enzymes in the stomach. Could the authors inform him what were the products of pancreatic fermentation on gelatin, and might the empty stomachs of healthy animals be said to be in any sense free from bacteria ?

Mr. J. M. **Wilkie** inquired whether the preservation of a tryptic ferment over a period of fifteen years, referred to by the authors, had ever been observed before. What was the advantage of the electrometric method over the formaldehyde method ?

Dr. **Snell** said that the acidity of the stomach was so great that it was possible to drink cultures of bacteria with impunity which would cause serious trouble if they got further down the intestines. It was considered by many that bacteria in the intestine were absolutely essential to the process of digestion and the present paper should go a long way towards clearing up many difficult cases of obstinate dyspepsia.

Mr. **Wood**, in reply, said it was not surprising that Mr. Innes had found difficulty in the treatment of goat skins with oropon, since the surface action of the latter, which was an enzyme bate, was very intense, and goat skins were very hard. As a result, the grain of the skin would go down before the bate had penetrated to the interior. Oropon might, however, be used for glove leather where the skins were thinner. Goat skins could be bated successfully with "erodin" by forcing the solution into the skin by means of a tumbler ; in fact one large German firm used erodin for bating goat skins for kid. With reference to the loss of hide-substance during the bating process, this matter was fully discussed in his book : The Puering, Bating and Drenching of Skins, where, *inter alia*, it was stated (p. 48) that the loss normally amounted to about 1 per cent. of dry ash-free skin.

Agitation of the bating liquid had been found to have a favourable effect. The normal calomel electrode employed in the experiments was kept at the temperature of the room. With regard to the products of the pancreatic digestion of gelatin, the only ones considered by the authors were amino acids.

Referring to the examination of the activity of enzymes, the authors found the electrometric method more delicate than the formaldehyde method. Since the completion of their paper they had also employed a method due to O. Gross* for the examination of the activity of trypsin preparations with good results. This method was as follows : 1 grm. of *Caseïnum purissimum* (Grübler) was dissolved in 1 litre of 1 per cent. sodium carbonate and a little chloroform added to prevent bacterial action. To a series of test tubes containing each 10 c.c. of the above solution at 40° C. was added the solution to be tested in gradually increasing amount. The tubes were put into a thermostat at 40° C. for a certain time and then acidified with a few drops of acetic acid which immediately stopped the digestive process. The contents of these tubes in which all the casein was digested, remained clear ; the others in which some undigested casein still remained, showed more or less turbidity.

The course of the digestion of a 0·1 per cent. Grübler trypsin dissolved in 0·1 per cent. soda solution was investigated by Gross. The temperature was kept constant at 40° C. Variations in the alkalinity of 0·5—2 per thousand were without influence on the strength of digestion, also the quantity of liquid in which known weights of casein and trypsin were dissolved was without influence. With regard to the influence of the amount of ferment and the time of action it was found that trypsin digestion did not follow the Schütz-Borrissoff law, but that the formula,

$$K = \frac{c}{f \cdot t}$$

held good, in which f = amount of ferment, t = time, c the amount of casein digested, and K a characteristic constant which expressed the activity of the digestive juices. As unit of tryptic activity Gross took the quantity of material capable of digesting 10 c.c. casein solution in 15 minutes at 40° C., so that there was no turbidity on adding acid. The authors had made some experiments with this method and had obtained good results, which seemed to be comparable with the gelatin liquefying test, and very suitable as a control method for rapidly estimating the proteolytic activity of bate liquors.

The effect of various salts on the activity of the proteolytic enzyme required investigation, as the authors found that the purified enzymes might be rendered considerably more active by the addition of a small quantity of ammonium chloride. That would probably explain why "puer" was more active than would be expected from the quantity of enzymes obtained from it by precipitation, since it contained various ammoniacal salts which had undoubtedly an activating effect on the enzymes present.

Yorkshire Section.

Meeting held at Queen's Hotel, Leeds, on Monday, November 18th, 1912.

MR. GEO. WARD IN THE CHAIR.

A CASE OF MERCURIAL POISONING, AND THE ESTIMATION OF MERCURY IN TEXTILE MATERIALS.

BY L. L. LLOYD, PH.D., AND PROF. W. M. GARDNER, M.SC.

Certain obscure diseases are frequently associated with particular industries, and a definite diagnosis is often a matter of considerable time and research. The operatives in hat factories have by no means been immune from such diseases, and recently certain ailments hitherto attributed to other causes were diagnosed as being due to mercurial poisoning. At this stage one of us was requested to investigate the matter, and an inspection of the various processes involved in the manufacture of felt hats was made, and samples of the materials at various stages were taken.

The original source of the mercury was not far to seek, since the rabbit or other fur used as raw material is treated with an acid solution of mercuric nitrate by the fur dealers prior to its purchase by the hat manufacturers. This process, which is known as "carrotting," has been carried on for a long period, its object being that of raising the outer scales of the fibre and thus increasing its felting properties. The great bulk of the fur used in hat manufacture is thus treated.

The fur is purchased by the hatters in sorted bundles representing various qualities, and of these raw materials six samples were taken at random and the amount of mercury estimated. The results were as follows :— 0·09, 0·16, 0·095, 0·14, 0·175, 0·17 per cent. Obviously each of the samples had been "carrotted."

The various processes through which the material passes in the making of the hats are as follows :—

(1) *Blowing.* A mechanical process separating the long and short fibres.

(2) *Forming.* A mechanical process whereby the fur is formed into a large cone about 24 in. high and 24 in. diameter.

(3) *Hardening.* Consists of a slight steaming in order to consolidate the cone.

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* Die Wirksamkeit des Trypsins und eine einfache Methode zu ihrer Bestimmung. Arch. f. exp. Pathol. u. Pharm., 58, 157 ; also Koch's Jahresbericht, 1907, 639.

(4) *Planking.* This most important process has the object of reducing the large cone, by the felting of the fibre, to a size approximating to that of the finished hat. The essential treatment is a rubbing, rolling, and kneading of the fur while saturated with a warm 2 per cent. solution of sulphuric acid. Planking is carried out both by machine and by hand, and the individual who had contracted mercury poisoning was a hand planker who had for many years worked at a planker's bench. Rubber gloves are worn, the hat bodies being dipped into a reservoir of the acid in the centre of the bench, and then rolled by hand on an inclined table sloping to the centre, several men working round one bench. Steam is given off by the hot acid, and this is carried off by a central hood placed above the acid trough.

The strong acid was found to be free from mercury, but the planker's acid, which is made up afresh each day, was found at noon to contain 0·0012 per cent.-volume of mercury. A hat body in process of treatment contained 0·138 per cent. of mercury, and some loose hair obtained from the acid trough contained 0·08 per cent. A cotton fringe cloth tied round the bottom of the hood, which could only be contaminated by vapourisation, contained 0·01 per cent. Mercury was also found to be deposited on a copper scoop used for straining loose fibre from the acid.

Further processes of manufacture.—After passing through other mechanical processes to improve the shape, etc., of the hat body, the bodies are stiffened or proofed in an alcoholic solution of shellac, etc., being impregnated by dipping and the excess removed by scraping. The bodies are then heated in a stove to drive off the solvent. The alcohol is recovered by condensing the vapour and collecting (in this case) in glass reservoirs. On inspecting the latter, globules of metallic mercury were found at the bottom, the mercury obviously having been reduced to the metallic condition, volatilised and condensed with the alcohol vapour.

The further processes of manufacture are of no interest from the point of view of the present inquiry.

It is obvious that some portion of the mercuric salts originally present in the fur in considerable quantity, pass right through the processes of manufacture, since it was found that in a finished hat, after dyeing, steaming, hot pressing, etc., mercury was still present. A hat which had been in use by one of the authors for about a year was also found to contain 0·0015 per cent. of mercury.

A most interesting point which emerged from the investigation was the remarkable volatility of mercury and of mercury compounds; and it was thus shown that mercury poisoning may result directly from the continual inhalation of steam or other vapour rising from liquids containing traces of mercury.

It should be pointed out that mercury may be readily detected in the steam when the metal is boiled with water or when acid solutions of mercuric or mercurous salts are distilled.

On the other hand, animal fibres retain mercuric compounds very persistently, as is shown by the fact that mercury in appreciable amount is still present in a hat which had passed through the dyeing process which would involve at least one hour's boiling, as well as the several steaming and stoving operations incidental to the manufacture.

The detection and estimation of mercury in textiles is a very difficult matter.

Detection of mercury.—The method of detecting mercury in minerals, by distillation and allowing the mercury vapour to alloy with gold leaf, and afterwards testing the gold leaf by the method described by A. Johnstone,* gives very good results. But when this method is applied to textiles, it is necessary to decompose the tarry products produced by partial decomposition of the wool, cotton, etc., by means of copper oxide. The results are very satisfactory but the process is extremely troublesome to carry out. In our experiments the gold leaf was replaced by a small piece of platinum thinly plated with gold.

In some cases it was found sufficiently delicate to extract the textile material with dilute *aqua regia*, nearly neutralise, and suspend a piece of clean copper in the solution. The copper was then dried by washing with alcohol and ether and the mercury distilled from it in a tube which was somewhat constricted, in order readily to condense the volatilised mercury. The mercury was then detected by dropping a crystal of iodine in the tube, and volatilising it through the tube, when, on coming into contact with the mercury, a red colour was obtained.

A very efficient method for the detection of mercury in textiles is as follows:—The textile material, of which about 5 grms. are taken, is cut into small pieces and warmed on the water bath with a small quantity of *aqua regia* diluted with three times its volume of water, in a 1½ litre flask fitted up for distillation in superheated steam. The acid solution in the flask is now slowly treated with a slight excess of zinc dust, and then distilled in superheated steam at 160° to 170° C., the flask being provided with a trap to prevent liquid spitting over. A coil of clean copper wire gauze is placed in the broad part of the inner tube of the condenser and another piece is placed in an adaptor at the lower end of the condenser. The mercury is volatilised by the superheated steam and amalgamates with the copper, the major portion being collected at the first copper gauze coil. The coils are washed with a little alcohol, dried in the air, and then heated in a dry tube closed at one end, the other end being drawn out fairly thin in order to obtain rapid cooling. The mercury is volatilised by gently heating, and with a little practice may be condensed on the drawn out or constricted portion of the tube. After cooling, a very small crystal of iodine is introduced into the tube, which is gently heated to volatilise the iodine through the tube; the iodine vapour on coming into contact with the mercury gives an orange to red colour. Arsenic gives a yellow colour and antimony a brown to yellow colour. The portion of the tube containing the iodide is cut out and heated in a test tube containing one drop of nitric acid. The iodides of arsenic and antimony, as has been shown by A. Johnstone, are quickly decomposed, whereas mercuric iodide is only slowly acted upon.

Estimation of mercury.—Many attempts were made to estimate mercury by distillation in superheated steam, in hydrochloric acid of constant boiling point, and in gaseous hydrochloric acid. Superheated steam gave fairly good results, but the quantity of water necessary for complete distillation is rather large. No ratio of the total amount could be obtained by comparative trials, such as is obtained during the estimation of free ammonia in potable waters.

When a dilute, nearly neutral solution of mercury is treated with an alkaline solution of potassium iodide and ammonia, a brown colour is obtained, this being practically the reversal of the Nessler method for the estimation of ammonia.

The following method was eventually worked out and gives good results for the estimation of mercury in textiles:—The weighed cloth, the amount depending upon the indication obtained from the qualitative test for mercury, is heated to about 50° C. with diluted *aqua regia* (1 *aqua regia* to 2 water) and the extract poured off, the extraction being repeated about six times; the residue is finally well washed with hot water. If the material contains animal fibres, the flask, during the extraction with acid, should be briskly shaken to prevent the gases that are given off from carrying material out of the flask. To avoid this it is advisable to fit the flask with a short air condenser. On no account should concentrated *aqua regia* be employed because mercuric chloride is fairly volatile in hydrochloric acid gas. The combined extracts and washings are made slightly alkaline with caustic soda, the solution saturated with sulphuretted hydrogen, allowed to stand in a warm place for a short time and then just acidified with acetic acid. After standing for some time the precipitate is filtered off and well washed until chlorides are completely removed. The precipitate is treated on the filter (which is described later) with warm dilute nitric acid, and finally with boiling dilute nitric acid (one acid to 3 water). The mercury remains upon the filter as mercuric sulphide; it is dissolved from it by warm somewhat dilute *aqua regia* and the solution compared colorimetrically with standard mercury solution.

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* *See* Crookes, "Select Methods of Chemical Analysis."

The solution is made as nearly neutral as possible with caustic soda, or with very small amounts of mercury the solution may be made alkaline. To this solution is added 5 c.c. of the reagent and the colour compared with standard solutions of mercury, treated under exactly the same conditions, in Nessler glasses.

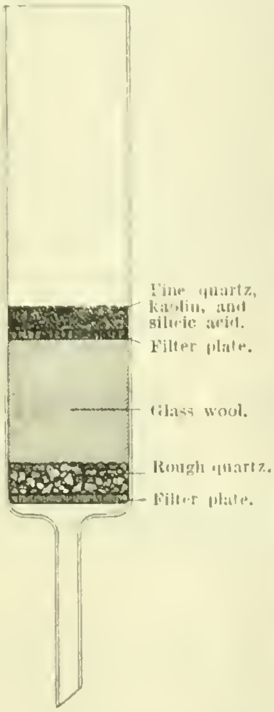
The standard solution of mercury is made from mercuric chloride, or better from mercury dissolved in dilute *aqua regia*. The reagent contains per 100 c.c. 0·2 grm. of potassium iodide, 6·0 grms. of caustic soda, and 2·0 grms. of ammonium chloride. The estimation must be carried out under exactly similar conditions as in the estimation of ammonia by the Nessler method; the standard mercury solution and the specimen under examination being treated with the same volume of reagent and the colour compared after the same lapse of time after mixing.

The mercury solution employed as standard contained 0·1 grm. of mercury per litre (1 c.c. = 0·0001 grm. Hg.) With this solution correct comparisons cannot be obtained if more than 10 c.c. are employed, the brown colour being too dense and also separating too quickly from the solution.

The special filter indicated in the figure has been found most satisfactory. It is made of glass.

The kaolin is deposited on the fine quartz from a thick cream along with a little sodium silicate solution; to this is added some dilute acid, the gelatinous silica acting as a binding material for the kaolin. Before using it is well washed with boiling water.

To prove the accuracy of the method, 20 c.c. of standard mercury solution and 0·01 grm. of copper sulphate were mixed in a flask with 4 grms. of alpaca wool, extracted by acid, etc., filtered, and the mercury sulphide separated, and finally dissolved in *aqua regia*. The solution was made to 100 c.c. and portions of 20 c.c. compared with standard mercury solution in Nessler glasses.



Mercury solution.		Standard mercury solution to match.
20 c.c.		7·8 +
20 c.c.		8·0 − −
20 c.c.		7·8 +
	Mean	7·86 c.c.
	Theory	8·00 c.c.

This shows an error of less than 2 per cent. on the amount of mercury present.

In the estimation of mercury in the hatter's material, 10 grms. of fur were used in each case and the final solution made up to 100 c.c., 50 c.c. being compared in Nessler glasses with the standard mercury solution.

Estimation of mercury in hat body. Wt. of hat taken, 13·440 grms.; solution made up to 100 c.c.: 50 c.c. required 9·25 c.c. for comparative tint = 0·138 per cent. mercury.

Estimation of Mercury in Hatter's Fur

Sample.	Vol. of mercury sol. required for equal tint.	Mercury.
		per cent
1........ ...	4·5 c.c.	0.09
2........ ...	8·0 „	0·16
3........	1·75 „	0.035
4........	7·00 „	0·14
5........	8·75 „	0·175
6........	8·5 „	0·17

Estimation of mercury in a felt hat after wearing for 12 months. Wt. of hat taken 10·0 grms.; solution made to 100 c.c.; 50 c.c. required 0·75 c.c. for comparative tint = 0·0015 per cent. mercury.

The above method of estimating mercury is applicable to the estimation of mercury when used for antiseptic purposes in sizes and stiffening agents in textile materials. A sample of cotton warp contained 0·00015 per cent. of mercury.

DISCUSSION.

Mr. G. **Ward** said that nearly all preparations of mercury were extremely volatile, and he had even heard that globules of mercury boiled with water in a flask could be volatilised along with the steam.

Mr. F. W. **Richardson** pointed out that the older toxicologists might have failed to detect mercury in many cases where it had been taken into the body. A method for estimating mercury by precipitating it on pure zinc, dissolving in hydrochloric acid, precipitating with sulphuretted hydrogen, and determining the colloidal sulphide colorimetrically, had been recently described in the Chemiker Zeitung, but he should imagine a good deal of mercury would be lost by the method. He had found that in the presence of organic matter oxidation with fuming nitric acid and distillation into cold water resulted in the whole of the mercury being carried over into the distillate. It had been lately noticed that mercury was much more volatile than had been formerly imagined. The paper indicated where the loss should be sought. If a mercury solution was boiled with acid and copper, would the copper retain most of the mercury?

Mr. W. Mc. D. **Mackey** asked if the authors could describe the symptoms of the case of poisoning described. Would mercury be lost by volatilisation in charring organic matter containing it with sulphuric acid?

Mr. G. **Ward** remarked that in the preparation of commercial red mercuric oxide from the sulphate, sulphuric acid was driven off by properly regulating temperature. Great care was necessary, but the acid could be removed with very little loss of mercury.

Mr. H. W. **Watson** asked if there was any danger of minute deposits of mercuric iodide obtained in the test described by the authors being masked by films of iodine.

Mr. W. **Lowson** inquired about the delicacy of this method in the estimation of minute amounts as compared with other methods, *e.g.*, the method recently described by Procter and Jones before the Section.

Dr. H. **Ingle** asked if the residual small amount of mercury left in the finished hat was likely to affect the wearer. He inquired as to the relative volatility in steam of mercury and its salts, especially the chloride. How did the authors know, in their work, when the whole of the mercury had distilled over? The volatility would depend on the relative vapour pressures of the salt solutions, and this would also apply in the case of amalgams with copper, gold, or zinc.

Dr. L. L. **Lloyd**, in reply, said that in the estimation of mercury, by deposition of the mercury upon copper or zinc, it was very doubtful whether the whole of the mercury was separated as an amalgam, and if the solution had been boiled undoubtedly some mercury would be volatilised. When mercury was used along with concentrated sulphuric acid for charring or oxidation of organic matter, very little mercury would be lost by volatilisation unless chlorides were present. In the manufacture of phthalic acid, where mercury and sulphuric acid were used, very small traces of mercury were known to be carried over into the distillate. If too much iodine was sublimed through the tube during the detection of mercury, the red colour was somewhat masked, but with a little experience the excess of iodine might be volatilised, leaving the yellow or red mercuric iodide. The method of Procter and Jones for the estimation of mercury gave very good results for pure mercury compounds but since, in most estimations, the separation of other metals that were precipitated by sulphuretted hydrogen had to be carried out, and a solution containing the mercury along with nitric acid was obtained, for such solutions the more delicate new test was certainly advantageous. The degree of accuracy was shown in the paper by testing a known quantity of mercury. Of the mercury salts tested the chlorides were the most volatile. By comparing the quantity of mercury and the mercuric chloride distilled in steam from known amounts of the substances, it was found that the relative volatility varied according to the strength of the solution. From strong solutions the mercuric chloride was more volatile than metallic mercury in suspension in water, but with dilute solutions the mercuric chloride was less volatile than metallic mercury, probably owing to the formation of basic salts. In the quantitative experiments for distillation in steam, known quantities of mercury and of mercuric chloride were distilled and the amount of mercury in the distillate estimated. The temperature necessary to remove mercury from amalgams varied; gold amalgam appeared to require the highest temperature for the distillation of the mercury from it, and it was therefore the best metal for arresting the mercury when carrying out a qualitative test. When mercury was used in the Kjeldahl process, some mercury passed over and gave a grey colouration to the distillate. This was prevented when sodium sulphide was added before distillation of the ammonia to precipitate the mercury as sulphide from white precipitate, etc. It was known that white precipitate, even in presence of a large excess of caustic soda, retained its nitrogen very tenaciously. This might account for the manner in which mercury was so tenaciously retained by animal fibres, the nitrogen in the animal fibre acting as an amine with production of complex mercury salts. In the separation of mercury in textiles, the solution was treated with sulphuretted hydrogen in caustic soda solution, because the sulphides that were precipitated appeared to aid in the separation of the decomposed wool substance; on adding acetic acid the solution must stand for some time in a warm place to separate the mercuric sulphide, the latter being fairly soluble in caustic soda. Procter and Jones used organic acids, in the cold, to preserve the colloidal form for comparative purposes; these solutions on warming soon deposited the mercuric sulphide.

Prof. W. M. Gardner said that the diagnosis of the case was made by Dr. F. E. Tylecote, of Manchester, who had fully described the symptoms in a paper in the "Lancet" October 26th, 1912. The chief symptoms of chronic as distinguished from acute mercurial poisoning were plentiful salivation, flabby and discoloured tongue, blackened teeth, blackened gum margin, and muscular tremor.

Journal and Patent Literature.

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I.—GENERAL PLANT; MACHINERY.

Patents.

Gas furnaces; Reversible regenerative ——. A. Reynolds, London. Eng. Pats. 16,041, July 11, 1911, and 20,144, Sept. 11, 1911.

In addition to the usual pairs of air and gas regenerator chambers, auxiliary air economisers or regenerators of large capacity are provided, adapted to be traversed by the waste gases from the ordinary regenerator chambers which are drawn through the auxiliary chambers by a fan. Part of the heated air from the auxiliary chambers may be mixed with the waste gases leaving the gas-reversing valves so that any combustible gas therein may be completely burned and the resulting heat utilised in the auxiliary chamber. A small igniting flame may be provided near the reversing valves to facilitate this action.—H. H.

Heating, evaporating, volatilising or distilling liquids by electricity; Apparatus for ——. T. McClelland, jun., Glasgow. Eng. Pat. 27,422, Dec. 7, 1911.

One (or more than one) rigid, perforated, slotted, or other open-work container is provided with carbon or other equivalent non-metallic resisting material, in the form of pieces, particles, granules or the like, the container being wholly or partially immersed in the liquid. The latter has free access from all sides, through the openings or perforations, to the carbon or other particles through which a current of electricity is passed. Various forms of containers, straight, curved, U-shape, cylindrical, etc., are described. —B. N.

Distilling apparatus. H. C. Duensing, Chicago Heights, Ill. U.S. Pat. 1,043,305, Nov. 5, 1912.

The apparatus comprises an evaporator, above which is mounted a dome-shaped condensing chamber which is jacketed so as to be surrounded by a cooling liquid. The cover of the evaporator carries a central pipe which projects upwards into the condenser. The condensed liquid passes into a coil in a cooling tank arranged beneath the condenser, and the cooled liquid passes from the coil into a storage tank. The cooling liquid for the condenser passes first through the cooling tank.—A. T. L.

Evaporation; Process for separating by —— *solid substances contained in solutions.* G. Jebsen and C. Finckenhagen. Fr. Pat. 443,977, May 18, 1912. Under Int. Conv., June 1, 1911.

The liquid is atomised by a current of air or gas, which may be compressed and cool, compressed and warm, or compressed to 1, 2, or 3 atmospheres and heated to 250°—600° C. The quantity of air or gas used is such that the liquid atomised by it is at once and completely vapourised; this enables gas at a high temperature to be used for easily damaged materials, such as milk, as the rapid evaporation quickly reduces the temperature, so that the time of exposure to the high temperature is very short.—W. H. C.

Deposits of salts in evaporators for liquids which deposit incrustations; Process and arrangement for detaching ——. G. Sauerbrey Maschinenfabrik, Akt.-Ges. Fr. Pat. 444,411, May 9, 1912.

The parts of the evaporator which are liable to be covered with incrustation are formed of curved plates, the curvature of which can be varied by altering the steam pressure. The parts liable to incrustation may also be covered with thin curved plates of sheet iron, the curvature of which may be altered by the flow of the liquid to be evaporated or by mechanical means. This intermittent alteration of curvature causes the crusts to be loosened from the plates.—W. H. C.

Liquid distributors. I. P. Llewellyn, Goole, Yorks, and Peter Spence and Sons, Ltd., Manchester. Eng. Pat. 1322, Jan. 17, 1912.

A DEVICE for automatically distributing or scattering liquids over a considerable area, *e.g.*, in cooling, washing, or absorbing towers, consists of a narrow bar or plate, about 9 in. long, twisted or coiled upon its longer axis to form a helix down which the liquid flows by gravity and scatters itself by centrifugal force. The pitch of the helix may be varied at different points, and the cross-section of the bar may vary from point to point to give an irregular movement to the liquid.—H. H.

Smoke and fumes; Apparatus for washing ——. J. J. De Mont, Bayonne, N.J. Eng. Pat. 12,456, May 25, 1912.

THE smoke to be cleaned passes in a downward direction into the treating tank through two flues arranged at opposite ends thereof and dipping almost to the bottom of the tank. Finely divided streams of water are projected forcibly down the flues in the same direction as the smoke, which is carried along thereby and at the same time cooled and cleaned. The cleaned gas passes into a smaller tank arranged above the treating tank and is carried away by means of an air injector. The water outlet of the treating tank is situated in such a position that the tank remains about half full of water.—H. H.

Refrigeration; Process of ——. W. W. Seay, Cincinnati, Ohio. U.S. Pat. 1,042,041, Oct. 22, 1912.

THE process consists in absorbing the refrigerating gas *e.g.*, anhydrous ammonia, in a tank containing a liquid formed from a salt having the property of passing from the solid state into liquid solution with the gas, the tank being cooled during the absorption period, removing the solution to another tank where the gas is driven off by heating, condensing the gas, and then expanding it in proximity to the article to be cooled. The weakened solution from the heating tank is returned to the absorbing tank to be again used for absorbing the gas.—H. H.

Ammonia [for refrigerating purposes]; Method and apparatus for the condensation of ——. L. Block. Fr. Pat. 444,688, June 6, 1912.

THE apparatus consists of a series of worm condensers, preferably of galvanised iron and of the "trombone" type, which are cooled externally by a descending flow of water. Hot ammonia gas is admitted under pressure (about 12 atmos.), into the lowest section of each condenser and at a sufficient velocity to carry forward the liquefied ammonia as produced, so that the ascending gas comes into very intimate contact with the liquid, which promotes rapid condensation, and the heat is quickly transferred to the exterior by the liquid ammonia in contact with the condenser wall. The cooling is so effected that the water on the outside of each section of the condenser is only slightly cooler than the mixture within and that the whole of the gas is liquefied before reaching the top of the condenser, from which point the relatively cold liquid is discharged. Suitable traps are arranged to prevent the escape of uncondensed gas and the backward flow of liquid ammonia.—F. SODN.

Filtering apparatus. L. C. Trent, Los Angeles, Cal. U.S. Pat. 1,042,295, Oct. 22, 1912.

A ROTARY filtering apparatus comprises a central hollow shaft carrying a number of filtering discs at right angles thereto, each consisting of hollow perforated radial arms communicating with the shaft and an outer perforated rim carried by the arms, the whole being enclosed in filtering cloth. Suction is produced within the shaft, and the liquid to be filtered is supplied in a reverse direction to the rotation of the shaft from a tank above the filtering tank. Porous segmental blocks may be placed in the spaces between the radial arms to prevent the filtering cloths on opposite sides of each disc from coming into contact.—H. H.

Filter-press; Continuous ——. F. Verbièse and E. Darras-Verbièse. First Addition, dated Aug. 8, 1911, to Fr. Pat. 427,901, June 7, 1910 (this J., 1911, 1148).

THE additional claims are for the exclusive employment of the material deposited from the liquid to be filtered, as the filtering material, the deposit being supported on metallic gauze of large mesh or on perforated plates. The scrapers have a curved or spiral form to ensure the progressive passage of the deposit towards the periphery of the filter-plates.—W. H. C.

Desiccating liquid substances. H. J. C. Forrester, Birmingham. From The Griscom-Spencer Co., New York. Eng. Pat. 23,436, Oct. 24, 1911.

SEE U.S. Pat. 1,011,993 of 1911; this J., 1912, 61.—T.F.B.

Desiccating fluid substances; Method and apparatus for ——. W. S. Osborne, New York. Eng. Pat. 23,561, Oct. 25, 1911. Under Int. Conv., Oct. 26, 1910.

SEE Fr. Pat. 436,762 of 1911; this J., 1912, 455.—T. F. B.

Filtering liquids; Press for ——. P. Krassa, Assignor to Chem. Fabr. Güstrow, Güstrow, Germany. U.S. Pat. 1,042,803, Oct. 29, 1912.

SEE Eng. Pat. 22,560 of 1911; this J., 1912, 320.—T.F.B.

Filtering apparatus. P. C. C. Isherwood, Leytonstone, Assignor to Refractory Zinc Ore Treatment Co., New York. U.S. Pat. 1,043,939, Nov. 12, 1912.

SEE Eng. Pat. 4358 of 1909; this J., 1910, 545.—T. F. B.

Heat-insulating compounds; Manufacture of ——. W. D. A. Bost, Assignor to International Refrigerating Insulator Synd., Ltd., Paisley. U.S. Pat. 1,044,126, Nov. 12, 1912.

SEE Eng. Pat. 2903 of 1910; this J., 1911, 346.—T. F. B.

Continuous rotary filter. U.S. Pat. 1,036,847. *See* X.

Method of protecting tunnel-furnaces from injurious gases. U.S. Pat. 1,040,892. *See* VII.

Channel-furnace. Tunnel-furnace. U.S. Pats. 1,040,895, and 1,040,978. *See* VII.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal and oil as fuel; Relative costs of ——. C. E. Stromeyer. J. Gas Lighting, 1912, 120, [2584], 572.

THE author deals with the relative costs of burning coal or oil under boilers, and exploding oil or gas in engines. He shows that at present prices oil cannot compete with coal below 38s. per ton; but that it can be profitably used in internal combustion engines whenever and wherever the price of coal exceeds 15s. per ton. He makes the following comparisons:—Roughly stated, a first-class modern steam engine utilises about 12 per cent. of the available heat in the coal, resulting in (say) from 1·6 to 1·7 lb. of fuel per brake-horse-power per hour during a week's work of 55 hours. If the boilers are to be fired by producer gas, for which purpose slack and dust can be used, then each brake-horse-power will require about 2 to 2·2 lb. of coal. Internally-fired gas and oil engines are approximately twice as efficient as steam-engines, which means that they utilise about 25 per cent. of the available heat. Crude oil being 37 per cent. better than good ordinary coal, oil-engines should use the equivalent of only about three-eighths of the quantities of coal mentioned above—say, about 0·6 lb. per brake-horse-power. Then, however, as there are no boiler radiation losses overnight, a material saving results; and the oil consumption per week of 55 hours may be about 0·5 lb. per brake-horse-power. Petrol and similar internal combustion engines would require about 0·4 lb. Gas-engines have about the same efficiency as oil-engines; but there is a loss of about 20 per cent. in the producers, if these work continuously, and another loss of quite 10 per cent. if they stand idle overnight, the efficiency of gas-engines is only about 40 per cent. better than that of first-class steam-engines.

Gas coals; Quality of —— for distillation in large masses. D. Meneghini. Gaz. chim. ital., 1912, **42**, II., 479—495.

The author has carried out a series of experiments to ascertain the probable cause of the difficulty sometimes experienced in discharging the coke yielded by certain coals when carbonised in chamber ovens. He concludes that this is due chiefly to the friability of the coke, whereby during the discharging operation it tends to break into small pieces; these impede the movement of the mass of coke when discharging is effected by gravity, whilst when a machine is used, this tends to crush the coke rather than to move it forwards. In general the fragility of the coke appears to increase with the proportion of ash in the coal, especially when this is distributed irregularly; three lots of Durham coal with which special difficulty was experienced in discharging the coke, all contained over 8 per cent. of ash. The friability of the coke also increases when the coals are exposed for long periods to the air before carbonisation, and the proportion of humic acid in the coal increases concurrently. The author recommends that the proportion of humic acid (or matter soluble in 10 per cent. potassium hydroxide solution) should always be determined in coals which are to be carbonised in chamber ovens. Good gas coals generally do not contain more than 1 per cent. of matter soluble in alkali, and when this limit is exceeded, it is stated that the coal must be regarded with suspicion in regard to risk of spontaneous ignition, and difficulty of discharging the coke after carbonisation in chamber ovens.—A. S.

Sulphur in illuminating gas; Determination of —— by Dickert's method. E. Bosshard and C. Horst. J. Gasbeleucht, 1912, **55**, 1093—1094.

Dickert's method for the determination of total sulphur in illuminating gas (this J., 1911, 347) depends upon the oxidation to sulphuric acid of all the sulphur compounds by passing the gas through a solution containing a crystalline precipitate, $Na_2O_2,8H_2O$, in suspension. The authors find that the sulphur compounds to a considerable extent, by the aid of oxidation, yield only sulphur and not sulphuric acid and hence the method is useless. For example, when the total sulphur determined by Drehschmidt's method was 32·9, 27·2, and 30·4 grms. per 100 cb.m., Dickert's method gave only 1·1, 4·4 and 2·6 grms., and experiments with known quantities of pure hydrogen sulphide, or carbon bisulphide, gave similar low results. The absorption of the sulphur compounds, however, is complete.—A. T. L.

Acetylene; Determination of phosphorus in commercial ——. L. M. Dennis and W. J. O'Brien. J. Ind. Eng. Chem., 1912, **4**, 834—836.

The authors have modified the method of Lunge and Cedercreutz (this J., 1897, 1046) for the determination of phosphorus in acetylene produced from calcium carbide. They use a Kipp apparatus for generating the acetylene and two Friedrichs' gas washing bottles, modified so that they can be readily rinsed out with water, for containing the sodium hypochlorite solution employed for oxidising the phosphorus compounds to phosphoric acid. The Friedrichs gas washing bottle is stated to be a very efficient absorption apparatus. It consists of a cylinder widened at the bottom, and closed at the top by a ground glass shoulder on the wide gas inlet tube. The latter fits close up against the inner wall of the cylinder and has a spiral groove on its outer surface. The gas issues from small openings near the bottom of the gas inlet tube, and in rising, passes along the spiral groove and forces some of the absorbing liquid ahead of it. Two of these bottles are stated to be more efficient than the 10-bulb absorption tube used by Lunge and Cedercreutz. Figures are given showing the accuracy and uniformity of the results obtained with the modified method.—A. S.

Oil gas; Calorific value of ——. F. S. Wade. J. Gas Lighting, 1912, **120**, 518—519.

The values given by Payne (this J., 1893, 1016) for the calorific values of the more common gases at 32° F. (0° C.) and 30 ins. (760 mm.) of mercury are largely used in calculating the heating value of gas from the results of chemical analysis. The author shows that even when these values are corrected to 60° F. (15·5° C), the calculated results in the case of oil gas do not correspond with the calorific value as determined in a calorimeter, the calculated results being always about 7 per cent. too low. He recommends the following constants for the calorific values of the constituents of oil gas: "illuminants," 2300; hydrogen, 325; carbon monoxide, 320; and methane, 1080 B.T.U. per cb. ft.; and gives the results obtained with nine samples of oil gas, showing that the calculated calorific value agrees closely with that found with the calorimeter when these constants are employed.—A. S.

Poisonous gases from oilfields. H. S. Shrewsbury. Analyst, 1912, **37**, 486—487.

While working at the bottom of a pit some 10 ft. deep under an oil derrick close to the Pitch Lake at La Brea, Trinidad, a man became giddy and, after being helped out, died twelve hours afterwards. A sample of the gas taken from the top of the well, contained:—Hydrogen sulphide, 0·1; carbon monoxide, 1·1; saturated hydrocarbons, 4·4; unsaturated hydrocarbons, 2·5; oxygen, 8·7; carbon dioxide, 11·9; hydrogen, 18·8; nitrogen, 52·5 per cent. Assuming that all the oxygen and some of the nitrogen was derived from air, the quantity of air present would be 43·4 per cent., and the gas as it issued from the ground would be proportionally concentrated. As the presence of 0·15 per cent. of hydrogen sulphide, or of 0·4 per cent. of carbon monoxide will render an atmosphere fatal to human life, it will be seen that the gas found in the well was extremely poisonous.—W. P. S.

"Shadowgraph" test for gas fires. Butterfield. *See* IIb.

Patents.

Coal washing plant. R. Thomson, Hamilton, Lanarkshire. Eng. Pat. 28,548, Dec. 19, 1911.

The coal rests on a grating in a tank containing water, and the water is caused to rise and fall through the grating by the vertical movements of a buoyant plunger sliding in a chamber which forms part of the tank. The plunger is depressed by the action of steam or other compressed fluid and rises again under the action of the water. The steam acts on a piston-like extension of the plunger, which is of reduced diameter and works in a vertical cylinder, and the flow of steam is controlled by a piston valve carried on a rod attached to the piston.—A. T. L.

Peat; Removal of moisture from wet carbonised ——. T. Rigby, Dumfries, and N. Testrup, London. Eng. Pat. 16,958, July 25, 1911.

The patent relates to a method for reducing the moisture content of peat carbonised by the Ekenberg process (see Eng. Pats. 10,834 of 1903 and 6041 of 1910; this J., 1911, 883), to about 55 per cent. so as to render it suitable for use in a briquetting plant or in a gas producer with ammonia recovery. The method described in Eng. Pat. 4684 of 1911 (this J., 1912, 323) is modified by substituting a special method of drying by heat for the second pressing. The bulk of the moisture is first removed in a filter-press, and the remainder is removed by exposing the peat to the direct action of flue gases, for example in a Ruggles-Coles dryer. The flue gases may be those from the boilers serving a steam-heated dryer in a briquetting plant, and they may be passed through the wet carboniser before use in the Ruggles-Coles dryer.—A. T. L.

Gas producers; Method of operating ——. H. L. Doherty, New York. U.S. Pat. 1,043,213, Nov, 5, 1912.

A vertical conveyor is arranged in a flue at the back of the producer and operates continuously to withdraw partially burned fuel from the lower part of the fuel column and deliver it, in admixture with fresh fuel, to the top of the fuel column. The partially burned fuel passes to the conveyor through an inclined perforated shoot, so that the ashes fall through the perforations into an ash-pit and are not fed again into the producer with the fuel.
—A. T. L.

Gas; Apparatus for manufacturing ——. H. L. Doherty, New York. U.S. Pat. 1,043,304, Nov. 5, 1912.

The producer contains a deep bed of fuel and is worked with an up-draught of steam and air, the steam being generated and the blast heated in a recuperator by means of the sensible heat of the gases leaving the producer. The gas outlet is at about the middle of the height of the fuel column. The upper part of the fuel column, consisting of freshly charged fuel, is carbonised by the flames from a number of burners arranged in the upper part of the producer walls. Each burner has a passage for the producer gas, surrounded by a passage for air, and regulating valves are provided in both passages.—A. T. L.

Ammonia from gases; Process of recovering combined ——. H. L. Doherty, New York. U.S. Pat. 1,043,210, Nov. 5, 1912.

The ammonia, carbon dioxide and hydrogen sulphide are separated from the gas by absorption in a liquid, the gases are distilled off and mixed with sufficient oxygen to form sulphur dioxide, the mixture is passed over a catalytic material, and the ammonium salts in the resulting gas are recovered.—A. T. L.

Ammonia salt; Process for recovering —— *from the distillation gases of coal.* H. L. Doherty, New York. U.S. Pat. 1,043,211, Nov. 5, 1912.

In order to convert the mixed ammonium sulphides and carbonates into more stable salts, they are heated so as to decompose them into ammonia and acid gases, the ammonia is separated, the acid gases are mixed with oxygen and passed over a catalytic material, and the ammonia is mixed with the oxidised gases. The resulting gas is cooled, whereby a mixture of ammonium salts of sulphur-oxygen acids is obtained.—A. T. L.

Ammonium carbonate and sulphur; Process for manufacturing —— *from crude coal-gas.* H. L. Doherty, New York. U.S. Pat. 1,043,212, Nov.. 5, 1912.

The ammonia, carbon dioxide, and hydrogen sulphide are separated from the gas, and the ammonia is separated from the acid gases. The latter are mixed with sufficient air or oxygen to form water and free sulphur, this reaction being brought about by means of a catalytic material. The free sulphur is separated from the resulting gas, and the gas is mixed with ammonia at a temperature below that at which the sesquicarbonate dissociates, whereby a hydrated carbonated ammonium salt is recovered.
—A. T. L.

Hydrocarbon gases; Process of manufacturing liquefiable ——. H. W. Lake, London. From F. R. W. Schroeter, Hamburg, Germany. Eng. Pat. 24,905, Nov. 8, 1911.

See Fr. Pat. 435,451 of 1911; this J., 1912, 378.—T. F. B.

Tar and ammonia from distillation gases; Method of direct recovery of ——. W. Mueller, Essen on Ruhr, Germany. U.S. Pat. 1,043,452, Nov. 5, 1912.

See Fr. Pat. 421,905 of 1910; this J., 1911, 530. T. F. B.

Mineral oil; Process of distilling —— *by steam.* H. Buchler, Zürich, Switzerland. Eng. Pat. 14,009, June 15, 1912. Under Int. Conv., June 16, 1911.

See Ger. Pat. 245,545 of 1911; this J., 1912, 526.—T. F. B.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

"Shadowgraph" test for gas fires; Study of the ——. W. J. A. Butterfield. J. Gas Lighting, 1912, **120**, 495—499.

If the draught in the flue-pipe of a gas-fire is not sufficient, the products of combustion escape also at the front of the fire, and close to the edge of the canopy the escaping gases will have substantially the same composition as the gases escaping through the flue. Use is made of this fact in the "Shadowgraph" method of testing the ventilation of gas-fires. A thick glass plate at a temperature between the respective dew-points of the air of the room and the hot products of combustion, is held close to the edge of the canopy in a plane perpendicular to the front of the fire. According to the composition of the escaping products of combustion (*i.e.*, to their moisture-content), a more or less dense film of moisture is deposited on the glass plate, and the degree of opacity of the plate, after the test, is a measure of the efficiency of the ventilation. The author has carried out a number of experiments in which the indications of the test were shown to correspond with the results found by chemical analysis. Tables and diagrams are given showing: (1) the variation in composition of the flue gases resulting from the combustion of town illuminating gas according to the extent to which the products of combustion are diluted with surplus air; and (2) the variation of the dew-point of flue gases according to their composition, *i.e.*, to their content of carbon dioxide or oxygen.—A. S.

Danger of explosion of methyl alcohol vapour. Arndt. *See* XVIII.

Patent.

Photometrically testing burners for gas or electricity; Apparatus for ——. W. Gordon, Edinburgh. Eng. Pat. 27,978, Dec. 13, 1911.

The patent relates to a burner standard on which different burners can readily be mounted, and which is provided with joints and connections such that the burner can be brought into any desired position. Vertical adjustment is provided by carrying the burner fitting on a vertical pipe which is moved vertically in guides by means of a screwed rod, the pipe being connected with the burner standard by flexible tubing. The whole is carried by a short horizontal arm connected by a swivel joint with the fixed vertical standard so that it can swing in a horizontal plane, and a swivel joint on this horizontal arm permits of turning in a vertical plane so as to bring the burner to any angle. The union for fitting the various burners on the standard comprises a tapered plug fitting by means of a bayonet joint into a tapered socket, both members having threaded orifices for attachment to the standard and to the burner respectively.—A. T. L.

III.—TAR AND TAR PRODUCTS.

Manufacture of trinitrotoluene. Langenscheidt. *See* XXII.

Manufacture of tetranitromethylaniline. Langenscheidt. *See* XXII.

Patents.

2-Nitro-4-carboxy-5-acidylaminobenzoyl-o-benzoic acids; Manufacture of ——. Act.-Ges. f. Anilinfabr., Treptow. W. Herzberg and G. Hoppe, Berlin. Eng. Pat. 17,259, July 24, 1912. Addition to Eng. Pat. 12,920 of 1912, dated Nov. 4, 1911 (see this J., 1912, 807).

When 5-acidylamino-4-carboxybenzoyl-*o*-benzoic acids are nitrated, the corresponding 2-nitro derivative is obtained: the acetyl compound is soluble with difficulty in alcohol and melts at 247° C.; when the acetyl group is eliminated, 2-nitro-4-carboxy-5-aminobenzoyl-*o*-benzoic acid, of m. pt. 270°—272° C., is produced.—T. F. B.

Xanthones of the anthraquinone series; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 251,696, April, 6, 1911.

The aryl ethers of 1-hydroxyanthraquinone-2-carboxylic acid or their nucleus-substitution products or the corresponding carboxylic acids with substituted carboxyl groups, are converted by treatment with condensing agents into anthraquinone-xanthones: these have no tinctorial properties themselves, but may serve for the preparation of dyestuffs.—T. F. B.

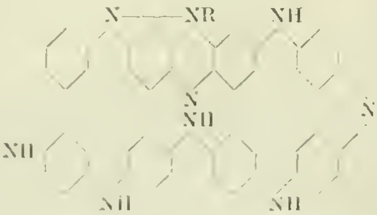
Coal-tar, petroleum residues, creosote and schist oils, and the like; Conversion of —— into pitch. H. Hennebutte, Paris. U.S. Pat. 1,044,175, Nov. 12, 1912.

See Fr. Pat. 443,207 of 1911; this J., 1912, 978.—T. F. B.

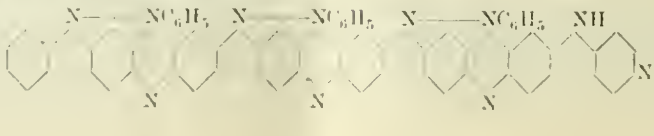
IV.—COLOURING MATTERS AND DYES.

Aniline Black and allied compounds. Part III. A. G. Green and S. Wolff. Proc. Chem. Soc. 1912, **28**, 250—251.

The authors have studied the action of various primary amines on nigraniline. They find that this base, when in a finely-divided state, reacts readily in the cold with neutral or weakly acid solutions of amine salts, giving compounds in which one molecule of amine has entered into combination with one molecule of nigraniline. The products obtained are represented as monoaryl-azonium compounds of the constitution:



In their formation a portion of the quinonoid groups has undergone reduction, and the product resembles protoemeraldine in character, although considerably blacker in colour. By treatment with hydrogen peroxide or chromic acid, by which the compound is re-oxidised to a higher (probably tri-) quinonoid stage, it is enabled to react again with a further quantity of a primary amine; and on several repetitions of these alternate treatments three molecules of amine can eventually be introduced. At this stage the product (when aniline is the amine employed) has all the properties characteristic of "ungreenable Aniline Black" produced on the fibre in the usual way. The analyses and properties agree with the constitution:



By employing *p*-bromoaniline in place of aniline, the corresponding tribrominated Aniline Black, of very similar properties to the above, was obtained, the analysis of which substantiated the above formula. Monoaryl-azonium compounds were also prepared and analysed, in which the reacting amines were *o*-toluidine, *p*-toluidine, *m*-bromoaniline, β-naphthylamine, tolidine, and diaminodiphenylmethane. All these products are very similar to the aniline condensation product.

Peroxydases; Biochemical rôle of —— in conversion of orcin into orceïn. J. Wolff. Comptes rend., 1912, **155**, 1031—1033.

The formation of orceïn (the principal colouring matter of archil and cudbear) from orcin in dilute solutions containing ammonia, is accelerated by the presence of peroxydase. This does not act by increasing the amount of oxygen absorbed, for it is found to exert a greater influence in a limited supply of air than in a large supply.—G. H. F.

Patents.

Sulphur [sulphide] dyestuffs; Manufacture of solid, stable leuco-alkali preparations of ——. Farbwerke vorm. Meister, Lucius, und Brüning, A. Schmidt, and A. Steindorff, Höchst on Maine, Germany. Eng. Pat. 4520, Feb. 22, 1912. Addition to Eng. Pat. 4510 of 1912, dated April 24, 1911 (see Fr. Pat. 440,061 of 1912; this J., 1912, 712).

Solutions of leuco-alkali salts of sulphide dyestuffs, such as those obtained by reduction with glucose or hydrosulphites in presence of alkali, are mixed with sulphite cellulose waste lyes and evaporated to dryness, forming solid, readily soluble, stable preparations, especially suitable for use in the "cold lime fermentation vat" or in the "lime glucose vat." For example, 20 kilos. of a Thiogene dyestuff are heated with 30 kilos. of caustic soda lye of 40° B., 30 kilos. of sulphite cellulose waste lye, and 80 kilos. of water; after addition of 2 kilos. of hydrosulphite or glucose the product is evaporated to dryness.
—T. F. B.

Anthraquinone series; Process for making condensation products [vat dyestuffs] of the ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pats. 251,234 and 251,235, March 16 and May 7, 1911.

Hydroxyanthraquinones and their derivatives are condensed in presence of concentrated sulphuric acid with sulphur chloride or with sulphur; the products may be finally oxidised by means of hypochlorite solutions. The resulting compounds may be used as vat dyestuffs or for the preparation of such.—T. F. B.

Triphenylmethane dyestuffs; Process for preparing chrome ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 252,287, July 26, 1911. Addition to Ger. Pat. 227,105, May 26, 1909 (see Eng. Pat. 12,130 of 1910; this J., 1910, 1297).

p-Halogen-benzaldehydes or their substitution products are condensed with two different *o*-hydroxycarboxylic acids, one of which contains a substituent in the *p*-position to the hydroxyl group: the products are then oxidised and heated with an aromatic base as described in the principal patent. The resulting dyestuffs give clear, fast violet to blue shades after chroming.—T. F. B.

Dyestuffs of the gallocyanine series; Process for preparing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 252,658, Sept. 3, 1911.

Dyestuffs suitable for use in dyeing or printing, are obtained by treating gallocyanines or analogous compounds with phenylpyrazolones or their derivatives.
—T. F. B.

Disazo dyestuffs ; Process for preparing blue ——. Chem. Fabr. Griesheim-Elektron. Ger. Pat. 251,233, Dec. 12, 1911.

The tetrazo compounds of diaminodiphenyl dialkyl ethers are combined with the arylides of 2·3-hydroxynaphthoic acid. When converted into pigment lakes, the dyestuffs are obtained in black-blue shades, fast to lime and oil. They may be also formed on the fibre, with or without the aid of copper salts, in which case greenish blue shades are produced, on which white discharges can be obtained by means of hydrosulphite in presence of catalytic agents. —T. F. B.

Disazo dyestuffs especially suitable for making lakes ; Process for preparing ——. Chem. Fabr. Griesheim-Elektron. Ger. Pat. 251,479, May 11, 1911.

By combining the tetrazo derivative of *o*-dichlorobenzidine with acetoacetarylides, yellow dyestuffs, insoluble in water and oil, and fast to light, are produced.—T. F. B.

Disazo dyestuffs fast to light ; Process for preparing blue substantive ——. Badische Anilin und Soda Fabrik. Ger. Pat. 251,349, March 31, 1911.

Diazo compounds, other than those of 1·8-aminonaphthol or its sulphonic acids, are combined in acid solution with 1·5-aminonaphthol or its 6- or 7-sulphonic acids, and the dyestuffs are diazotised and combined with 2·5-aminonaphthol-7-mono- or -1·7-disulphonic acid or their amino-substitution products. In place of 1·5-aminonaphthol or its sulphonic acids, their acidyl derivatives (substituted in the hydroxyl) may be used, combination being effected in acid or alkaline solution, and the acidyl group being eliminated at the conclusion of the process.—T. F. B.

Dyestuffs of the anthraquinone series ; Process for preparing ——. Badische Anilin und Soda Fabrik. Ger. Pat. 251,709, May 31, 1911.

The thio-aryl ethers of anthraquinone, obtained by the action of arylmercaptans on halogen-, sulpho-, or nitro-anthraquinones, are converted by sulphonation into dyestuffs which dye wool fast shades from acid baths.—T. F. B.

Condensation products of the anthraquinone series containing nitrogen ; Process for preparing ——. A. Schaarschmidt. Ger. Pat. 251,480, Nov. 20, 1910.

o-Diaminoanthraquinones or their derivatives are condensed with ω-di- or -trihalogenmethyl derivatives, aldehydes, carboxylic acids, or acid chlorides of the anthraquinone or benzanthrone series ; sulphuric acid or glacial acetic acid may be used as condensing agent. The vats obtained by means of hydrosulphites from the resulting compounds, dye cotton fast yellow and orange shades. The products can also be converted into other vat dyestuffs by fusion with alkali hydroxide or by other means ; thus, the products from *o*-diaminoanthraquinones and benzanthronecarboxylic acids when melted with caustic potash furnish green to black dyestuffs—T. F. B.

o-Hydroxydisazo dyestuffs ; Process for preparing chrome ——. Farbwerk Mühlheim vorm. A. Leonhardt und Co. Ger. Pat. 251,844, Nov. 21, 1911.

Two molecular proportions of an *o*-diazophenol which contains halogen or nitro groups, or both, are combined with one mol. of resorcinol. The shades obtained by dyeing in presence of a chromium compound or by afterchroming are deep brown or violet-brown, and are fast to light and to potting.—T. F. B.

Anthraquinone series ; Process for preparing oxidation products of the ——. Chem. Fabr. vorm. Weiler-ter Meer. Ger. Pat. 251,845, July 23, 1911.

A new series of products, some of which are available for use as dyestuffs, is obtained by treating arylaminoanthraquinones with oxidising agents, *e.g.*, peroxides, persulphates, bichromates, nitroso compounds, etc. The oxidation is preferably effected in sulphuric acid solution. —T. F. B.

Anthraquinone derivatives ; Process for preparing vat-dyeing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 251,956, Sept. 12, 1911.

Isatin or its derivatives can be readily condensed with *o*-diaminoanthraquinones, forming vat dyestuffs.—T.F.B.

Anthracene derivatives ; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat 252,530, July 27, 1911.

Dyestuffs, or substances suitable for use in preparing dyestuffs, are obtained by the action of condensing agents on dianthraquinonyl thio-ethers (see Eng. Pat. 12,865 of 1912 ; this J., 1912, 1025).—T. F.B.

Anthraquinone derivatives containing nitrogen ; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 252,529, Nov. 24, 1911.

By the action of ketones on *o*-aminoarylaminoanthraquinones, products are obtained which are probably hydro-azines ; they may be used directly as vat dyestuffs, or they may be converted into dyestuffs by sulphonation, etc.—T. F. B.

Vat dyestuffs of the anthraquinone series ; Manufacture of ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 27,113, Dec. 4, 1911.

See Fr. Pat. 438,263 of 1911 ; this J., 1912, 635.—T.F.B.

[Hydr]oxyanthraquinones ; Manufacture of ——. Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 11,915, May 20, 1912. Under Int. Conv., June 14, 1911.

See Fr. Pat. 435,118 of 1911 ; this J., 1912. 278.—T. F. B.

Seleniferous and titaniferous substances ; Process for the preparation of coloured ——. A. von Wassermann, Berlin, and E. Wassermann, Frankfort on Maine, Germany. Eng. Pat. 978, Jan. 12, 1912. Under Int. Conv., Nov. 4, 1911.

See Fr. Pat. 443,554 of 1912 ; this J., 1912, 1025.—T.F.B.

Condensation products of the anthracene series ; Manufacture of ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 10,446, May 2, 1912.

See Fr. Pat. 442,757 of 1912 ; this J., 1912, 979.—T.F.B.

Dyestuffs of the triphenylmethane series and process of making same. A. Stock and F. Heim, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,042,498, Oct. 29, 1912.

See Addition of July 7, 1910, to Fr. Pat. 417,490 of 1910 ; this J., 1911, 17.—T. F. B.

Indigo dyestuffs ; Manufacture of brominated blue ——. A. Schmidt, H. Rössner, and H. Balhorn, Assignors to Farbwerke vorm. Meister, Lucius, und Bruning, Höchst on Maine, Germany. U.S. Pat. 1,043,468, Nov. 5, 1912.

See Eng. Pats. 25,513 and 26,276 of 1907 ; this J., 1909, 17.—T. F. B.

Azo dyestuff ; Brown —— *and process of making same.* F. Scholl and W. Tropp, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,043,873, Nov. 12, 1912.

See Eng. Pat. 22,691 of 1911 ; this J., 1912, 380.—T. F. B.

Indigo compounds ; Halogenised —— *and process of making such bodies.* H. S. A. Holt, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany U.S. Pat. 1,042,679, Oct. 29, 1912.

See Fr. Pat. 412,642 of 1910 ; this J., 1910, 1003.—T.F.B.

Vat dyestuffs of the anthracene series and process of making same. A. L. Laska, A. Zitscher, and E. J. Rath, Offenbach, Assignors to Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. U.S. Pat. 1,042,931, Oct. 29, 1912.

See Fr. Pat. 444,819 of 1912; this J., 1912, 1073.—T.F.B.

Condensation products [from indigo] and process of making same, Coloured ——. G. Engi. Assignor to Soc. of Chem. Industry in Basle, Switzerland. U.S. Pat. 1,043,682, Nov. 5, 1912.

See Eng. Pat. 8121 of 1912; this J., 1912, 635.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Celluloid; Departmental Committee on ——: Times, Nov. 25, 1912. [T.R.]

The Departmental Committee on celluloid appointed by the Home Secretary (see this J., 1912, 980) have opened their inquiry, and will be glad to receive evidence on the following heads:—(1) The inflammability of celluloid, its liability to explosion and spontaneous ignition; standard tests for ascertaining purity and inflammability; the cost, reliability, and practical utility of non-inflammable substitutes. (2) Serious accidents due to fire or explosion in this country or abroad in factories or workshops or retail shops, or in connection with storage, conveyance, or private use. (3) Government and local regulations existing or proposed. (4) The various uses of celluloid in manufacture; the precautions adopted and their adequacy. (5) The dangers of celluloid; how far they are realized by the public. Witnesses will not be limited to the above. Persons desirous of giving evidence or of submitting information to the committee are required to communicate with the secretary, Mr. C. G. Markbreiter, of the Home Office.

Camphor in celluloid; Methods for determination of ——. E. Barthélemy. Caout. et Guttapercha, 1912, 9, 6735—6736.

The sample must be well averaged and, in the case of "tortoiseshell," the light and the dark portions should be analysed separately. The fragments are reduced to powder, either with a rasp or with a grinding mill. Two methods for the separation of the camphor are available: extraction and distillation. For extraction, the Soxhlet apparatus is used with a thimble of wire gauze or asbestos cloth; the solvent is light petroleum spirit, b.p. 45° to 55° C.; 20 grms. of the finely ground celluloid are extracted for 8—10 hours, care being taken not to pack the sample too tightly. For the separation of the camphor by distillation, 20 grms. of the sample are placed in a flask with 200 c.c. of water; a little sodium hydroxide may be added if phenolic camphor-substitutes are present. A current of steam is passed through the liquid, preferably with the use of a superheater. The distillate is collected in a long-necked flask immersed in a bath of running water, the delivery tube of the condenser passing right down the neck of the receiver. The distillate is acidified with hydrochloric acid and the camphor is extracted by shaking with benzene; the aqueous residue should be tested for acetanilide. For the determination of the camphor by means of the polarimeter, the petroleum spirit extract is evaporated to dryness in an atmosphere saturated with camphor; the solid residue is dissolved in benzene and the volume of the solution made up to 100 c.c. for polarisation. If α_D be the rotation observed, the quantity of camphor per 100 c.c. is obtained by the formula $C = 2{\cdot}51536\ \frac{\alpha}{l} - 0{\cdot}02746\ (\frac{\alpha}{l})^2$. The benzene extract containing the camphor obtained by distillation is made up to a known volume and examined in the same way. In default of a polarimeter, the quantity of camphor may be determined gravimetrically as follows: The solution is diluted so that it contains about 5 per cent. of camphor; 10 c.c. of this are placed in a tared crystallising dish in a desiccator. When only a few c.c. remain, the dish is removed, covered and weighed. Weighings are repeated at equal intervals, until it is certain that only camphor is evaporating. A curve is plotted showing weights of the extract as ordinates and time increments as abscissæ. This curve will consist of two inclined straight lines with a sharp bend at their junction. The line tending to approach the line of the abscissæ indicates the rate of evaporation of the camphor. By prolonging this line backwards until it cuts the datum line of the ordinates, the weight of camphor originally present can be read off on the latter. Whatever method be employed, it is important to confirm the purity of the camphor by means of its physical constants.—J. F. B.

Clays; Testing of ——. C. S. Gwinn. Trans. Amer. Ceram. Soc., 1912, 14, 571—574.

The physical characteristics of a clay which have to be considered when it is to be used as a loading material in the manufacture of paper, are: presence or absence of grit, colour, capability of disintegration, "retention." Grit should be absent, as it leads to wear on the machine wires and "clothing," causes breaks and specks in the finished product. It is determined by agitating a weighed amount of clay (200 grms.) in a beaker of water (800—1000 c.c.) for an hour or more and then screening through a 200-mesh sieve. For an ordinary high-grade news, 2 per cent. of grit would be objectionable, though micaceous grit would not be as detrimental as sand. For colour, the clay is compared with standards, by making the samples into smooth pastes with water on a glass plate, and allowing them to dry before judging. Rapid disintegration is a desirable quality in paper clay. It is noted by observing how quickly a clay falls to pieces in a beaker of water. "Retention" is the proportion of clay found, by analysis, in the finished paper to the amount added to the pulp in the beater. The less clay lost in the back-water the better.—H. H. S.

Paper; Discolouration of ——. V. Schoeller. Wochenbl. Papierfab., 1912, 43, 3222—3225, 3408—3409, 3489—3491, 3673—3675, 3963—3965, 4148—4150, 4336—4338.

Papers turn yellow under the influence of long storage, air, light and heat. Comparative tests for this tendency are obtained by storing for at least a year, exposing to the action of air and light for about a week, or, most rapidly, by heating in a steam oven at 95° C. for 3, 5 or 30 hours, according to the stability of the paper. Excluding the presence of mechanical wood pulp, two main causes of yellowing are recognised: sizing with rosin size and modification of the cellulose, *e.g.*, by the action of bleach liquor. The discolouring effect of rosin size may be twofold; in the first place, the rosin itself, as an unsaturated body, darkens on exposure in the finely divided state as it occurs in the paper; secondly, when any considerable proportion of the rosin is in combination with iron, the resinate so formed causes a gradual darkening of the paper. Klemm has considered this latter agency as the main factor in the discolouration of papers, but the author shows that its influence is secondary to the darkening produced by the alteration of the rosin itself, and that it only becomes appreciable when the proportion of iron in the form of resinate exceeds 0·04 per cent. of the total rosin present. This proportion is twice as large as the outside limit occurring in practice with papers sized with commercial aluminium sulphate. Experiments in connection with the alteration of the rosin, when heated in presence of air, showed that the darkening so produced is not a direct function of oxidation as measured by the decrease in iodine absorption value. Purified resin acids, extracted by aqueous alcohol, show a greater tendency to darken in colour than the original rosin, yet the resin acids possess a lower iodine value. Oxidation does occur during the heating, but it affects mainly some constituent which is not concerned in the darkening. Thus the iodine value of a sample of rosin is no indication of its tendency to discolouration. The author found, however, that rosin can be stabilised by the action of chlorine. For this purpose, 5 kilos. of rosin are dissolved with 1800 grms. of sodium hydroxide, the solution is diluted to contain 200 grms. per litre and precipitated with excess of hydrochloric acid. The finely divided precipitate of resin acids is filtered off and introduced wet into a solution of bleaching powder of 10° Bé. (sp. gr. 1·075) in the proportion of 1 kilo. of rosin per 10 litres of bleach liquor. The rosin contains sufficient acid to liberate the chlorine, and the mixture is allowed to stand for 5–8 days. The treated rosin contains 16·9 per cent. of chlorine, and its iodine absorption value has fallen to 33; it readily forms a soap with sodium carbonate and, provided it be employed in conjunction with a good commercial grade of aluminium sulphate, it yields a sized paper which is practically stable in colour. With regard to the condition of the cellulose, papers made from old, worn rags are more likely to turn yellow than those made from sound or new rags; the strength of the bleaching liquor is of less account than the time during which the bleach is allowed to act on the half-stuff. The fibre should therefore be bleached with a moderately strong liquor, the chlorine neutralised and the soluble residues washed out before the half-stuff is stored. Straw and wood-cellulose papers show a strong tendency to discolour, partly on account of the greater sensitiveness of these celluloses to the attack of the bleach liquor and partly on account of residual non-cellulose impurities, *e.g.*, lignin and resin. Finally, discolouration may be due to the fading of tinting dyestuffs employed to increase the brilliancy of white papers.—J. F. B.

Adsorption by clays. IV. [*Decolourisation of waste sulphite-cellulose lyes.*] P. Rohland. Biochem. Zeits., 1912, **46**, 374—375. (See also this J., 1911, 150.)

The author has shown previously that clays rich in colloids have the power of adsorbing complex animal, vegetable and artificial colouring matters, but attempts to remove the colouring matter from waste sulphite-cellulose lyes by adsorption with clay failed. The yellowish-brown colouring matter present in these lyes is probably an iron compound, for on adding potassium ferrocyanide, the deep greenish-blue colour of Prussian blue makes its appearance after some time. After this preliminary treatment the lyes can be decolourised by means of clay, for the latter adsorbs Prussian blue.—A. S.

Estimation of mercury in textile materials. Lloyd and Gardner. *See* Yorkshire Section, p. 1109.

Patents.

Flax fibres; Process for the preparation of —— for spinning. J. E. Bek, Schaffhausen, Switzerland. Eng. Pat. 8683, April 12, 1912.

In the process described in U.S. Pat. 1,004,136 of 1911 (this J., 1911, 1248) the "volatile oil" is replaced by an oil which promotes fermentation, such as a sulphonated castor oil which is not decomposed during fermentation. —T. F. B.

Felting animal fibres; Process for ——. C. H. Boehringer Sohn. Ger. Pat. 249,942, Jan. 1, 1911.

The soaps used in the ordinary fulling process are replaced entirely or partially by soluble salts of the lower organic acids, especially by formic, acetic, and lactic acids; sodium lactate, alone or mixed with other salts of the acids named, is particularly suitable.—T. F. B.

Silk; Process for reducing the brittleness of weighted ——. Nitritfabrik A.-G. Ger. Pat. 251,561, May 9, 1911.

The tendering of weighted silk may be avoided to a great extent by treatment with solutions of ammonium formate. It is stated that the strength of silk weighted by the tin-phosphate-silicate process, can be made more than twice as great as that of the untreated weighted silk by treatment with a 10 per cent. solution of ammonium formate. —T. F. B.

"*Luc-binh*" [*Eichhornia crassipes*]. *Utilisation of —— as a textile material.* J. Perret. Fr. Pat. 434,643, Nov. 30, 1911.

This aquatic plant, of the family of the *Pontederiaceæ*, is found in Cambodia, where it spreads with such extraordinary rapidity that it threatens to block up all the important bodies of water. Multiplying by means of its stolons, a single plant will cover 600 sq. m. in a few months. It is now found that by crushing out the pulp and scutching, the stems of the "luc binh" yield a valuable textile fibre which can be utilised for cordage and for coarse textiles, and as a substitute for jute for the manufacture of bagging.—J. F. B.

Cellulose plates and films; Hopper for producing ——. J. E. Brandenberger, Thaon-les-Vosges, France. Eng. Pat. 4066, Feb. 17, 1912. Under Int. Conv., Mar. 22, 1911.

The receptacle for the aqueous solution of cellulose has the shape of a horizontal tube, of a section not necessarily circular, closed at the ends and split along one of its sides parallel to its axis. The tube has lugs at the ends, enabling the slit to be turned upwards for inspection; a branch pipe is provided through which the cellulose solution is introduced into the hopper-tube under suitable forced pressure independent of the action of gravity.—J. F. B.

Cellulose esters and their transformation products; Manufacture of new ——. H. Dreyfus. Fourth and Fifth Additions, dated Apr. 1, 1912, to Fr. Pat. 432,046, July 5, 1911 (this J., 1912, 24, 225, 329).

(1) For the manufacture of these esters [acetates] the cotton used is subjected to a preliminary purification with a dilute alkali, such as sodium carbonate or borate, in conjunction with a bleaching treatment. For the precipitation of the esters, suitable precipitating agents, preferably benzene, are introduced into the reaction mixture in such quantity that the precipitate at first formed is redissolved on stirring. This addition is repeated until a solution of maximum fluidity is obtained, which can be filtered; subsequent addition of precipitating agents to the fluid solution increases the viscosity and ultimately precipitates the ester. The product of acetylation, suitably diluted, may be forced through jets to produce threads. An alternative method of acetylation consists in allowing the reaction to proceed in presence of benzene or other neutral liquid, in which case the cotton is preferably saturated with the condensing agent, suitably diluted, before introducing it into the acetylating agent.

(2) The esters described in the original specification may also be obtained by carrying out the acetylation in the presence of a neutral liquid without the product being dissolved. The cellulose is steeped in a solution of sulphuric acid in glacial acetic acid so that 15—25 per cent. of sulphuric acid is absorbed according to the effect desired. The steeped cellulose is then introduced into an indifferent liquid *e.g.*, benzene, to which the necessary quantity of acetic anhydride is added, either before or after the introduction of the cellulose. The quantity of benzene used should be such that no portion of the product of acetylation enters into solution. The reaction is interrupted when the desired degree of solubility is reached, and the liquid which is drained off may be regenerated either by distillation or chemical treatment.—J. F. B.

Cellulose solutions; Apparatus for producing brilliant threads from ——. A. Boisson. First Addition, dated Aug. 3, 1911, to Fr. Pat. 436,556, Jan. 24, 1911 (this J. 1912, 428).

The spinneret employed consists of a simple disc pierced with a variable number of holes. Suitable materials for the manufacture of these discs are mica, iridium-gold, ebonite, etc.—J. F. B.

Artificial threads from cuprammonium solutions of cellulose; Process for manufacture of ——. E. de Haën Chem. Fabr. "List." First Addition, dated May 2, 1912, to Fr. Pat. 440,907, Mar. 4, 1912 (see U.S. Pat. 1,034,235; this J., 1912, 841).

The use of coagulating baths containing nitrites, described in the original specification, yields threads considerably stronger than those obtained in the ordinary way, owing, it is claimed, to the suppression of the formation of oxycellulose. The nitrites may be replaced by other slightly alkaline reducing agents, such as sodium arsenite, formate or sulphite. A suitable bath is composed of 30 kilos. of caustic soda lye at 22° Bé, 30 kilos. of water, 25 kilos. of sodium nitrate and 15 kilos. of sodium arsenite (Na_2HAsO_3).—J. F. B.

Cellulose intended for the manufacture of artificial textiles; Purification of ——. P. Girard. Fr. Pat. 443,897, May 6, 1912.

The chief objection to the use of wood cellulose for the manufacture of artificial filaments lies in the presence of resins, gums and other non-cellulose residues. In order to purify the cellulose, the wood-pulp, disintegrated or in sheets, is extracted by means of a volatile solvent which, whilst not attacking the cellulose, readily dissolves the resins, etc. Suitable solvents are alcohols, acetone, carbon tetrachloride and the chlorinated derivatives of ethylene and ethane. The solvents are preferably employed in conjunction with 5—10 per cent. of the commercial aqueous solution of formaldehyde.—J. F. B.

Silk [artificial]; Manufacture of —— *from all kinds of substances.* J. Ubertin. Fr. Pat. 444,462, Aug. 7, 1911.

It is claimed that substances of all kinds, animal, vegetable, ethereal, oily, and even "gases soluble in water," may be converted into artificial silk by dissolving them in a dilute alkaline solution, in specified proportions, and subjecting them to the action of an electrical induction current in a closed vessel, then drawing out the resulting liquid in the form of fine threads, winding these on a bobbin.—J. F. B.

Artificial silk filaments, films, ribbons, and the like; Preparation of alkaline precipitating baths for cuprammonium cellulose solutions for the production of ——. E. G. Legrand. Ger. Pat. 250,357, Oct. 15, 1911.

A solution of diastase is added to the alkaline precipitating bath. By the reducing action of the diastase, the copper in solution is precipitated as cuprous oxide, whereby the alkaline bath gradually acquires a reddish colour, which facilitates observation and guidance of the blue filaments. The precipitated cellulose has a uniform dark green colour which is not removed by protracted washing with water. After treatment for the removal of copper, the filaments preserve their transparency and exhibit a fine uniform lustre and colour; they also possess specially high elasticity and durability.—A. S.

Cellulose solutions; Process for the preparation of ——. W. Traube. Ger. Pat. 252,661, Aug. 6, 1911. Addition to Ger. Pat. 245,575, Jan. 10, 1911 (this J., 1912, 532).

Cellulose or its transformation products are treated with copper hydroxide dissolved in alkylenediamine solutions containing a few parts per cent. of ammonia. For example 5—6 parts of cellulose are introduced into a solution containing 5—6 per cent. of ethylenediamine and about 3 per cent. of ammonia and which has been saturated with copper hydroxide; by thorough mixing a clear solution is ultimately obtained. The ammonia can be removed from the solution by warming *in vacuo* or by a current of air.—A. S.

Sulphite liquor; Concentration of waste ——. C. Ellis, Montclair, N.J., Assignor to Ellis-Foster Co. U.S. Pat. 1,042,538, Oct. 29, 1912.

Concentrated sulphite liquor suitable for use as a binding material for road-surfaces is prepared by approximately neutralising the waste sulphite liquor containing the diffusible constituents, separating the solid matters, aerating the liquid, fermenting it with yeast to remove the saccharine matter, separating volatile substances from the product and concentrating the residue to a density of about 30° Bé. (sp. gr. 1·263).—J. F. B.

Sulphite-cellulose waste liquors; Process and apparatus for the regeneration of sulphurous acid from ——. H. Achenbach. Ger. Pat. 252,412, July 21, 1911.

The pipe through which the liquor passes after leaving the digester is provided with an atomising device enclosed in a closed chamber, and the liquor is atomised by means of its own pressure. The sulphurous acid thereby evolved, and the residual liquor, are led off from the closed chamber through separate outlets.—A. S.

Fibrous materials [waste paper]; Apparatus for pulping, bleaching and mixing ——. H. Strieth. Fr. Pat. 444,045, May 20, 1912. Under Int. Conv., May 23, 1911.

The apparatus consists of a helical agitator which turns rapidly in a chest, with a hollow fixed cylinder surrounding the helix and forming an envelope composed of fixed vertical bars spaced equally apart. Outside this fixed barred cylinder is a reticulated cylinder joined to the helical agitator and revolving with it on the same axis. The exterior of this latter cylinder carries spiral ridges which, when revolved, pass over a set of vertical spaced bars forming the internal lining of the chest. Scrapers are provided at the bottom of the chest to promote the circulation of the material and to facilitate its discharge when the operation is completed.—J. F. B.

Artificial threads from solutions of copper oxide ammonia cellulose; Process for the manufacture of ——. E. de Haën, Chem. Fabrik "List," Seelze, Germany. Eng. Pat. 11,613, May 15, 1912. Under Int. Conv., Jan. 26, 1912.

See Addition of May 2, 1912, to Fr. Pat. 440,907 of 1912; preceding.—T. F. B.

Solvents for cellulose esters used in the manufacture of cinematograph films. H. Danzer, Paris. Eng. Pat. 13,239, June 5, 1912. Under Int. Conv., July 4, 1911.

See Fr. Pat. 443,031 of 1911; this J., 1912, 1008.—T. F. B.

Treating waste sulphite liquor [for the manufacture of tanning extracts]. U.S. Pat. 1,043,303. *See* XV.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Mercerisation of dyed goods. M. Freiberger. Sealed notes No. 1167, Feb. 19, 1900, and 1280, Aug. 19, 1901. Bull. Soc. Ind. Mulhouse, 1912, 82, 549—551.

The author finds that mercerisation after dyeing increases the depth of shade, and covers up "dead" cotton in indigo-dyed pieces. By mercerising after dyeing, streaks, irregular dyeings, and imperfect penetration by the dye—faults liable to occur in dyeing mercerised materials—are avoided. Mercerisation may, it is stated, be carried out with good results at any intermediate stage of the dyeing, or printing process, *e.g.*, after dyeing in the vat and before washing and souring, and, in discharge printing, after steaming, or, after steaming, washing and drying and before finishing. In a report on the process, O. Michel confirms the author's statements with regard to mercerising after dyeing when direct dyestuffs are used, but found that in indigo-dyed goods, the "dead" cotton is not completely covered.—G. H. F.

Aniline Black; Ungreenable —— *on wool.* J. Heilmann and Co. and M. Battegay. Sealed notes No. 2042, Oct. 6, 1910, and 2089, May 20, 1911. Bull. Soc. Ind. Mulhouse, 1912, 82, 538—546.

Ungreenable Aniline Black is produced on wool in a single bath by oxidation with chlorate together with *p*-phenylenediamine, or its analogues and derivatives, in combination with vanadium salts, cyanides, etc. It is probable that the *p*-phenylenediamine acts as a catalyst, just as it does when used for the production of Aniline Black on cotton, with the difference that in the case of wool the oxidising agent (the chlorate) is indispensable. The process is applicable to dyeing or printing, and in printing where chlorinated wool is used, the black develops before drying, so that for the production of reserves part of the aniline hydrochloride, or nitrate, is replaced by acetate. If printed on unchlorinated wool a good black is not obtained. In dyeing, after padding followed by squeezing off, the black is developed by passing through a Mather-Platt for two or three minutes; it is then soaped and dried. Recipes for the various processes are given in the paper. White reserves may be obtained with zinc white in conjunction with Hyraldite and coloured reserves with acid, sulphide, and vat dyestuffs in conjunction with Rongalite. In a report on the process, L. Bloch testifies to its simplicity and to the good results it yields.—G. H. F.

Basic colours on an indigo ground. P. Gadda. Sealed note, No. 1197, July 9, 1900. Bull. Soc. Ind. Mulhouse, 1912, **82**, 553—555.

Tannin and zinc acetate are printed on the material which is then passed through a Mather-Platt, and dyed with indigo. The tannin acts as a resist, and subsequently serves to fix the basic colours on dyeing. In a report on the process, E. Stalder points out that the chief defect of the process is the difficulty of obtaining a pure white with a tannin resist.—G. H. F.

Soaping of printed goods by means of soap-foam. C. Favre. Bull. Soc. Ind. Mulhouse, 1912, **82**, 547—548.

The author recommends a solution of olive oil soap in carefully purified water (*e.g.*, condensed water carefully filtered). This is heated by a copper coil in a wooden vat, all iron fittings being excluded, and the pieces are passed rapidly over rollers, through the foam. The advantages claimed are the purity of the whites, economy in soap and labour, and rapidity in working.—G. H. F.

Patents.

Textile materials with liquids; Apparatus for treating ——. C. W. Fulton, Paisley, Renfrewshire. Eng. Pats. 26,893 and 26,894, Dec. 1, 1911.

Several receptacles, U-shaped or partly U-shaped, are arranged in series with a number of tanks in communication with one another, suitable pumps being arranged to circulate the liquid within the tanks and the receptacles, and to spray it on to the goods as they enter the latter. The material is passed round guide rollers in each tank, then through pressure rolls outside the tank, again round the guide rolls and finally through the pressure rolls before entering each receptacle. Travelling devices are arranged at the point of entry to each receptacle, so that the material is piled up in one limb of the U-shaped vessel, the liquid tending to float the material round the bend towards a lateral outlet. The liquid flows through the vessels in a direction opposite to that of the travel of the material. From the last receptacle the material passes into box-like washing machines, divided into compartments so that the goods pass through each machine in a zig-zag path. Each machine is provided with a sloping false back, behind which is located a steam pipe. The material, by the action of steam jets, is moved on the sloping surface without becoming entangled. Means may be provided for regulating the speed of the material at various points in its passage through the receptacles.—B. N.

[*Bleaching, dyeing and washing*]; *Treating permeable substances with liquids and gases; Apparatus for* ——. A. E. Stoll. Eng. Pat. 5704, March, 6, 1912.

A vehicular tank or container is arranged for the circulation of liquid through it, the tank having removable trays for holding the fabric or articles in separate layers. Channels connect the spaces between the trays, so as to provide for the passage of the liquid in case of obstruction by the articles in the trays.—B. N.

Bleaching and dyeing of textiles. A. Haensel. Fr. Pat. 414,030, July 28, 1911.

The bleaching and dyeing are carried out during the operations, such as combing, carding, etc., which precede spinning. The dry fibres are only slightly wetted with a small quantity of the dye bath before being admitted to the carding operation. The dye bath is preferably composed of soft soap, a dyestuff, and a small quantity of sodium sulphate.—B. N.

Mercerising; Apparatus for use in washing and recovery of caustic subsequent to ——. J. R. Denison, J. F. Preussner and J. W. Banks, Bradford. Eng. Pat. 1073, Jan. 13, 1912.

In machines in which the liquid pours from a trough on to the piece, gutters or deflectors are arranged above each selvedge of the cloth, and between the piece and the trough for protecting the stentering clips, used for holding and stretching the material, from the liquid. The gutters are mounted on adjustable brackets carrying the clips, and project beyond the latter, so that the protective device is automatically positioned for every width of material. The gutters consist of open channels, closed at the outer but open at the inner ends, so that the liquid is collected and deflected on to the cloth instead of falling on to the selvedges of the material.—B. N.

Mercerisation lyes or analogous waste liquors; Process for purifying waste ——. J. P. Bemberg, A.-G. Ger. Pat. 249,913, Jan. 31, 1911.

The waste liquors are treated with substances which will form a light, voluminous mass with the impurities in the liquors, and an attenuated stream of gas, preferably produced electrolytically, is introduced, in order to carry the solid matter to the surface of the liquor, when separation can be readily effected.—T. F. B.

Hairs and furs; Dyeing ——. Act.-Ges. fur Anilinfabr. Second Addition, dated May 7, 1912 (under Int. Conv., Nov. 17, 1911) to Fr. Pat. 413,877, March 21, 1910 (this J., 1910, 1103; 1911, 355).

The hair or fur, with or without a preliminary mordanting, is treated in a bath containing a mono- or dialkyl derivative of an aromatic para-diamine, in which the two alkyl radicals are contained in one only of the two amine groups, such as monomethyl-*p*-phenylenediamine, monoethyl-*p*-phenylenediamine, *p*-aminodimethylaniline, *p*-aminodiethylaniline, or one of their derivatives, mixed with an appropriate *m*-diamine, more particularly *m*-diaminoanisol or *m*-diaminophenetol, and with an oxidising agent.—B. N.

Dyeing furs, hairs, feathers, etc.; Process for ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 250,463, Dec. 28, 1911. Addition to Ger. Pat. 250,462, March 5, 1911 (see Fr. Pat. 438,476; this J., 1912, 638).

Furs, hairs, or feathers are mordanted with a salt of chromium, iron, or copper, and then treated with a solution of a monoalkyl derivative of 2·5-diamino-*p*-cresol, either alone or in presence of an oxidising agent. The shades produced are somewhat greener than those resulting from the process described in the principal patent.—T. F. B.

Textile fabrics; Process of colouring ——. J. Rousseau. First Addition, dated May 4, 1912, to Fr. Pat. 443,310, April 26, 1912 (this J., 1912, 1028).

By means of needles, previously soaked in the dye, the latter is made to penetrate the textile fabric at predetermined points. The process is applied to the dyeing of stretched threads, such as the warp in a power loom, and the material may be afterwards woven. If the thickness of the threads permit, two different colours may be produced on each of their sides, by means of two needles soaked in different dyes.—B. N.

Azo dyestuffs on the fibre; Process for producing ——. Act.-Ges. f. Anilinfabr. Ger. Pat. 248.383, May 13, 1911.

INSOLUBLE dyestuffs are produced by preparing the fibre in the usual manner with derivatives of aminonaphtholsulphonic acid which are not dyestuffs, and which contain hydroxynaphthiminazole-, hydroxynaphthoxazole-, hydroxynaphthothiazole-, hydroxynaphthotriazole-, or hydroxynaphthotriazine groupings: the dyestuffs are developed by treatment with suitable diazo compounds by the known methods.—T. F. B.

Dyeing union goods by means of substantive dyestuffs by the single-bath process; Method of ——. E. Elsaesser Ger. Pat. 250,046, Nov. 11, 1911.

IT is stated that union goods can be dyed level shades in the single bath process by means of substantive dyestuffs, if sulphurous acid or mixtures developing sulphurous acid be added to the dye-bath. In the example given, the bath contains 4 per cent. of each of two black dyestuffs, 25 per cent. of sodium sulphate, 9 per cent. of bisulphite, and 3 per cent. of sulphuric acid calculated on the weight of the goods.—T. F. B.

Dyed fabrics; Process for preventing the bleeding of —— during simultaneous bucking and bleaching. Chem. Werke vorm. Dr. H. Byk. Ger. Pat. 250,397, March 8, 1910.

BY adding a perborate to the liquor used for bucking coloured fabrics made from unbleached yarn, it is possible to effect the bleaching of the undyed fibres without causing the bleeding of the dyes from the dyed fibres. —T. F. B.

Red dyeings on the fibre; Process for producing ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 252,575, Feb. 9, 1911.

COTTON is dyed with the dyestuffs obtained by combining one mol. of diazotised *m*-amino-γ-5-hydroxy-7-sulpho-2-naphthylbenziminazole with one mol. of an acidyl derivative of 2.5.7-aminonaphtholsulphonic acid, and is then treated with nitro-diazobenzene. The dyeings are analogous to those obtained with *p*-Nitraniline Red, but are faster to milling.—T. F. B.

Dyeing cotton from the vat with Coërulein or its derivatives; Process for ——. Farbwerke vorm. Meister Lucius, und Brüning. Ger. Pat. 252,576, April 9, 1911.

COERULEIN or its derivatives are converted into leuco-compounds and applied to cotton in the vat: after oxidation the goods are treated with metallic salts, and may be subsequently soaped or steamed.—T. F. B.

Fabrics dyed with oxidisable dyestuffs, especially indigo; Production of white or coloured resists on ——. M. Freiberger. Ger. Pat. 250,303, May 12, 1911. Addition to Ger. Pat. 228,694, June 20, 1908.

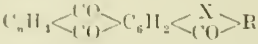
IN place of using the nitrogen-oxygen compounds mentioned in the principal patent (see Eng. Pat. 18,896 of 1908; this J., 1909, 472), chlorates, bromates, chromates, manganates, or similar compounds are used, which generate oxygen in presence of oxidisable substances and the vapours of volatile acids.—T. F. B.

Bistre-brown shades in dyeing and printing; Process for producing fast ——. H. Schmid. Ger. Pat. 250,466, Feb. 14, 1912.

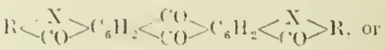
DYEINGS or printings which can be reserved are produced by applying to the goods a solution of o-dianisidine and sodium chlorate in hydrochloric acid and an organic acid, such as formic acid, the organic acid being in excess; the goods are finally dried and steamed. By adding varying proportions of potassium ferrocyanide to the above bath, fast red-brown, yellow-brown, golden-brown, orange-brown, and rust-brown dyeings are produced. —T. F. B.

Dyeing and printing animal fibres; Process for ——. Badische Anilin und Soda Fabrik. Ger. Pat. 252,266, March 26, 1911.

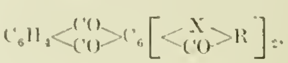
ACRIDONE- and thioxanthone-derivatives of the anthraquinone series, of the general formulæ,



$$C_nH_4{<}\substack{CO\\CO}{>}C_6H_2{<}\substack{X\\CO}{>}R.$$



$$R{<}\substack{X\\CO}{>}C_6H_2{<}\substack{CO\\CO}{>}C_6H_2{<}\substack{X\\CO}{>}R, \text{ or}$$



$$C_6H_4{<}\substack{CO\\CO}{>}C_6\left[{<}\substack{X\\CO}{>}R\right]_2.$$

where X is an imino or substituted imino group or a sulphur atom, and R a simple or substituted benzene, naphthalene, or anthraquinone radicle, are applied to animal fibres after reduction in the usual manner. The goods may be subsequently steamed or treated with hot water, with or without addition of acids, salts, etc., or of oxidising or reducing agents.—T. F. B.

Dry cleaning fabrics and clothes and degreasing materials; Process and apparatus for ——. S. Zocheddu, Milan, Italy. Eng. Pat. 27,720, Dec. 9, 1911.

THE carbon tetrachloride, ethylene dichloride or trichloride, employed for the cleansing operation, is heated directly by a fire, without the use of steam, in a rocking cleansing chamber, and the evaporator in which the liquid is recovered by distillation is similarly heated, the vapour being passed into a suitable condenser. The fabric is dried in the cleansing chamber, which is rotated during the operation, by the heat of the fire and the vacuum produced by a suction pump, the vapours being passed into the condenser.—B. N.

Disinfecting, washing, starching, dry cleaning, dyeing, and like machines. R. C. Fritz, Seacombe, Chester. Eng. Pat. 10,887, May 8, 1912.

THE machine comprises an enclosed chamber or cylinder provided with an inlet and outlet for the treating fluid, and with means for keeping the liquid at the desired temperature. A perforated vessel, with a perforated concave base, carries the articles, the shallow part of the vessel being in the middle. The vessel is shaken by means of a crank and connecting rod, driven from a shaft above or below the chamber, or the vessel may be suspended from one arm of a rocking lever.—B. N.

Cotton tulle and other similar textile materials; Process for giving the lustre of silk to ——. Pausaer Tüllfabr. Akt.-Ges. Fr. Pat. 444,273, May 25, 1912.

THE material is submitted to a preparation obtained by dissolving in about 100 litres of water, 6 kilos. of potato starch, 500 grms. of gum arabic, 500 grms. of cocoanut oil, and half a litre of "agarine." The material is spread out to dry it rapidly, and it is then passed through a calender.—B. N.

Bleaching apparatus. E. D. Jefferson, Lowell, Mass. U.S. Pat. 1,044,185, Nov. 12, 1912.

SEE Eng. Pat. 10,289 of 1908; this J., 1909, 652.—T. F. B.

Dyeing of cotton or linen cloth with vat colours. A. Kertesz, Mainkur, Germany, Assignor to Cassella Color Co., New York. U.S. Pat. 1,043,016, Oct. 29, 1912.

SEE Eng. Pat. 18,877 of 1911; this J., 1912, 813.—T. F. B.

Product [gum] for use in textile and other manufactures. Eng. Pat. 20,048. *See* XVII.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Alkali-chlorine cells; The Billiter ——. A. J. Allmand. Faraday Soc., Nov. 1912. [Advance proof.]

After a brief description of the Billiter-Siemens cell, the author describes the actual working of the Billiter-Leykam cell (see this J., 1911, 905) as at present installed in Austria. The cells consist of cement troughs, B, covered with cement bell-jar lids, A. The lids are provided with chlorine outlets and the brine runs in through narrow tubes. The cells are 5·5 metres long, 1·1 metres broad, and 1·3 metres high. Each cell has three lids cemented on to the narrow shelf, shown in the diagram, by means of putty, which does not suffer heavily from the action of chlorine. Each lid carries eight anodes each carrying 50 ampères with a current density of about 1·6 to 1·7 ampères per sq. dm. The cathodes are of T-iron, enclosed in asbestos tubes, held firm, as shown, by an asbestos brace. The tubes are about 5 cm. in diameter, 5 to 8 mm. apart, and slope upwards about 2 cm. per metre. The brine enters the cells through tin tubes and the causticised product leaves the cell by means of capillary overflows. The cells are heated to 65° or 70° C., and are worked under slightly reduced pressure. The current leads, which are of copper, are covered with a protective composition stable against chlorine and acid fumes. The concentration of the alkali is from 12 to 16 per cent., which is high compared with that of other non-mercury cells. Since the electrolyte does not pass through the diaphragm, impure brines may be used without filtering. Although large floor space is needed, owing to the electrodes being horizontal, the cell has the lowest energy consumption per ton of product of any now working on a large scale.—W. H. P.

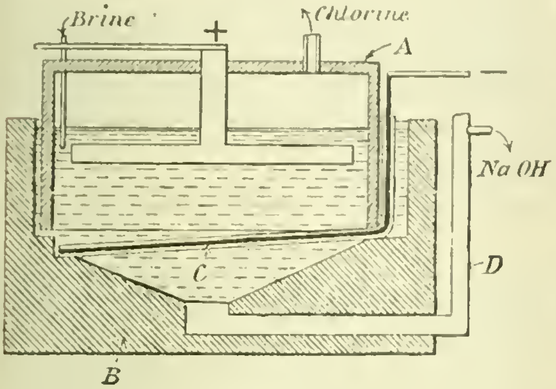


Fig. 1.

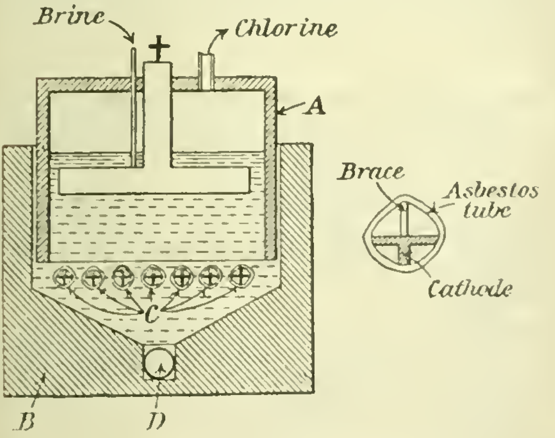


Fig. 2.

Calcium hydroxide; Dissociation of ——. R. K. Bursh. Trans. Amer. Ceram. Soc., 1912, 14, 792—800.

Various temperatures have been given for the dissociation of calcium hydroxide, ranging from 450° by Le Chatelier to 517° C. by Johnston. Using the loss of weight method, the author finds two dissociation points; calcium hydroxide dissociates at 375° C. forming a lower hydrate, which loses its water at 580° C. No "mechanical water" was driven off above 25° C.—H. H. S.

Saline solutions; Process for the rapid evaporation of ——. E. Kedesdy. Mitt. Kgl. Materialprufungsamt, 1912, 30, 212—213.

Whenever concentrated solutions of salts, especially sodium chloride and ammonium salts, have to be evaporated to dryness, the low vapour pressure of the solutions and the formation of a crust of crystallised salts on the surface, make the process of evaporation a very slow one. The author has found that the periodical addition of small quantities of alcohol to such solutions, as soon as a crust has been formed, greatly accelerates the evaporation, prevents spurting during the final dehydration of the separated crystals, and minimises the "creeping" of ammoniacal solutions.—O. R.

Bromine in halogen salts; The iodic acid process for the determination of ——. F. A. Gooch and P. L. Blumenthal. Amer. J. Sci., 1912, 34, 469—474.

The determination of bromine in halogen salts, in presence of chlorine, by oxidation with iodic acid (Bugarsky, Z. anorg. Chem., 10, 387) is found to be vitiated by secondary reactions.—F. Sodn.

Carnallite; Molten —— [and its mixtures with potassium chloride.] K. Arndt and H. H. Kunze. Z. Elektrochem., 1912, 18, 994—998.

The authors have taken cooling curves for carnallite and mixtures containing varying amounts of potassium chloride. The results lead to the following melting points:—carnallite, 496°; carnallite with 6 per cent. of potassium chloride, 493°; with 12 per cent., 484°; 18 per cent., 470°; 24 per cent., 462°; and 30 per cent., 436° C. The densities and conductivities of mixtures of the same substances at temperatures varying from 550° to 780° C. have been taken by means of a modified Westphal balance with a platinum sinker. It is found that the density of a mixture can be calculated from the known composition and the densities of carnallite and potassium chloride. The authors have also prepared rods of metallic magnesium, by using a movable cathode in the electrolysis of fused carnallite.—W. H. P.

(1) *Chloroauric acid; Action of —— on aqueous solutions of potassium ferrocyanide.* (2) *Action of aqueous solutions of potassium ferrocyanide on aurous cyanide and gold hydroxide.* (3) *Solubility of finely divided gold in potassium ferrocyanide solutions.* E. Beutel. Z. anorg. Chem., 1912, 78, 141—158.

(1) Mixtures of chloroauric acid and potassium ferrocyanide solutions give, on long standing, precipitates, the nature of which depends on the relative proportions of the reacting substances, and sunlight is found to have an important influence in determining the velocity of the reaction. In some cases interaction is accompanied by a series of colour changes. A considerable excess of chloroauric acid gives a precipitate consisting wholly of aurous cyanide, whilst with about equimolecular proportions, or with a moderate excess of ferrocyanide, a precipitate of Prussian blue is formed, the solution containing potassium chloride and complex cyanogen compounds; a very large excess of ferrocyanide causes slow precipitation of ferric hydroxide. (2) Aurous cyanide slowly dissolves in potassium ferrocyanide solution, in the presence of oxygen, with the formation of potassium aurocyanide and a precipitate of ferric hydroxide, and gold hydroxide and fulminating gold are similarly dissolved with the precipitation of ferric hydroxide and formation

of a faintly alkaline solution containing potassium gold cyanide. (3) In presence of air, finely divided gold dissolves in potassium ferrocyanide solution, in accordance with the equation:—

$$3Au+K_4FeCy_6+2H_2O+O_2=3KAuCy_2+Fe(OH)_3+KOH.$$

ferric hydroxide being precipitated: but even on boiling the process of solution is very slow.—F. Sodn.

Nitrogen; Fixation of —— by alumina and carbon. S. A. Tucker and H. L. Read. Met. and Chem. Eng., 1912. 10, 745—746.

The authors studied the interaction of pure alumina and commercial bauxite with carbon (petroleum coke) and pure nitrogen, the charge being heated in a graphite boat in a graphite tube surrounded by a resistance mass of granular carbon. With pure alumina a product containing up to 30·19 per cent. of combined nitrogen was obtained at 1800°—2000° C.; below 1600° C. little nitrogen was fixed, and above 2000° C. decomposition of the aluminium nitride took place. The nitride, AlN, contains 34·06 per cent. of nitrogen. The presence of appreciable quantities of oxygen, sulphur dioxide, or hydrogen chloride in the nitrogen used is harmful. Producer gas would probably prove a useful source of nitrogen, as the residual gas, after the reaction, could be burned and used to preheat the charge. Impurities in the charge appear to act favourably, especially iron and lime. It is probable that the first stage of the reaction consists in the reduction of the alumina by the carbon, and that the nascent aluminium in the presence of fairly pure nitrogen, combines preferably with that element rather than with carbon; the impurities mentioned probably act as catalysts in the union of aluminium and nitrogen. Aluminium nitride slowly evolves ammonia on treatment with boiling water, and would probably behave in a somewhat similar way in the soil. It would be more advantageous however to obtain ammonia quantitatively by boiling the nitride with alkali solution, as the residual pure alumina would then be available for use again or as a saleable by-product. The experiments indicate that there should be no difficulty in manufacturing aluminium nitride containing 30 per cent. of nitrogen as compared with the 17—20 per cent. of nitrogen in crude calcium cyanamide (nitrolim).—A. S.

Radio-active constituents of the deposit from the hot springs of Hokuto, Taiwan. M. Hayakawa and T. Nakano. Z. anorg. Chem., 1912, 78, 183—190.

The deposit from the hot springs of Hokuto consists chiefly of angleso-barytes containing small quantities of cerium and lanthanum and at least three radio-active constituents, *viz.*, ionium, polonium, and radium. It contains no uranium.—F. Sodn.

Explosion of tubes containing a compressed mixture of air and hydrogen; A cause of ——. Lelarge. Comptes rend., 1912, 155, 914–916.

Tubes of compressed hydrogen, accidentally contaminated with air, have been known to explode on connecting them with a manometer for the purpose of measuring the pressure of the gas. The author has found that if ordinary manometers are employed in the usual way, such explosions may occur whenever the hydrogen contains enough air to render it explosive, and the pressure is sufficiently high. The reason probably lies in the rise of temperature produced by the sudden and more or less adiabatic compression of the air in the manometer. Such accidents may be avoided by interposing, between the tube of compressed gas and the manometer, a safety-tube containing discs of metallic gauze of such mass that they are not appreciably heated by combustion of the gas mixture in the manometer. By this means the ignition of the main body of gas is prevented. Similar safety-tubes should be employed whenever a highly compressed explosive gas mixture is allowed to expand suddenly into a confined space. Before measuring the pressure of compressed hydrogen, liable to contain air or oxygen, it is advisable to determine its density, as a further safeguard.—J. H. L.

New reaction for bromine, sensitive even in presence of other halogens. Guareschi. *See* XXIII.

Diffusion of bromine in nature, and its detection, even in organic substances. Guareschi. *See* XXIII.

Patents.

Sulphur burning apparatus. H. B. P. Humphries, London. Eng. Pat. 11,750, May 17 1912.

A plate, which may be made hollow to allow the circulation of a cooling fluid such as water, divides the burner into an upper and lower chamber, connected by a narrow passage in the plate, and each with a suitable air supply. A tray on which the sulphur is burnt is situated below the plate, and air, introduced preferably from below, is made to flow uniformly to the periphery of the tray, so that it may pass with the products of combustion equally over the burning sulphur to the aperture in the plate. An extension (normally closed) of the lower chamber allows the sulphur tray to be removed for cleaning, and a charging hopper, round which the gases circulate before issuing, extends through the upper chamber to below the plate. The burner is said to yield sulphur dioxide free from unburnt sulphur.—F. Sodn.

Lead chambers for the manufacture of sulphuric acid; Construction of ——. R. Moritz. Fr. Pat. 441,474, May 31, 1912.

Each chamber is disposed within a light iron framework consisting of uprights with suitably shaped horizontal connecting pieces, and is supported by means of vertical strips of lead, which are soldered to the chamber wall throughout its entire height, and fastened to the uprights by means of bolts or the like. This arrangement serves, it is claimed, not only to support the walls, but also to facilitate the elimination of heat from the interior of the chamber, thereby increasing the production of acid. The chambers are preferably circular in section, or square, with rounded corners.—F. Sodn.

Hydrochloric acid and alkali silicoaluminates; Process for producing ——. A. H. Cowles, Assignor to The Electric Smelting and Aluminium Co., Sewaren, N.J. U.S. Pat. 1,040,977, Oct. 8, 1912.

A porous mass (see following abstract) composed of an intimate mixture of an alkali chloride and an aluminous material, such as clay, is treated with steam and air at a high temperature, and the hydrochloric acid and water vapour thus produced are condensed. (See also this J., 1912, 990.)—A.S.

Alkali silico-aluminate and hydrochloric acid; Charge mixture for forming ——. Process for forming a charge mixture for producing hydrochloric acid and alkali silico-aluminate. A. H. Cowles, Assignor to The Electric Smelting and Aluminium Co., Sewaren, N.J. U.S. Pats. 1,040,893 and 1,040,894, Oct. 8, 1912.

(1). The charge consists of non-ferruginous clay (or a mixture of alumina and silica), an alkali chloride, and a proportion of carbon (*e.g.*, 3—10 per cent.) so small as to render the mass incapable of use as fuel. (2). A mixture of silico-aluminous material (*e.g.*, clay), an alkali chloride and a substance which will disappear on heating to 1700°—2400° F. (927°—1316° C.) is formed into shaped masses which are heated so as to expel at least a part of the last-mentioned substance, whereby the masses become porous whilst retaining their external shape.—A. S.

Channel furnace. Tunnel furnace. A. H. Cowles, Assignor to The Electric Smelting and Aluminium Co., Sewaren, N.J. U.S. Pats. 1,040,895 and 1,040,978, Oct. 8, 1912.

The furnaces are suitable for use in the process of manufacturing hydrochloric acid and alkali silicoaluminate described in the preceding abstracts (1). The material to be treated is loaded on trucks which travel on rails and divide the furnace into an upper and a lower compartment. Means are provided for supplying gas to, and withdrawing gas from, the upper compartment. The lower compartment is divided by movable baffles into longitudinal sections, to each of which gas is supplied separately, and sufficient pressure is maintained in these sections to prevent any inflow of gas from the upper compartment of the furnace. At the entrance end of the furnace is a chamber at a lower level, which is sealed against the furnace and against the outer air. When a fresh truck is to be introduced into the furnace, it is placed upon rails on the upper surface of a transfer car which is run into the chamber mentioned until the rails on the transfer car register with those on the floor of the furnace, whereupon the loaded truck is gradually moved into the furnace by a "pusher." A series of curtains is provided at the entrance end of the furnace for the purpose of isolating the upper and lower compartments of the furnace from each other, while the loaded truck is being introduced. (2). A tunnel furnace, open at the exit end, and similar in general character to that just described. Steam and air are admitted to the upper compartment near the exit end, and there is also a "gas heating source" and a device for withdrawing the acid fumes produced. An inert gas is supplied to the lower compartment. Means are provided for controlling the gas pressure in the chamber at the entrance end of the furnace.—A. S.

Tunnel-furnaces; Method of protecting —— from injurious gases. A. H. Cowles, Assignor to The Electric Smelting and Aluminium Co., Sewaren, N.J. U.S. Pat. 1,040,892. Oct. 8, 1912.

In furnaces similar to those described in the preceding abstract, the metal portions of the cars and the portion of the furnace walls below the tops of the car are protected from corrosion by gases produced in the upper portion of the furnace, by introducing into the lower part of the furnace an inert gas (*e.g.*, air) under a pressure sufficient to counteract the tendency of the injurious gases to flow downwards from the upper part of the furnace. The pressure of the inert gas is unequally distributed throughout the length of the furnace to correspond with the pressure of the injurious gases in various parts of the furnace.—A. S.

Mercury bichloride; Manufacture of ——. F. Kaufler, Brückl, Austria, A. Klages, Salbke, and Saccharin-Fabr. A.-G. vorm. Fahlberg, List und Co., Salbke-Westerhüsen, Germany. Eng. Pat. 19,601, Aug. 27, 1912.

Chlorine and mercury are separately and continuously introduced into a retort containing boiling mercury, preferably in such a manner that the fresh mercury is led in through a tube, which passes downwards to below the level of the boiling mercury, so that it is subjected to a preliminary heating by the chlorine flame which fills the retort above the surface of the mercury; the mercury bichloride vapour, as it issues from the retort, is chilled by means of cold air, which is preferably mixed with a small proportion of chlorine (not exceeding 10 per cent.). Apparatus is described which consists of a retort and admission tubes of quartz glass (the chlorine tube surrounding that for the admission of mercury) and a cooling tower of large volume, into which the vapours are led, besides a blowing device for the delivery of air into the cooling tower at a point near the retort outlet. A finely crystalline and voluminous product is obtained, which is said to be chemically pure and very suitable for use in dispensing.—F. Sodn.

"Lime-nitrogen"; Method of treating ——. A. P. Zamore, Månsbo, Sweden, and O. F. Carlson, Ljunga Verk, Sweden. U.S. Pat. 1,042,746, Oct. 29, 1912.

"Lime-nitrogen" is treated with 15—50 per cent. by weight of dilute nitric acid containing 3—25 per cent. of nitric acid, and the mass is cooled during treatment. —O. R.

Ammonia: Manufacture of —— from nitrolim [crude calcium cyanamide] and water. Oesterr. Verein für chem. und metall. Produktion. Ger. Pat. 251,934, June 9, 1911.

In order to obtain ammonia quantitatively from a mixture of calcium cyanamide and water, a temperature of 180° C. is required. According to the present patent, this is attained by heating under pressure produced by a liquid column of the necessary height. The apparatus consists of a series of tall chambers with suitable connections, so that each can in turn be used as the first, second, third, etc., of the series. The ammoniacal vapours evolved in the first vessel, which is heated to the desired temperature, pass through the other vessels of the series, and relatively dry ammonia gas escapes from the last vessel. The pressure in each vessel is equal to the sum of the pressures corresponding to the liquid columns in the chambers behind it. The spent mixture is discharged from the first vessel of the series, which is then re-charged and put in place as the last vessel of the series.—A. S.

Ammonia; Process of producing ——. Badische Anilin und Soda Fabrik. First Addition, dated May 21, 1912, to Fr. Pat. 425,099, Nov. 24, 1910 (this J., 1911, 1012). Under Int. Conv., Sept 9 and Dec. 1, 1911.

Mixtures of metals, or of substances which are transformed into metals or into metallic nitrogen or hydrogen compounds under the conditions described in the principal patent, are selected so as to include, at the same time, substances which contain or fix hydrogen and those which contain or fix nitrogen, the mixtures iron-molybdenum and nickel-molybdenum, already claimed, being excepted (see also Eng. Pat. 21,151 of 1911; this J., 1912, 1031). Or the mixtures may contain metals or derivatives of metals belonging to different sub-groups of the same group or (and this is preferred) to different groups of the periodic system, no claim being made, however, for the mixture uranium-manganese. A number of examples are given.—F. Sodn.

Ammonium salts; Preparation of sublimed ——. Kunheim und Co. Ger. Pat. 250,378, March 2, 1911.

The components of the salt are intimately mixed, whilst in the gaseous condition, before they are admitted to the sublimation chamber. For example, if carbon dioxide, ammonia gas, and steam be intimately mixed, the formation of ammonium carbonate proceeds much more rapidly than by the usual method and without the objectionable production of mist or fog.—A. S.

Lime-sulphur solution; Process of making ——. W. H. Volck, Watsonville, Cal. U.S. Pat. 1,043,276, Nov. 5, 1912.

Lump sulphur is subjected to the action of (a relatively small amount of) lime, and, whilst heating, water is circulated through the mass so as to dissolve the product. For example, a solution of lime is allowed to percolate through heated sulphur contained in a perforated receptacle, in such a way that the lime completely reacts with a portion of the sulphur.—F. Sodn.

Silver oxide; Process of preparing colloidal ——. J. L. Turner, Assignor to The H. K. Mulford Co., Philadelphia, Pa. U.S. Pat. 1,043,646, Nov. 5, 1912.

A solution of a silver salt is made to act upon a silver-proteid compound in the presence of a fixed alkali, and the resulting silver compound is subsequently separated. For example, 48 oz. of silver nitrate are added to a solution of a proteid (38 lb.) in 50 gallons of water, containing 2 lb. of sodium carbonate; the resulting precipitate is dissolved in 12 gallons of water, containing 4 gallons of ammonia solution, a solution of silver nitrate (33 lb.) in 4 gallons of ammonia solution and 4 gallons of water is added, together with a solution of 16 lb. of potassium hydroxide in 5 gallons of water, the mixture is heated to about 60° C., precipitated with an acid, the precipitate dissolved in a solution of potassium hydroxide (5 lb. in 8 gallons), and the final solution dialysed to obtain colloidal silver oxide. —F. Sodn.

Cream of tartar and tartaric acid; Extraction and manufacture of ——. H. Cornette and L. Faucheux. First Addition, dated Aug. 10, 1911, to Fr. Pat. 435,915, Jan. 9, 1911 (this J., 1912, 386).

Claim is made for the modification, by treatment at suitable temperatures above 100° C., as indicated in the principal patent, of the organic matter present in the crude tartaric material employed, in such a manner that the organic matter is partially dissolved (being transformed more or less completely into sugars) which may be utilised, and no longer interferes with the free solution, crystallisation, and separation of the tartrate.—F. Sodn.

Thorium; Process for separating —— from the other rare earths. Deutsche Gasglühlicht Aktienges. (Auerges.). Fr. Pat. 444,798, June 10, 1912. Under Int. Conv., Aug. 17, 1911.

Hypophosphoric acid or a readily soluble hypophosphate is added to an acid solution containing rare earth metals, when the thorium alone is precipitated. (See also this J., 1912, 664, 719.)—F. Sodn.

Hydrogen peroxide; Manufacture of solid stable mixtures yielding —— on treatment with water. Chem. Werke vorm. Dr. H. Byk. Ger. Pat. 250,522, Aug. 25, 1910. Addition to Ger. Pat. 243,368, April 15, 1908.

The method described in the original patent and previous additions thereto (this J., 1909, 1198; 1911, 361; 1912, 774) is modified in that instead of using partially dehydrated per-compounds, dehydrating substances (*e.g.*, anhydrous sodium sulphate, fused calcium chloride, fused sodium acetate, etc.) are added to the mixtures of per-compounds and solid acid substances.—A. S.

Chromium solutions; Process for the electrolytic regeneration [oxidation] of ——. C. F. Boehringer und Söhne. Ger. Pat. 251,694, July 9, 1911.

The oxidation is effected in an apparatus without a diaphragm, bell, partition, or the like, the liquid being conducted through or over an anode, *e.g.*, lead shot resting on a leaden support, which causes it to traverse a long path and which opposes a not too small resistance to the passage of the current.—A. S.

Hydrogen, nitrogen or a mixture of these two bodies; Special material for the manufacture of ——. O. Dieffenbach and W. Moldenhauer. Fr. Pat. 444,044, May 20, 1912. Under Int. Conv., May 24, 1911.

In the manufacture of hydrogen by the alternate decomposition of steam by metallic iron, and subsequent reduction of the iron oxide produced, by means of some reducing gas or substance, alloys of iron with manganese, chromium, tungsten, titanium, aluminium or other similar elements are employed as the primary materials. These have the advantage that they are not fusible, do not soften, and do not form fusible or soft compounds with iron or its oxides. In place of alloys, mixtures of iron or its oxides with the other elements specified, or their oxides, may be employed, for instance in the form of briquettes. The same materials may be used for the manufacture of nitrogen, or of mixtures of nitrogen and hydrogen, by substituting air, or a suitable mixture of air and steam, for steam alone in the oxidising operation, and eliminating the excess heat, if necessary, by external or internal cooling.—W. C. H.

Hydrogen; Process and apparatus for the manufacture of ——. A. Messerschmitt. Fr. Pat. 444,105, May 22, 1912. Under Int. Conv., July 8, 1911, and Feb. 8, 1912.

The process depends upon the alternate oxidation of spongy iron by means of steam with the evolution of hydrogen, and the reduction of the resulting iron oxide by means of reducing gases, such as water-gas. An upright, cylindrical, unlined, iron reaction chamber is suspended inside a refractory, masonry furnace chamber, with which it is in open communication at the bottom, the lower end of the cylinder being provided with a grate to support the column of reacting mass. The width of the reaction cylinder is relatively small, so that the mass may readily be heated from all sides, and the furnace chamber is provided with a chequer-work of refractory masonry constituting a superheater. Both the reaction chamber and the furnace chamber are capable of being hermetically sealed, and are provided with a system of pipes and valves, whereby either steam or water-gas may be introduced as required into the reaction chamber, the furnace chamber, and a chimney communicating with the atmosphere respectively; in addition, an air-supply pipe communicates with the furnace chamber, and the pipe leading from the top of the reaction chamber can be put into communication with a gas-purifier and the steam-raising plant. The process is carried out in three phases: water-gas and air are first burnt in the furnace chamber until the mass inside the reaction cylinder has reached the required temperature; the air supply is then cut off and water-gas, flowing in at the bottom of the furnace, becomes strongly heated, traverses the mass of iron oxide through the open, lower end in an upward direction, and finally escapes at the top through the pipe system, which communicates with the steam-raising plant, where any unburnt reducing gases are utilised. When the reduction of the iron oxide is complete the supply of water-gas is cut off and steam is introduced, first into the bottom of the furnace to sweep out any residual gases from the second operation, (the furnace being in communication with the exit chimney whilst this is going on), and then into the top of the furnace chamber, from which it passes downwards through the superheating system, and finally upwards through the mass of spongy iron. Hydrogen issues from the top of the reaction chamber, through a purifier into a gasometer. The iron reaction chamber may take the form of two concentric cylinders, the reaction mass being in that case charged into the annular space between the two; the cylinder or cylinders in question are periodically heated and reduced by means of the reducing gases, both inside and outside.—O. R.

Hydrogen or gases containing it; Process for carrying out operations employing ——. Badische Anilin und Soda Fabrik. Fr. Pat. 444,455, May 30, 1912. Under Int. Conv., July 26, 1911.

In operations in which hydrogen, or a gaseous mixture containing it, is employed under pressure and at a high temperature, in order that the heated iron wall of the apparatus may be able to withstand the pressure, the temperature of the wall is prevented by appropriate means from rising appreciably above 450° C. The process is specially applicable to the catalytic synthesis of ammonia from its elements under pressure. (See also Fr. Pat. 441,695, March 23, 1912; this J., 1912, 922.)—W. C. H.

Carbonic acid from the exhaust gases of a gas engine; Method of extracting ——. Maschinenfabrik Sürth G.m.b.H., and E. Volland, Sürth on Rhine, Germany. Eng. Pat. 23,592, Oct. 25, 1911.

See Fr. Pat. 435,926 of 1911; this J., 1912, 378.—T. F. B.

Caustic-alkali solutions; Purification of ——. E. Bloch-Pimentel, Paris. U.S. Pat. 1,044,434, Nov. 12, 1912.

See Eng. Pat. 1573 of 1912; this J., 1912, 431.—T. F. B.

Aluminium sulphate containing iron; Process for treating —— for utilisation for technical purposes. G. Eschellmann, and Ges. der Tentelewschen Chem. Fabrik, St. Petersburg. Eng. Pat. 29,283, Dec. 29, 1911.

See Fr. Pat. 438,625 of 1912; this J., 1912, 641.—T. F. B.

Thorium from other rare earths; Process of precipitating and separating ——. Deutsche Gasglühlicht Akt.-Ges. (Auerges.), Berlin. Eng. Pat. 15,919, July 8, 1912. Under Int. Conv., Aug. 17, 1911.

See Fr. Pat. 444,798 of 1912; preceding.—T. F. B.

Hypophosphoric acid and of its salts; Manufacture of ——. A. Rosenheim, Berlin. U.S. Pat. 1,042,605, Oct. 29, 1912.

See Eng. Pat. 14,420 of 1911; this J., 1911, 1210.—T. F. B.

Nitrogen compounds, including nitrides and ammonia; Process of making ——. A. Sinding-Larsen, Assignor to Storm, Bull, & Co., Christiania. U.S. Pat. 1,042,723, Oct. 29, 1912.

See Fr. Pat. 414,837 of 1910; this J., 1910, 1205.—T. F. B.

Ammonia and aluminium compounds ; Process of producing ——. C. Bosch and A. Mittasch, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,043,798, Nov. 12, 1912.

See Fr. Pat. 418,059 of 1910 ; this J., 1911, 26.—T. F. B.

Hydrogen ; Process for making —— *by means of iron.* A. Messerschmitt. Fr. Pat. 441,106, May 22, 1912. Under Int. Conv., July 8, 1911.

See Eng. Pat. 12,117 of 1912 ; this J., 1912, 1079.—T.F.B.

Method and apparatus for the condensation of ammonia. Fr. Pat. 441,688. *See* I.

Recovering combined ammonia from gases. Recovering ammonia salt from the distillation gases of coal. Manufacturing ammonium carbonate and sulphur from crude coal gas. U.S. Pats. 1,043,210 to 1,043,212. *See* IIa.

VIII.—GLASS ; CERAMICS.

Borate and silicate glasses ; Density of some ——. E. W. Tillotson, jun. J. Ind. Eng. Chem., 1912, **4**, 820.

Experiments with some pure borate and sodium-barium silicate glasses have shown that for calculating the approximate density of glass from the chemical composition, the factors used should be 2·24 for boron trioxide and 2·8 for sodium oxide. These factors are somewhat higher than those given by Winkelmann and Schott (Hovestadt, "*Jena Glass and its Industrial Application,*" p. 148) for the density of boron trioxide (1·9) and sodium oxide (2·6) respectively in glasses. (See also this J., 1912, 28.)—A. S.

Boric-acid—silica mixtures ; Thermal study of ——. A. V. Bleininger and P. Teetor. Trans. Amer. Ceram. Soc., 1912, **14**, 210—217.

Boric acid, when fused with silica, first dissolves some of the latter. The quantity soluble in water decreases somewhat more rapidly than the B_2O_3 content. Between 2·0—2·2SiO$_2$: 1·0B$_2$O$_3$ a decided drop in solubility occurs, indicating the probability of chemical combination. No endothermic nor exothermic phenomena were observed throughout the series B_2O_3 to $B_2O_3.3SiO_2$. These fused boric-silica mixtures are typical glasses possessing no definite deformation temperatures.—H. H. S.

Clay ; Plasticity of ——. F. F. Grout and F. Poppe. Trans. Amer. Ceram. Soc., 1912, **14**, 71—81.

In a previous paper (this J., 1905, 1017) Grout measured the effects of fineness, shape of grain, and other factors and found them quantitatively insufficient to account for the plasticity of clay. He advanced the theory of molecular attraction, based on the facts that water is required to develop plasticity and that attraction varies with the nature of the substance and the nature of the solution. If attraction is stronger in clay than in other powders, a thicker film will be bound and rendered more viscous than by other powders, and the wet clay will therefore be more plastic. Purdy challenged the theory on the ground that in practice more water is required than is needed for films theoretically. The authors present calculations showing that for grains less than 0·001 mm. in diameter an average of about 75 per cent. of water is required ; for grains below 0·01 mm. about 18 per cent. In twenty clays reported by the Illinois survey, the average water used was 15·8 per cent., and that calculated for films and pores was 16·3 per cent. The authors then attack the colloid theory on the grounds that alkali, or both acid and alkali, is necessary to soften a colloid, while water only is required for clay, and that colloids have not been found capable of making other minerals plastic.—H. H. S.

Clay in the plastic state ; Effect of acids and alkalis upon ——. A. V. Bleininger and C. E. Fulton. Trans. Amer. Ceram. Soc., 1912, **14**, 827—839.

Experiments were conducted on clay in the wet plastic state as distinguished from clay suspensions on which many previous investigators have worked. Drying shrinkage is reduced by hydrochloric and sulphuric acids but increased by caustic soda and sodium carbonate up to a point whence it diminishes and again rises. The clays were not deflocculated by acids, but completely by sodium carbonate. Making the general assumption that drying shrinkage is a function of plasticity, the above results are contrary to Rohland's statements in his book on clays.—H. H. S.

Clay ; Specific heat of ——. J. M. Knote. Trans. Amer. Ceram. Soc., 1912, **14**, 394—398.

In Landolt-Börnstein's "Phys. Chem. Tabellen" the specific heat of kaolin is given as 0·2243 at 22°—98° C. Bleininger and Moore found 0·235 at 140°—1000° C. The author finds that burnt clay decreases in specific heat owing to dehydration. At 22°—150° C., raw clay gave the figure 0·237, clay burned to 650°, 0·201, and burned to 1050° C., 0·200.—H. H. S.

Pyrometric cones ; Melting points of —— *under various conditions.* S. Geijsbeek. Trans. Amer. Ceram. Soc., 1912, **14**, 849—871.

A summary of the recent work done by Hoffmann at Charlottenburg and by Rieke and others on the value of Seger cones as pyrometers. Under the same conditions, the cones will turn at approximately the same temperatures, but will melt at a lower temperature after a long fire than in a quick fire. They cannot be used to determine exact temperatures. The range between cone and cone is not uniform.—H. H. S.

Bodies for inverted mantle rings. R. L. Clare. Trans. Amer. Ceram. Soc., 1912, **14**, 407—417.

The hottest part of a lighted inverted burner was found to be at a temperature of 860° C. Bodies of low coefficient of expansion proved unsatisfactory, and flint and felspar were accordingly omitted in the trials. Mixtures were made of ball clay and china clay with calcined kaolin, magnesia or alundum (fused bauxite or corundum) as grog, and were fired up to cones 10 or 12. The alundum trials proved successful, alundum of 200-mesh size giving better results than that of 100-mesh. Calcined kaolin is cheaper but was unsatisfactory in amounts greater than 15 per cent. Magnesia gives successful rings when present in amounts of less than 25 per cent., but causes a very high fire shrinkage. The alundum rings had the composition : ball clay 15, kaolin 30—70, alundum 55—15 per cent.—H. H. S.

Dielectric strength of some porcelains ; Investigations on ——. B. S. Radcliffe. Trans. Amer. Ceram. Soc., 1912, **14**, 575—591.

Dielectric strength is found to be proportional to the thickness of the porcelain. The rate of burning and cooling does not materially affect dielectric strength so long as such treatment does not develop blebs, cracks or other flaws. Molecular substitution of soda felspar for potash felspar decidedly increases resistance. High-grade fireclays are as suitable for insulators as potash felspar porcelain vitrifying at the same temperature, but stoneware clay lowers both maturing temperature and dielectric strength. Lime used as flux instead of felspar yields insulators of low resistance. When an insulator is punctured, the current appears to fuse the porcelain in passing.—H. H. S.

Dielectric strength of porcelains ; Effect of temperature on ——. G. Weimer and C. T. Dun. Trans. Amer. Ceram. Soc., 1912, **14**, 280—291.

Watts (this J., 1903, 27) found that the dielectric strength of porcelain decreases at high temperatures, and Doelter (this J., 1908, 900, 910) established the electrolytic conduction of solid silicates by his experiments on quartz glass and diopside, mica and other minerals. The authors find that increasing temperature causes porcelain to change progressively from a dielectric to a conductor, the transition being gradual and occurring over a wide range of temperature. It is affected by the composition of the porcelain, as bodies high in felspar fail at high temperatures more quickly than others, while clay added at the expense of flint favours resistance. The frequency of the current and its nature, whether alternating or direct, are also factors in the result.—H. H. S.

Glaze composition; A study of —— on the basis of "norms." R. C. Purdy. Trans. Amer. Ceram. Soc., 1912, **14**, 95—112.

The author applies petrographic methods to the study of glazes, and, aided by the eutectic data afforded by the U.S. Geophysical Laboratory, considers opacity, gloss, crawling and crazing from the view of normative instead of chemical constitution. [By consideration of available data an opinion is formed as to the minerals, which would crystallise out from a given mixture if the latter were completely fused, and then allowed to cool, and the constitution thus ascertained is termed the "normative" as distinct from the chemical constitution.] The normative constitution of glaze, $0{\cdot}3K_2O.0{\cdot}3\,CaO.0{\cdot}4\,ZnO.0{\cdot}4\,Al_2O_3.2{\cdot}2\,SiO_2$, for example, would, if carried to complete fusion, be 0·3 orthoclase, 0·2 willemite, 0·1 eutectic $2CaO.Al_2O_3.SiO_2$, 0·1 wollastonite. The author finds that anorthite and $2CaO.Al_2O_3.SiO_2$ are most favourable to opacity, while $CaO.SiO_2$ and $2CaO.SiO_2$ are most prejudicial to it. Increase of silica in a mixture only slightly decreases opacity if wollastonite be not formed. Increased heat diminishes opacity, but the effect is less pronounced if the glaze be high in anorthite and is scarcely perceptible when sillimanite is present. Variation in felspar has little influence on opacity, the net effect in the considered glaze being the substitution of orthoclase for anorthite or conversely. Opacity is attributed to willemite held in suspension. Reference is made to the similar work of Jüptner on slags, of Zulkowski on glasses, and of others on cement and igneous rocks.—H. H. S.

Matte glazes. R. C. Purdy. Trans. Amer. Ceram. Soc., 1912, **14**, 671—681.

Matte glazes of low and medium fire are divided into two types. The first consists of those containing 0·5—0·7 equivalent PbO. In this type a matt glaze cannot be produced with less than 0·15CaO present; no other oxide can replace the lime. The zinc oxide should not exceed 0·1, and the oxygen ratio should be 2·0. In the second type, lead has been partially replaced by barium, to the extent of 0·2—0·4. Such glazes may contain less alumina and less lime, and the silica content is more a function of heat treatment than of molecular proportion to other oxides. Regarded "normatively," the author supposes that the formation of anorthite and leucite produces a matt texture. Wollastonite also leads to mattness, especially with low lead content. In no matt glaze was free silica found by "normative" calculation. A properly constituted matt glaze does not require to be dipped thick or with gum, nor need it be applied in any way differently from glossy glazes.—H. H. S.

Mattness in glazes; Theory for cause of ——. F. K. Pence. Trans. Amer. Ceram. Soc., 1912, **14**, 682—690.

Like Purdy (see preceding abstract) the author divides matt glazes into high raw lead and lead-barium glazes, but he subdivides the former class according to whether they rely for mattness on lime-alumina or zinc. The mattness is produced in this class by the precipitation of compounds, whether calcium aluminates, calcium-aluminium silicates or zinc silicates, which are difficultly soluble in the matrix. Such matt effects are due to crystallisation, while those of the second, the barium, class are the result of immaturity, the texture being due to the retarded combination and solution of an essential part of the glaze.—H. H. S.

Matte glazes; Microscopic examination of twelve ——. H. F. Staley. Trans. Amer. Ceram. Soc., 1912, **14**, 691—708.

Mattness is an optical phenomenon caused by refraction from innumerable small particles set at a variety of angles in the surface of the glaze. In no sample was there evidence of mattness produced by an undissolved scum; the grains are in all cases coated with a thin film of glass. Colouring oxides show no tendency to unequal distribution in the glaze, but are uniformly diffused through glass and crystal or segregation. To the two types of matt glaze in the preceding abstracts given by Purdy and by Pence, the author adds two more; the crinkled, due to the body of the glaze contracting differently from the skin, and the gas vesicle type in which elevation of the skin at innumerable points is caused by bubbles.—H. H. S.

Porcelain glazes of constant RO (K_2O : CaO); Influences of variable silica and alumina on ——. R. T. Stull. Trans. Amer. Ceram. Soc., 1912, **14**, 62—70.

Keeping the RO group constant at $0{\cdot}3K_2O,0{\cdot}7CaO$, the alumina was varied from 0·3 to 1·0 and the silica from 1·8 to 7·2 molecules. The results are plotted graphically, but it is observed that crazing and mattness decrease with increase of silica, until a point is reached when brilliancy decreases, crazing increases, and finally devitrification occurs. Increasing alumina decreases crazing whatever the silica content, decreases devitrification in high silica glazes and increases mattness when silica is low. Boron trioxide functions like alumina in high silica glazes, but oppositely with low silica. Matt glazes fall within narrow limits, but bright glazes cover a wider range. The best bright glazes are found between oxygen ratios 2·5—3·6 and silica-alumina ratios 7—8·2, while the best matt glazes occur between oxygen ratios of 1·5—1·8 and SiO_2/Al_2O_3 3·2—3·8. In high alumina glazes a high oxygen ratio should be maintained for glazes, whether bright or matt.—H. H. S.

Terracotta glazes; Production of black spots upon ——. C. W. Parmelee and R. Heidingsfeld. Trans. Amer. Ceram. Soc., 1912, **14**, 227—237.

Black spots, which are produced upon terracotta in order to imitate the appearance of polished granite, may be obtained by using calcines of cobalt, chromium and iron oxides, the problem being to avoid blue, green or brown tints. With glaze composition constant, the probability of black spots being produced increases with the increase of whiting up to 3—4 per cent. in the underslip. The most favourable glaze had the composition:— $0{\cdot}1\,MgO, 0{\cdot}1\,BaO, 0{\cdot}4\,CaO, 0{\cdot}4\,K_2O, 0{\cdot}56\,Al_2O_3, 3{\cdot}08\,SiO_2$. The slips were made from ball clay, china clay, flint, felspar, and whiting. From the charts the stains appear to be richer in cobalt than in iron and chrome.—H. H. S.

Glaze imitation of granite. R. Heidingsfeld. Trans. Amer. Ceram. Soc., 1912, **14**, 245—249.

Attempts were made to imitate the characteristic markings of granite, by using minerals as stains. Biotite gave a brownish-black spot somewhat fused at the edges, and also induced crazing. Hornblende, tourmaline and garnet settled too rapidly in the glaze. Graphite caused crazing, and franklinite was too refractory. Damourite gave good results, but was surpassed by specular iron ore, which was most effective in semi-matt glazes when present to the extent of 3 per cent.—H. H. S.

[Glazes] Cobalt colours other than blue. R. T. Stull and G. H. Baldwin. Trans. Amer. Ceram. Soc., 1912, **14**, 764—777.

As in blowpipe analysis magnesia gives a pink with cobalt nitrate, while alumina yields a blue, the use of a glaze high in magnesia and low in alumina suggested itself for the production of pink cobalt glazes. Highly magnesian glazes, however, are refractory, and it was found that lead oxide introduced as a flux destroyed the pink, but boric acid did not; in fact, increase of borate caused the glazes to become redder. Decrease of magnesia or increase of silica diminished the red and increased the blue. Most of the trials gave results lying between red and violet, cobalt silicate yielding the blue component and the magnesia-cobalt compound the red. Increase of temperature tends towards redness. The best results were obtained from the formula: $0{\cdot}2Na_2O, 0{\cdot}6MgO, 0{\cdot}2CoO, 1{\cdot}2B_2O_3, 0{\cdot}75SiO_2$.—H. H. S.

[*Glazes.*] *Colours produced by nickel oxide in ceramic mixtures containing zinc.* F. K. Pence. Trans. Amer. Ceram. Soc., 1912, **14**, 143—151.

In order to ascertain whether colours other than brown produced by nickel and zinc in glazes were due to impurity in the nickel, the author prepared nickel oxide free from cobalt by precipitating the carbonate from nickel ammonium sulphate. The results show that nickel in the presence of zinc and flint can produce colours varying from brown through reddish purple to dark blue. A formula for blue is: $0{\cdot}25K_2O, 0{\cdot}14CaO, 0{\cdot}21BaO, 0{\cdot}40ZnO, 0{\cdot}15NiO, 0{\cdot}3Al_2O_3, 2SiO_2$; and for purple: $0{\cdot}25K_2O, 0{\cdot}20CaO, 0{\cdot}30BaO, 0{\cdot}25ZnO, 0{\cdot}15NiO, 0{\cdot}3Al_2O_3, 2SiO_2$. The atmosphere need not necessarily be oxidising. The stain is attributed to a nickel-zinc silicate.—H. H. S.

[*Glazes.*] *Chrome-tin pink stains; Influence of composition of stain in the production of red from ——.* R. C. Purdy. Trans. Amer. Ceram. Soc., 1912, **14**, 172—179.

The differences of opinion on the production of the well-known chrome-tin pink are discussed, and it is concluded from fresh experiments that the composition of the stain is as vital as the composition of the glaze; that difference in the source of the chromium affects the tint; that the stains need not be washed nor re-calcined; and that it is better to calcine the stain at as high a temperature as possible. Pure pinks and reds are obtained only with 1·5—2·0 equivalents of lime in the stain, higher lime giving brownish pink and red. The best reds are obtained with potassium bichromate, and the darkest pure red with chromium trioxide and lead chromate. With increase of chromium in the chromium trioxide and potassium bichromate stains, the glazes pass from pink to red, and then to green, while with the lead chromate stains, the tints pass from pink to brown-red.—H. H. S.

[*Glazes.*] *Chromium stains; Light green ——.* A. R. Heubach. Trans. Amer. Ceram. Soc., 1912, **14**, 418—433.

Seger's recipe for Victoria green contains the inconvenient substances potassium bichromate and calcium chloride. The author succeeded in replacing the former by chromium oxide and nitre, and the latter by whiting, fluorspar and plaster. This amended formula is: chromium oxide 18·6, nitre 24·7, flint 20, fluorspar 11, whiting 22, plaster of Paris 11.—H. H. S.

Enamel for terracotta; Accidental pink discolouration of a white ——. D. F. Albery. Trans. Ceram. Amer. Soc., 1912, **14**, 640—641.

The pink discolouration was found to be removed by reducing the lime content in the enamel, which contained tin oxide, to below 0·2 equivalent and substituting lead, zinc or magnesium oxide. Staley notes that enamels on cast iron suffer from a similar defect if high in calcium, and especially if fritted and applied to the iron under strongly oxidising conditions.—H. H. S.

Enamels on cast iron; Cause and control of crazing in ——. H. F. Staley. Trans. Ceram. Amer. Soc., 1912, **14**, 516—545.

Crazing may be general or special. General crazing is usually treated according to Seger's rules, viz., by an increase of felspar or boric acid, but the defect may be caused by a lack of conformity of ground coat to enamel. The enamel should be as thin and uniform as possible. According to the author, the addition of fluorides, keeping the fusibility the same, tends to increase the defects of an enamel, whether in crazing or peeling. Zinc oxide, on the other hand, minimises the fault, but tends to crystallise out. Seger's theory that peeling and crazing depend on the relative coefficient of expansion of body and glaze is regarded as unproved. Strength and elasticity must also be regarded, and unequal cooling may be the most potent of all factors. Special crazing occurs on unsuitable patterns, and on castings made, or ware enamelled, by faulty workmen. The first precaution is to minimise the tendency to general crazing. Then thick spots in the casting should be avoided by properly finished moulds and by reducing the thickness of the metal. The ware should be turned and chilled while the ground coat is being fused, and a more fusible coat put on heavy spots. The ground coat should have a wide temperature range. With thin spots, turning is also practised and a more refractory coat is applied locally. Sharp corners should be avoided in patterns; the reverse side of convexly curved portions should be properly moulded and hollowed out. Concave curves cause less rupture as the power of resistance of an enamel to crushing is 10—20 times as great as its resistance to tension; but they have a special defect in the difficulty of dusting enamel uniformly on to them. Thick spots or areas of enamel cause crazing. Beads are formed if trimming is not done before the enamel starts to become rigid. Mechanical stresses in the casting, such as those due to warping or bending, or to exterior restraint, may also induce crazing.—H. H. S.

Enamels for cast iron; Replacement of tin oxide by antimony oxide in ——. R. E. Brown. Trans. Amer. Ceram. Soc., 1912, **14**, 740—755.

The effect of antimony oxide is to increase the maturing temperature and also to increase whiteness and opacity if employed between the limits $0—0{\cdot}09Sb_2O_4$. Further additions cause dulness and then mattness and shivering. The satisfactory limits of antimony are regarded as 0·06—0·09, the best results being obtained with 0·075 equivalent. If barium and antimony be introduced into the same enamel, mattness will ensue. The formula recommended by the author is: $0{\cdot}16K_2O, 0{\cdot}05ZnO, 0{\cdot}10CaO, 0{\cdot}15PbO, 0{\cdot}54Na_2O, 0{\cdot}16Al_2O_3, 0{\cdot}20B_2O_3, 1{\cdot}80SiO_2, 0{\cdot}075Sb_2O_3$, fluorine being introduced as 0·06 equivalent of cryolite. Antimony is apt to give bluish and greenish tints in the enamel.—H. H. S.

Enamels for sheet steel; Comparison of ten white ——. R. D. Landrum. Trans. Amer. Ceram. Soc., 1912, **14**, 489—509.

The enamels were tested for resistance to acid, expansion and contraction, loss under the hammer, and appearance of ware with regard to gloss and opacity. The cost was also considered. Taking all these circumstances into account, the best enamel is that having the formula: $0{\cdot}497Na_2O, 0{\cdot}186K_2O, 0{\cdot}278CaO, 0{\cdot}039MgO, 0{\cdot}3Al_2O_3, 2{\cdot}513SiO_2, 0{\cdot}262B_2O_3, 0{\cdot}6F_2$. The cost is placed at \$6·70 (£1 8s.) per 100 lb.—H. H. S.

Testing of paper clays. Gwinn. *See* V.

PATENTS.

Clouded glasses, enamels, and similar products; Process for the manufacture of and of clouding agents allowing of the carrying out of this process. H. Kretzer. Fr. Pat. 444,440, May 30, 1912.

The clouding agents employed are oxidised compounds of antimony or tin with barium, strontium, calcium, magnesium or aluminium. The compounds are made by bringing together at a red heat those salts of the metals which after heating will leave a residue of their oxides, whilst the acid contained in them is volatilised. The process may be carried out by heating together only the salts of the kind just described of one of the metals with those compounds of the other metal which when heated to redness leave a residue of their oxidised compounds. The process may also be carried out by heating compounds of antimony and tin with compounds of barium, strontium, calcium, magnesium or aluminium and adding acids which after heating are volatilised and leave a residue of the metallic oxides.—W. C. H.

Tiles with mitre-joints and similar materials; Process for drying ——. F. Haas, G. m. b. H. Fr. Pat. 444,560, June 3, 1912. Under Int. Conv., June 13, 1911.

The articles are dried by being passed through two drying tunnels, in the former of which they undergo a short preliminary drying in moderately warm air, and in the latter they are exposed to the action of superheated steam. —W. C. H.

IX.—BUILDING MATERIALS.

Hydraulic lime. G. Hentschel. Tonind.-Zeit., 1912, 36, 1843—1844.

In calculating the hydraulic modulus $\frac{CaO + MgO}{SiO_2 + R_2O_3}$ of a sample of hydraulic lime, any undecomposed calcium carbonate and insoluble silica must be taken into consideration by subtracting the amount of lime, which is in combination with carbon dioxide, and the amount of silica, which is not present in the soluble form, from the respective constituents as they appear in the formula. The nearer its hydraulic modulus approximates to that of Portland cement (1·7—2·1), and the smaller the amounts of insoluble residue and calcium carbonate which it contains, the greater is the value of a hydraulic lime. The author found that by raising the temperature of calcination, so as to decompose the calcium carbonate completely without dead-burning the lime, a stronger-setting hydraulic lime was obtained, yielding sand-mortars which had 2½ times the crushing strength of sand-mortars prepared from the same raw material calcined at a lower temperature. The addition of 2 per cent. of stucco plaster, or of 2½ per cent. of raw gypsum, greatly increased the crushing strength of hydraulic lime mortars, especially when these were exposed to atmospheric conditions only.—O. R.

Reinforced concrete. E. P. Wells. Times Eng. Suppl., Nov. 20, 1912.

Cement intended for concrete should be protected from the atmosphere, as over-hydrated cement sets slowly and concrete made from it has a very low crushing strength; the only use for such cement is as a retarding agent for mixing with cements that are too quick-setting. Though a large proportion of sand is required to obtain perfectly dense mixtures for waterworks, the addition of sand should not be overdone. Concrete for reinforced work should have a slight excess of moisture rather than a deficiency, since it is better to have steel perfectly protected with a slightly weaker concrete than to have imperfect protection with a stronger concrete, because in the latter case corrosion is almost bound to take place, with consequent disruption of the concrete. Test-cubes should be made of the concrete as it is being put into work for reinforced constructions, and the crushing strengths of these cubes should be ascertained *in situ* after exposure to the obtaining atmospheric conditions, and compared with test-cubes made of the same materials in the laboratory and maintained at the normal temperature of, say, 60° F. (15·5° C.). It is fair to assume that concrete, mixed and utilised under wintry conditions, when its crushing strength will be very low, will increase in strength with the return of temperate weather, and ultimately attain the same strength as the laboratory test-cubes. —O. R.

Paving bricks; Comparison between rattler test and sand-blast test for ——. E. Orton, jun. Trans. Amer. Ceram. Soc., 1912, 14, 180—209.

The sand-blast method is found to have no advantage on either technical or economic grounds over the rattler process as a method of testing paving bricks for resistance and wear. It measures hardness rather than strength or toughness, and as a laboratory process is recommended for exposing the structure of strong bodies, whether natural or artificial.—H. H. S.

Patents.

Artificial stone; Process for the manufacture of —— *by a cold method.* M. Binetter and D. Komlos, Kismánya, Hungary. Eng. Pat. 6597, Mar. 16, 1912. Under Int. Conv., July 25, 1911.

Brick-dust is mixed with about 6—8 per cent. of dry, pulverised, vegetable fibre rich in silica, such as "equisetum, shave-grass," or the like, and 20—25 per cent. of hydraulic cement, the mixture is wetted with aqueous hydrofluoric acid of 2°—5° B. (sp. gr. 1·014—1·037) strength, and moulded under great pressure. The product is then dried in the air for about 10 hours, and subjected to a final treatment with aqueous hydrofluoric acid, preferably more concentrated than in the first instance, whereby the partially set mass is completely hardened. —O. R.

Artificial stone of constant volume; Process of manufacture of ——. J. Billwiller. Fr. Pat. 443,991, May 18, 1912. Under Int. Conv., May 19, 1911, and Jan. 24, 1912.

The artificial stone is made by treating dolomite, which has been incompletely calcined so that only the magnesia has been freed from the carbon dioxide, with magnesium chloride or with "soluble glass." If the dolomite is heated too strongly, so that it contains some caustic lime, the material should be subjected to a preliminary slaking with water. Additions of calcium sulphate and small quantities of clay may be made to the mixture, and the hardened stone may be treated with a solution of an alkali phosphate, *e.g.*, sodium phosphate.—W. C. H.

Road-making and binding materials therefor. E. A. Paterson, Port Arthur, Ontario. U.S. Pat. 1,042,474, Oct. 29, 1912.

Claim is made for a mixture of calcium carbonate and an alkali silicate in such proportions as to form—when wet and exposed to the action of atmospheric carbon dioxide—a hard, insoluble and durable binder composed of silica and calcium carbonate.—W. E. F. P.

Refractory material. F. J. Tone. Assignor to The Carborundum Co., Niagara Falls, N.Y. U.S. Pat. 1,042,844, Oct. 29, 1912.

Claim is made for a self-sustaining, plastic, refractory, furnace-lining material containing 80 per cent. of carborundum, 10 of fireclay and 10 of sodium silicate. —W. E. F. P.

Cement furnace. H. Trachsler, Zürich, Switzerland. U.S. Pat. 1,042,727, Oct. 29, 1912.

See Fr. Pat. 416,781 of 1910; this J., 1911, 431.—T. F. B.

Concentration of waste sulphite liquor. U.S. Pat. 1,042,538. *See* V.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Iron, nickel, cobalt, and manganese; Equilibrium diagrams of carbon with ——. O. Ruff. Ber., 1912, 45, 3139—3148.

With the aid of the electric vacuum furnace (this J., 1910, 886) it is possible to attain and keep constant temperatures up to about 2700° C., and hence to study the systems of carbon with iron, nickel, cobalt, and manganese respectively up to the temperatures at which the melts saturated with carbon volatilise at a pressure of 10—20 mm. (see also this J., 1912, 233, 285). The results obtained in these and other experiments show that the formation of carbides stable at high temperatures and decomposing at lower temperatures, with separation of graphite, is of frequent occurrence, namely with iron, nickel, cobalt, tungsten, and molybdenum, and probably with many other metals. Curves representing the four systems mentioned above are given, with the temperatures as ordinates and percentages of carbon as abscissæ. Up to about 2500° C. the solubility of carbon in the metals in question appears to be due almost entirely to the carbide equilibrium, which is displaced in one or the other direction according to the temperature. For example, in the case of iron, the equilibria:

$$3Fe_2C_{liq.} \rightleftharpoons 2Fe_3C_{liq.} + C_{solid};$$
$$Fe_3C_{liq.} \rightleftharpoons 3Fe_{liq.} + C_{solid},$$

are displaced from left to right with falling temperature below 2220° C. and from right to left above 2220° C. In the case of nickel, the equilibrium: $Ni_3C_{liq.} \rightleftharpoons 3Ni_{liq.} + C_{solid}$, is displaced from left to right with falling temperature below 2080° C., and the same holds true for cobalt. On the other hand, solid and liquid trimanganocarbide, Mn_3C, appears to be stable within the whole range of temperature.

The vapours escaping from the melts saturated with carbon contained only traces of carbide, and it is suggested that this affords an explanation of the very low degree of carburisation of iron in the electric steel furnace, even when carbon electrodes are used, for if the author's observations are correct, it must be accepted that the vapours carrying the arc consist of almost pure iron.—A. S.

Manganese; Determination of —— in mild steel and pig iron by Smith's persulphate method. H. Kunze. Stahl u. Eisen, 1912, **32**, 1914—1916.

The author has modified the method as originally given by Smith (Chem. News, 1904, **90**, 237; compare also Stehman, this J., 1903, 112) in order to render it more suitable for commercial purposes without impairing its accuracy. The following is recommended as being a suitable procedure for mild steel: 0·2 grm. of borings is dissolved in 10 c.c. of nitric acid of sp. gr. 1·2, in a tall beaker of 200 c.c. capacity, warming until the red fumes have been driven off. 20 to 30 c.c. of *N*/100 silver nitrate solution (10 c.c. suffices if less than 0·7 per cent. of manganese be present) and about 1 grm. of solid ammonium persulphate are now added, the beaker is maintained at 50° to 60° C. for five minutes to complete the oxidation of the manganese, and after cooling, and diluting with 50 c.c. of water, the solution is titrated with a solution of arsenious acid until the pink colour changes to a pale green. The arsenious acid solution is prepared by dissolving 10 grms. of arsenious acid and 20 grms. of sodium bicarbonate in 750 c.c. of hot water, and then diluting to 10 litres. To standardise this solution a steel of known manganese content must be taken and treated as described above. For pig iron, the above process is modified as follows: 2 grms. of pig, or 1 grm. of spiegel, are dissolved in 30 to 40 c.c. of nitric acid of sp. gr. 1·2, in a 500 c.c. graduated flask. After driving off the red fumes, the flask is filled to the mark, shaken, and allowed to stand. 25 c.c. of the solution are then treated as in the case of steel, except that a beaker of 300 or 350 c.c. capacity is used, a further 10 c.c. of nitric acid are added, and a *N*/10 solution of silver nitrate is used; 5 to 10 c.c. for pig iron, 15 c.c. for spiegel. Dilution to 150 c.c. is effected before titration, which is carried out with the same solution as in the case of steel. The above methods have been for several years in constant use, and have given entire satisfaction. The results agree closely with those obtained by other methods, and are very concordant. —R. W. N.

Special steels; Microscopic investigation of highly alloyed ——. F. Fettweis. Stahl u. Eisen, 1912, **32**, 1866—1869.

The special steels examined microscopically, contained (a) 2·4 per cent. of carbon and 13·7 of chromium, (b) 1·18 of carbon and 14·1 of chromium, (c) 0·44 of carbon, 17·6 of tungsten, and 4·42 of chromium, (d) 0·80 of carbon, 12·84 of tungsten, 2·86 of chromium, (e) 0·57 of carbon, 17·21 of tungtsen, 6·60 of chromium, and 0·10 of molybdenum were examined microscopically. The usual alcoholic solutions were found to be quite useless as etching reagents, but a solution of copper ammonium chloride was sometimes successful, the best reagent, however, being an alcoholic solution of sulphurous acid. The carbide corresponding to the eutectic of carbon steels was only visible in the cast specimens, there being no segregation in forged samples. It is concluded that:—(1) Carbide in the chrome and chrome-tungsten steels arises from an eutectic corresponding to the ledeburite of iron-carbon alloys. (2) In consequence of high chromium content, and still more, of the presence of tungsten as well, the carbide-concentration of the solid solution separated from the molten mass is so diminished that often even with a few tenths per cent. of carbon, the eutectic appears. (3) The crystals forming during cooling do not equalize in composition owing to their slow rate of diffusion and the quantity of eutectic is increased. (4) Chilled chromium-tungsten steels show as a rule the same structure and constituents as are found in hardened hyper-eutectic carbon steels. The paper is illustrated by thirty-six microphotographs.—A. H. C.

Iron, manganese, and copper; Ternary alloys of ——. N. Parravano. Gaz. chim. ital., 1912, **42**, II, 513—531.

The study of the ternary alloys of iron, manganese, and copper is complicated by the fact that whilst iron and manganese and manganese and copper are miscible in all proportions in both the liquid and solid states, iron and copper are completely miscible when liquid but only partially miscible in the solid state. Since manganese is completely miscible both with iron and copper, on adding manganese to iron copper alloys composed of two solid phases, the heterogeneity should be diminished until finally, with a certain content of manganese, the alloy becomes homogeneous. After a theoretical discussion of the subject, the author gives the results of the study of 49 ternary alloys by the thermal method. Triangular diagrams of the points of initial and final solidification are given and also six sections of the surfaces of equilibrium. The exact delimitation of the field within which the solid alloys contain two solid phases, was not possible from the results of thermal analysis alone, but by micrographic examination of the alloys after more or less prolonged annealing at 780°—900° C., it was found that alloys containing: (1) Fe 20, Mn 60, Cu 20; (2) Fe 40, Mn 40, Cu 20; (3) Fe 60, Mn 30, Cu 10; and (4) Fe 70, Mn 20, and Cu 10 per cent. were homogeneous: whilst those containing: (1) Fe 40, Mn 30, Cu 30; (2) Fe 50, Mn 30, Cu 20; and (3) Fe 60, Mn 20, and Cu 20 per cent. were composed of two solid phases. The alloy, Fe 30 per cent., Mn 40, and Cu 30, was about on the border line between the two types, for although composed of two solid phases, it showed a great tendency to become homogeneous on annealing.—A. S.

Nickel, manganese, and copper; Ternary alloys of ——. N. Parravano. Gaz. chim. ital., 1912, **42**, II., 385—394.

In each of the three binary systems, nickel-manganese, nickel-copper, and manganese-copper, the metals form solid solutions; in the case of the copper-nickel alloys, the melting-point curve falls continuously from the melting-point of nickel to that of copper, but in the other two cases the melting-point curve passes through a minimum. The author investigated by the thermal method 5 manganese-copper alloys and 36 ternary nickel-manganese-copper alloys, and gives two triangular diagrams showing the temperatures of initial and complete solidification of the ternary alloys. With all the alloys solidification takes place over an interval of temperature, and the smaller this interval the less heterogeneous is the structure of the alloys when cooled under ordinary conditions. Annealing for two hours at 900° C. suffices to render the alloys homogeneous. Twelve photomicrographs accompany the paper.—A. S.

Iridium in American placer platinum. F. W. Horton. Eng. and Min. J., 1912, **94**, 873—875.

Russian and Colombian crude platinum generally contain from 1 to 3 per cent. of iridium. The total Russian production of osmiridium for the last ten years is officially reported as only 308 oz. The amount of iridium and its natural alloys imported into the United States amounts only to about 3 per cent. of the weight of platinum imported, notwithstanding the great demand for the former metal. Iridium is usually associated with osmium and platinum. On Trinity River, Trinity County, California, coarse nuggets are found of the following average composition: osmiridium 69·7 per cent., platinum 22·7 per cent., and 0·4 per cent. of gold. On treating this material with *aqua regia* it disintegrates, small flat scales of osmiridium remaining undissolved. The nuggets seem therefore to consist of osmiridium cemented by platinum. A 17 oz. sample from China Flat, fifty miles farther down the Trinity River, gave on analysis the following figures: osmiridium, 74·883; platinum, 17·640; iron, 6·376; copper, 0·568; gold 0·074 per cent.; nickel, traces; chromium and palladium, none. The osmiridium contained: iridium, 55·04; osmium, 44·28; iron, 0·59; silica, 0·09 per cent.; rhodium and ruthenium, none. Analyses show that crude platinum from this district contains in general 69 to 75 per cent. of osmiridium, of which over 50 per cent. is iridium; and on the whole the crude platinum contains about 40 per cent. of iridium as compared with 20 per cent. of platinum. This river basin has long been worked for gold and has also produced much platinum and other allied metals, though the greater part of the output of the platinum metals has been, until recently, thrown away as worthless. For comparison, the following analyses of crude platinum from Oroville, California, are given. (1) Osmiridium, 23·36; platinum, 65·66; iridium, 0·66; gold, 0·72 per cent. (2) Osmiridium, 32·01; platinum, 56·19; iridium, 1·02; gold, 4·16 per cent. The following table given by Kemp (U.S. Geol. Surv., Bull. 193, pp. 18—19), is appended.

Analyses of American and foreign platinum.

	Russia.										
	Goroblagodat District.	Nijni Tagilsk District.	Colombia El Choco District.	California.	Oregon.	New South Wales.	Borneo.	British Columbia.	Brazil.	Australia (probably New South Wales).
Iridium	0·33	2·44	1·44	1·70	0·40	1·30	0·66	1·14	27·79	1·65
Platinum	82·90	76·28	82·70	76·29	51·45	75·90	82·60	72·07	55·44	60·60
Rhodium	1·54	2·37	2·08	1·35	0·65	1·30	—	2·57	6·86	1·68
Palladium	1·24	0·22	0·93	0·99	0·15	—	—	0·19	0·49	1·65
Osmium	0·54	0·20	0·23	0·33	—	—	—	—	—	0·40
Ruthenium	—	—	—	—	—	—	—	—	—	—
Osmiridium	1·17	0·73	2·62	9·04	37·30	9·30	3·80	10·51	—	25·50
Gold	—	—	0·74	0·71	0·85	—	0·20	—	—	1·80
Insoluble.......	0·17	1·56	—	—	—	—	—	—	—	—
Iron	10·72	13·75	7·60	5·93	4·30	10·15	10·67	8·59	4·14	4·43
Copper	0·56	1·31	0·51	1·91	2·15	0·41	0·13	3·39	3·30	1·10
Sand	—	—	1·54	1·76	3·00	1·22	—	1·69	—	1·20
Manganese	—	—	0·08	—	—	—	—	—	—	—
	99·17	98·17	100·47	100·01	100·25	99·58	98·06	100·15	98·02	100·01
Number of samples analysed to obtain average analyses	3	17	5	4	1	1	1	1	1	2

—R. W. N.

Gold ore; Research upon a refractory ——. M. Green. J. Chem., Met., and Min. Soc., S.A., 1912. **13**, 84—101.

Ore from the Mount Morgan Mine, Barberton, was taken, and systematically examined to determine the reasons for the difficulties encountered in its treatment, and to devise a treatment-scheme. The ore consists of pyrite in chert and schist, with small quantities of talc, graphite, calcite, dolomite and sphalerite, besides quartz. After crushing and careful grading the relationship between the gold and the sulphur content was investigated at length, and the possible ratio of mechanical concentration determined. The applicability of amalgamation and cyaniding is carefully and elaborately discussed and examined in the light of large numbers of tests made under varying conditions. Incidentally the effect of the presence of graphite is studied, and it is conclusively shown that graphite in an ore does not hinder solution of the gold, nor does it cause premature precipitation. On the contrary, it tends to hasten solution, though having no effect on the final ratio of extraction. A minute examination of a very rich and refractory portion of the pyritic concentrate showed the gold to be present in the ore partly in the pyrite as free gold, and partly in the form of grains of a gold-silver alloy, each particle of which is surrounded by a film of marcasite. Selenium and tellurium are absent. The feasibility of obtaining a good extraction after roasting is then demonstrated, and a proposed scheme of treatment outlined, as follows:—After crushing to 90-mesh, and closely concentrating, the concentrate is roasted, the roasted material ground with mercury, the amalgam separated from the pulp, and the latter (which should consist mainly of slime) cyanided, using mechanical agitation. The tailing from concentration should be weathered to expose the gold, and then cyanided. Or, as a possible alternative treatment, the whole of the ore is roasted, ground with mercury, and the pulp subsequently cyanided. The price of fuel would probably be the determining factor.—R. W. N.

Copper; Electrolysis of nitric acid solution of ——. J. H. Stansbie. Faraday Soc., Nov., 1912. [Advance proof.]

It is practically impossible to deposit the whole of the copper from a solution containing nitric acid under ordinary conditions. The fact that nitrous acid is formed in electrolysis and that this acid plays a very important part in the solution of copper by ordinary nitric acid suggests a suitable explanation and a partial remedy for the difficulty. A series of experiments showed that the greatest deficiency in copper was found when the greatest amount of nitrous acid was formed. This latter can be greatly reduced by adding sulphuric acid, which may act in two ways:—(1) The ions of the sulphuric acid help to carry the current and thereby check the formation of nitrous acid. (2) It unites with any nitrous acid to form a nitro-compound which has a much smaller solvent effect on the copper.—W. H. P.

Copper; Structure, recrystallisation power, and strength of electrolytic ——. O. Faust. Z. anorg. Chem., 1912, **78**, 201—212.

Microscopic examination of copper deposited electrolytically at the ordinary temperature shows that its structure is independent of the nature of the cathode used, and that the lower the concentration of the electrolyte and the greater the current density, the smaller are the crystallites. These grow in the direction of current flow, and their orientation is so regular that aggregates of crystallites may be employed for the study of their vectorial properties. In this manner it has been established that the lower limit of elasticity in the direction of growth of the crystallite is somewhat less than in a direction perpendicular to this. Electrolytic copper is found to resemble the mechanically worked metal in many of its properties, and a study of the phenomenon of recrystallisation, which has been observed in both, combined with that of the slip bands induced by pressure, has led to the conclusion that in the process of recrystallisation long crystallites are transformed, under the influence of surface tension, into shorter and broader crystallites.—F. Sodn.

Bismuth and antimony; Spontaneous crystallising capacity of ——. E. Bekier. Z. anorg. Chem., 1912, **78**, 178—182.

The method of investigation consisted in pouring the molten metals into massive iron moulds and counting the number of crystallites per unit area in the resulting regulus. The temperature of the mould ranged from 200° C. to—70° C. with bismuth and from 600° C. to —70° C. with antimony, and it is assumed that, within these temperature limits, the number of crystallites per unit area is a measure of the spontaneous crystallisation power of the metal. The crystallising capacity of bismuth is thus found to increase as cooling is accelerated, whereas with antimony a maximum is reached at temperatures between 200° and 400° C., and the crystallising capacity then decreases, the metal again becoming coarser in grain: it is suggested, that by the use of very low temperatures, the metal might be made to solidify in the amorphous form.—F. Sodn.

Metals: Effect of tension on ——. Hanriot. Comptes rend., 1912, **155**, 971—974.

The ordinary method of determining the hardness of a metal gives only very imperfect knowledge of its general physical condition, since the latter is altered by the pressure of the sphere in the determination. The author has therefore attempted, using silver, brass and aluminium, to decide whether tensile tests will give a more valuable figure. It is found, however, that the tension itself produces a hardening effect on soft metals and a softening effect on hard metals. The softer specimens show practically the same load at fracture and the same elongation, and the general effect of the tensile strain is to determine in the metal a certain degree of toughness. The effect does not begin to manifest itself immediately the load is applied, but only appears when permanent deformation occurs.—W. H. P.

Alloys; The chemical method for the study of ——. A. Portevin. Rev. Mét., 1912, **9**, 884—890.

The investigation of the constitution of alloys by methods depending upon the elimination (or supposed elimination) of certain of the metallographic constituents by means of solvents is regarded as unsatisfactory and liable to result in erroneous conclusions. It is pointed out that although an insoluble residue obtained in this manner may be crystalline and of reasonably constant composition, it may not consist of the pure substance indicated by the calculated formula. During the solidification of alloys the crystals first formed may (and sometimes do habitually) enclose, more or less completely, considerable quantities of the surrounding liquid which ultimately solidifies in the interior of the crystals; or well-defined crystals may be formed around pre-existing crystalline aggregates of different composition: in either case the enclosed material is protected from the attack of the solvent.—W. E. F. P.

Solubility of finely divided gold in potassium ferrocyanide solution. Beutel. *See* VII.

Molten carnallite [and its mixtures with potassium chloride]. Arndt and Kunze. *See* VII.

Tantalum electrodes. Brunck. *See* XI.

Patents.

Steel sheets for use in making tin-plates; Manufacture of ——. R. P. Bevan, Briton Ferry, Glamorgan. Eng. Pat. 23,002, Oct. 18, 1911.

The sheets obtained by rolling suitable steel bars at a red heat are separated, heated with or without the addition of oxide of iron, treated with dilute sulphuric acid, washed, dried, cold-rolled, "white" annealed and finally cleaned for tinning. It is claimed that by heating after hot-rolling, the metal is partly decarburised (by the scale or added iron oxide) so that steel of higher carbon content (up to 0·2 per cent.) and of a quality inferior to that usually employed for tin-plates may be utilised.—W. E. F. P.

Iron and steel; Composition for the treatment of molten . J. R. C. Marsh. Fr. Pat. 444,340, May 29, 1912. Under Int. Conv., Aug. 3, 1911.

Claim is made for various mixtures which, when added to molten iron or steel contained in the crucible or casting-ladle, are stated to impart to the metal certain qualities (*e.g.*, homogeneity, fineness of grain, etc.) usually acquired only by subsequent heat treatment. The mixtures consist of (1) ferro-titanium, copper, chromium, boric anhydride and arsenic: (2) ferro-manganese, ferro-silicon, copper, chromium, boric and arsenious anhydrides; (3) ferro-boron, ferro-vanadium and copper: (4) ferro vanadium, chromium, and copper.—W. E. F. P.

Steel and process for transforming it into steels of various qualities. G. Hantke. Fr. Pat. 444,635, June 5, 1912.

The patent relates to steel containing 0·45—0·60 per cent. of carbon, 0·12—0·70 of silicon, 0·25—0·50 of manganese, 1·00—2·25 of nickel and 1·00—2·25 of chromium; the nickel may be wholly or partly replaced by cobalt or chromium, and the chromium by molybdenum, tungsten, vanadium, titanium or, boron. It is claimed that, by appropriate treatment, objects made of this material acquire great elasticity, the hardness of the metal varying from one face, or extremity, of the object to the other. The treatment consists in first heating the metal (object) to a temperature below its transformation point and cooling it in oil, water or air, then heating it above the transformation point and cooling it in oil, water or air, and finally heating it above the transformation point and quenching it in water, oil or other liquid at a temperature between the transformation point and 150° C.—W. E. F. P.

[Tungsten.] Metal; Working of ——. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, U.S.A. Eng. Pat. 9877, Apr. 25, 1912.

Metal (tungsten) which has become brittle during drawing or other working operation is rendered workable, it is claimed, by removing the outer surface or skin; this is effected either by passing the metal through a fused oxidising salt (such as potassium nitrate or nitrite, sodium carbonate or barium chlorate) or mechanically by grinding. —W. E. F. P.

Tungsten and molybdenum; Process for the production of malleable metals of high melting-point, especially ——. J. Canello. Fr. Pat. 444,878, June 12, 1912.

In the preparation of malleable tungsten free from carbon, the metallic powder obtained by heating pure tungsten trioxide in a current of pure hydrogen is mixed with a small proportion of glycerin and moulded by pressure to the desired form. After being heated in an oven to expel the glycerin, the moulding is subjected—electrically or otherwise—to a temperature of about 2000° C. with the object of causing the metallic particles to fuse together: both heating operations are so conducted as to avoid contact of the metal with air or hydrogen. The metal is then consolidated by successive compressions at a high temperature and is finally rolled or drawn as required, the cementation and tempering of the products being effected by cooling in air or quenching in mercury or molten lead from a red heat. The tungsten trioxide employed must be quite free from alkali salts and is preferably obtained by heating powdered wolfram with *aqua regia*, extracting the insoluble residue with ammonia and igniting the resulting ammonium tungstate.—W. E. F. P.

Furnaces [for the manufacture of steel and iron alloys]; Electric ——. G. Massip. Eng. Pat. 19,172, Aug. 21, 1912. Under Int. Conv., Aug. 22, 1911.

The furnace is of the tilting variety, the crucible having walls of a material which is capable of conducting electric current at high temperatures. It is provided with an auxiliary electrode in the side walls, so that when the furnace is tilted, an arc is formed between a vertical electrode passing through the cover of the furnace and the auxiliary electrode. The opening in the roof is so shaped as to prevent displacement of the vertical electrode during the tilting operation. When the temperature of the walls has been sufficiently raised, the furnace is restored to its normal position, the auxiliary arc is cut out, and the main arc between the vertical electrode and the walls of the furnace is put into operation.—B. N.

Furnace; Electric ——. The Jøssingfjord Manufacturing Co. A/S. Fr. Pat. 444,151, April 4, 1912. Under Int. Conv., April 4, 1911.

The furnace, furnished with electrodes for triphase alternating current, is provided with a star winding, the neutral point being connected by a conductor with the bath of metal. One or several metallic electrodes are disposed through the hearth of the furnace, of dimensions calculated for a current of short duration with the intensity of phase current. The furnace is made to oscillate, the force of transmission being applied vertically by a system of levers. The electrode support, constructed of iron, is mounted on a carriage, the support being made solid with the furnace so that it oscillates with it, or it may be made entirely separate, and is made to open automatically when the electrode with its steel frame is raised.—B. N.

Crucible furnace. W. S. Rockwell, Jersey City, N.J., Assignor to W. S. Rockwell Co., New York. U.S. Pat. 1,042,825, Oct. 29, 1912.

The furnace consists of a refractory body provided with a discharge spout and adapted to be tilted. The combustion chamber, fired by gas from the top, is situated by the side of, and is in open communication with, the crucible chamber in which latter the crucible (its spout conforming to that of the furnace body) is supported on a block or pedestal.—W. E. F. P.

Converter. A. F. S. Blackwood, Detroit, Mich. U.S. Pat. 1,042,876, Oct. 29, 1912.

The converter consists of an upper and a lower lined section the junction of which is coincident with the plane of greatest wear of the lining. Means are provided whereby the upper portion may be gripped for removal from the lower section, trunnions being secured to the former to facilitate remounting. Tuyères are arranged to deliver air through the side of the lower section, and provision is made for supporting and swinging the latter. —W. E. F. P.

Filter; Continuous rotary —— *[for cyanide plants].* A. A. Holland, Hastings-upon-Hudson, N.Y., Assignor to E. K. Scheftel, New York. U.S. Pat. 1,036,847, Aug. 27, 1912.

A rotary filter for use with cyanide plants consists of a rotary frame in the form of a cylinder or drum carrying a large number of flat filter chambers so shaped that, say, 12 of them, arranged edge to edge, form a ring in a plane at right angles to the axis of rotation of the frame, while, say, 10 of such rings occupy the length of the frame, making 120 chambers in all. A series of pipes leads to the separate chambers from one end of the shaft which acts as a rotary valve. As the drum is slowly rotated, the pipes of those filter chambers which are immersed in the liquid are connected with a suction pump which draws off filtered liquid, leaving cakes of solid material adhering to the sides of the filter chambers. As soon as the filter chambers leave the liquid, streams of washing water are projected upon these cakes from "wash-boxes" situated between the filter chambers and connected by a series of pipes with a water-distributing valve at the other end of the shaft. When the filter chambers reach a position vertically over the shaft, compressed air is automatically admitted to them from the rotary valve so that the cakes drop away and are collected in a hopper situated in the hollow portion of the drum above the shaft.—H. H.

Titanium and copper; Method of producing alloys or compounds of ——. I. Ladoff, Cleveland, Ohio, Assignor to W. D. Edmonds, Boonville, N.Y. U.S. Pat. 1,042,694, Oct. 29, 1912.

A mixture of the oxides of copper and titanium is heated with carbon or in a reducing atmosphere (carbon monoxide) for a sufficient length of time and at a temperature sufficiently high to ensure complete reduction without melting the resulting metals.—W. E. F. P.

Metals of the nickel group; Process for the purification of mattes of ——. C. Gabrielli. Fr. Pat. 444,067, July 29, 1911.

After the removal of iron, manganese, alumina, sulphites, etc. from the nickel-copper matte by means of dilute sulphuric acid, the bulk of the copper (with only a small proportion of the nickel) is extracted by treatment with (1) a solution of ferric sulphate (containing no free acid) in the absence of air or oxidising agents, or (2) a solution of an alkali- or alkaline-earth cyanide in water or ammonia-water; when cyanide is employed the solution may be heated and aerated by the simultaneous injection of steam and air.—W. E. F. P.

Briquetting finely granular materials for metallurgical treatment; Process for ——. W. Boehm. Fr. Pat. 444,271, May 25, 1912.

The material (finely divided iron ores, blast-furnace dust, etc.) is mixed with about 10 per cent. of lime and 2 of the chloride or sulphate of an alkaline-earth metal (or 1 per cent. of a mixture of calcium and magnesium chlorides in equal proportions). After being moistened with water the mixture is moulded under pressure (about 400 atmospheres), the briquettes being subsequently heated, electrically or otherwise, to a temperature of about 200° C.—W. E. F. P.

Electrolytic cleansing [of metals]; Process of ——. L'Hospied et Cie. and C. H. Thompson. Fr. Pat. 444,324, May 28, 1912. Under Int. Conv., Feb. 9, 1912.

Metallic pieces, more particularly iron, are cleansed by immersion in a neutral or slightly acid electrolytic bath, the articles forming the anode. The salt employed, such as sodium chloride, magnesium sulphate or ammonium alum, produces anions which effect the cleansing action. An alternating current may be employed, the two electrodes being formed of the pieces to be cleansed.—B. N.

Drying the air for blast-furnaces or other wind-furnaces; Process for ——. Chem. Fabr. Griesheim Elektron. Fr. Pat. 444,365, May 29, 1912.

The claim is for the use of strong solutions of caustic potash or soda as drying agents, the air being previously deprived of its carbon dioxide by any known process. —W. H. C.

Metals; Process for refining ——. M. Care. Fr. Pat. 441,669, June 6, 1912. Under Int. Conv., June 7, 1911.

Hydrochloric acid is heated with mercury, and the acid liquid is allowed to act on a thin plate of aluminium. The resulting greyish powder is added to the molten metal (*e.g.*, copper) to be refined. The metal is then cast and placed opposite to an aluminium electrode in a bath composed of "nitric acid and mercury in suspension" (nitric acid to which mercury has been added up to the complete "evaporation" of fumes), and an electric current passed, whereupon the metal is deposited on the aluminium in a pure state.—A. S.

Metals; Process and apparatus for melting and refining ——. J. Meyrucis. Fr. Pat. 441,809, Aug. 16, 1911.

A process for simultaneously melting and refining metals and alloys (*e.g.*, ferro-chrome) in a cupola fired by means of gas, air and oxygen in adjustable proportions. The cupola is provided with two pairs of horizontal "tuyère-burners" situated at different levels and with a third pair extending through the bottom of the furnace; each tuyère-burner is provided with a water-jacketed nozzle and consists of a central gas-conduit having two branch pipes for the admission of regulable quantities of air and oxygen respectively. The procedure may be varied by melting the charge in the upper part of the furnace by means of a neutral or oxidising flame (gas and oxygen) and refining the molten metal in the lower part of the chamber by the injection of pure oxygen.—W. E. F. P.

Steel; Manufacture of ——. F. A. Wilmot, Bridgeport, Conn., U.S.A. Eng. Pat. 23,526, Oct. 24, 1911.

See U.S. Pat. 1,012,310 of 1911; this J., 1912, 77.—T. F. B.

Iron and steel; Processes and apparatus for the direct production of ——. J. Herrmann, Halle on Saale, and C. J. L. Otto, Dresden, Germany. Eng. Pat. 23,861, Oct. 27, 1911.

See Fr. Pat. 435,851 of 1911; this J., 1912, 393.—T. F. B.

Armour plate; Method of treating ——. S. S. Wales, Munhall, Pa., U.S.A. Eng. Pat. 5089, Feb. 29, 1912.

See Fr. Pat. 441,383 of 1912; this J., 1912, 820.—T. F. B.

Armour-plate and other steel article. F. Giolitti, Rome, Assignor to Soc. Anon. Italiana Gio. Ansaldo Armstrong & Co., Genoa, Italy. U.S. Pat. 1,043,416, Nov. 5, 1912.

See Eng. Pat. 17,935 of 1906; this J., 1907, 1012.—T.F.B.

Steel poor in carbon; Process of hardening ——. C. Burian, Assignor to Offene Handelsges. Gebr. Schubert, Berlin. U.S. Pat. 1,042,999, Oct. 29, 1912.

See Eng. Pat. 5702 of 1912; this J., 1912, 590.—T. F. B.

Steel; Manufacture of ——. P. Girod, Ugines, France. U.S. Pat. 1,043,090, Nov. 5, 1912.

See Addition of June 15, 1910, to Fr. Pat. 402,758 of 1909; this J., 1911, 32.—T. F. B.

Lead-silver-zinc ores, lead ores containing silver, and like ores; Process and equipment for reducing ——. E. Langguth, Limbourg, Belgium. Eng. Pat. 27,111, Dec. 6, 1911. Under Int. Conv., March 22, 1911.

See Ger. Pat. 240,768 of 1911; this J., 1911, 1457.—T.F.B.

Copper alloys; Manufacturing and refining ——. W. S. Rockey and H. Eldridge, New York. Eng. Pat. 4409, Feb. 21, 1912.

See U.S. Pat. 1,017,629 of 1912; this J., 1912, 287.—T.F.B.

Copper; Process of fusing and purifying ——. W. S. Rockey and H. Eldridge, New York. Eng. Pat. 4410, Feb. 21, 1912.

See U.S. Pat. 1,018,681 of 1912; this J., 1912, 342.—T.F.B.

Copper and nickel; Process for the extraction of ——, *particularly from low-grade ores and products.* W. Borchers, Aachen, Germany, and H. Pedersen, Trondhjem, Norway. U.S. Pat. 1,043,291, Nov. 5, 1912.

See Ger. Pat. 240,198 of 1911; this J., 1912, 497.—T. F. B.

Manganese ores; Treatment of —— *with a view to the extraction of the metal contained therein.* Isabellen-Hütte G. m. b. H., Dillenburg, Germany. Eng. Pat. 8400, April 9, 1912. Under Int. Conv., April 7, 1911.

See Ger. Pat. 250,035 of 1911; this J., 1912, 933.—T. F. B.

Electroplating; Method of ——. L. Daft, Rutherford, N.J., Assignor to Electro-Chemical Rubber and Manufacturing Co. U.S. Pat. 1,042,533, Oct. 29, 1912.

See Eng. Pat. 11,513 of 1911; this J., 1912, 591.—T. F. B.

Light metals; Electrolytic production of ——. G. O. Seward, East Orange, N.J., and F. von Kugelgen and F. von Bidder, Holcombs Rock, Va., Assignors to Virginia Laboratory Co., New York. U.S. Pat. 1,043,154, Nov. 5, 1912.

See Eng. Pat. 11,175 of 1910; this J., 1911, 695.—T. F. B.

Metals; Method of purifying ——. A. G. Sundberg, Assignor to Helsingborgs Kopparverks Aktiebolag, Helsingborg, Sweden. U.S. Pat. 1,043,371, Nov. 5, 1912.

See Fr. Pat. 440,537 of 1912; this J., 1912, 822.—T. F. B.

Ores; Process of separating ——. A. A. Lockwood, Assignor to Murex Magnetic Co., Ltd., London. U.S. Pats. 1,043,850 and 1,043,851, Nov. 12, 1912.

See Eng. Pat. 18,189 of 1911; this J., 1912, 930.—T. F. B.

Crucible-furnace. W. Buess, Hanover, Germany. U.S. Pat. 1,044,012, Nov. 12, 1912.

See Eng. Pat. 17,238 of 1910; this J., 1911, 961.—T. F. B.

XI.—ELECTRO-CHEMISTRY.

Tantalum electrodes. O. Brunck. Chem.-Zeit., 1912, 36, 1233—1234.

Metallic tantalum, which was originally manufactured solely for use in metal filament electric lamps, has recently been introduced as a substitute for platinum for certain purposes; shaped articles of tantalum are sold at M. 2·50 per grm. (about £3 9s. per oz.). Below 200° C. tantalum is not attacked by air or oxygen nor by acids, with the exception of concentrated hydrofluoric acid; it is not affected by *aqua regia.* Aqueous solutions of alkalis have no action on it, but it is attacked by fused alkalis. It oxidises at a temperature considerably below red heat when heated. It has proved very useful for surgical and dental instruments, and the author has found it very suitable as a substitute for platinum for electrodes, especially for electro-analysis. As cathode tantalum can replace platinum in all cases, but when used as anode it becomes coated with a badly conducting film of dark blue tantalum oxide and for this purpose it is necessary to coat it electrolytically with a thin deposit of platinum before use. When used as cathode for the electrolytic determination of metals, tantalum possesses the advantage that the deposits can be removed from the electrode by dissolving in acid or *aqua regia.* Zinc and cadmium show no tendency to alloy with tantalum when deposited thereon. A further advantage of tantalum compared with platinum, apart from the actual difference in price of the two metals, is that tantalum has a specific gravity of only 16·6 compared with 21·48 for platinum, and hence less metal is needed in making articles of a given size. Tantalum electrodes could also be used in place of platinum in the electrolysis of alkali chloride solutions for the manufacture of hypochlorites (bleaching solutions).—A.S.

The Billiter alkali-chlorine cells. Allmand. *See* VII.

Patents.

Gaseous reaction ; Method and apparatus for producing a —— by a silent discharge [*Preparation of ozone, etc.*]. British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, N.Y., U.S.A. Eng. Pat. 27,951, Dec. 12, 1911.

See U.S. Pat. 1,041,340 of 1912 ; this J., 1912, 1083. Air or other gas is submitted to a series of silent discharges, and the treated gas is mixed with a further quantity of untreated gas after each discharge.—T. F. B.

Electrodes for galvanic batteries ; Manufacture of —. A. Wedekind, Hamburg, Germany. Eng. Pat. 1198, Jan. 15, 1912.

Hard electrodes, insoluble in alkalis, are obtained by mixing a metallic oxide, such as copper oxide, with a chloride of another metal, other than magnesium, *e.g.*, zinc chloride. An electrode is produced from the mixture which is ready for immediate use, without submitting the same to electrolysis for the extraction of oxygen and chlorine. The invention is not applicable to lead cells. —B. N.

Furnace ; Electric ——. J. A. Seede, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,042,613, Oct. 29, 1912.

The furnace is provided with a movable arc electrode, and an electric motor for moving the electrode, means being provided for controlling the motor in response to variations in the arc. A circuit-closing magnet, having a plunger provided with a "lost motion device," is arranged with a switch operatively connected to the plunger and in circuit with the motor, one of the contacts of the switch yielding so as to prolong the time of contact. A contact, in circuit with the magnet winding, is operatively connected to the plunger of the magnet through the "lost motion device," so that the magnet circuit is automatically opened by the movement of its plunger, whereby the motor is de-energised for predetermined intervals.—B. N.

Furnace ; [Electric] Induction ——. C. P. Steinmetz, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 1,042,986, Oct. 29, 1912.

The low-voltage secondary of a step-down transformer is extended to form a single turn low-resistance metallic winding, arranged on a metallic core for a second transformation. A current of low voltage and high amperage is passed through this primary low-resistance winding, which is adapted to act as a furnace chamber or crucible with an insulating winding, the charge forming the secondary circuit thereto.—B. N.

Furnace [for the manufacture of aluminium nitride] ; Revolving electric ——. Soc. Générale des Nitrures. Third Addition, dated Aug. 4, 1911, to Fr. Pat. 430,553, Aug. 11, 1910 (this J., 1911, 905 and 1222).

Each section forming the resistance of the furnace is bevelled on its periphery.—B. N.

Furnaces ; Electric ——. A. D. A. Lambert. Fr. Pat. 144,604, Aug. 11, 1911.

The furnace, of the polyphase type, covered or not, is provided with active horizontal or inclined electrodes, and with a central neutral electrode serving for the regulation of the current.—B. N.

Furnace electrodes ; Producing and feeding ——. E. R. Taylor, Penn Yan, N.Y. U.S. Pat. 1,043,181, Nov. 5, 1912.

A "stemless" electrode, rectangular in cross-section, is built up of relatively small rectangular units "breaking joint longitudinally," by building a given length *in situ* upon an "endwise" movable support, layer upon layer. A suitable cement is interposed between the units, and the electrode compressed to gauge by lateral and vertical pressure into a practically homogeneous mass. This is done in a movable mould having an electrode support, with removable side and top members, and transverse clamps provided with jack screws perpendicular to the side and top members. The electrode thus formed is fed endwise into the furnace under pressure, the support being then removed and withdrawn, and the operations of building, compressing and feeding repeated.—B. N.

Electrolytic apparatus. W. E. Greenawalt, Denver, Colo. U.S. Pat. 1,043,096, Nov. 5, 1912.

The apparatus comprises a central circular pier, and an outer wall concentric with the central pier, with a space between them. Intermediate walls divide the space into compartments, thereby forming circular channels concentric with the outer wall and pier, and adapted to contain the electrolyte. Anodes are immersed in the electrolyte adjacent to the vertical walls of the channels, thus forming two concentric rows of anodes in each compartment, between which a cathode revolves on a vertical axis. Means are provided for supplying electricity to the interior row of anodes through perforations in the central pier, and electrolyte is similarly supplied. Suitable electric connections are also made between a stationary conductor and the revolving cathodes. The electrolyte is introduced at one side of the cathode in the inner compartment of the electrolyser, circulated down and up the respective cathodes and finally withdrawn from the outer compartment. The electrodes being arranged in concentric circles, the lineal speed of the rotating cathodes will be greater in the compartments where the electrolyte is more impoverished through deposition of metal. Pockets are located below the electrolyte spaces for the accumulation of disintegrated anode material.—B. N.

Electrolyte. W. H. Lowe, Brondesbury, England, Assignor to The Float Electric Co., Ltd. U.S. Pat. 1,043,328, Nov. 5, 1912.

The electrolyte contains 28 oz. of anhydrous sodium bichromate, 18 oz. of concentrated sulphuric acid, 5 oz. of salt, and water.—B. N.

Gas-reactions in an electric furnace ; Process for carrying out ——. A. Helfenstein, Vienna. Eng. Pat. 26,371, Nov. 25, 1911. Under Int. Conv., Nov. 26, 1910.

See Fr. Pat. 436,828 of 1911 ; this J., 1912, 499. Reference is directed under Sect. 7, Subsect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 21,755 of 1895, 2894 of 1897, 1984 of 1898, and 5658 of 1907. —T. F. B.

Negative electrodes for alkaline accumulators ; Process of manufacturing ——. Svenska Ackumulator Aktiebolaget Jungner, Stockholm. Eng. Pat. 5545, March 5, 1912. Under Int. Conv., March 7, 1911.

See Fr. Pat. 440,621 of 1912 ; this J., 1912, 825.—T. F. B.

Anode and process of manufacturing the same. M. Huth, Charlottenburg, Assignor to Siemens und Halske A.-G., Berlin. U.S. Pat. 1,043,937, Nov. 12, 1912.

See Eng. Pat. 15,128 of 1911 ; this J., 1911, 1168.—T.F.B.

Apparatus for heating, evaporating, volatilising or distilling liquids by electricity. Eng. Pat. 27,422. *See* I.

Electrolytic regeneration of chromium solutions. Ger. Pat. 251,694. *See* VII.

XII.—FATS; OILS; WAXES

Iodine values of oils and fats; A comparative study of the Hubl and Wijs methods for the determination of the ——. Auguet. Ann. Falsif., 1912, 5, 159—475.

The low results given by the Hubl method as compared with those yielded by the Wijs process for one and the same oil or fat, as well as the discordant figures sometimes obtained by the former method, are stated as due to the age of the Hubl iodine reagent. When the iodine solution is prepared immediately before use, the results found may be from 1 to 5 units below the corresponding Wijs values, but an iodine solution 25 or more days old will give values closely approximating to those given by the Wijs method. The author finds that this is due to the gradual formation of hydriodic acid in the iodine solution and shows that the presence of this acid is essential in order that correct values may be obtained. He recommends that 3·5 grms. of hydriodic acid should be added to each litre of the iodine solution and that this solution should be mixed with the mercuric chloride solution just before the reagent is used. A larger proportion of hydriodic acid does not affect the results. The values obtained by either method are not influenced by variations in temperature ranging from 10° to 15° C., and for most oils, one hour's contact between the reagent and the oil is sufficient in the case of Hübl's method; a much shorter time suffices with Wijs' reagent. With oils having an iodine value below 130, the difference in the results yielded by the two methods does not usually exceed 1 per cent. In the case of linseed oil, the absorption is only complete after 18 hours' contact with Hubl's reagent, or 2 hours with Wijs' reagent.
—W. P. S.

Arachis oil: Detection and determination of ——. N. Evers. Analyst, 1912, 37, 487—492.

A modification of the Bellier test (this J., 1899, 393) proposed by Mansfeld, Adler, and Franz, is recommended for the detection of arachis oil in olive oil. One grm. of the oil is boiled for 4 minutes under a reflux condenser with 5 c.c. of alcoholic potassium hydroxide solution (80 grms. of potassium hydroxide dissolved in 80 c.c. of water and diluted to 1 litre with 90 per cent. alcohol); after adding 1·5 c.c. of dilute acetic acid (1 vol. of glacial acetic acid to 2 vols. of water) and 50 c.c. of 70 per cent. alcohol, the mixture is cooled to 15·5° C., and maintained at this temperature for 5 minutes. A distinct turbidity is produced by the presence of 5 per cent. of arachis oil. The following modification of the process is given for the determination of arachis oil in olive oil. Five grms. of the oil are boiled for 5 minutes in a flask under a reflux condenser with 25 c.c. of alcoholic potassium hydroxide solution (see above) and to the hot soap solution are added 7·5 c.c. of the dilute acetic acid and 100 c.c. of 70 per cent. alcohol containing 1 per cent. (by vol.) of hydrochloric acid. The mixture is cooled to 12°—14° C. for 1 hour, the precipitate being then collected on a filter and washed with 70 per cent. alcohol (containing 1 per cent. of hydrochloric acid) at 17° C. until the washings yield no turbidity when diluted with water. The volume of the washings is noted. The precipitate is now dissolved in from 25 to 70 c.c. of hot 90 per cent. alcohol (according to its bulk), the solution is cooled to 15°—20° C., set aside at this temperature for 3 hours, and the precipitate then collected on a filter, washed with a measured volume of 90 per cent. alcohol (about one half the volume used for the crystallisation), and then with 50 c.c. of 70 per cent. alcohol. It is now dissolved in ether, the solution is evaporated, the residue is dried at 100° C., and weighed. If the melting point of this residue is lower than 71° C., it should be recrystallised from 90 per cent. alcohol. To the weight found is added a correction for the solubility in 90 per cent. alcohol (as given by Archbutt; Allen's "Commercial Organic Analysis," vol. 2, p. 94) and also for the solubility in the total volume of 70 per cent. alcohol used in precipitating and washing (including the 100 c.c. added in the first instance); this latter correction is given in the following table:—

Weight of acids (Corrected for 90 per cent. alcohol.)	Correction per 100 c.c. of 70 per cent. alcohol.		
	M. pt. 71° C.	M. pt. 72° C.	M. pt. 73° C.
	grm.	grm.	grm.
Above 0·1 grm.	0·013	0·008	0·006
0·08—0·10 „	0·011	0·007	0·006
0·05—0·08 „	0·009	0·007	0·005
0·02—0·05 „	0·007	0·006	0·005
Less than 0·02 grm.	0·006	0·005	0·004
Factor for conversion of percentage of fatty acids into arachis oil..	17	20	22

If no crystals are formed from the 90 per cent. alcohol solution, a quantity of water is added sufficient to reduce the strength of the alcohol to 70 per cent. After the lapse of 1 hour, any crystalline precipitate is collected, washed with 70 per cent. alcohol, and weighed, the correction for solubility in 70 per cent. alcohol being added. If the melting point is below 71° C., re-crystallisation is necessary. Olive, almond, poppy, and rape oil did not yield any crystalline precipitate when tested by the method.—W. P. S.

Patents.

Oil: Boiling apparatus for the continuous treatment of the flesh, blubber and the like of whales, seals and other marine animals or of herrings and other species of fish for the extraction of —— and other products therefrom. R. and J. M. Osmundsen, Christiania. Eng. Pat. 2357, Jan. 29, 1912. Under Int. Conv., Feb. 22, 1911.

The apparatus consists of an inner boiler of rectangular section in which are arranged, in a vertical series, a number of horizontal endless perforated band conveyors, actuated by chain or other gear outside the boiler. By means of these conveyors comminuted flesh, blubber, etc., introduced into the top of the boiler from a hopper by means of a double-piston pump—arranged in such a way that the charge is forced into the boiler by steam-pressure when the space between the two pistons comes opposite the mouth of a steam pipe on the upper and an inlet opening into the boiler on the lower side of the pump cylinder—is carried forwards and backwards a number of times through the inner boiler. The oily and other liquid products of the cooking process drain through the perforations in the bands on to shoots which carry them through perforations in the walls of the boiler into an outer cylindrical jacket from which they can be run off by means of cocks placed at various levels, whilst the flesh drops from the lowest band-conveyor to the bottom of the boiler, whence it is carried away continuously by means of a screw conveyor.
—E. W. L.

Solvents: Separation and recovery of —— from refuse or deposits obtained in extractions or from mixtures of oil with the said solvents. S. Zipser. Fr. Pat. 414,194, May 23, 1912.

The solvent is separated from the deposit, etc., by means of a current of air or hot or cold gas under normal pressure or increased or reduced pressure. The products thus separated are recovered by usual methods.—C. A. M.

Candelilla-plant: Process of treating —— for the recovery of wax. W. S. Watson, Memphis, Tenn. U.S. Pat. 1,042,992, Oct. 29, 1912.

The plants are subjected to a temperature of about 300° F. (149° C.), and a current of dry steam at a higher temperature is then passed downwards through them in order to remove the wax which has been expelled from the plants during the preliminary heating. Any remaining portions of wax are removed by passing a stream of hot water downwards through the plants.—W. P. S.

Soap; New insecticidal ——. H. Gouthiere et Cie. and P. Ducancel. Fr. Pat. 444,021, July 27, 1911, and First Addition thereto, dated Aug. 8, 1911.

(1) Pyridine or pyridine bases are mixed with a small amount of alkali, preferably ammonia, and commercial oleic acid is added to the mixture, to obtain an "oleate of pyridine," which may be used either alone or in admixture with preparations of copper as an insecticide in agriculture, etc. (2) Pyridine bases or nicotine are made to combine with fatty acids (*e.g.*, oleic, stearic, palmitic, or sulphoricinic acids) or with resins, either in the cold or under pressure in an autoclave.—C. A. M.

Fats and fatty oils; Process for splitting —— into glycerine and fatty acids. G. Petrow, Novo-Gireevo, Russia. Eng. Pat. 27,244, Dec. 5, 1911.

See Fr. Pat. 437,336 of 1911; this J., 1912, 515.—T. F. B.

Oil-testing machine. P. Wendt, Assignor to Oelwerke Stern-Sonneborn Act.-Ges., Hamburg, Germany. U.S. Pat. 1,044,317, Nov. 12, 1912.

See Eng. Pat. 7616 of 1911; this J., 1911, 1188.—T. F. B.

Renovating butter [and rancid oils]. U.S. Pat. 1,042,471. *See* XIXa.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Lead in lead pigments; [Electrolytic] determination of ——. Utz. Farbenzeit., 1912, **18**, 18—20. Chem. Zentr., 1912, **2**, 1788.

The author uses gauze electrodes in nitric acid solution, with continuous stirring, and a current density of 0·05 to 0·5 ampère according to the temperature. For white lead, massicot, and lead chromate, 0·1 grm. is dissolved in a mixture of 10 c.c. of nitric acid and 40 c.c. of water, the solution is heated to 70° C. and electrolysed at 60°—65° C. The deposition of the lead dioxide is complete in ¼ hour. The anode is washed without interrupting the current, then dried at 200° C. and weighed, or the dioxide may be converted into the monoxide by cautious ignition before weighing. For red lead, the sample is treated as above with dilute nitric acid, and the undissolved residue is brought into solution by addition of a small quantity of hydrogen peroxide or a 40 per cent. solution of formaldehyde. The electrodes may be cleaned by suspending them in warm dilute nitric acid to which a reducing agent such as oxalic acid, sugar, hydrogen peroxide, or formaldehyde is added.—A. S.

Amber substitutes; Detection of ——. J. Marcusson and G. Winterfeld. Mitt. Kgl. Materialprüfungsamt, 1912, **30**, 191—195.

Of the substances which are chiefly used as substitutes, copal, especially hard Zanzibar copal, most resembles amber. It is distinguished from the latter by the absence of succinic acid on distillation, and by its much greater solubility in cajuput oil. Artificially hardened copal, however, prepared according to Spiller's method (Ger. Pat. 207,744 of 1907; this J., 1909, 483), may contain succinic acid and is almost insoluble in cajuput oil; it is identified by its low ester value (8·2—9·4) compared with the high ester value of natural and moulded amber (71—112), and by its high acid value (71·4—56·2) compared with the low acid value of amber (15—35). The determination of the acid and ester values of amber, copal, and resins generally, was much simplified by the use of a mixture of equal parts of benzene and absolute alcohol as solvent, in the place of alcohol only, in which these products are very difficultly soluble. The determination of the sulphur content yielded an even simpler method of distinguishing between amber and hardened copal. The former contains 0·34—0·42 per cent. of sulphur, whereas three samples of hardened copal contained 0·06, 0·04, and 1 per cent. of sulphur respectively.—O. R.

Patents.

Lead pigments; Manufacture of ——. Pigments Ltd. and W. P. Thompson, Liverpool. Eng. Pat. 28,503, Dec. 18, 1911.

Sublimed lead monoxide is made into a paste with water and introduced into a revolving, lead-lined barrel, preferably containing a few lead balls; a small quantity of a catalytic agent, preferably acetic acid, is added to the mixture, and sulphuric acid and water are very slowly run into the barrel with constant stirring, the amount of water being such as to keep the material of a creamy consistence. After about half an hour to an hour's stirring, and aided by the grinding action caused by the lead balls, the reaction is complete and the basic lead sulphate, which results, forms a suitable substitute for white lead. Lead chromate, or other lead salts suitable for pigments, may be prepared in the same way by substituting the required acid for sulphuric acid.—O. R.

Zinc white and other zinc pigments; Process for removing lead from ——. S. E. Goldschmidt und Sohn. Ger. Pat. 251,846, May 3, 1911.

The pigment is extracted with a solution of commercial calcium thiosulphate.—A. S.

Pigment dyes: Yellowish-green —— and process of making same. A. Stock, Assignor to Farbwerke vorm. Meister, Lucius, and Brüning, Höchst on Maine, Germany. U.S. Pat. 1,043,271, Nov. 5, 1912.

See Fr. Pat. 422,843 of 1910; this J., 1911, 636.—T. F. B.

Elastic products and substitutes for natural lacs; Process for the preparation of ——. L. C. T. Turcat and G. E. Nuth, Marseilles, France. Eng. Pat. 29,278, Dec. 29, 1911. Under Int. Conv., Dec. 30, 1910. Addition to Eng. Pat. 23,668 of 1909, dated Oct. 16, 1908.

See Fr. Pat. 435,650 of 1910; this J., 1912, 399.—T. F. B.

Synthetic preparation of caoutchouc. Fr. Pat. 444,031. *See* XIV.

Preparing disazo dyestuffs especially suitable for making lakes. Preparing blue disazo dyestuffs [suitable for making lakes]. Ger. Pats. 251,479 and 251,233. *See* IV.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Gutta percha exports from the Philippines. India-Rubber World, 1912, **47**, 115. [T.R.]

The following table shows the amounts of gutta-percha exported from the Philippine Islands during the years 1904—1911:—

	lb.
1904	6,255
1905	50,899
1906	228,604
1907	303,910
1908	84,993
1909	155,689
1910	224,403
1911	136,873

Hevea; Use of ammonia or sodium carbonate in tapping ——. W. Lucas. Bull. Assoc. Planteurs de Caoutchouc, 1912, **4**, 123—124. Bull. Bureau Agric. Intell. and Plant Diseases, 1912, 1987—1988.

Experiments have shown that a dilute solution of ammonia is very useful in preventing the premature coagulation of Hevea latex. Comparative trials in which water and a solution containing 30 c.c. of a 17 per cent. solution of ammonia per litre respectively were used to facilitate the flow of the latex (1 litre of liquid for 150 trees), showed that 50 per cent. more "scrap" formed on the trees when water was used than when the ammonia solution was employed. The production of "lumps" in the cups is also greatly retarded by addition of 1·6 c.c. of the dilute ammonia solution per litre of water in the vessels. For example, with water, about 240 grms. of dry "lump" were obtained from 150 trees; using ammonia solution on the trees alone, about 120 grms., and using ammonia solution both on the trees and in the cups, only from 3 to 14 grms. When the ammonia solution is used on the trees alone, only the same amount of acetic acid (0·7 c.c. of 98 per cent. acid per litre of diluted latex) is required for coagulation as when water is used, but somewhat more time (30 mins. instead of 20 mins.) is needed. When ammonia solution is used in the cups as well as on the trees, 1·3 c.c. of acetic acid are required. The use of ammonia is stated to present also the advantages that the straining of the latex is facilitated, and the impurities which pass through the strainer settle more readily. Some preliminary experiments with sodium carbonate indicate that this is equally efficacious as ammonia.—A. S.

Sublimed white lead in rubber; Determination of lead sulphate and the ultimate determination of ——. J. A. Schaeffer. J. Ind. Eng. Chem., 1912, **4**, 836—838.

The use of sublimed white lead (basic lead sulphate) as an ingredient of rubber mixings is stated to have given good results; during the vulcanisation it is converted into a mixture of lead sulphide and lead sulphate. Certain grades of rubber are, however, sold under specifications regulating the allowable sulphur content, and hence a demand has arisen for a method of differentiating the sulphur combined with the rubber and that present as lead sulphate and sulphide. The following method has proved to be rapid and to give accurate results. Two grms. of the rubber are placed in a piece of hard glass tubing through which a current of carbon dioxide is passed, and the tube is heated gently until all organic matter has been expelled. The residue is allowed to cool whilst still passing the carbon dioxide, and is then removed, ground finely, and treated with 25 c.c. of concentrated hydrochloric acid in a flask through which a current of carbon dioxide is passed. The mixture is boiled for 15—20 mins., diluted, filtered, and any residue is washed with hot water, ignited in a porcelain crucible, digested with concentrated hydrochloric acid, diluted, filtered, and the residue washed, the filtrate and washings being added to the acid solution obtained previously. The solution now contains practically the whole of the lead present in the rubber as sulphide and sulphate. It is nearly neutralised with ammonia, an excess of about 2 grms. of sodium carbonate added, and after boiling for 15 minutes, the lead carbonate is filtered off and washed, and the sulphate in the filtrate determined with barium chloride. Sublimed white lead contains on the average 78·5 per cent. of lead sulphate, 16 of lead oxide, and 5·5 of zinc oxide, so that the sulphur determined as barium sulphate can be readily calculated in terms of sublimed white lead.—A. S.

Nitrogenous constituent of Para rubber. Beadle and Stevens. *See* London Section, p. 1099.

Action of oxygen on india-rubber. Peachey. *See* Manchester Section, p. 1103.

Patents.

Rubber; Machines for preparing ——. J. E. Pointon, Peterborough, Northants. Eng. Pat 25,148, Nov 11, 1911.

Washing- or mixing-rolls, disposed obliquely, rotate within a barrel which is also capable of rotation, in such a way as continuously to return the material from the leaving to the entering side of the rolls, at the same time "working" the rubber between the inner surface of the barrel and the surface of the lower roll, from which it is only separated by a short distance.—E. W. L.

Rubber, gutta-percha and balata; Manufacture of a foam of —— *vulcanised at high temperatures.* F. Pfleumer. First Addition, dated May 18, 1912 (under Int. Conv., Aug. 29, 1911) to Fr. Pat. 430,473, April 19, 1911 (this J., 1911, 1323).

The process described in the main patent (*loc. cit.*) is modified, with the object of facilitating the process of filling tyres, etc., with the spongy mass, in the following particulars:—De-resinified gutta-percha or balata is lightly vulcanised (2 hours at about 136° C.) in an atmosphere of nitrogen at a high pressure (320 atmospheres) and is then allowed to cool under the same, or an increased, pressure (350 atmospheres) and is kept under this pressure for about 48 hours. When the pressure is then lowered, the mass does not expand to such an extent as that prepared according to the original patent, and the gas in its cells is therefore at a higher pressure. The mass is introduced into a tyre outer cover, fitted on the wheel, and placed in a chamber in which it is heated to 70°—90° C. The mass softens and the gas in its cells expands, causing the mass to fill the tyre under pressure. In order that, under running conditions, the walls of the foam-cells may be somewhat relieved from an excess of pressure within the cells, the whole tyre is now subjected to an external vacuum, whilst still hot, in order that the outer cover itself may expand as well as the internal mass, and that when the external pressure is allowed to return to atmospheric pressure the cover, in contracting, may take up some of the excess pressure in the foam-cells, so protecting them against rupture.—E. W. L.

Caoutchouc; Process for the synthetic preparation of ——. C. E. Anquetil. Fr. Pat. 444,031, July 27, 1911.

When copal and kauri resins are heated, as in the manufacture of varnish, a certain amount of mechanically held essential oil, together with hydrocarbons, formed from the resin by molecular degradation, is driven off. These products are condensed and redistilled, either dry or in a current of steam, and are thus separated into fractions distilling below and above 180° C. Or, the crude oil may be treated with caustic soda, then dried over calcium chloride and distilled as long as the temperature does not rise above 180° C. The distillate contains (1) a mobile hydrocarbon having a constitution similar to that of *a*-pinene; (2) a pentene, identical with isoprene; (3) a dipentene; and (4) oxygenated substances. The pentene (C_5H_8) is separated by distillation between 25° and 60° C., and the rest of the liquid is distilled through an iron tube heated to faint redness, where its vapours are converted into (1) isoprene, and (2) a terpene isomeric with terebenthene (b. pt. 170° C.) and capable of being used commercially as a substitute for it. The isoprene is mixed with the pentene obtained in the first distillation and polymerised to di-isoprene in heating in an autoclave at 150°—200° C.

—E. W. L.

Caoutchouc substitutes or preparations suitable therefor; Process of manufacturing ——. W. Plinatus, Stuttgart, Germany. Eng. Pat. 25,805, Nov. 18, 1911. Under Int. Conv., Mar. 18, 1911.

Gelatin, or other colloid of animal or vegetable origin, is mixed with esters of the "multivalent" alcohols of the fatty acid series or of their derivatives, with or without the addition of glycerin or glycerin-like products and water, and with application of heat if desired. Hardening agents, such as formaldehyde, chromium compounds, tannic acid, etc., may then be added. The chlorhydrins and acetin are esters which cannot be employed in this process. The product obtained is said to be more resistant to the action of water than similar masses made with glycerin and gelatin, and to be capable of being mixed with rubber or cellulose or their derivatives, or with camphor and other compounds, dissolved if desired in suitable (volatile) solvents.—E. W. L.

XV.—LEATHER; BONE; HORN; GLUE.

Thiosulphates in the leather industry; The rôle of ——. A. Seymour-Jones. Collegium, 1912, 620—622.

The discovery by Meunier (see this J., 1912, 292) of the use of alkali carbonates and thiosulphates as dehydrating agents in the formation of leather, has led the author to disclose several other useful purposes to which sodium thiosulphate can be put in the tanning industry. It can be satisfactorily used for curing hides or skins if it is sufficiently finely ground. A white leather can be prepared, if pelt is saturated with it and then treated in a weak acid bath. The leather, the formation of which is due partly to dehydration and partly to the deposition of sulphur, can be fat-liquored and dyed, or curried, and with suitable oils a species of chamois leather may be made. If, instead of using acid, alum be added, the tannage will be increased. Sodium thiosulphate acts as a deliming agent. It possesses the property of being able to remove grease from pelt or from leather. If greasy hides or skins are delimed in a saturated solution of thiosulphate, or the skins treated successively with thiosulphate and with acid, or in the reverse order, in a drum or paddle, and are subsequently worked out over the beam, the grease may be expelled. With greasy tanned butts, suspension in a 10—20 per cent. solution of thiosulphate for a few hours at 140 F. (60° C.) will cause the grease to float at the top of the liquor. An acid bath after the treatment with thiosulphate will improve the colour. For bleaching over-tanned, brittle, dark coloured leather, immersion for 24 hours in a 10—20 per cent. solution of thiosulphate, followed by a weak acid bath, will much improve the colour. Thiosulphate may also be used as a stripping agent. For depickling pickled pelts, 4—5 lb. of thiosulphate per dozen skins, in the paddle, will safely remove the acid. Bad coloured quebracho extracts may be bleached by its use. If hides are treated with from 2½—10 per cent. of thiosulphate in drum or paddle and then with "neat" extract, the time of tanning is considerably reduced, with corresponding excellence of weight and colour. Not only is tanning much increased, but the amount of extract required can be more exactly calculated. For sheep skins, it is recommended to use a 10 per cent. solution of thiosulphate and then add the tanning extract direct: 1 lb. of extract to the dozen skins produces excellent results by this method. For decomposing the thiosulphate in the above cases, formic acid is preferred, but lactic, acetic or butyric acid may be employed. Hints on the use of other materials are given. White leather can be made by sodium or potassium permanganate. Crude ammonium sulphate from gas producer plants also makes a satisfactory leather. Lead acetate is useful for weighting chrome leather.—J. R. B.

Gelatin ; Optimal concentration of hydrogen ions for the first phase of the tryptic decomposition of ——. (" *Liquefaction of gelatin* ".) S. Palitzsch and L. E. Walbum. Comptes rend. des Trav. Lab. de Carlsberg, 1912, **9**, 200—236.

EXPERIMENTS having shown that the gelatinising power of gelatin solutions varies with their concentration of hydrogen ions, the solutions in the comparative experiments were always rendered neutral to litmus paper before cooling them in order to ascertain their gelatinising power. Also, in order to keep the hydrogen ion concentration as nearly uniform as possible during the experiments, boric acid was added. The procedure adopted was as follows:— A solution of gelatin (about 6 per cent.) to which boric acid had been added (0·2 grm.-mol. per litre) was brought to the desired concentration of hydrogen ions by addition of sodium hydroxide solution, then heated to the desired temperature, the trypsin preparation (obtained from "pancreatin Rhenania") added, and after a suitable time, a sample (5 c.c.) was withdrawn, introduced into a cooled test-tube containing 1 c.c. of hydrochloric acid of the requisite concentration to effect neutralisation, then cooled for 15 mins. in ice water, and the degree of gelatinisation observed. The results of a large number of experiments are given in tables and curves. For a solution containing about 0·04 per cent. of trypsin, the optimal concentration of hydrogen ions for the liquefaction of the gelatin was found to be $10^{-9\cdot9}$ at 30°, $10^{-9\cdot7}$ at 37°, $10^{-9\cdot1}$ at 45°, and 10^{-8} at 55° C. It appears therefore that as the temperature is increased, the optimal concentration of hydrogen ions is displaced from the alkaline side towards the neutral point. With the relatively strong solution of gelatin employed, it was found that as the concentration of trypsin was increased, the rate of decomposition increased still more rapidly; Grützner (Pflüger's Arch., 1911, **141**, 63) obtained similar results in the tryptic digestion of casein. Whilst a gelatin solution free from boric acid sets more rapidly in neutral than in alkaline solution, in presence of boric acid no such difference can be observed; indeed in the case of a sample of German gelatin, a solution partially decomposed by alkali, and containing boric acid, set more rapidly when alkaline than after neutralisation.—A. S.

Enzymes concerned in the puering or bating process. Wood and Law. *See* Nottingham Section, p. 1105.

PATENT.

Sulphite liquor [for the manufacture of tanning extracts]; Process of treating waste ——. W. H. Dickerson, Muskegon, Mich., Assignor to Tanning Extract Co., New York. U.S. Pat. 1,043,303, Nov. 5, 1912.

IN the manufacture of tanning extracts from waste sulphite liquor, the latter is digested with an electrolyte, such as sodium chloride, capable of gelatinising the liquor, or of converting it into a light-coloured mass of thin consistence, when concentrated. To this mass may be added a thin tanning extract made by the addition of a "non-decomposing precipitant" for lime to waste sulphite liquor.—E. W. L.

Glue and method of making same. H. C. Heide, London. From Perkins Glue Co., Lansdale, Pa., U.S.A. Eng. Pat. 24,692, Nov. 6, 1911.

SEE U.S. Pat. 1,020,655 of 1912; this J., 1912, 453. After treatment with acid, the material is treated with not more than four times its weight of water, in presence of caustic soda or equivalent substance. A product containing from 3 to 14 per cent. of alkali salts, calculated as hydroxide, is claimed.—T. F. B.

Leather ; Process of treating ——, and the products obtained thereby. W. R. Smith and J. D. Larkin, Buffalo, U.S.A. Eng. Pat. 8603, April 11, 1912.

SEE U.S. Pat. 1,025,324 of 1912; this J., 1912, 548.—T. F. B.

Glue and method of making same. H. C. Heide, London. From Perkins Glue Co., Lansdale, Pa., U.S.A. Eng. Pat. 24,691, Nov. 6, 1911.

SEE U.S. Pat. 1,020,656 of 1912; this J., 1912, 453.—T. F. B.

Caseine ; Process for treating —— to render it suitable for forming objects of great tenacity. F. Lebreil, Villeurbanne, and R. Desgeorge, Lyons, France. Eng. Pat. 28,306, Dec. 15, 1911. Under Int. Conv., Dec. 19, 1910.

SEE Fr. Pat. 435,239 of 1910; this J., 1912, 400.—T. F. B.

XVI.—SOILS ; FERTILISERS.

PATENTS.

Phosphoric acid ; Process of manufacturing available ——. J. H. Connor, Nashville, Tenn. U.S. Pats. 1,042,400, 1,042,401, and 1,042,402, Oct. 29, 1912.

(1) 1400 PARTS of phosphatic material are ground to pass through a screen of sixty meshes to the inch, mixed with 250—400 parts of sodium carbonate and 50—100 parts of powdered limestone, which may contain iron oxide, and the mixture is heated to a temperature of 2000°—3000° F. (1093°—1649° C.) for 40—60 minutes, when all the phosphoric acid will have become soluble. (2) Limestone is omitted from the above specification, and water, sufficient to form a thick mud, may be added in its place. (3) (*a*), 100—400 parts of sodium sulphate, with or without the addition of iron oxide, are substituted for the sodium carbonate in (2), and the mixture is heated to 1700°—3400° F. (927°—1871° C.) for such length of time that the phosphoric acid becomes soluble; (*b*), 100 parts and upwards of sodium sulphate and 200 parts and upwards of sodium carbonate, with or without the addition of enough water to form a thick mud, are

substituted for the sodium sulphate in the preceding specification. O. R.

Fertiliser and process of making same. S. B. Newberry and H. N. Barrett, Baybridge, Ohio. U.S. Pat. 1,042,588, Oct. 29, 1912.

See Fr. Pat. 430,850 of 1911 ; this J., 1911, 1400.—T. F. B.

New insecticidal soap. Fr. Pat. 440,021, and Addition thereto. *See* XII.

Phospho-calcic process for the continuous defecation and clarification, in one operation, of saccharine juices from plants such as beet-root, sugar cane, etc. Fr. Pat. 444,128. *See* XVII.

Treatment of night-soil. Fr. Pat. 443,913. *See* XIXB.

XVII.—SUGARS ; STARCHES ; GUMS.

Carbonatation scums of the sugar factory ; Contribution to the study of ——. L. Lindet and Charpentier. Bull. Soc. Chim., 1912, 11, 956—958. (See also this J., 1912, 550.)

Carbonatation scums do not contain free lime when they have been properly produced and washed with the condensed ammoniacal vapours from the juice. A certain amount of lime is present combined with albumin or pectin substances, and this may be extracted by solutions of phenol (see this J., 1911, 702) but not by water alone. The sugar extracted by water or phenol is present, not as soluble calcium sucrate, but in the free state, and is due to incomplete washing of the scum in the filter. A further quantity of sugar (5—66 per cent. of the total) is present as insoluble calcium trisaccharate, which has escaped decomposition during carbonatation ; it may be extracted by acetic acid but not by phenol.—J. H. L.

Photolysis of sucrose by ultra-violet rays. D. Berthelot and H. Gaudechon. Comptes rend., 1912, 155, 1016—1018.

Continuing previous work on this subject (see this J., 1912, 847) the authors show that ultra-violet rays of relatively long wave length photolyse di-saccharides in two stages. In the first stage hydrolysis takes place without any evolution of a gas, and the second stage is characterised by a regular evolution of gas due to decomposition of the mixture of monoses produced in the first stage. The solutions remain neutral throughout the experiments, so that the photolysis of sucrose to dextrose and lævulose, and of maltose to two mols. of dextrose, is not brought about by the formation of acid in the solutions, as has been suggested by various authors.—G. H. F.

Patents.

Saccharine juices from plants such as beetroot, sugar cane, etc. ; Phospho-calcic process for the continuous defecation and clarification, in one operation, of ——. H. Manoury. Fr. Pat. 444,128, May 23, 1912.

Beetroot diffusion juice or expressed cane juice is treated with phosphoric acid in a soluble form and in quantity equivalent to not less than 0·2 kilo. per 10 hectolitres. For this purpose, superphosphates, containing 30—55 per cent. of soluble phosphoric acid and only a small proportion of calcium sulphate, are preferably used. The treated juice is neutralised with lime and then heated to 90°—100° C. in order that the precipitated calcium phosphate may exert its maximum defecating effect. On filtering the defecated juice, a clear, decolourised liquid and a defecation mud of high calcium phosphate-content are obtained. The latter, which is de-saccharified in the usual way, may be utilised in the manufacture of fertilisers or may be used as a fertiliser directly.—L. E.

Sugar ; Process of manufacture of white refined —— from raw sugar directly. Norit White Sugar Co. Fr. Pat. 444,691, June 6, 1912. Under Int. Conv., Sept. 22, 1911.

This process, which is applicable both to cane and beetroot juice and to raw sugar, depends on the observations (1) that the decolourising action of charcoal on solutions of crude sugar increases with the acidity of the latter up to a certain point, and (2) that the spent charcoal may be regenerated by treatment with alkali. The clear solution of crude sugar (*e.g.*, cane juice that has been defecated with lime in the usual way) is acidified (with sulphur dioxide) to the required degree, and heated with charcoal. The mixture is then passed to a battery of filter-presses ; to insure a clear filtrate, kieselguhr is added to the juice before, during, or after the treatment with charcoal, or it is added to the filtered juice, the latter then being filtered a second time. The white sugar, obtained from the colourless filtered juice by the usual methods, is free from odour, and retains its white colour permanently. The spent charcoal is removed from the filter-press, boiled with caustic alkali or alkali carbonate, filtered, washed, neutralised with acid, and used for treating a further quantity of juice, the cycle of operations being repeated without interruption. L. E.

Textile and other manufactures ; Product [gum] for use in ——. P. C. D. Castle, London. Eng. Pat. 20,648, Sept. 18, 1911.

Gum or mucilage is extracted from locust bean kernels by steeping them in strong caustic alkali solution, then washing away the husk and washing in 1 per cent. borax solution. After washing away the borax, the kernels are ground into flour and treated with a saccharine solution. B. N.

XVIII.—FERMENTATION INDUSTRIES.

Malt ; Proteolytic enzyme of ——. R. Wahl. Eighth Int. Cong. Appl. Chem., 1912, Sect. VIB. Orig. Comm., 14, 215—229.

The proteolytic activity of malt extract is greatly increased by acidifying the water used for extraction with a liquor containing lactic acid organisms which may be prepared by inoculating a mixture of crushed malt and water with lactic acid ferment, and keeping the mixture, first at 50°—60° C. for 30 minutes, and then at 50°—55° C. for 24—48 hours. Thus, if ground malt is treated with an active solution containing 0·1—2·0 per cent. of lactic acid, the extract obtained has a much greater gelatin-liquefying power than the ordinary aqueous extract, and contains practically no coagulable albumin. It appears therefore that the peptic enzyme in malt is combined with some base and becomes active through liberation by bacterial acidity. Experiments in which ground malt was extracted with the acidified water at various temperatures, showed that the proteolytic activity of the extract is practically nil at 0°, considerable at 10°, and that, contrary to conclusions drawn from earlier work (cp. Hantke, this J., 1896, 366), it attains a maximum at about 30°, and is rapidly destroyed at about 50° C. Unlike the bacterial acid, commercial lactic acid and mineral acids do not increase the proteolytic activity of malt extract, or only slightly. Addition of a small quantity (0·1 per cent.) of lactic acid (bacterial origin) to a brewers' mash increases the yield of extract owing to the greater peptic activity, but addition of a considerable quantity (0·9—2·0 per cent.) of the acid appears to diminish the yield of malt extract. Pale malts are found to possess greater proteolytic activity than high dried malts.—L. E.

Industrial alcohol. Report of Commissioners of H.M. Customs and Excise. [Cd. 4642.] [T.R.] (See also this J., 1912, 1090.)

The following table shows the quantities of home-made and imported spirits received for the manufacture of industrial and mineralised methylated spirit during the years ended March 31st, 1910, 1911, and 1912:—

Financial year.	Industrial methylated spirit.	Mineralised methylated spirit.	Allowances paid to methylators of industrial spirit.
	Proof galls.	Proof galls.	£
1910 ..	3,859,158	2,302,691	47,946
1911 ..	4,323,452	2,407,578	54,534
1912 .	4,853,581	2,529,544	60,244

The total amount includes only 31,010 gallons of imported spirits. The quantities of methylated spirit sent into consumption by makers were:—

	Industrial.	Mineralised.	Total.
	Bulk galls.	Bulk galls.	Bulk galls.
1910 ..	2,404,019	1,558,393	3,962,412
1911 ..	2,877,429	1,688,313	4,565,742
1912 ..	3,091,463	1,720,031	4,811,494

The following quantities of spirits were received in the latest financial year in a pure state for use in connection with arts and manufactures under the Finance Act, 1902.

	Home made.	Imported.		Total.
		Methyl alcohol.	Other.	
	Proof galls.	Proof galls.	Proof galls.	Proof galls.
Arts and manufactures	582,040	47,816	311	630,167
Universities, hospitals, etc. ..	1,516	230	4,317	6,063
Totals	583,556	48,046	4,628	636,230

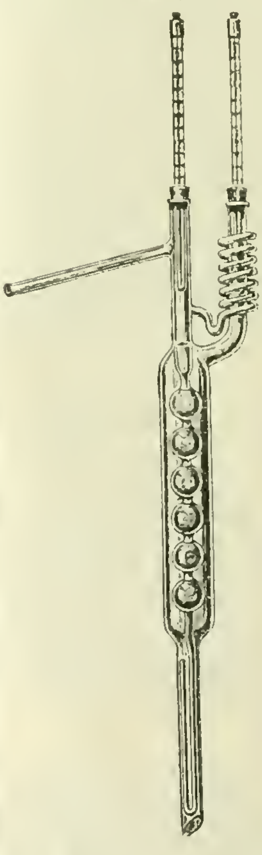
Hop; Effect of kiln-drying at 145° F. (63° C.) *on the composition of the* ——. H. V. Tartar and B. Pilkington. J. Ind. Eng. Chem., 1912, **4**, 839—840.

CONFLICTING statements have been made as to the best temperature for the kiln-drying of hops, but these have been largely based on results obtained by unreliable analytical methods (compare this J., 1912, 403). The authors have studied the effect of kiln-drying at 145° F. (63° C.) on the composition of hops. In each case a sample was taken from a carefully marked place when the kiln was charged, and then, after kiln-drying, a second sample was taken from the same place and compared with the first sample, which was air-dried. The hard resin and total soft bitter resins were determined by the methods described previously (*loc. cit.*); the α- and β-soft resins were separated by Siller's method (this J., 1909, 1056); and the tannin was determined by Chapman's method (this J., 1908, 135; 1909, 618); moisture and wax were also determined. The results, which are tabulated, show that there is little if any change in the composition of the hops (referred to the dry substance) during the kiln-drying process at 145° F. (63° C.). There was also scarcely any perceptible difference in the aroma of the air-dried and kiln-dried samples.—A. S.

Alcoholic fermentation, Primary transformation of hexoses in ——. H. Euler and T. Berggren. Z. Gärungsphysiol., 1912, **1**. 203. Z. ges. Brauw., 1912, **35**, 543.

THE results of the authors' investigation may be summarised as follows: (1). The fermentation induced by living yeast is accelerated by about 100 per cent. by extract of dried yeast. (2). The difference observed previously (see this J., 1912, 246) between the amount of sugar decomposed as measured by the fall of optical rotation and that corresponding to the carbon dioxide produced in fermentation by living yeast is increased by about 20 per cent. by yeast extract. This result may be explained in two ways on the assumption that fermentation proceeds in two stages, *i.e.*, the yeast extract might contain a co-enzyme capable of accelerating only the first stage, viz., the conversion of the sugar into an intermediate product, or it might contain two co-enzymes by which the two stages of the fermentation would be accelerated to different degrees according to the relative proportions in which the two co-enzymes were present. (3). From the results obtained by fractional precipitation of yeast extract, it may be inferred that this contains two activators, resistant to heat, necessary for the accomplishment of alcoholic fermentation (4). Fermentation by living yeast is strongly accelerated by the sodium salt of nucleic acid. —A. S.

Fusel oil, Valuation of ——. G. Heinzelmann. Z. Spiritusind., 1912, **35**, 612—613.



RAW fusel oil should be bought on the basis of its content of amyl alcohols (b.pt. 127°—131° C.) which varies greatly in commercial samples. The author describes a method for determining the content of amyl alcohols by fractional distillation, used in the *Institut für Gärungsgewerbe*, Berlin. The best form of fractionating column for the purpose is that shown in the figure. The vapour rises in the enlarged portion of the column, outside the inner bulb-tube, and passes into the right-hand limb, and thence through the spiral tube into the left-hand limb. The portion condensed in the latter limb runs down inside the bulb-tube, and forms a trap in the lower U-shaped portion, which should be at least 12—13 cm. long. When used with liquids which boil above 110° C. the column may be surrounded with cotton wool as far up as the spiral tube. The left-hand thermometer usually indicates 1·5°—2° C. lower than the right-hand one. The method of fractionation employed is illustrated by the following example:—1500 c.c. of raw fusel oil were distilled and collected in four fractions, viz., 540 c.c. passing over below 90° C., 420 c.c. between 90° and 115° C., 45 c.c. between 115° and 127° C., and 475 c.c. between 127° and 131° C. The first fraction, consisting chiefly of ethyl alcohol, but containing some water and fusel oil, was distilled from a water-bath (with the fractionating column) so long as ethyl alcohol passed over: the residue, which separated into two layers, one aqueous and the other of fusel oil, was treated with sodium chloride (about 20 per cent. of the aqueous portion), and the fusel oil was isolated by means of a separating funnel. The second fraction, which consisted of two immiscible layers, aqueous and oily, was treated in the same way. The fusel oil thus obtained from the first two fractions was mixed and re-fractionated. When the thermometer indicated 112° C., the third fraction was added and distillation continued. The portion passing over above 127° C., amounted to 175 c.c., which together with the fourth fraction from the original distillation

(475 c.c.), gave a total yield of 63·0 c.c. of amyl alcohols, corresponding to 13·3 per cent. of the volume of the raw fusel oil. Particulars respecting three other samples of fusel oil are also given.—J. H. L.

Ropiness in lager beer; A new pediococcus capable of producing —, Pediococcus viscosus III. F. Schönfeld and G. Himmelfarb. Woch. Brau., 1912, **29**, 653—655.

A new organism, *Pediococcus viscosus III*, which produces ropiness in beers, has been isolated by the authors from a ropy sample of "Munsterlander Altbier," a hopped beer which is usually stored for a long time in a warm cellar and allowed to develop considerable acidity. Unlike *Ped. visc. I* and *II*, which have been isolated from "Weissbier," the new pediococcus readily produces ropiness in strongly hopped liquors such as lager beer. It also differs from the former organisms in the smaller size of its cells and in the preponderance of single cells in young cultures grown in wort or beer; in older cultures the proportion of diads and tetrads increases but many single cells may still be seen. *Ped. visc. III* produces much more pronounced ropiness in beers than *Ped. visc. I* and *II*. Like the latter it forms considerable quantities of acids, which, however, confer a rather pleasant flavour on the beer. When grown in lager beer, it first produces cloudiness owing to rapid multiplication, and gives the beer a slimy, syrupy character. After a time the organisms settle to the bottom as a thick slimy deposit, but even though the beer is thus left quite clear in appearance it retains its syrupy character for some months. Only after many months does the ropiness disappear completely even from the deposit.—J. H. L.

Methyl alcohol vapour; Danger of explosion of —. K. Arndt. Chem.-Zeit., 1912, **36**, 1350—1352.

A wrought-iron drum which had contained a mixture of 4 parts of crude wood-spirit and 1 part of pyridine bases, used for denaturing alcohol, was emptied of the liquid and sent to the smithy for repairs, and on heating the drum, a fatal explosion occurred. Laboratory experiments with a small drum of proportionate dimensions, made with a detachable end-cover yielding to the explosions, showed that with pure methyl alcohol, an explosive mixture may be formed if the drum is left mouth downwards for ¼ hour or less after emptying all the liquid, and the explosion occurs on heating the wall of the drum to redness. If left for half an hour, the vapour left is too dilute for explosion. Using the liquid which had been stored in the drum with which the accident occurred, no explosion took place unless the metal was heated rapidly to bright redness. With slower heating the vapour burns without explosion and is consumed before a bright red heat is reached. The vapour is, however, explosive until the drum has been open for 3 hours. With another liquid sold for the same purpose, no explosion could be obtained.—A. T. L.

Influence of temperature on the absorption of water by the seeds of Hordeum vulgare [barley] in relation to the temperature-coefficient of chemical change. Brown and Worley. *See* XXIV.

Patents.

Fermentation processes [yeast-food]. A. Fernbach, Paris, and E. H. Strange, London. Eng. Pat. 16,925, July 24, 1911.

The yeast food is prepared by the action of proteolytic ferments of the type *tyrothrix tenuis*, or of enzymes prepared therefrom, upon waste yeast. For instance, 100 lb. of pressed yeast are mixed with 1000 lb. of water and the mixture is sterilised by heat. The liquid is sown at a temperature of 30°—35° C. with a culture of bacteria of the type *tyrothrix tenuis* and digestion is allowed to proceed at the above temperature for from 4 to 5 weeks, sterilised air being supplied every 24 hours. At the end of the operation about 90 per cent. of the total nitrogenous matter of the yeast will have become converted into substances not precipitable by tannin. (See also Eng. Pat. 15,204 of 1911; this J., 1912, 1091.)—J. F. B.

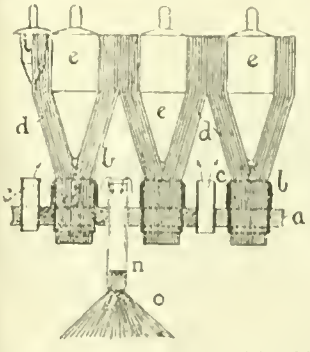
Stout and like beverages. W. J. Melhuish, Poole, Dorset. Eng. Pat. 2187, Jan. 27, 1912.

For the purpose of predigesting the proteins of "milk stout" (see this J., 1909, 225, 538; 1910, 1127), a proteolytic enzyme is added to the beverage at any suitable stage of its manufacture. Such enzyme should be capable of acting in slightly acid media, and pepsin is specified as being suitable.—J. F. B.

Beverages containing carbonic acid; Process for the continuous manufacture by fermentation of —. A. Römer, Stuttgart, Germany. U.S. Pat. 1,043,361, Nov. 5, 1912.

"Still wine" is passed through a series of vessels containing wine in different stages of fermentation, the contents of each successive vessel being in a more advanced stage of fermentation than that in the preceding vessel. The wine is drawn from the last vessel of the series and bottled. During its passage through the vessels the wine is under the uniform pressure produced by the carbon dioxide evolved by the fermentative process and it is withdrawn as "sparkling wine."—W. P. S.

Rectifying apparatus; Device for the uniform distribution of the vapours and of the returning condensed liquid (weak spirit) in —. C. Kalveram. Ger. Pat. 248,693, Nov. 29, 1910.



The rectifying column is divided as usual, into compartments, by plates, *a*, a portion of one of which is shown in the fig. In the plates, *a*, besides the vapour-tubes, *c*, are holders, *b*, carrying brushes, *d*, of metallic wires, bristles, or the like. By means of conical or other intermediate pieces, *e*, *i.e.* the upper parts of the brushes are so spread out and pressed one against the other, that they occupy the whole of the free space; hence the vapours are forced to pass through the fine spaces between the wires or bristles of the brushes, and come into intimate contact with the condensed liquid thereon. The condensed liquid flows gradually down the brushes, and any dirt, etc., settles on the plate, *a*, whilst clear liquid overflows through pipes, *n*, and is distributed in the form of fine drops by brushes, *o*.—A. S.

Fermentation process for the production of acetone and higher alcohols from starch, sugars, and other carbohydrate material. A. Fernbach, Paris, and E. H. Strange, London. U.S. Pat. 1,044,368, Nov. 12, 1912.

See Eng. Pat. 15,204 of 1911; this J., 1912, 1091.—T. F. B.

Nutrient medium for use in fermentation processes; Manufacture of a —. A. Fernbach, Paris, and E. H. Strange, London. U.S. Pats. 1,044,446 and 1,044,447, Nov. 12, 1912.

See Eng. Pat. 16,925 of 1911; preceding.—T. F. B.

Alcoholic liquids and beverages; Process of purification of alcohols, phlegms, wines, rums, tafias and other —. Soc. Civile pour l'Exploitation de Brevets d'Invention concern. l'Industrie de l'Alcool. Fr. Pat. 444,736, June 7, 1912.

Identical with the process claimed in Fr. Pat. 429,998 of 1911, of which an abstract appeared in this J., 1911, 1329.—L. E.

XIXa.—FOODS.

Flour ; Nature of the colouring matter of —— and its relation to processes of natural and artificial bleaching G. W. Monier-Williams. Local Govt. Board Report. New Series. No. 73. Food Reports. No. 19, 1912. Pp. 9. (Compare this J., 1911, 568.)

The colouring matter of flour is either carrotene ($C_{40}H_{56}$) or a substance so closely allied to it that the two absorption spectra are practically identical. The colour of carrotene may be destroyed either by atmospheric oxygen or by nitrogen peroxide, these two processes being quite distinct and resulting in the formation of different substances. Pure carrotene on exposure to air is bleached by absorption of oxygen. It is assumed that the natural ageing of flour is a similar process and hence that in the bleaching of flour by nitrogen peroxide certain substances are produced which are not formed during natural ageing. The amount of nitrite in flour tends to increase on storage, but the maximum amount found thus in an unbleached flour was 1·4 parts of sodium nitrite per million. All unbleached samples showed an increase of nitrite on exposure, whilst bleached samples which already contained 1·6 parts per million showed no increase. Highly bleached flours after storage for two years only contained the same amount of nitrite as stored unbleached flour. Samples of excessively bleached flours were submitted to baking tests: the loaves, with the exception of that from the most highly bleached flour (300 c.c. of nitrogen peroxide per kilo.), were of excellent quality and had no taste or smell.—E. F. A.

Casein of milk ; State of combination of the phosphorus and calcium in the ——. L. Lindet. Comptes rend., 1912, **155**, 923—924.

Casein, precipitated from milk by rennet, contains 3·5—3·55 per cent. of phosphoric acid (P_2O_5) and 3·1—3·8 per cent. of lime. Dilute organic acids, such as acetic acid, extract the whole of the calcium but only about one-half of the phosphorus. The remainder of the phosphorus appears to be present in the form of compounds of organic substances with phosphoric acid, which are readily hydrolysed, *e.g.*, by contact with milk of lime for 24 hours at the ordinary temperature. Of the total calcium about 60 per cent. is present as phosphate, whilst the rest is probably combined with the casein by virtue of the acid properties of the latter.—J. H. L.

Essential oil of cocoa. Bainbridge and Davies. *See* XX.

Patents.

Milk sterilising or pasteurising apparatus. I. Levinsohn, Ferrol, Spain. Eng. Pat. 23,646, Oct. 26, 1911.

A water-jacketed conical vessel is provided with a spiral projection or ledge on its outer wall; this is surrounded by a casing so that a spiral channel is formed between the casing and the vessel. The milk is introduced at the bottom of this channel, passes upwards and then downwards through a similarly constructed spiral channel in a casing surrounding the first. During the passage of the milk the water in the conical vessel is heated by means of a burner in the interior of the vessel, and, before it leaves the bottom of the apparatus, the milk is cooled, a spiral water-jacket being provided round the lower portion of the outermost casing for this purpose.—W. P. S.

Butter [and rancid oils] ; Process of renovating ——. J. D. Oudsteyn, Chicago. U.S. Pat. 1,042,471, Oct. 29, 1912.

A current of steam is passed through rancid butter while the latter is maintained in a melted condition in a chamber from which the steam and vapours are exhausted continuously during the operation. The process may be applied to rancid oils.—W. P. S.

Chocolate : Apparatus for caramelising ——. E. L. A. Savy, Courbevoie, France. Eng. Pat. 12,362, May 24, 1912.

The material is fed on to a grooved rotating drum by means of a hopper and a smooth roller; a casing forms a chamber round the drum, and both this chamber and the interior of the drum are heated by means of a current of air at a temperature of from 100° to 140° C. The material is removed by a scraper when the drum has made about three-quarters of a revolution. Means are provided for heating the air and supplying it to the drum and outer chamber. (See also Fr. Pat. 422,275 of 1910; this J., 1911, 526.)—W. P. S.

Alimentary substances [fruits, vegetables, etc.] ; Method of preserving ——. V. Frestadius, E. Norlin and E. Oman, Stockholm, Sweden. Eng. Pat. 20,262, Sept. 5, 1912. Under Int. Conv., Sept. 15, 1911.

The material, such as fruits, berries, vegetables, mushrooms, etc., is heated to from 60° to 100° C., with a concentrated solution of sugar or salt in a closed vessel from which the air is exhausted. It is then subjected to a second similar treatment with a dilute solution of sugar or salt, but, in certain cases, the air is not exhausted as completely from the vessels as in the first treatment. In the first part of the process, the sugar or salt may be added to the material and allowed to dissolve in the juice.—W. P. S.

Preserving ; Process of ——. J. C. Lincoln, Assignor to Electric Meat Curing Co., Cleveland, Ohio. U.S. Pat. 1,044,201, Nov. 12, 1912.

See Fr. Pat. 409,255 of 1909; this J., 1910, 779.—T. F. B.

XIXb.—WATER PURIFICATION ; SANITATION.

A case of mercurial poisoning. Lloyd and Gardner. *See* Yorkshire Section, p. 1109.

"Shadowgraph" test for gas fires. Butterfield. *See* IIb.

Patents.

Filtering apparatus for water and other liquids. A. J. and P. A. G. Bell, Ravensthorpe, Yorks. Eng. Pat. 23,906, Oct. 28, 1911.

An arrangement of funnel-shaped strainers is fitted at the lower portion of a closed cylindrical vessel; these strainers discharge into pipes or boxes which deliver the filtered water into an exit pipe at the bottom of the vessel. The water to be filtered is introduced at the top of the vessel and distributed over the surface of filtering material, such as sand, contained in that portion of the vessel above the strainers. When it is desired to cleanse the filtering material, water is forced upwards through the chamber, valves or baffle-plates in the pipes at the bottom of the chamber causing the supply to pass uniformly through the strainers; a portion of this water passes upwards through a revolving tube in the centre of the chamber and is distributed through jets fitted at the ends of arms attached to the central pipe. These arms also bear a number of teeth or prongs by means of which the filtering material is stirred up thoroughly during the washing process.—W. P. S.

Water ; Process of and apparatus for heating and purifying feed ——. J. Muehka, Vienna. Eng. Pat. 1959, Jan. 24, 1912.

The feed water, under a pressure equal to that of the steam in the boiler, is passed through a two-stage nozzle apparatus or injector; after passing through the first nozzle the water mixes with steam (conducted from the top of the boiler); the heated water then passes through the second nozzle and mixes with a quantity of water drawn from the bottom of the boiler, and the mixture enters the latter. The water from the bottom of the boiler passes through a filter before it mixes with the hot feed-water. A modified form of the apparatus for use with locomotive boilers is described.—W. P. S.

Water ; Process and apparatus for the purification of ——. E. Roquette. First Addition, dated March 7, 1912, to Fr. Pat. 438,417, Dec. 23, 1911 (this J., 1912, 658).

The two solutions mentioned in the original patent, sodium peranhydrosulphate and sodium peroxychloride, are used to add to the water. For application they may be converted into tablet form and added directly to the water which is then filtered, or the tablets may be enclosed in a cotton bag and allowed to diffuse into the water without producing a precipitate. Another method is to immerse a sheet of unsized paper in each solution and then transfer them to the water. To use the solutions directly, they are placed in a double compartment box from which two capillary siphons lead the liquids into a common opening in the mouth of the service tap, so that, as the water passes out of the tap, it draws the two solutions with it.—J. H. J.

Sea-water ; Distillation of —— and its transformation into potable water. R. Köster and G. Kolleretzky. Fr. Pat. 443,914, May 15, 1912.

The sea-water, or other impure water, is run from a reservoir through the interior of the condenser, in which it acts as the cooling water for the distillate, into the evaporator, which consists of a vessel standing over a furnace and arranged concentrically round the flue. The water enters the bottom of the evaporator and passes through a short coiled pipe placed in the lower part of the flue, which leads it into a coil of trays placed round the upper part of the flue ; here the evaporation takes place, and the vapour passes away from the top of the evaporator by a pipe which opens on to a channel running spirally down the outside of the condenser, which, together with the spiral channel, is completely enclosed. From the bottom of the channel a pipe leads the distillate to a filter, through which it passes before being drawn off for use.—J. H. J.

Night-soil ; Treatment of ——. J. L. F. Garrigou. Fr. Pat. 443,913, July 25, 1911.

The night-soil is placed in settling tanks from which the clarified liquid passes to fermentation vats. Then gypsum is added to convert the ammonium carbonate into sulphate, and after the calcium carbonate has settled, the liquid is run off and concentrated until the ammonium sulphate crystallises out ; or, the liquid may be absorbed by cinders, or other substances, with the object of being used directly. The precipitated calcium carbonate being rich in nitrogenous matter is used as a manure. The solid portion of the night-soil which is found at the bottom of the settling tanks, is charged into autoclaves where it is heated to 150° C. to obtain a dry powder completely sterilised. When the heating is finished, the escape valve is opened and the ammoniacal vapours cooled and absorbed in sulphuric acid.—J. H. J.

Germicide and insecticide. G. Fritsche, Strzebowitz, Austria-Hungary. Assignor to The Roessler and Hasslacher Chemical Co., New York. U.S. Pat. 1,042,422, Oct. 29, 1912.

See Eng. Pat. 28,707 of 1906 ; this J., 1907, 835.—T. F. B.

Disinfecting, washing, starching, dry cleaning, dyeing and like machines. Eng. Pat. 10,887. *See* VI.

New insecticidal soap. Fr. Pat. 440,021 and Addition thereto. *See* XII.

XX.—ORGANIC PRODUCTS ; MEDICINAL SUBSTANCES ; ESSENTIAL OILS.

Thalleioquin test. C. H. La Wall. Amer. J. Pharm., 1912, **84**, 484—488.

In testing for quinine the following reagent is made up : 0·5 grm. of potassium bromate is dissolved in 10 c.c. of 10 per cent. hydrobromic acid and made up to 100 c.c. A solution of quinine sulphate as weak as 1 : 100,000 or 1 : 200,000, is then prepared. 100 c.c. of the quinine solution are placed in a Nessler glass and 5—10 drops of the bromine reagent added, the whole stirred and 10 drops of strong ammonia added, when a green tint is produced. For drugs or extracts, about 1 grm. of the material is shaken with ammonia and 20 c.c. of ether. The ethereal portion is separated and evaporated. The residue is taken up with 1 c.c. of N/10 sulphuric acid and made up to 15 c.c. with water. 5 c.c. are then made up to 100 c.c. in a Nessler tube and tested as described above with the bromine reagent. If the result is negative, the remaining 10 c.c. of acid solution can be made up to 100 c.c. and tested in the same way. If no green colour is produced in either case, cinchona alkaloids are absent or present in amount less than 0·1 mgrm. The alkaloids of other commonly used drugs do not interfere with the test.

F. Shdn.

Aconitine ; Oxidation of ——. F. H. Carr. Proc. Chem. Soc., 1912, **28**, 253.

It was shown that a neutral substance, *oxonitin*, $C_{23}H_{29}O_9N$, together with acetaldehyde, results from the oxidation of aconitine with potassium permanganate in acid solution. Oxonitin crystallises in white, prismatic crystals, m. p. 276°—277° C. ; it is sparingly soluble in all solvents, neutral in reaction, and does not combine with acids or alkalis, nor does it give a precipitate with the common alkaloidal reagents. Methyl iodide, hydroxylamine, and acetic anhydride fail to act upon it. It contains three methoxyl groups, and since it gives, like aconitine, acetic and benzoic acids on hydrolysis, it contains also an acetyl and benzoyl group. It may be presumed that the $N.CH_3$-group contained in aconitine is unchanged ; its constitution may therefore be represented thus :

$$C_{10}H_9O_2NCH_3(OCO.C_6H_5)(OCO.CH_3)(OCH_3)_3.$$

Oxonitin yields different products according as the hydrolysis is brought about by alkali or by hydrochloric acid ; in the former case a neutral substance, and in the latter an alkaloid, is produced ; in both instances acetic and benzoic acids are formed. The investigation is being continued with a view to the elucidation of the constitution of the hydrolytic substances and of the hypothetical base, $C_{10}H_{15}O_2N$.

Pilosine : a new alkaloid from Pilocarpus microphyllus. F. L. Pyman. Proc. Chem. Soc., 1912, **28**, 267.

From the mother liquors remaining after the separation of pilocarpine and *iso*pilocarpine from the total alkaloids of *Pilocarpus microphyllus*, a new alkaloid, *pilosine*, has been isolated in a yield amounting to 0·007 per cent. of the leaves. Pilosine has the empirical formula $C_{16}H_{18}O_3N_2$, and is a monacid base. It melts at 187° C. (corr.), and has $[\alpha]_D = +39·9°$. It contains an N-methyl, but no methoxy-group. It also contains a lactonic grouping. On treatment with acetic anhydride it yields a new unsaturated base, *anhydropilosine*, $C_{16}H_{16}O_2N_2$, which melts at 133°—134° C. (corr.), and has $[\alpha]_D = +66·2°$. Pilosine is decomposed on distillation with 20 per cent. aqueous potassium hydroxide, benzaldehyde and a new base, *pilosinine*, $C_9H_{12}O_2N_2$, being formed. The chemical and physiological properties, as well as the solubilities of the latter base, are very similar to those of pilocarpine and *isopilo*carpine, and it seems probable that this base is a lower homologue of these alkaloids. The physiological action of the three alkaloids is similar to, but very much weaker than that of pilocarpine.

Alkaloids of Pilocarpus racemosus. H. A. D. Jowett and F. L. Pyman. Proc. Chem. Soc., 1912, **28**, 268.

The statements in the literature with regard to the amount and nature of the alkaloid contained in the leaves of *Pilocarpus racemosus* (Guadeloupe jaborandi) are conflicting. Holmes (Pharm. J., 1903, [iv], **17**, 713) quoted the statement of G. Rocher, who examined the leaves in 1898—1899, that these contained 1 per cent. of total alkaloids, of which two-thirds was pilocarpine, but mentioned that another sample examined in the laboratories of Messrs. Wright, Layman, and Umney, Ltd., contained only 0·34 per cent. of total alkaloids. Later, Holmes stated (*ibid.*, 1904, **18**, 54) on the authority of A. J. Cownley, that the leaves of *P. racemosus* contained 0·6 per cent. of total alkaloids, which gave about 50 per cent. of a crystalline nitrate melting at 155° C. Since pilocarpine nitrate melts at 178° C. and *iso*pilocarpine nitrate at 159° C., he considered that this nitrate probably consisted largely of *iso*pilocarpine nitrate, or possibly of some other alkaloid. Some time ago the authors examined a quantity of leaves of *P. racemosus* at the request of the Director of the Royal Gardens at Kew; on extracting the alkaloids and purifying them in the usual way, they obtained pure pilocarpine nitrate melting at 178° C. (corr.) in a yield amounting to 0·12 per cent. of the leaves, but no other crystalline products. This result confirms Rocher's statement that the leaves contain pilocarpine. The mother liquors after the removal of pilocarpine gave a red coloration with sodium diazobenzene-*p*-sulphonate, indicating the presence of a base containing a free imino-group, and contained a small amount of bases sparingly soluble in water. The latter did not yield pilosine (compare the preceding abstract) when seeded with this alkaloid, and the quantity was insufficient to admit of further purification.

Cluytia similis; The constituents of ——. F. Tutin and H. W. B. Clewer. Proc. Chem. Soc., 1912, **28**, 265.

Cluytia similis, Muell. Arg., which is identical with the plant referred to by Smith ("A Contribution to South African Materia Medica," Cape Town, 1895, p. 57) as a smaller variety of *Cluytia hirsuta*, is reputed in South Africa to be of value as an antidote for anthrax and for the disinfection of "milt-ziek," or anthrax-infected meat. The root of this plant is also stated to be eaten by natives as an antidote for snake-bite poisoning. The entire above-ground portions, and also the root, of *C. similis* have therefore been submitted to chemical examination, when, in addition to chrysophanol, fatty acids, and other known compounds, the following new substances were isolated: (i) *Cluytyl alcohol*, $C_{28}H_{58}O$ (m. p. 82·5° C.); (ii) *cluytinic acid*, $C_{21}H_{42}O_2$ (m. p. 69° C.); (iii) *cluytyl cluytinate*, $C_{49}H_{98}O_2$; m. p. 76·5° C.); (iv) *cluytiasterol*, $C_{27}H_{44}O$ (m. p. 159° C.); (v) a new *acid*, $C_{10}H_{10}O_4$ (m. p. 159° C.); (vi) *cluytianol*, $C_{23}H_{37}O(OH)_3$ (m. p. 300°—305° C.). Cluytianol is isomeric with the dihydric alcohol, ipuranol, which it resembles in its general properties. *Triacetyl-cluytianol* melts at 160° C., and the *tribenzoyl* compound at 192° C. The root also contained a quantity of inorganic matter, in which strontium was present.

Trimethoxyphthalic acids; Constitution of some ——. G. Bargellini and O. Molina. Gaz. chim. ital., 1912, **42**, II., 394—417.

Using a reaction first studied by Fritsch (Annalen, 1897, **296**, 351; 1898, **301**, 359), the authors have synthesised 3.4.5-trimethoxy-*o*-phthalic acid, starting from the methyl ether of trimethylgallic acid. The latter was condensed with chloral hydrate in presence of sulphuric acid, the resulting trimethoxytrichloromethylphthalide was treated with alkali, and the trimethoxyphthalidecarboxylic acid thus produced was heated above its melting point so as to convert it into trimethoxyphthalide, which when oxidised with alkaline permanganate, yielded 3.4.5-trimethoxy-*o*-phthalic acid. This acid melts at 175° C., its anhydride at 143° C., and its anilide at 146° C., and is thus identical with the acid obtained by Windaus (Chem. Zentr., 1911, **1**, 1638) by the oxidation of colchicine and regarded by that author as 3.4.6-trimethoxyphthalic acid. The supposed 3.4.5-trimethoxyphthalic acid (m. pt. 195° C.) synthesised by Feist (*see* this J., 1907, 1159) by the methylation of pyrogalloldicarboxylic acid must, in accord with the recent work of Voswinckel and de Weerth (Ber., 1912, **45**, 1242) be regarded as 2.3.4-trimethoxyisophthalic acid, and hence, by a process of exclusion, the acid melting at 202° C. obtained by Feist (*loc. cit.*) by the oxidation of the methyl ether of columbamine is probably the 3.4.6-trimethoxy-*o*-phthalic acid.—A. S.

Cassiope tetragona (L.) G. Don. A. Wichmann. Z. Allgem. österr. Apoth.-Ver., 1912, **50**, 561—564.

After a full anatomical description of the Arctic shrub, *Cassiope tetragona*, the author gives the results of a brief chemical examination. Distillation with steam produced a small amount of an essential oil. The residue left was treated with a mixture of ether and alcohol, when 22·71 per cent. was extracted. Water subsequently removed 5·70 per cent. There was some evidence of the presence of a glucoside. Arbutin was proved to be absent.
—F. Shdn.

Otto of rose. J. C. Umney. Perfum. and Essent. Oil Rec., 1912, **3**, 291

The otto of rose of the present season's distillation is quite as good in quality as that of last season. But a number of samples have been found to be adulterated with gurjun oil. The presence of the latter can be detected by the following test: 5 drops of the otto are mixed in a test-tube with 10 c.c. of glacial acetic acid and 3 drops of pure nitric acid added. A reddish violet colouration will develop in 30 seconds if gurjun oil is present. This test will probably detect about 0·5 per cent. of gurjun oil. The latter oil may be concluded to be absent if the optical rotation be not above —3°50′ and the above test give a negative result.—F. Shdn.

Cineol [eucalyptol] in eucalyptus oil; Determination of ——. C. T. Bennett. Perfum. and Essent. Oil Rec., 1912, **3**, 295—296.

The permanganate method proposed by F. D. Dodge (this J., 1912, 840) for the determination of cineol has been compared with the resorcinol and phosphoric acid methods (this J., 1912, 1052) when applied to certain eucalyptus and cajuput oils. It is shown that the permanganate method gives reliable results with eucalyptol itself and with eucalyptus oils of high cineol content, but it is not to be relied upon for cajuput oils, or eucalyptus oils of the amygdalina type, for these contain constituents not readily oxidised by cold permanganate.—F. Shdn.

Cocoa; The essential oil of ——. J. S. Bainbridge and S. H. Davies. Proc. Cehm. Soc., 1912, **28**, 253.

The authors find that the aromatic principle of the cocoa bean is an essential oil. Two thousand kilos. of cocoa nibs were subjected to distillation with steam. From the distillate 24 c.c. of a purified oil were isolated, which proved to be a mixture of esters formed during the fermentation of the cocoa bean with the true essential oil. The latter consists chiefly of a *d*-linalool. Octoic acid and other fatty acids probably derived from cocoa-(cacao-) butter were present, and a small proportion of a stable nitrogenous compound, which was not identified.

Pinene; Oxidation of —— *with hydrogen peroxide. Part XII.* G. G. Henderson and M. M. J. Sutherland. Proc. Chem. Soc., 1912, **28**, 270—271.

When pinene is oxidised with 30 per cent. aqueous hydrogen peroxide in presence of acetic acid, the chief product is *α*-terpineol, $C_{10}H_{17}{\cdot}OH$, partly free and partly as the acetate. The other neutral products of the reaction include borneol (as the acetate), a small quantity of dipentene, a trace of the aldehyde, $C_{10}H_{16}O$, formerly obtained by the oxidation of pinene with chromyl chloride, and some menthane-1:4:8-triol (1:4:8-trihydroxyterpan), $C_{10}H_{17}(OH)_3$. The last compound has been obtained by oxidising $\Delta^{4\cdot8}$-menthenol-1 with dilute permanganate, but has not hitherto been directly produced from pinene. Neither pinene glycol, pinol, nor any ketone was detected among the oxidation products, and only a trace of on oily acid, or mixture of acids, was obtained.

It is obvious that the behaviour of pinene towards hydrogen peroxide differs very considerably from that of camphene under similar conditions (Henderson and Sutherland, Chem. Soc. Trans., 1911, **99**, 1539), and that in this case, as in many others, the action of the reagent leads to disruption of the dimethyl*cyclo*butane ring in pinene, and to the formation of derivatives of isomeric terpenes.

Patents.

Nicotine; Preparation of ——. W. Holle, Budapest, Hungary. Eng. Pat. 11,758, May 17, 1912. Under Int. Conv., Nov. 13, 1911.

Tobacco residues are treated with a base to liberate the nicotine, which is then taken up by a volatile solvent and the solution evaporated. The free base is purified by distillation under reduced pressure in a current of an indifferent gas. Tobacco juice is brought to the dry state by mixing with tobacco residues and water-absorbing agents, and the nicotine extracted in the same way. —F. Sodn.

Amino-antipyrine; Manufacture of methyl sulphites of ——, *and of derivatives of amino-antipyrine substituted in the phenyl nucleus.* Farbwerke vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. Eng. Pat. 15,658, July 4, 1912. Under Int. Conv., July 20, 1911.

The methyl sulphite of amino-antipyrine can be prepared by heating alkali or ammonium formaldehyde-bisulphite with amino-antipyrine. The latter may be replaced by amino-antipyrine derivatives substituted in the phenyl nucleus.—F. Sodn.

Hexamethylenetetramine camphorates; Manufacture of ——. Farbwerke vorm. Meister, Lucius, and Brüning, Höchst on Maine, Germany. Eng. Pat. 21,728, Sept. 24, 1912. Under Int. Conv., Sept. 25, 1911.

The camphorates of hexamethylenetetramine can be prepared by dissolving molecular proportions of the base and acid in an indifferent solvent, and allowing the product to crystallise.—F. Sodn.

Monochlorhydrin; Preparation of ——. Sprengstoffwerke Dr. R. Nahnsen und Co., A.-G., Hamburg, Germany. Eng. Pat. 26,036, Nov. 21, 1911. Under Int. Conv., Feb. 11, 1911.

See Fr. Pat. 437,315 of 1911; this J., 1912, 557.—T. F. B.

Esters of phosphoric acid from phenols or naphthols or derivatives thereof; Manufacture of normal ——. A. G. Bloxam, London. From Act.-Ges. f. Anilinfabr., Treptow, Germany. Eng. Pat. 1154, Jan. 15, 1912.

See Fr. Pat. 439,067 of 1912; this J., 1912, 604.—T. F. B.

Thyroid glands and other organs; Process for obtaining the inner secretions of the —— *in a pure state.* E. Hoennicke, Dresden, Germany. U.S. Pat. 1,043,007, Oct. 29, 1912.

See Eng. Pat. 27,023 of 1907; this J., 1908, 1084.—T. F. B.

Cascara sagrada; Process of preparing a refined extract from ——. A. Diefenbach, Bensheim, Germany. U.S. Pat. 1,043,209, Nov. 5, 1912.

See Ger. Pat. 240,407 of 1911; this J., 1911, 1470.—T.F.B.

Acetaldehyde and condensation and polymerisation products thereof; Manufacture, from acetylene, of ——. N. Grünstein, Assignor to Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. U.S. Pat. 1,044,169, Nov. 12, 1912.

See Ger. Pat. 250,356 of 1910; this J., 1912, 1053.—T.F.B.

Manufacture of mercury bichloride. Eng. Pat. 19,601. See VII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Resins; Photochemical action of ——. F. Vignolo-Lutati. L'Ind. Chim., 1912, 12, 322—325.

It is known that resinous substances exert an action on the photographic plate in the dark, and Russell (this J., 1899, 516; 1901, 998; 1908, 939) has ascribed this to the reducing action of hydrogen peroxide formed in the autoxidation of resins. The author describes experiments the results of which cannot be explained on the assumption that hydrogen peroxide is the active agent, and he suggests that the phenomenon is due, at least in part, to rays of short wave-length formed in the autoxidation or other chemical alteration of the resin (compare Matuschek and Nenning, this J., 1912, 155). For example whilst ordinary glass interposed between the resin and the photographic plate almost completely prevents the action, Uviol glass (transparent to ultra-violet rays) is quite without effect in this respect. Moreover paper saturated with a dilute solution of quinine bisulphate, a dried green leaf, a solution of gum arabic, etc., and other substances impermeable to ultra-violet rays, are also capable of preventing the action of resin on the photographic plate.—A. S.

XXII.—EXPLOSIVES; MATCHES.

Trinitrotoluene; Manufacture of ——. F. Langenscheidt. Z. ges. Schiess- und Sprengstoffw., 1912, 7, 125—127.

A mixed acid (1400 kilos.) consisting of equal quantities of sulphuric acid and nitric acid (94 to 95 per cent.) is allowed to flow slowly into a cast iron vessel containing a solution of orthonitrotoluene (500 kilos.) in sulphuric acid (1400 kilos. of 100 per cent. acid), which has been warmed to 60°—70° C. This vessel is steam-jacketed and has also water-cooling coils, and a screw agitator which runs at about 182 revolutions per minute. At the commencement the temperature of the mixture is prevented from rising by means of the water coils until the whole of the orthonitrotoluene is converted into dinitrotoluene. Steam is now passed through the jacket to start the conversion of the dinitrotoluene into trinitrotoluene, and the temperature is not allowed to rise above 150° C. When nitration is complete, the temperature is maintained at this point for one hour. It is then allowed to fall to 100° C., and 200 litres of water are added in order to increase the yield. The molten trinitrotoluene is separated from the acid and washed until neutral. This product has a melting point of 72° to 74° C., and is used in the ammonium nitrate class of explosives. To produce the trinitrotoluene of higher melting point (81° to 82° C.), which is used for filling shells, the lower melting product (500 kilos.) is dissolved in 2300 litres of a mixture of 90 per cent. alcohol containing 5 to 10 per cent. of benzene, and after filtering, the solution is crystallised in a water-jacketed enamelled pan. By evaporating the mother liquor to one-third of its bulk, a quantity of brownish coloured crystals are obtained which are used in the ammonium nitrate class of explosives, whilst on further evaporation, a dark brown or red liquid is obtained which is used in the explosives industry under the name of liquid trinitrotoluene.—G. W. McD.

Tetranitrodimethylaniline; Manufacture of ——. F. Langenscheidt. Z. ges. Schiess- und Sprengstoffw., 1912, 7, 445—447.

Pure dimethylaniline (100 kilos.) is run slowly, with continuous stirring and cooling, into 1000 kilos. of sulphuric acid, free from lead. If the dimethylaniline is added too fast, or the cooling is insufficient, the solution and the resulting product are dark coloured. Nitric acid (430 kilos.) is run into an enamelled iron water-jacketed nitrating vessel and warmed to 44° C. The sulphuric acid solution of dimethylaniline is slowly run in and the temperature maintained below 44° C. When two-thirds of the dimethylaniline have been added, the temperature is allowed to rise to 53° to 55° C. The injection takes from 8 to 9 hours, and the mixture is kept stirred for two hours longer to ensure complete nitration. Tetranitrodimethylaniline crystallises out from the acid, the size of the crystals depending upon the strength of the nitric acid employed. The product is filtered off, washed free from acid, and crystallised from pure benzene, 550 kilos. being dissolved in, say, 1850 litres of benzene. The yield is 87 per cent., and the melting point of the pure product is 129° to 130° C.—G. W. McD.

Patents.

Explosives; Process and apparatus for drying —— in vacuo and for recovery of the solvents. H. Risler. Fr. Pat. 444,159. April 22, 1912.

The explosive material is arranged in layers in a vessel in which a partial vacuum is created and is rapidly dried by regulated heat, whilst the vapourised solvents are condensed in condensers, some of which are placed within the vessel and others outside. As a further safeguard in case of explosion, the walls and covers of the vessel are so arranged as not to offer resistance to internal pressure. —C. A. M.

Explosives. V. L. Bedier. Washington, U.S.A. Eng. Pat. 24,763, Nov. 7, 1911. Under Int. Conv., Nov. 7, 1910.

See U.S. Pat. 981,969 of 1911; this J., 1911, 241.—T. F. B.

Explosives containing nitro derivatives of common resin; Method of producing ——. O. B. Carlson, Mansbo. Assignor to O. F. Carlson, Stockholm. U.S. Pat. 1,043,042, Oct. 29, 1912.

See Eng. Pat. 5707 of 1910; this J., 1911, 448—T. F. B.

XXIII.—ANALYTICAL PROCESSES.

Zinc; Gravimetric determination of ——. H. Schilling. Chem.-Zeit., 1912, **36**, 1352.

A precipitate of zinc sulphide which can be rapidly filtered and washed without loss is obtained by the following process. The solution containing zinc, and free from other metals which are precipitated by hydrogen sulphide, is treated with an excess of potassium hydroxide, and then with an excess of benzenesulphonic acid. The solution is heated to boiling, and hydrogen sulphide is passed through it until cold. The precipitate can be filtered off at once, washed with water, and weighed as zinc sulphide in the usual manner.—A. T. L.

Temperature scale; Present status of the ——. G. K. Burgess. Eighth Int. Cong. Appl. Chem., 1912. Sect. Xb, Orig. Comm., 22, 53—63.

In exact gas thermometry the results should be reduced to the thermodynamic or ideal gas scale, but for most purposes the usual gas scales approximate to this sufficiently closely. As a secondary temperature measuring instrument, the platinum resistance thermometer is the most satisfactory, and may be used for calibrating all other types of thermometers between —200 and +1100° C. For the interval of temperature 0° to 100° C., the platinum resistance thermometer calibrated in ice, steam, and sulphur vapour will give the International hydrogen scale to within 0·004° C. With the Callendar formula it is exact to within 2° at 1100° C., and it can be used with considerable exactness down to —200° C. if the boiling point of oxygen or the sublimation point of carbonic acid be taken as the third calibration temperature. For moderate precision thermo-couples are most convenient—iron-constantan and copper-constantan for ordinary temperatures, and platinum-platinum rhodium (90Pt—10Rh) for high temperatures. In the following table are given the corrections for readings of platinum-platinum-rhodium couples calibrated at the freezing points of zinc, antimony, and copper for the usual three-term formula and at the freezing points of zinc and copper for Holman's two-term formula. Nearly the same corrections may be used for the platinum-platiniridium (90Pt—10Ir) couple.

Formula.	Temperature, °C.							
	300	600	900	1200	1400	1600	1700	1750
$e = a + bt + ct^2$	—0·8	0	+0·3	+0·5	+8	+26	+40	+46
$\log e = a + b \log t$	—0·6	+1·5	+2·5	—5	—5	—3	+1	+3

The following table of standard temperatures on the thermodynamic scale is given:—

Substance.	Phenomenon.	Temperature.	Uncertainty.	Reproducibility.
		°C.	°C.	°C.
Hydrogen	Boiling	—252·7	0·2	0·05
Oxygen	Boiling	—182·9	0·1	0·03
Carbon dioxide	Sublimation in gasoline	—78·34	0·1	0·03
Mercury	Freezing	—37·7	0·1	0·05
Water	Freezing	0	0	—
$Na_2SO_4 + 10H_2O$	Transformation to anhydrous salt	32·383	0·002	0·001
Water	Boiling	100	0	0·001
Naphthalene	Boiling	271·96	0·02	0·01
Tin	Freezing	231·85	0·1	0·05
Benzophenone	Boiling	305·90	0·05	0·02
Cadmium	Freezing	320·92	0·1	0·03
Lead	Freezing	327·4	0·1	0·05
Zinc	Freezing	419·4	0·1	0·15
Sulphur	Boiling	444·6	0·1	0·03
Antimony	Freezing	630	0·5	0·3
Ag^3—Cu^2	Eutectic freezing	779	1·0	1·0
NaCl	Freezing	800	2·0	1·0
Silver	Freezing	960·5	1·0	0·5
Gold	Freezing	1063	2·0	1·0
Copper	Freezing	1083	2·0	1·0
Palladium	Freezing	1549	10	3
Platinum	Melting	1755	15	5
Alumina	Melting	2000	30	20
Tungsten	Melting	3000	100	25
Carbon arc	Positive crater	3600	150	50
Sun	Surface	6000	500	100

—A. S.

Bromine; New reaction for ——, sensitive even in presence of other halogens. I. Guareschi. Atti R. Accad. Sci. di Torino, 1912, **47**. [Sep. copy, pp. 8.]

Magenta decolourised with sulphur dioxide forms a very delicate reagent for bromine, giving an intense bluish violet colour with a drop of bromine water or with bromine vapour. An excess of the reagent must be avoided. The reaction is applicable in presence of other halogens, or of chromyl chloride, nitrous fumes, and even aldehydes, when carried out in the following manner, and is especially suitable for detecting bromine in halogen salts. A small quantity of the substance under examination is mixed with a few drops of water and about 5 c.c. of a 25 per cent. solution of chromic acid, and a slow current of air is drawn through the mixture and then over a test-paper (free from starch) moistened with the reagent; in presence of even traces of bromine, the characteristic colouration is produced after a shorter or longer time.—A. S.

Bromine; Diffusion of —— in nature, and its detection even in organic substances. I. Gaureschi. Atti R. Accad. Sci. di Torino, 1912, **47**. [Sep. copy, pp. 11.]

By the aid of the reaction described previously (see preceding abstract), the author has been able to detect bromine in numerous commercial inorganic salts and compounds. In applying the reaction to organic substances, the sample is oxidised by heating with a 25 per cent. solution of chromic acid or, where necessary, with solid chromic anhydride and a drop of water, and a test paper moistened with the reagent (Magenta decolourised with sulphur dioxide) is suspended in the containing tube. The reagent may also be used for the detection of bromates: when dropped into a solution of potassium bromate a violet-red colouration is immediately produced; as little as 0·0000025 grm. of potassium bromate can be detected in this way, even in presence of a large quantity of bromide, which does not interfere with the reaction. As reagents for bromine, the following may be used in addition to Magenta decolourised with sulphur dioxide, viz., Magenta with bisulphite, rosaniline acetate with sulphur dioxide, pararosaniline hydrochloride with bisulphite and hydrochloric acid, Hofmann's violet with bisulphite and hydrochloric acid. The colouration is destroyed by the prolonged action of chlorine.—A. S.

Estimation of mercury in textile materials. Lloyd and Gardner. *See* Yorkshire Section, p. 1109.

Determination of sulphur in illuminating gas by Dickert's method. Bosshard and Horst. *See* IIA.

Determination of phosphorus in commercial acetylene. Dennis and O'Brien. *See* IIA.

Determination of camphor in celluloid. Barthélemy. *See* V.

Rapid evaporation of saline solutions. Kedesdy. *See* VII.

Iodic acid process for the determination of bromine in halogen salts. Gooch and Blumenthal. *See* VII.

Determination of manganese in mild steel and pig iron by Smith's persulphate method. Kunze. *See* X.

Comparative study of the Hübl and Wijs methods for the determination of the iodine values of fats. Auguet. *See* XII.

Detection and determination of arachis oil. Evers. *See* XII.

[Electrolytic] determination of lead in lead pigments. Utz. *See* XIII.

Detection of amber substitutes. Marcusson and Winterfeld. *See* XIII.

Determination of lead sulphate and the ultimate determination of sublimed white lead in rubber. Schaeffer. *See* XIV.

Valuation of fusel oil. Heinzelmann. *See* XVIII.

Thalleioquin test. La Wall. *See* XX.

Determination of cineol [eucalyptol] in eucalyptus oil. Bennett. *See* XX.

Tantalum electrodes. Brunck. *See* XI.

Patent.

Apparatus for photometrically testing burners for gas or electricity. Eng. Pat. 27,978. *See* IIB.

XXIV.—MISCELLANEOUS ABSTRACTS.

Hordeum vulgare [barley]; Influence of temperature on the absorption of water by the seeds of —— in relation to the temperature coefficient of chemical change. A. J. Brown and F. P. Worley. Proc. Roy. Soc., 1912, **85B**, 546—553.

The seed covering of barley acts as a very efficient differential septum. It is freely permeable by water but impermeable by most electrolytes and many non-electrolytes (see this J., 1908, 131; 1909, 145). The authors have studied the rate of absorption of water when the seeds are immersed in pure water at temperatures between 0° and 25° C. The rate of absorption falls off, of course, as the degree of saturation of the seeds increases. At any given degree of saturation, the velocity of absorption increases with rise of temperature, and indeed is practically doubled by a rise of 10° C., so that the temperature-coefficient is of the same order as that of many chemical reactions occurring in solution. The velocity of absorption is almost exactly an exponential function of the temperature, *i.e.*, the logarithms of the velocities are proportional to the temperature. It is remarkable that the vapour tension of water alters with temperature in almost exactly the same way. Such a relationship with temperature is rare amongst physical properties, and the author suggests that in both cases it may be due to the same cause, viz., the influence of temperature on the proportion of molecules of "hydrone," $(OH_2)_2$, present in water. Ethyl acetate belongs to the class of solutes (hormones) capable of penetrating the seed covering of barley, and it is further remarkable in that it accelerates the rate of absorption of water by the seeds. Whilst water is absorbed more rapidly from dilute solutions of ethyl acetate than from pure water, the temperature-coefficient of the velocity of absorption is the same in both cases. Possibly the dissolved ester simplifies the molecular structure of water (*i.e.*, increases the proportion of "hydrone" molecules).
—J. H. L.

Books Received.

The Materials Used in Sizing. Their Chemical and Physical Properties, and Simple Methods for their Technical Analysis and Valuation. A Course of Lectures delivered at the Manchester School of Technology. By W. F. A. Ermen, M.A. Constable and Company, Ltd., 10, Orange Street, Leicester Square, London, W. 1912. Price 5s. net.

Small 8vo volume, containing 119 pages of subject matter and six illustrations. There is a series of 31 tables of weights, measures, temperatures, specific gravities, and other constants, and an alphabetical index of subjects. The text is subdivided and classified as follows:—I. Introduction, with definitions, etc. II. The starches and other agglutinants. III. Weighting materials. IV. Softening ingredients. V. Antiseptics. VI. Analysis of sized warps and cloth. VII. Preparation of normal volumetric solutions.

LA CEMENTAZIONE DELL' ACCIAIO. Dr. FEDERICO GIOLITTI. Professore nel Regio Politecnico di Torino. Unione Tipografico-Editrice Torinese, Torino. 1912. Price 15 lire.

8vo volume (9¾ by 6½ inches), containing 506 pages of subject matter, with numerous illustrations, index of subjects, including much original work of Dr. Giolitti. The scheme of arrangement is as follows:—FIRST PART. Chemistry of cementation processes. (i.) Early scientific investigations of the cementation of steel. (ii.) Cementation during the last 20 years of the 19th century. (iii.) Cementation during the first seven years of the 20th century. (iv.) Recent investigations of cementation. (v.) Actual state of our knowledge concerning the cementation of steel. SECOND PART. The industrial application of the cementation process. (i.) Cementation of iron and low carbon steel. (ii.) Case-hardening of iron and low carbon steels; (*a*) General remarks; (*b*) Using solid carburisers; (*c*) Using liquid carburisers; (*d*) Using gaseous carburisers; (*e*) Using mixed carburisers; (*f*) Special processes. (iii.) The thermal treatment of cemented, or case-hardened products. (iv.) Precautionary measures in cementation in reference to: (*a*) Raw material; (*b*) Temperature and duration; (*c*) Rate of carburisation; (*d*) The carburised products; (*e*) The carburised and tempered products. (v.) Some patents affecting the cementation of steel.

ANALYSIS OF PAINT AND VARNISH PRODUCTS. By CLIFFORD DYER HOLLEY, M.S., Ph.D. John Wiley and Sons, New York. Chapman and Hall, Limited. 1912. Price 10s. 6d. net.

8vo volume, containing frontispiece, preface, 287 pages of subject matter, nine illustrations, and an alphabetical index. The subject matter is classified as follows:—I. Separation of vehicle from pigment. II. Estimation of water in paints. III. Water emulsions and emulsifiers. IV. Estimation of linseed oil, and its adulteration in mixed paints. V. and VI. Determination of the purity of linseed oil. VII. Analysis of the volatile oils. VIII. Turpentine thinners. IX. Turpentine substitutes. X. The inert pigments. XI. Analysis of white lead. XII. and XIII. Analysis of sublimed white lead, and the zinc pigments. XIV. Determination of fineness, covering power, and tinting strength of pigments. XV. Practical testing-out of paints. XVI. and XVII. Analysis of white paints. XVIII. Kalsomine, cold water paints and flat wall finishes. XIX. Composition of coloured paints. XX. Indian reds, Venetian reds, Tuscan reds, red oxides and ochres (Analysis). XXI. Black pigments and paints. XXII. Brown pigments and paints. XXIII. Blue ditto. XXIV. Yellow, Orange and Red Chrome leads. Vermilions. XXV. Red lead. Orange mineral and litharge. XXVI. Analysis of paints for manufacturing purposes. XXVII. Composition and analysis of fillers. XXVIII. Shingle stains. Barn and roof paints. XXIX. Japans and driers. XXX. Shellac and spirit varnishes. XXXI. Oil varnishes. XXXII. Practical testing of varnishes. XXXIII. Varnish stains and colour varnishes. XXXIV. Enamels and varnish specialities.

THE PRINCIPLES AND PRACTICE OF TEXTILE PRINTING. By EDMUND KNECHT, Ph.D., M.Sc., Professor of Technological Chemistry, Victoria University, etc., and J. BEST FOTHERGILL. Charles Griffin and Company, Ltd., Exeter Street, Strand, London. 1912. Price 36s. net.

8vo volume, containing 604 pages of subject matter, with 13 plates, numerous patterns, and 80 illustrations, also an alphabetical index of subjects. The subject matter is arranged and classified as follows:—I. HISTORICAL INTRODUCTION, etc. II. METHODS OF PRINTING. III. PREPARATION OF THE CLOTH FOR PRINTING. (i.) Bleaching. (ii.) Mercerising. (iii.) Shearing, brushing, and "winding-on." (iv.) Preparation of the cloth with "prepares." IV. PREPARATION OF COLOURS FOR PRINTING. V. TREATMENT OF GOODS AFTER PRINTING. (i.) Ageing. (ii.) Dunging. (iii.) Dyeing. (iv.) Steaming. (v.) Fixing. (vi.) Raising and developing. (vii.) Cutting. (viii.) Washing. (ix.) Soaping. (x.) Clearing or chemicking. (xi.) Drying. VI. MORDANTS, etc. VII. STYLES OF PRINTING. (i.) Direct printed styles. (ii.) The dyed style. (iii.) The insoluble azo colours. (iv.) Discharge and Reserve (resist) styles. (v.) Resist or reserve styles. (vi.) "Raised" styles. (vii.) Paste colours. (viii.) Metal printing. (ix.) Crepon or "Crimp" style. VIII. FINISHING OF PRINTED CALICOES. IX. WOOL PRINTING. X. SILK AND HALF-SILK PRINTING. XI. ADDENDA. (i.) Ciba yellows. (ii.) Hydron colours. (iii.) Leukotrope resists under vat colours. (iv.) Preventing tendering of goods dyed with sulphide colours. Tables, etc.

MINE FIRES. A Preliminary Study. By GEORGE S. RICE. Department of the Interior. Bureau of Mines. Joseph A. Holmes, Director. Government Printing Office, Washington. U.S.A. 1912.

PAMPHLET, containing 47 pages of subject matter, one illustration, a list of "Publications on Mine Accidents and Tests of Explosives," and an alphabetical index of subjects. The matter is classified as follows:—I. Some disastrous mine fires. II. Fires in surface buildings. III. Fires underground. IV. Fighting mine fires. V. Chemical analysis of gases from mine fires. VI. Summary of precautions.

ELECTROPLATING. A Treatise on the Electro-deposition of Metals, with a Chapter on Metal-Colouring and Bronzing. By WILLIAM R. BARCLAY and CECIL H. HAINSWORTH. Edward Arnold. 41 and 43, Maddox Street, London, W. 1912. Price 7s. 6d.

8vo volume, containing 381 pages of subject matter with 62 illustrations, 12 pages of Appendices, and an alphabetical index of subjects. The subject matter is classified as follows:—I Fundamental chemical principles. II. Fundamental electro-chemical principles. III. Fundamental electrical principles. IV. Quantitative electro-deposition. V. Primary and secondary cells. VI. The dynamo. VII. Plant used in electroplating. VIII. Preparatory processes. IX. The deposition of silver. X.—XVII. The deposition respectively of gold, copper, nickel, iron and cobalt, zinc and cadmium, lead, tin, and antimony, platinum and palladium, brass and other alloys. XVIII. Finishing processes. XIX. Metal-colouring and bronzing. APPENDICES: 1. Assay of silver—Volhard's method. 2. Weight of deposit on silver-plated articles. 3. Calculation of thickness of electro-deposits. 4. To find capacity of a plating vat. 5. Testing, polarity and direction of current. 6. First aid in cases of poisoning. 7. Tables.

THE PRINCIPLES OF APPLIED ELECTRO-CHEMISTRY. By A. J. ALLMAND, D.Sc. Edward Arnold, 41 and 43, Maddox Street, London, W. 1912. Price 18s. net.

8vo volume, containing 527 pages of subject matter with 136 illustrations, and four pages of Appendices, followed by alphabetical indexes of authors' names and subjects. The matter is divided into two parts: I. GENERAL AND THEORETICAL, and II. SPECIAL AND TECHNICAL. These are subdivided and grouped as follows:—PART I. (i.) Introductory. Power. (ii.) Equilibrium. (iii.) Faraday's laws. Current efficiency. (iv.) Osmotic pressure. Theory of solutions. (v.) Ionic transport during electrolysis. (vi.) Conductivity of electrolytes. Theory of electrolytic dissociation. (vii.) Energy relations. (viii.) Electromotive force. (ix.) Electrolysis and polarisation. Energy efficiency. (x.) Cathodic and anodic processes in detail. (xi.) The electrolysis bath. (xii.) Molten electrolytes. (xiii.) Electrothermics. (xiv.) Electrical discharges in gases. PART II. (xv.) Primary cells. (xvi.) Secondary cells. (xvii.) Copper. Silver. Gold. (xviii.) Zinc. Tin. Nickel. Iron. Lead. Various. (xix.) Electroplating and Electrotyping. (xx.) Hypochlorites and chlorates. (xxi. and xxii.) Alkali-chlorine cells. etc. (xxiii.) Metals from fused electrolytes. (xxiv.) Electrothermics in the iron and steel industries. (xxv. and xxvi.) Calcium carbide and cyanamide, etc. (xxvii.) Oxidation of atmospheric nitrogen. (xxviii.) Ozone.

YEAR-BOOK OF PHARMACY, comprising Abstracts of papers relating to Pharmacy, Materia Medica, and Chemistry contributed to British and Foreign Journals from July 1, 1911, to June 30, 1912, with the Transactions of the British Pharmaceutical Conference at the Forty ninth Annual Meeting held in Edinburgh, July, 1912. Editor of the Abstracts, J. O. BRAITHWAITE. Editor of the Transactions, H. FINNEMORE. Abstractors: F. W. GAMBLE, HAROLD WYATT. J. and A. Churchill, 7, Great Marlborough Street, London. 1912. Price 10s. 6d.

A HANDBOOK OF SUGAR ANALYSIS. A practical and descriptive Treatise for use in Research, Technical, and Control Laboratories. By C. A. BROWNE, Ph.D. Chemist in charge of the New York Sugar Trade Laboratory, etc., etc. John Wiley and Sons, New York, U.S.A. 1912. Price $6.00 net (25s. 6d. net) Chapman and Hall, Limited, London.

LARGE 8vo volume, containing 787 pages of subject matter, with 200 illustrations, an Appendix of sugar tables filling 98 additional pages, and an alphabetical index. The work is dedicated by the author to his teacher, Geh.-Rath.-Prof. Dr. B. Tollens of Göttingen University. The subject matter is subdivided and classified as follows: PART I. PHYSICAL AND CHEMICAL METHODS OF SUGAR ANALYSIS. (i.) Sampling of sugar and sugar products. (ii.) Determination of moisture in sugars and sugar products by methods of drying. (iii.) Densimetric methods of analysis. (iv.) Principles and uses of the refractometer. (v.) Polarised light. Theory and description of polarimeters. (vi.) Theory and description of saccharimeters. (vii.) Polariscope accessories. (viii.) Specific rotation of sugars. (ix.) Methods of simple polarisation. (x.) Methods of invert or double polarisation. (xi.) Special methods of saccharimetry. (xii.) Miscellaneous physical methods as applied to the examination of sugars. (xiii.) Qualitative methods for the identification of sugars. (xiv.) Reduction methods for determining sugars. (xv.) Special quantitative methods. (xvi.) Combined methods and the analysis of sugar mixtures. (xvii.) Miscellaneous applications. PART II. THE OCCURRENCE, METHODS OF PREPARATION, PROPERTIES AND PRINCIPAL REACTIONS OF THE SUGARS AND ALLIED DERIVATIVES.

* New Books.

[The Roman numerals in thick type refer to the similar classification of abstracts under "Journal and Patent Literature" and in the "List of Patent Applications."]

I. *Ennis*, W. D.: Vapours for heat engines. 8vo. Constable. London. 1912. Net 6s.

Lindner, Prof. G.: Winddruck in Silos u. Schachtöfen. (VI. 82 S.). Lex. 8° Berlin. J. Springer. 1912. M. 2.

IIA. *Grzybowski*, Prof.: Die östliche Grenze des Krakauer Kohlenbeckens u. das mittelgalizische Becken. [Aus: "Montanist. Rundschau."] (8 S. m. 2 Fig.) Lex. 8°. Berlin, Verlag f. Fachliteratur. 1912. M. 1.

Say, A.: La fabrication du coke et les sous-produits de la distillation de la houille, 91 fig. et pl., in-8. br. Dunod et Pinat. Paris. 1912. 15 fr.; cart., 16 fr. 50.

Hole, W.: The Distribution of Gas. 3rd ed. 8vo, pp. 866. J. Allen. London. 1912. Net 15s.

Frentzel, Dr. A.: Die Oelfelder v. Gurien. [Aus: "Petroleum."] (4 S. m. 3 Abbildgn.) Lex. 8°. Berlin. Verlag f. Fachliteratur. 1912. M. 1.

Hofer, Prof. H. v.: Das Erdöl u. seine Verwandten. Geschichte, physikal. u. chem. Beschaffenheit, Vorkommen. Ursprung, Auffindg. u. Gewinng. des Erdöles. 3 verm. Aufl. (XVI. 351 S. m. 33 Abbildgn. u. 1 Taf.). 3. Folge v. Bolley's Handbuch der chem. Technologie. Bd. IV. Hrsg. v. Prof. C. Engler. Lex. 8°. Braunschweig. F. Vieweg und Sohn. 1912. Cloth M. 13.50.

Schmitz, Dr. L.: Die flüssigen Brennstoffe ihre Gewinnung, Eigenschaften u. Untersuchung (XII. 168 S. m. 56 Fig.) 8°. Berlin, J. Springer. 1912 Cloth M. 5.60.

IIB. *Snow*, W. G.: Principle of Heating. 8vo. Spon. London. 1912. Net 9s.

Houston, R. A.: Studies in Light Production. 8vo, pp. 122. Electrician. London. 1912. Net 5s.

III. *Lunge*, Prof. G., u. Dr. H. *Kohler*: Die Industrie des Steinkohlenteers u. des Ammoniaks. 5. gänzlich umgearb. Aufl. 1. Bd. Steinkohlenteer (XVIII. 1010 S. m. 351 Abbildgn.). 3. Folge v. Bolley's Handbuch der chem. Technologie II. Bd. (1.). Hrsg. v. Prof. C. Engler. Lex. 8°. Braunchweig, F. Vieweg u. Sohn. 1912. Cloth M. 30.50.

V. *Thornley*, T.: Cotton Waste: Its Production, Manipulation, and Uses. 8vo, pp. 286. Scott Greenwood. London. 1912. Net 7s. 6d.

VI. *Erban*, Dr. F.: Versuche üb. den Einfluss v. Oxydationsmitteln als Zusätze zu den Oelbeizen der Rotfärberei u. v. oxydierenden Nachbehandlungen der geölten Ware auf Nüance, Egalität u. Echtheit der darauf erzeugten Alizarinrotfärbungen. Mitteilung aus dem Laboratorium des Herrn Prof. Dr. W. Suida f. chem. Technologie organ. Stoffe an der k. k. techn. Hochschule in Wien. [Aus: "Deut. Färber-Ztg."] (16. S.) 37,5×25,5 cm. Wittenberg, A. Ziemsen. 1912. M. 2.

Farrell, F. J.: Dyeing and Cleaning. A Practical Handbook. Cr. 8vo., pp. 266. C. Griffin. London. 1912. Net 5s.

VII. *Fresenius*, Prof. H.: Chemische Untersuchung der Drei-Lilien-Quelle zu Wiesbaden, sowie Untersuchung derselben auf Radioaktivität. Im Auftrage des Magistrates der Stadt Wiesbaden ausgeführt im chem. Laboratorium Fresenius. (22 S.) gr. 8° Wiesbaden, C. W. Kreidel. 1912. 80 Pf.

Holthusen, Dr. H.: Ueber quantitative Radiumbestimmung durch Emanationsmessung, insbesondere bei festen Substanzen. ((Aus bem radiolog. Institut der Universität Heidelberg.). (31 S.). gr. 8°. Heidelberg. C. Winter. 1912. M. 1.10.

Lucien, A. Le radium, sa genèse, ses proprietés, ses emplois, préf du Dr. Johannès Lineke (Bibl. Larousse). 39 grav., 1 pl., Libr. Larousse, Paris. 1912. Cloth 1 fr. 90.

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* Compiled by H. Grevel and Co., 33, King Street, Covent Garden, London, W.C., from whom all the works in the preceding list can be obtained.

Journal of the Society of Chemical Industry.

No. 21, Vol. XXXI. DECEMBER 31, 1912. No. 21, Vol. XXXI.

London Section.

Meeting held at Burlington House, on Monday, December 2nd, 1912.

MR. G. T. HOLLOWAY IN THE CHAIR.

NEW APPARATUS FOR THE EXAMINATION OF MINE AIR.

BY DR. LEONARD A. LEVY, M.A. (CANTAB.), F.I.C.

The author desires to describe a new form of oxidation capillary tube, which he has employed for the past twelve months in the estimation of small quantities of methane, carbon monoxide, and hydrogen in air and in other gases.

Considerable attention has been recently drawn to this subject, owing to the impending operation of the Coal Mines Act, 1911, which comes into force in January, 1913.

The method of oxidation first employed by the author has subsequently been adopted in modified forms by others, and the author ventures to think that the apparatus incorporating his oxidation tube described below is worthy of this special note, on account of its extreme simplicity, accuracy and absolute safety.

This oxidation tube can be employed in ordinary gas analysis apparatus as well as in the two special instruments for mine air examination to which attention is now particularly drawn.

1. *Silica-platinum oxidation capillary tube.*

During the past year, the author has made a considerable number of experiments on the estimation of small quantities of methane in air. The oxidation of the methane was effected by passing the gases through a silica platinum capillary tube. After numerous trials, the following type of tube was finally decided upon.

A B (Fig. 1) is a silica capillary tube. The leading-in tubes, A C and B D, are 1¼ in. each in length and 0·5 mm. bore. The portion, C D, is 1 in. long, and has a bore of 1·0 mm. A platinum wire, E F, is stretched axially along this tube, one end being attached to a small spiral spring, G. The object of this spring is to take up the expansion of the wire on heating, as if no spring is inserted, the wire sags against the walls of the tube and does not heat properly. The leading-in wires at H and J are fused into the silica, the difficulties attendant upon this operation having been satisfactorily overcome. The platinum wire is brought to a white heat by the passage through it of a current of 2·5 amperes supplied from a two-volt cell. The fine bore of the leading-in tubes, A C and D B, acts as a valve and prevents the passage of the gas over the heated wire at too great a speed. This oxidation tube can also be employed in ordinary gas examination and is a considerable improvement upon the methods at present in vogue.

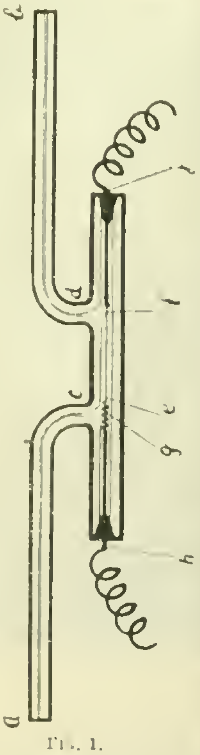

Fig. 1.

It was noticed that a tube through which too large a current had been accidentally passed, appeared to act even more efficiently than before. This was due to the catalytic acceleration of the oxidation effected by the platinum deposit on the walls of the silica capillary. This deposit was produced by the volatilization of a trace of the platinum owing to the passage of too heavy a current through the wire. Experiments are now in progress in which the walls of the silica capillary are coated with finely divided platinum or palladium.

The following provisions of the Coal Mines Act, 1911, call for the routine examination of the air of mines. The apparatus described below is designed to afford rapid, safe and accurate methods of estimation according to the requirements of this Act.

Part 2, Section 29 (3):

"A place shall not be deemed to be in a fit state for working or passing therein if the air contains either less than 19 per cent. of oxygen or more than 1¼ per cent. of carbon dioxide and an intake air-way shall not be deemed to be normally kept free from inflammable gas if the average percentage of the inflammable gas found in six samples of air taken by an inspector in the air current in that air-way at intervals of not less than a fortnight exceeds one quarter."

Part 2, Section 32 (1):

"No lamp or light other than a locked safety lamp shall be allowed or used in any seam where the air current in the return air-way from any ventilating district in the seam is found normally to contain more than ½ per cent. of inflammable gas."

Part 2, Section 60 (2):

"If at any time in any place in the Mine the percentage of inflammable gas in the general body of the air in that place is found to exceed 1¼, the electric current shall be at once cut off from all cables and other electrical apparatus in that place. . . . Provided that nothing in this subsection shall apply to any telephone or signalling wires or instruments so long as the conditions prescribed . . . are complied with."

It is evident that the provisions of this Act call for two separate instruments, one for the rapid and accurate estimation of fire damp and the other providing means for the rapid and accurate estimation of carbon dioxide and oxygen and, preferably, also of fire damp.

Apparatus for the estimation of fire damp.

This instrument is designed to give a very rapid estimation of methane in mine air, and is so arranged that the examination can be carried *in situ* in the mine without the slightest danger of exploding a fiery atmosphere.

The air to be examined is drawn into the burette, A, (Fig. II.) of 10 c.c. capacity surrounded by a water jacket. The finely divided stem indicates to 2 per cent. of methane, and is graduated to read to 0·01 per cent. It is easy to read to one half of one of the small sub-divisions. The cock, B, has an "L" shaped bore so that it is impossible to place the silica platinum capillary, C, in direct communication with the atmosphere. A screw attachment is fixed to the back of the plug of the cock, thus rendering its accidental withdrawal impossible. The final adjustment of the mercury level is made by the rack and pinion movement from which the reservoir, F, is suspended. The gas is passed through the silica platinum capillary, C, into the U tube, G, which is filled with mercury to the mark, H, on the capillary stem at atmospheric pressure. The platinum wire is heated to whiteness by the passage of the current and effects the complete oxidation of the methane to carbon dioxide and water. The resulting contraction is equal to twice the volume of the methane. The graduated stem of the burette is divided so as to read directly in percentages of methane. Three red marks on the burette indicate the three limits permissible according to the various provisions of the Act. The silica platinum capillary, C, is entirely surrounded by a water jacket and is therefore completely innocuous with respect to the external atmosphere.

The current is passed through the silica platinum capillary as soon as the mercury in the burette reaches the fused end platinum contact, D, and so completes the circuit. Thus the act of raising the mercury reservoir to pass the gas over the heated wire, simultaneously causes the current to pass and heat the wire. As the make and break of the current are entirely enclosed, there is no danger of firing the atmosphere. The current only passes so long as the mercury reservoir, F, is raised and thus should the apparatus be accidentally dropped, no explosion could possibly result.

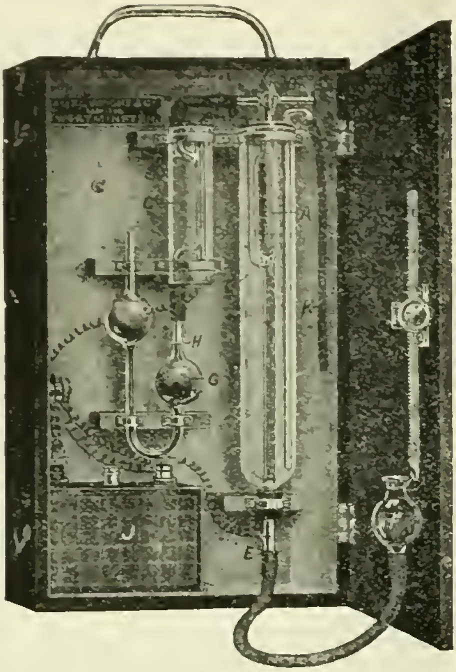

FIG. 2.

The following results of experiments upon mixtures of air and methane prove that the oxidation of the inflammable gas is completed by a single passage of the gas through the tube. The slight increase observed on the second passage is due to the fact that the small portion of the gas in the capillary bore of the burette does not get exposed to the action of the heated wire on the first passage.

1. Mixture of air and methane made up approximately to 0·5 per cent. methane.

No. of passages through combustion tube.	Reading on burette.
1.	0·47
2.	0·48
3.	0·48
4.	0·48

2. Mixture of methane and air made up approximately to 1 per cent. methane.

No. of passages through combustion tube.	Reading on burette.
1.	0·96
2.	0·98
3.	0·98
4.	0·98

3. Mixture of methane and air made up approximately to 2 per cent. methane.

No. of passages through combustion tube.	Reading on burette.
1.	1·91
2.	1·94
3.	1·95
4.	1·95

The water in the jacket surrounding the burette must be thoroughly mixed before each observation by blowing through the tube, K. An estimation can readily be completed in two minutes.

Apparatus for the estimation of carbon dioxide, methane and oxygen in mine air.

This apparatus affords a safe and rapid method of estimating carbon dioxide, oxygen and methane as specified by the Act.

The salient points of this instrument are:—

(1) The oxidation of the inflammable gases in a silica-platinum capillary tube.

(2) The measurement of the gas in a special burette which gives readings of adequate accuracy without undue length of stem, thus rendering the apparatus readily portable.

(3) The use of the safety devices to render the instrument perfectly safe.

(4) The provision of a correction tube for compensating for any slight changes in temperature or barometric pressure occurring during an analysis.

(5) Provision of means for effecting the rapid and complete absorption of oxygen.

The gas to be analysed is drawn into the burette, E, through the three-way cock, D, by manipulation of the mercury reservoir, C. The capacity of the burette is 25 c.c. It consists of:—

(*a*) A narrow graduated stem reading up to 4 per cent. and divided to 0·02 per cent. The percentages of carbon dioxide and methane are observed on this stem.

(*b*) A broader graduated portion reading up to 22 per cent. and divided to 0·2 per cent. The amount of oxygen is read off on this portion.

(*c*) An ungraduated bulb.

The connection tube, K, is of the same shape and capacity as the burette and communicates with the vertical capillary tube through the vent cock, L. The burette, E, communicates through the water jacketed oxidation capillary, F, to the potash pipette, A. The burette can also be put into communication with the absorption pipette, B, through the cock, O and J.

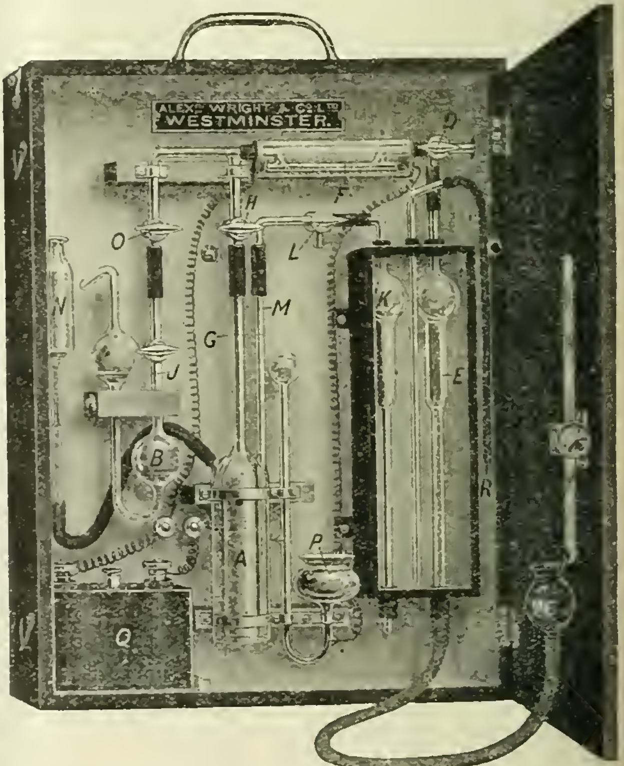

FIG. 3.

Before commencing an analysis the potash in the vessel, A, is filled up to the mark on the capillary neck at G, and the alkaline pyrogallate is filled up to the mark at J; these are the levels of the liquids in the absorption vessels at atmospheric pressure. The sample of gas is drawn into the burette, the mercury is adjusted to the zero by the rack and pinion, the cock at H is opened. The potash levels are adjusted in the tubes, G and M, by raising or lowering the potash reservoir, N, attached to the vessel A by the rubber tube. The cock, L, is closed. Any change in the temperature or external barometric pressure during the analysis will affect the volume of air in K and will alter the level of the potash in the tube, M. This level is corrected if required by raising or lowering the vessel, N. This manipulation affects equally the whole volume of the gas contained in the burette, E, and thus any slight changes are compensated for.

The gas is passed into the potash pipette and back again into the burette adjusting the potash levels as described. The reading of the mercury level in the burette gives the percentage of carbon dioxide. The current is passed through the water jacketed platinum silica capillary, F, by depressing the leather top, P, of the mercury switch. This causes the mercury to rise and complete the circuit. The make and break of the current are entirely enclosed and the current only passes so long as P is depressed. The gas is passed over the heated platinum wire into the potash and back again two or three times. The percentage of methane is equal to one-third of the contraction now observed. The cock, H, is closed and the gas is passed into the pyrogallate pipette, B. The cocks, O and J, are closed and the pipette, B, is detached and shaken. A rapid absorption of the oxygen is thus effected. The pipette is re-attached, and the gas is then drawn back into the burette. The mercury reservoir is adjusted until the pyrogallate reaches the mark on the capillary neck at J. Twice the percentage of methane when added to the contraction now observed gives the amount of oxygen. This observation can readily be made with an accuracy of 0·1 per cent., which is sufficient. Before each observation, the water in the jacket is thoroughly mixed by blowing through the tube, R.

Both instruments are small, compact and readily portable.

The author desires to acknowledge his indebtedness to Mr. Lacell, of the Silica Syndicate Ltd. for his assistance in the construction of the silica platinum capillaries. The manufacture of both types of apparatus has been undertaken by Messrs. Alexander Wright and Co., Ltd., Westminster.

Discussion.

Mr. **Arnold Philip** asked what percentage of methane could be detected by Mr. Levy's method, and secondly whether carbon monoxide could be estimated, and if so, with what accuracy. He thought, generally speaking, the principle was the same as in the Chatelier apparatus, that was to say the combustion of methane over a white-hot platinum wire. Dr. Haldane's apparatus was of course on a similar principle. In Haldane's apparatus about 0·05 per cent. of carbon monoxide could be determined, and rather less methane. What was the weight of the apparatus, and was a battery and all that it was necessary to take down in the mine included in the case?

Dr. **Levy**, in reply, said that the burette in both types of apparatus was graduated to read to 0·01 per cent., and methane was readily estimated with that degree of accuracy. Carbon monoxide could be determined, and to differentiate from methane a fractional combustion was necessary. He had carried out experiments with the idea of oxidising the carbon monoxide at a low temperature and then raising the temperature of the platinum wire to white heat and so oxidising the methane. The experiments were still in progress, so he could not say with what degree of accuracy it could be done; but his experiments indicated that it could be done successfully. A modification which he had introduced into the tube was coating its walls with finely divided platinum. That appeared to accelerate considerably the oxidation. He found that a tube which had accidentally been exposed to high current, thereby causing the deposition of some platinum on the walls of the silica tube, seemed rather more efficient in the production of rapid oxidation than a new tube which had no platinum on the walls. Secondly, with regard to the principle of the apparatus. The points of novelty which he wished to claim were, firstly, the use of the silica platinum capillary, which caused a very intimate contact of the gas with the heated wire and enabled the oxidation to be effected very much more rapidly than it could otherwise be done. Secondly, the introduction of the devices to render the use of the apparatus *in situ* in a mine quite safe. The le Chatelier method, to which reference had been made, consisted of adding methane or air, as the case might be, to the gas to be measured until the explosion point was just reached, and then calculating the percentage of methane from the amount of gas or air which was required to be added. If it was required to estimate carbon monoxide by the apparatus, the same degree of accuracy was attainable as in the estimation of methane. Personally he was of opinion that the iodine pentoxide method was far more satisfactory for the estimation of minute traces of carbon monoxide, because in that case it was certain that no other combustible gas was being oxidised. The possible exception—ethylene—he did not think had ever been found in mine air, and the method was absolutely quantitive for the most minute traces. The weight of the apparatus was eight pounds, complete with the battery, mercury, and water in the water jackets, ready for use.

New York Section.

Meeting held at Rumford Hall, Chemists' Building, on Friday, November 22nd, 1912.

PROF. M. C. WHITAKER IN THE CHAIR.

THE HYDROGENATION OF OILS.

BY CARLETON ELLIS.

The treatment of unsaturated oily bodies with hydrogen to obtain saturated derivatives is of great scientific and technical interest. In the fat industry a most fascinating problem has been that of the conversion of oleic acid or olein into stearic acid or the corresponding glyceride.

Oleic acid and hydrogen combine, molecule for molecule, to yield stearic acid according to the equation, $C_{18}H_{34}O_2 + H_2 = C_{18}H_{36}O_2$. Thus 282 pounds of oleic acid require 2 pounds (or about 0·7 per cent.) of hydrogen for the production of 284 pounds of stearic acid, and similarly the transformation of olein into stearin requires the use of about 0·68 per cent. of hydrogen. One thousand cubic feet of hydrogen weigh approximately 5·6 lb., hence a pound of olein calls for a little over 0·1 of an ounce of hydrogen equivalent to approximately 2500 cubic feet of hydrogen per ton of olein (of 2000 lb.). Thus by weight only a relatively small quantity of hydrogen is needed.

Many attempts to hydrogenate oleic acid have been made. Reviewing this subject in 1897 (this J., 1897, 389) Lewkowitsch refers to the ease with which the lower members of the oleic series are converted into saturated acids and states that "oleic acid itself resists all attempts at hydrogenisation," further remarking that he had "carried out a large number of experiments in this direction under most varied conditions, but hitherto all of these gave negative results."

Prior to this, however, Goldschmidt in 1875 (Sitzungber. Wiener Akad. Wissenschaften, **72**, 366) had reduced oleic acid by means of hydriodic acid and amorphous phosphorus at 200°—210° C. This presumably led to the attempted commercial development of a process by de Wilde and Reychler (Bull. Soc. Chim., 1889, 295—296; this J., 1889, 466) involving heating oleic acid to 280° C. with

1 per cent. of iodine, adding and melting therein a certain quantity of tallow soap, and then boiling with acidulated water. The product was then distilled and the iodine in part recovered from the pitch. The yield of stearic acid or saturated fat is stated to be approximately 70 per cent. of the theoretical. Only about two-thirds of the iodine could be recovered so the process apparently did not find technical use (Chem.-Zeit., 1889, 595). Should the much-lauded method of treating kelp primarily for obtaining potash salts come into use, a cheap supply of iodine would be available which might then make the Wilde and Reychler process of some technical interest.

Chlorine in lieu of iodine has been tried, but great difficulty has been experienced in securing an autoclave of resistant material. Imbert (Fr. Pat. 368,543 of 1906; this J., 1907, 25; and U.S. Pat., 901,905, Oct. 20, 1908. See also Bull. Soc. Chim., 1899, 695 and 707) recommends using quantities of chlorine and alkali exactly calculated on the iodine number of the fatty acid and operating at a temperature of 120° to 150° C. and pressure of about five atmospheres for a period of six hours.

Zurrer (Ger. Pat. 62,407, Aug. 8, 1891) chlorinates the fatty acid and then heats with water in the presence of a finely divided metal, such as zinc or iron. Lewkowitsch alleges that the treatment of monochlorostearic acid in this manner causes a reversion to oleic acid.

Tissier in 1897 (Fr. Pat. 263,158, Jan. 16, 1897) lays claim to a process for the reduction of oleic acid by nascent hydrogen. Powdered metallic zinc is placed in an autoclave, water and the fatty material introduced and treated under pressure. Under the circumstances the glyceride is hydrolysed to fatty acid and glycerin, and, according to Tissier, nascent hydrogen is evolved by virtue of the finely divided metal and reduces the oleic to stearic acid. Freundlich and Rosauer (Chem.-Zeit., 1900, 566; this J., 1900, 832) state that the Tissier process is inoperative.

The conversion of oleic acid into palmitic and acetic acids by means of caustic potash in accordance with the Varentrapp reaction (this J., 1883, 98 and 1884, 200) has not proved to be of much commercial significance, although I am advised that certain firms have been making use of the process in a limited way.

The Schmidt zinc chloride process (Lewkowitsch, "Oils, Fats and Waxes," 4th edit. Vol. iii., 189) involves heating oleic acid and zinc chloride at exactly 185° C. while interaction is taking place. "Deviation from this point leads to an increase of liquid substance. Unfortunately the solid candle material must be distilled and the considerable proportion of β-hydroxystearic acid (m. pt. 82° C.) in the crude product is seriously diminished by the partial conversion of this acid into oleic and iso-oleic acids. Thus, from a candle maker's point of view, a substance of high melting point is rendered practically valueless. Schmidt's process was tried on the large scale in an Austrian candle works. The quantity of liquid unsaponifiable substance obtained was, however, so large that commercial success was out of the question."

Many processes have been proposed based on the well-known action of sulphuric acid on oleic acid. Hydroxystearic acid is obtained by steaming the product. It would lead too far from the present subject to enter into any further discussion of these reactions.

In 1886, Weineck (Österr. Privil. No. 10,400, July 19, 1886) called attention to the possibility of electrolytic addition of hydrogen to oleic acid. Kuess (Chem.-Zeit., 1896, 618) later attempted to apply the electric current in the steam distillation of fatty acids.

In patents taken out by Magnier, Brangier, and Tissier (Eng. Pat. 3363 of 1900; Ger. Pat. 126,446, Oct. 3, 1899, and additional Ger. Pat. 132,223; this J., 1901, 261) the fatty material is acidified with sulphuric acid, whereupon the acidified mass is mixed with 5 to 6 times its weight of water and is then under a pressure of 5 atmospheres subjected to the action of an electric current, which generates hydrogen in a nascent state.

An interesting method of converting oleic into stearic acid is that comprised in the Hemptinne electric discharge process. The method is carried out by interposing a thin layer of the oil in the path of an electric discharge, while bringing hydrogen into contact with the oil (Eng. Pat. 1572 of 1905; U.S. Pat. 797,112, Aug. 15, 1905; see this J., 1905, 448). Fig. 1 shows the arrangement of apparatus for this purpose. The conversion is effected in a chamber having an inlet pipe, H, furnishing hydrogen under constant pressure. Oleic acid is supplied by a pipe, O, to a sprinkling device which discharges the acid on to a system of parallel plates consisting of the glass plates, G, and alternately the metal plates, M, N. The metal plates, M, are connected to one pole, the others, N, being connected with the other pole of a source of electricity. As the oil passes over the plates the electrical discharge causes conversion of some oleic acid into stearic acid and analogous compounds having melting points in the neighbourhood of 69° C. Hemptinne prefers to work at pressures less than atmospheric, since the yield is lower at atmospheric pressure. By treatment in this manner it is not difficult to secure a yield of 20 per cent. of stearic acid. Repeated treatment permits even up to about 40 per cent. yield. Here, as so often elsewhere, the effect of mass action becomes manifest, and as the content of stearic acid increases the speed of reaction greatly decreases. Much better results are obtained by saturating to the extent of about 20 per cent., removing the stearic acid by pressing, when the oil of reduced stearic acid content is again subjected to the electric discharge, and a further 20 per cent. yield obtained. The oleic residue contains liquid condensation products amounting to about 40 per cent., of the total weight. It is stated that the presence of these bodies does not impair the market value of what some one has termed "electrocuted" oleic acid.

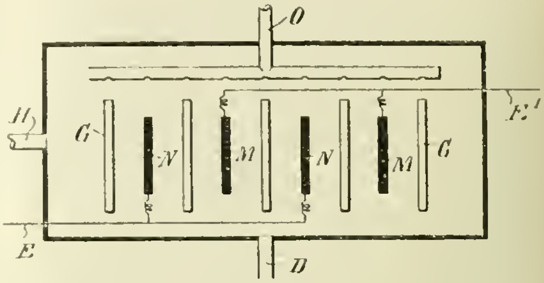

Fig. 1.

J. Petersen (Zeits. Elektrochemie, 1905, 549; see this J., 1905, 895) also endeavoured to reduce oleic acid to stearic acid by allowing an electric current to act on an alcoholic oleic acid solution, slightly acidulated with sulphuric acid or preferably with hydrochloric acid, between nickel electrodes. But the yield of stearic acid was small, even under the most favourable conditions, and did not exceed 15 to 20 per cent. Petersen also endeavoured to reduce sodium oleate in aqueous or alcoholic solution to the stearate. No satisfactory results were obtained.

C. F. Böhringer und Söhne (Ger. Pats. 187,788 and 189,332, 1906; this J., 1908, 132, 168), obtained by the same method much better results when using as cathodes, metallic electrodes, which were covered with a spongy layer of the same metal. They recommend as cathodes platinised platinum, as also palladium electrodes covered with a spongy layer of palladium-black. Nickel electrodes are not as effective.

Kolbe (J. prakt. Chem., 2nd Series, 4, 1871, 418) states that Saytzeff reduced nitrobenzol to aniline by passing the vapours of the former, mingled with hydrogen, over palladium black.

About twenty-five years later Sabatier and Senderens began their classic study of nickel and other metallic catalysts. The work of Sabatier and Senderens laid the foundation for the present processes of hydrogenation of oils. Their work is so well known that it is needless to discuss it here.

Fig. 2 shows apparatus used by these investigators in the hydrogenation of bodies capable of vaporization. In this apparatus 1 is a hydrogen generator; 2 and 3 wash bottles and 4 is a vaporiser containing the substance to be converted into a vapour; 5 is a hydrogen chamber containing nickel catalyst and heated by an oil bath; 6 is a condenser.

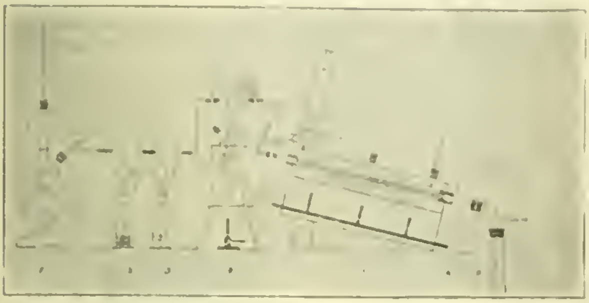

FIG. 2.

While a good deal of work has been done on the hydrogenation of fatty oils, the literature on the subject is very meagre indeed, and only through the patents which have been issued can we gather from any published records much that is enlightening as to developments in this industry. The patents concerned with the matter have, moreover, been subjected to a great deal of scrutiny because of the alleged basic character of certain of them. For these reasons the following discussion pertains very largely to processes which have been covered by patents in this country or abroad.

(NOTE.—The illustrations herein are largely derived from the drawings of patent records or have been prepared from written descriptions. All details deemed unnecessary in the portrayal of the essential features of these processes have been omitted. The original records should, of course, be consulted for details.—AUTHOR.)

A patent (Ger. Pat. 139,457, and Fr. Pat. 312,615 of 1901; see this J., 1902, 169) to J. B. Senderens is probably the first patent record having to do with the reduction of organic bodies by hydrogen in the presence of nickel catalysts. This patent is for the production of aniline from nitrobenzol and involves passing the latter body in the form of a vapour over heated nickel, copper, cobalt, iron, or palladium in the presence of hydrogen. The hydrogen may be in the pure state or in the form of water-gas.

The first disclosure of the possibility of hydrogenation of oils in a *liquid* state apparently comes from Le Prince and Siveke (Ger. Pat. 141,029, Aug. 14, 1902; Herforder Maschinenfett und Oelfabrik). In England a corresponding patent (1515 of 1903; this J., 1904, 26) was issued to Normann, and the latter patent has become widely known because of its alleged fundamental character.

Normann states that he may carry out the hydrogenation of oils by treatment either in the form of vapours or as liquids. In the former case he states that the fatty acid vapours together with hydrogen may be passed over catalytic material carried by a pumice stone support.

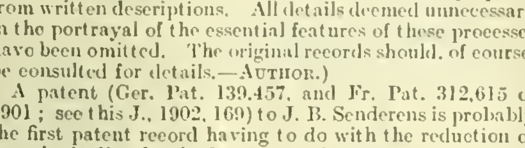

FIG 3.

This may be represented by Fig. 3, in which A is a bed containing granular pumice coated with a metal catalyst. O is an inlet for oil vapours and H is an inlet for hydrogen. The mixture passes through the tube A and the converted material is withdrawn at B. Normann states, however, that it is sufficient to expose the fat or fatty acid in a liquid condition to the action of hydrogen and the catalytic substance. He states, for instance, that if fine nickel powder, obtained by the reduction of nickel oxide in a current of hydrogen, is added to oleic acid, the latter heated over an oil bath and a strong current of hydrogen passed through it for a considerable time, the oleic acid may be completely converted into stearic acid.

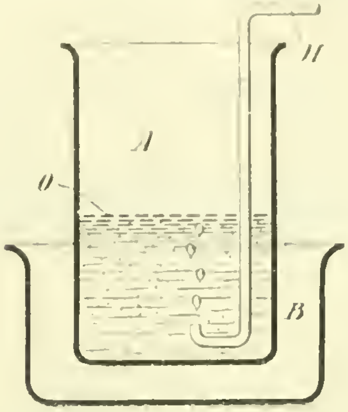

FIG. 4.

Fig. 4 shows very simple apparatus such as might have been used by Normann to this end. A is a vessel containing oil, O, in which fine particles of nickel are suspended while a strong current of hydrogen from the pipe, H, affords the hydrogen requisite for reduction of the oil. Normann states that by this means he has treated the fatty acid of tallow having an iodine number of 35 and melting at about 46° C., thereby converting it into a body of improved colour having an iodine number of about 10 and a melting point of about 58° C. Normann also states that commercial gas mixtures such as water-gas may be used in lieu of pure hydrogen. On the whole, however, the disclosures of this patent seem to be rather meagre.

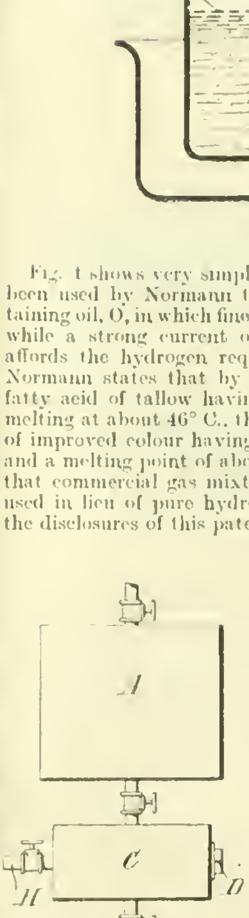

FIG. 5.

Dr. David T. Day of Washington has brought out a process (U.S. Patent 826,089 of July 17, 1906; this J., 1906, 1035) in which he treats, not fatty oils, but hydrocarbon oils, with hydrogen in the presence of what he terms a porous absorptive substance, mentioning palladium-black, platinum sponge, zinc dust, fuller's earth and other clays. Fig. 5 shows one method proposed by Day to this end. The upper chamber, A, is filled with hydrocarbon oil, and porous absorptive material such as palladium-black is introduced in the intermediate chamber, C, by way of the plugged orifice, D. Any air present in C may be expelled by flushing out with hydrogen or an indifferent gas. Hydrogen is then admitted by the pipe, H, until the porous material has absorbed its full quota. The hydrogen gas may be admitted under a pressure of 100 lb. or more to the square inch. When the porous material in C has become properly charged with hydrogen, the oil is allowed to run from the chamber, A, through the chamber, C, into the collecting chamber, E, hydrogen being introduced as required by the pipe, H. In the place of hydrogen Dr.

Day states that ethylene or other hydrogen-carrying gas or vapour may be employed. By this treatment the disagreeable odour of hydrocarbon oil is in great part removed and the burning qualities of the oil improved. When palladium-black is used it is recommended that a proportion of one-half ounce to the gallon of oil be taken.

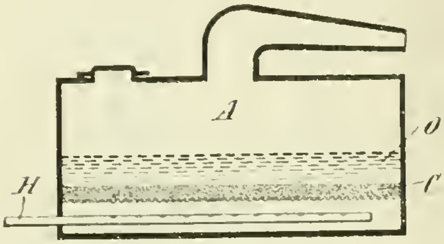

Fig. 6.

Fig. 6 shows a modification of Day's process. A is an oil still into the lower part of which the perforated pipe, H, serves for the admission of hydrogen. Palladium-black or other porous absorptive material forms a layer, C, on a screen above the hydrogen inlet. O shows the charge of oil. In operating this apparatus the layer of material, C, is first charged with hydrogen and then oil is run into the still. Distillation is carried out while hydrogen gas is being forced through the absorptive material and oil.

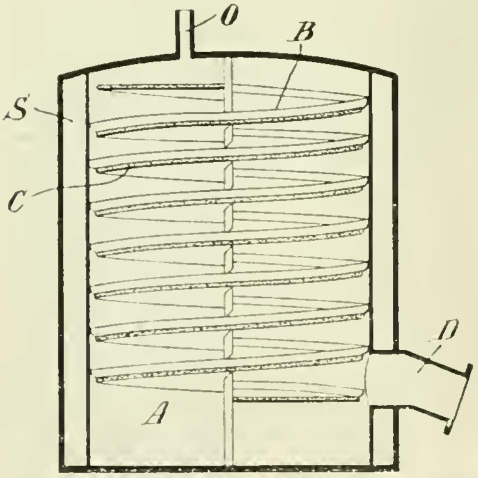

Fig. 7.

A peculiar manner of treatment has been shown by Schwoerer (Ger. Pat. 199,909, 1906; this J., 1908, 949) which will be made clear by Fig. 7. The receptacle, A, which is heated by the steam jacket, S, is provided with what Schwoerer calls a helical pan, shown at B. The underside of the pan carries a layer of nickelised asbestos. O is an inlet for oil and hydrogen, and D an outlet for the treated material. Schwoerer states that he first mixes fatty acid and hydrogen by atomising the oil with a jet of super-heated steam in the presence of hydrogen and conducts this mixture through the pipe, O, into the chamber, A. The temperature maintained in the apparatus is from 250° to 270° C. Vapours of oleic acid come in contact with the layer of catalyst on the underside of the helical pan and are converted into stearic acid. The product collects, more or less, in the gutter of the helical pan and is removed at D.

The repeated caution given by Sabatier to bring in contact with the catalyst only the *vapours* of the material, doubtless lead Schwoerer to devise this form of apparatus.*

Bedford, presumably with the same caution of Sabatier in mind, discloses in Eng. Pat. 9112 of 1908 (this J., 1909, 1005) and U.S. Pat. 949,954, Feb. 22, 1910, a process which also has to do with vaporization of the oily material. Fig. 8 shows the Bedford apparatus. A still or tower, A, carries two beds of catalyst, C and C^1. This is said to be preferably nickelized pumice. By means of hydrogen under pressure oleic acid is sprayed from the pipe, O, on to the catalyst bed, C^1. Hydrogen is admitted through the pipe, H. A temperature of about 200° C. and a diminished pressure of about 50 to 100 mm. is maintained in the still or tower, A. The vapours of oleic acid mingled with hydrogen pass through the second catalyst bed, C, where more or less conversion occurs, then pass to the condenser, D, and finally collect in the receptacle, E. F is a connection to a vacuum pump.

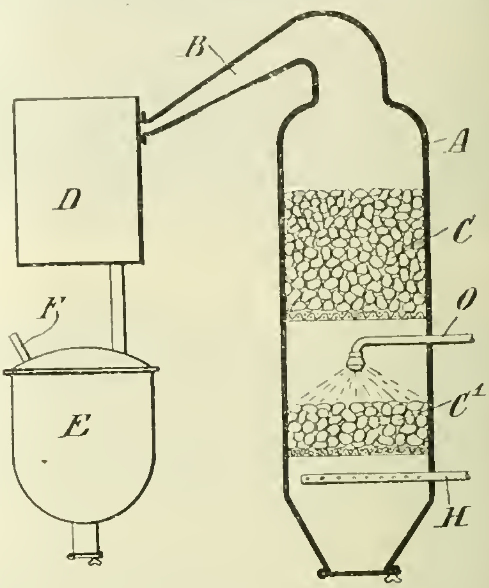

Fig. 8.

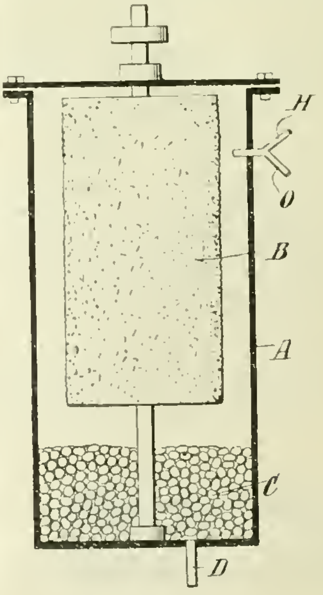

Fig. 9.

Neither this process nor that of Schwoerer is broadly applicable to the treatment of glycerides, as these cannot be vapourised without undue decomposition.

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* Note. Sabatier and Senderens (Ann. de Chim. et de Phys., 8 Ser., 1905, **4**, 335) say "Le métal ne soit jamais mouillé par un afflux excessif du liquide que l'on traite, ou à la suite d'un abaissement accidentel de la température du tube." They further say that in the preparation of cyclohexanol and its homologues from phenol or cresol at a temperature but slightly above the boiling points of the latter bodies, sometimes by their condensation the nickel becomes moistened and immediately becomes almost inactive due, no doubt, to the surface becoming permanently changed in character by contact with the liquid phenol or cresol.

Erdmann has taken out a Ger. Pat. 211,669 Jan. 19, 1907 (this J., 1909, 941) involving passing an oil as spray or mist into a chamber containing nickel catalyst supported on pumice and the like. Fig. 9 indicates one form suggested by Erdmann, who, by the way, does not show any drawings in the patent. The chamber, A, has a rotatable cylinder, B, which is coated with nickel catalyst. In the bottom of the receptacle is a quantity of nickelized pumice. Oil enters at O and is atomized by hydrogen entering at H. The atomized mixture impinges upon the rotating cylinder, B, then passes through the bed, C, the oil being drawn off at D. The excess of hydrogen is presumably vented in the upper part of the apparatus.

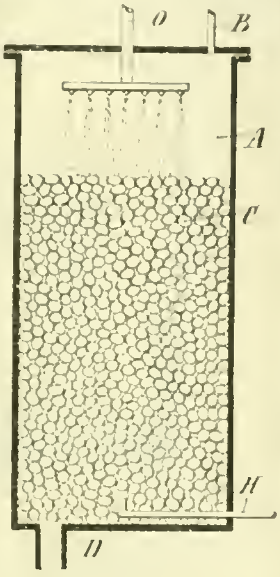

FIG. 10

A second modification (Fig. 10) involves a tower, A, filled with catalyst, C, which may be in the form of nickel supported on coarse fragments of pumice. By the pipe, O, oil is admitted to the chamber in an atomized or finely divided state. Hydrogen enters by the pipe, H. Erdmann states that the temperature of treatment should be from 170° to 180° C. The treated oil is drawn off at D while the excess of hydrogen passes away at B.

In a supplemental Patent, 221,890, of Jan. 19, 1907 (this J., 1910, 720) Erdmann recommends the steam distillation from the reaction chamber of the saturated product under diminished pressure.

Vereinigte Chemische Werke A.-G. (Ger. Pat. 236,488 Aug. 6, 1910, Fr. Pats. 425,729 and 434,927 of 1911, also Eng. Pat. 18,642 of 1911; see this J., 1911, 1022; also 1912, 346) make use of palladium catalyst precipitated on an indifferent body as a carrier, and recommend as carriers finely divided metals which do not have anti-catalytic properties, also metal oxides and carbonates.

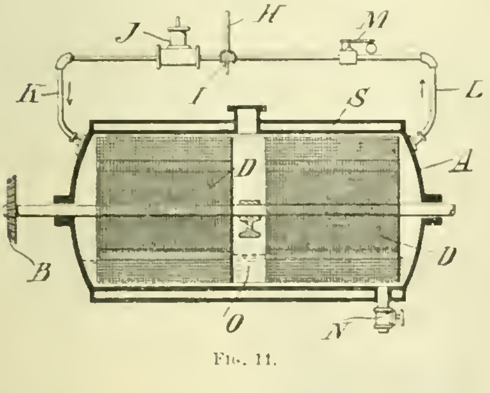

FIG. 11.

Under these circumstances it is stated that one part of palladium is sufficient to convert in a few hours 100,000 parts of oily material to a firm mass. They recommend the use of a hydrogen pressure of two to three atmospheres and a temperature somewhat above the solidification point of the saturated fat. They caution against arsenic, hydrogen phosphide and sulphide, liquid hydrocarbons, and carbon bisulphide, chloroform, acetone, and free mineral acids as being destructive to the activity of the catalyst.

Kayser (U.S. Pat. 1,004,035 of Sept. 26, 1911; this J. 1911, 1266) describes a process of treating oil with metallic catalyst, consisting in mechanically agitating the oil and catalyst in the presence of hydrogen, preferably under pressure. One form of the apparatus indicated by Kayser for this purpose is diagrammatically represented by Fig. 11.

Here A is a closed horizontal cylindrical vessel in which is a paddle wheel, D, made up of blades carrying wire gauze. The paddle wheel is rotated by a driving gear at B. In the upper part of the tank is an inlet for charging oil and presumably also catalyst; the oil is admitted to the tank in an amount sufficient to fill to perhaps one-fourth or one-fifth the entire capacity. Hydrogen is admitted at H and passes by the three-way cock, I, to the compression pump, J, going from there to the treating receptacle. At the opposite end of the tank is an exhaust pipe, L, carrying a blow-off valve, M, for the purpose of venting the unabsorbed hydrogen. The temperature of treatment is stated to be about 150 to 160 C. Although the claims call for the use of hydrogen under pressure, no working pressures are specified.

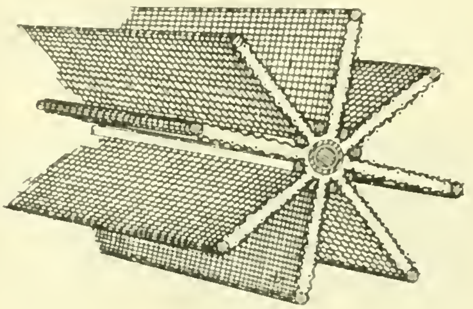

FIG. 12.

Fig. 12 shows diagrammatically one form of construction of the screen-covered paddle wheel used by Kayser.

In another (U.S. Pat. 1,008,474 of Nov. 14, 1911; this J., 1911, 1461) Kayser claims the use of an inert pulverulent material such as kieselguhr as a carrier for the nickel catalyst, he apparently having found that hydrogenation is more rapid or complete when an inert pulverulent carrier is used; and he claims the process of hydrogenating oil involving agitation of a metallized inert pulverulent carrier with a fatty oil in the presence of hydrogen. It is commonly understood that the Kayser process is in operation on the large scale in this country.

Two patents, relating to the spraying of oil into a chamber containing compressed hydrogen, have attracted some attention abroad. One of these is Eng. Pat. 7726 of 1910 (this J., 1910, 1022) to Testrup and the other is to Wilbuschewitch (Fr. Pat. 426,343 of 1910; this J., 1911, 966) which finds its counterpart in U.S. Pat. 1,024,758 of April 30, 1912.

Fig. 13 shows the elements of the Testrup process. Oil and catalyst are pumped through the pipe, O, into the tank, A, and hydrogen is admitted by the pipe, H, to furnish a gas pressure of say 15 atmospheres. The tubes, B, are heated by steam and the stirrer, C, circulates the oil and catalyst in the tank, A, until the oil has become heated and, presumably, somewhat hydrogenated. The oil is allowed to pass into the adjacent tank, E, entering this tank by the spray nozzle, F. Hydrogen gas is admitted to the tank, E, from the tank, A, so as to afford a pressure of, say, 12 atmospheres in the tank, E. A series of tanks may be arranged with a constantly decreasing pressure so that the differential pressure enables the spraying of the oil from tank to tank. Testrup states that spraying the material ten or fifteen times is sufficient to bring an oil of an iodine number of 110 down to an iodine number of 50.

As catalyst Testrup recommends finely-divided palladium or preferably nickel, the latter being two to three per cent. by weight of the oil. As a treating temperature 160° to 170° C. is mentioned.

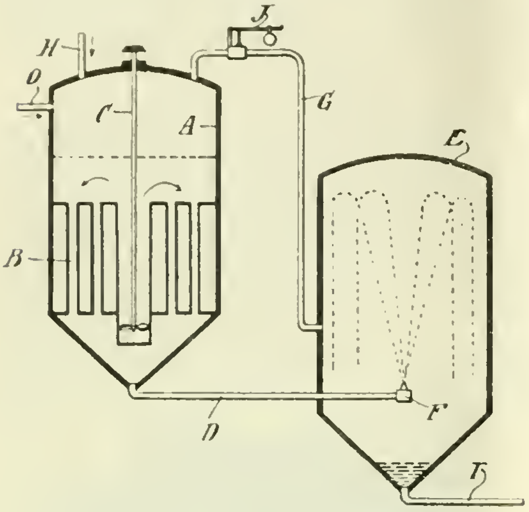

Fig. 13.

The Wilbuschewitsch patent itself details a rather complicated system, and Fig. 14 shows only the essential features of the treating apparatus. Several tanks or autoclaves are connected as shown at A and A¹, oil entering the top of the tank, A, by the pipe, O, to form a spray which in descending meets an upward current of hydrogen entering by the pipe, H. The oil is drawn off through the pipe, O¹, and sprayed into the tank, A¹. This time it meets a current of hydrogen represented by the excess of hydrogen coming from the tank, A. The treated oil is drawn off and may be centrifuged to remove the catalyst. A pressure of nine atmospheres is recommended and the pressures may be varied in the different tanks.

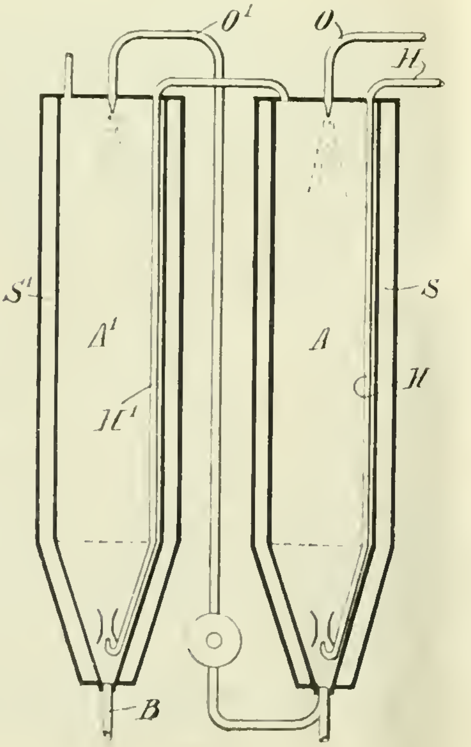

Fig. 14.

Of the Wilbuschewitsch process Goldschmidt (Chem.-Zeit., 1912, 945) states that the high hydrogen pressures employed enable the reaction to take place quickly at temperatures between 100 and 160° C., so that the fat is not likely to be injured by the temperature to which it is subjected. It should be stated that several years previous to the date of the Wilbuschewitch patent, Ipatiew had noted and carefully studied the accelerating effect of increased pressure.

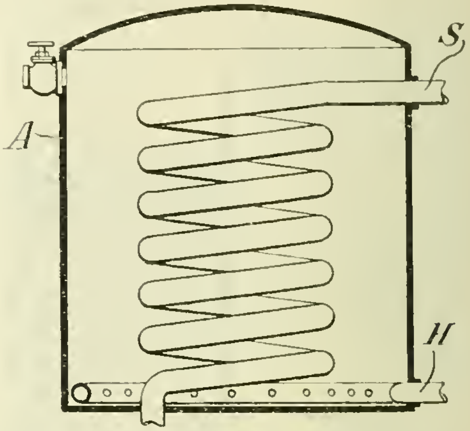

Fig. 15.

Bedford and Williams have brought out an interesting process represented by Eng. Pat. 29,612 of 1910 and U.S. Pat. 1,026,339 of May 14, 1912 (this J., 1912, 398). Fig. 15 shows the apparatus indicated for carrying out this process. Oil is placed in the receptacle, A, which is heated by a steam coil, S. Metallic oxide catalyst is added, about 1 per cent. being recommended, and hydrogen and oxygen or air is introduced by the pipe, H. As a catalyst nickel oxide (previously used by Ipatiew) is recommended, and instead of the customary hydrogenating temperature of 150° to 170° C., a temperature of about 250° C. is employed. While hydrogen alone may be used for the purpose, the inventors recommend and claim treatment of the oil with a mixture of hydrogen and oxygen to form hydroxy-fatty acids or their glycerides.

Shukoff (Ger. Pat. 241,823 of Jan. 18, 1910) claims the process of hydrogenating oils by means of nickel derived from the decomposition of nickel carbonyl. Nickel carbonyl may be obtained from reduced metallic nickel by passing carbon monoxide over it at a low temperature. Nickel carbonyl is soluble in oil and is very readily taken up by gases. On heating to a temperature of 200° C. or so the carbonyl is decomposed setting

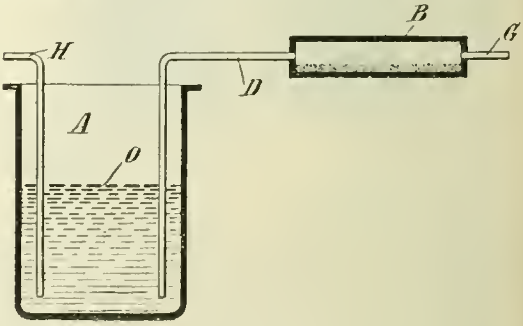

Fig. 16.

free, in a nascent state, metallic nickel which acts as a catalyst. Shukoff makes use of this reaction of nickel carbonyl by the method indicated by Fig. 16. Carbon monoxide is passed by the pipe, G, into the tube, B, containing finely divided nickel and the nickel carbonyl formed is conducted to the oil, O, which is heated to about 180° C. After sufficient nickel catalyst has formed in the oil, the carbon monoxide stream is cut off, the temperature raised to 220° or 240° C. and hydrogen gas introduced by the pipe, H, to bring about hydrogenation.

Day has taken out U.S. Patent No. 1,004,632 of Oct. 3, 1911 (this J., 1911, 1244) supplementing his earlier patent on the treatment of hydrocarbon oils with hydrogen. In the present instance tubes packed with catalyst are placed in an oil still in such a manner that vapours from the oil may pass through the catalyst tube in conjunction with hydrogen while being super-heated by exterior contact of the tubes with boiling oil.

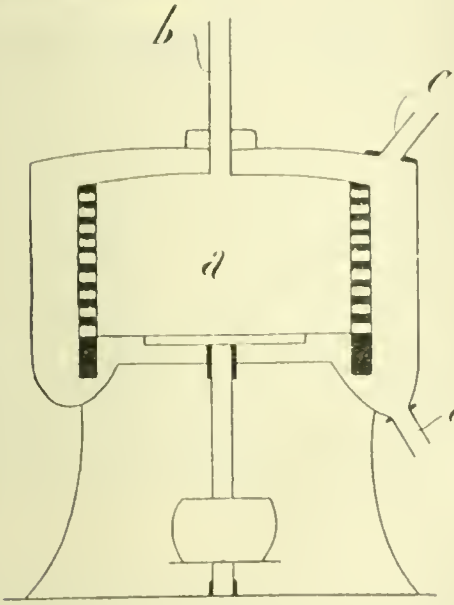

FIG. 17.

An English Patent (23,977 of 1909; this J., 1910, 1366) to Phillips and Bulteel claims to convert mineral oils into oils of lower specific gravity by heating with hydrogen in the presence of nickel or other catalytic agents. The patentees state that a mixture of oil, gas, and catalyst may be blown into a heated cylinder and the jet given a gyratory motion either by means of a nozzle revolving about its axis, or by injecting the mixture tangentially to the periphery. In the latter case they state that the cylinder may have an axial core.

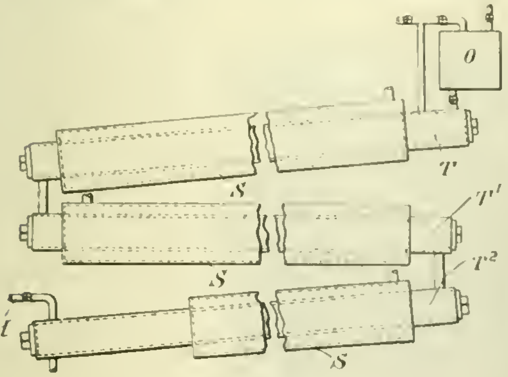

FIG. 18.

The firm of H. Schlinck und Co., of Hamburg (Eng. Pat. 8117 of 1911; this J., 1911, 1322) hydrogenate oil by passage through a centrifuge, the drum of which carries a porous lining of palladium catalyst which offers a frictional resistance to the passage of the oil. Fig. 17 shows a centrifugal drum, *a*, which is closed at the top and can be heated. Oil and hydrogen are introduced through the pipe, *b*. Openings are provided in the walls of the drum in which is placed rough or porous material covered with precipitated palladium. Several drums may be arranged in series through which the oil may be caused to progress until sufficiently hydrogenated.

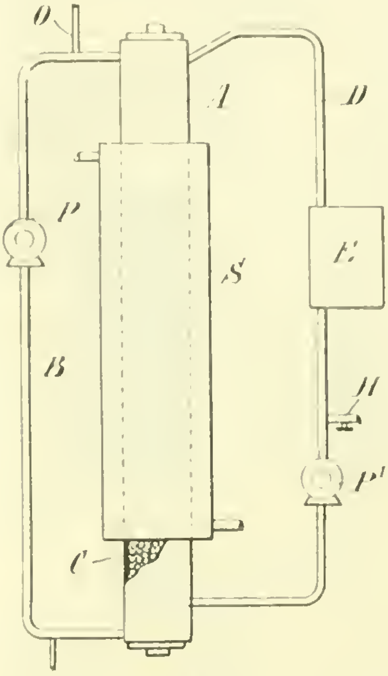

FIG. 19.

Ellis (U.S. Pat. 1,026,156 of May 14, 1912) uses a stationary catalyst, filling tubes with the material in granular form and allowing oil to flow through the tubes while passing hydrogen in an opposite direction. Fig. 18 shows a three-section apparatus with the catalyst tubes, T, T¹, and T², heated by the jackets, S, S. Oil from tank, O, flows through the apparatus while hydrogen admitted by the pipe, H, passes through in an opposite direction. The arrangement permits of differential heating so that, for example, the oil may be heated to a temperature corresponding to its particular degree of hydrogenation at any given point, enabling a hydrogenated product free from burnt odour to be obtained.

Fig. 19 shows a vertical form of apparatus, (from preceding patent) the catalyst being shown at C in the tube, A. Oil is introduced by the pipe, O, and passes into the tube or cylinder, A. The pump, P, causes oil to circulate from the top to the bottom of the apparatus through the pipe, B. Hydrogen gas admitted at H is pumped into the bottom of the cylinder, A, and the excess is withdrawn at the top by the pipe, D, passing through the drier, E, and back into the treating cylinder. Oil may be continuously fed through the pipe, O, in the upper part and the treated product withdrawn at the same rate at the lower part of the apparatus.

In Ellis' U.S. Pat. 1,040,531, of October 8th, 1912 (this J., 1912, 1085), the catalyst is placed in trays or baskets as shown by Fig. 20 at C. The oil travels in a cyclic path downwards through several layers of catalyst, and hydrogen gas passes in an opposite direction. Separation of the catalyst in layers in this manner enables the hydrogen to pass more uniformly through the catalyst bed, Otherwise if the catalyst forms a bed of considerable depth and width, the gas in taking the path of least resistance is liable not to come in contact with some parts of the bed.

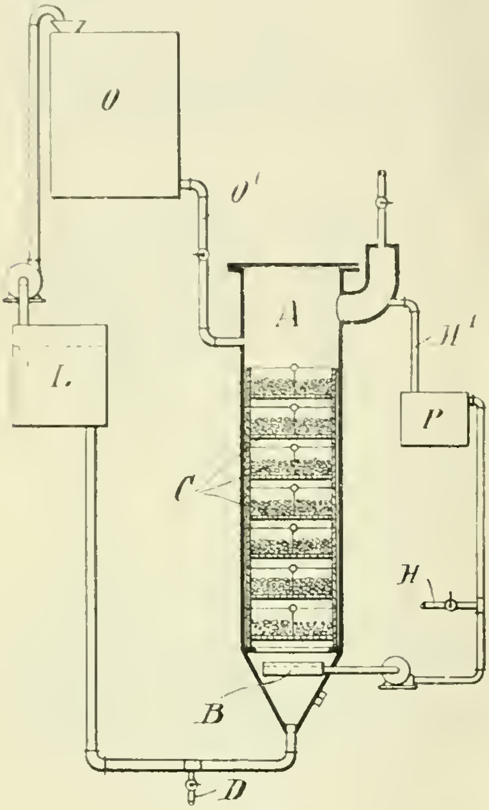

FIG. 20.

The activity of a properly made catalyst is often surprising. In the case of a stationary catalyst we have noted instances of hydrogenation where oil is converted into a hardened fat by momentary contact with the catalyst.

Fig. 21 shows a photograph of a small laboratory apparatus for testing catalysts, consisting of an inclined tube containing catalyst and carried in a heating jacket. Oil is admitted at the right and hydrogen at the left hand end.

Recently, when using a new type of catalyst, the author started to pass oil through the catalyst tube and found hydrogen to be absorbed so vigorously by the oil that instead of passing off through an oil seal at the lower end of the inclined catalyst tube, the oil, curiously enough, was impelled against the strong current of hydrogen passing to the end of the horizontal tube, and there solidifying, actually being well hydrogenated from its momentary passage through the apparatus. A peculiar feature was the advance of the oil from the tube containing catalyst far into the tube through which only the hydrogen was entering the apparatus. The travel of the oil along the hydrogen supply pipe in opposition to a rapid current of hydrogen, indicates the possibility of hydrogenating in a very short time, provided a catalyst of a high degree of activity is secured.

On the other hand, some catalysts of the nickel and cobalt type, when first brought into contact with oil and hydrogen, show for a time a marked degree of sluggishness, but after a period, usually ranging from one to three hours, their activity rather suddenly augments and thenceforth remains apparent for a long period.

Ellis (U.S. Pat. 1,040,532 of October 8th, 1912 ; this J., 1912, 1085) effects a constant circulation and contact of the hydrogen gas in accordance with the method shown by Fig. 22. The tank, A, contains a body of oil, O, the space above the oil being filled with hydrogen under any suitable pressure. The tank is heated by the jacket, S. A pump, P, withdraws the hydrogen from the upper part of the tank and impels it through the pipe, D, into the lower part of the tank. Catalyst is added to the oil when the proper temperature is reached and the constant bubbling of a stream of hydrogen through the oil causes intimate contact between the reacting elements. When the operation is completed, the porous plate fastened to a movable stem in the upper part of the tank, may be depressed to fit into the bottom of the conical base, so that when the oil is withdrawn, a good portion of the catalyst remains without exposure to the air and may be used with, perhaps, a small addition of fresh catalyst for the treatment of a succeeding charge of oil.

In U.S. Pat. 1,043,912, Ellis hydrogenates oil in the autoclave, A (Fig. 23). The pump, P, circulates hydrogen through the oil. The treated product is run into the deodoriser, D, where it is treated with superheated steam under diminished atmospheric pressure until the oil is freed from noxious gases or vapours. While the deodorisation of ordinary cotton-seed oil, for example, requires a temperature from 200° to 300° C. and a vacuum down to one or two inches mercury, the deodorisation of the hydrogenated cotton-seed oil does not necessarily require as high a temperature and the vacuum "pulled" may be considerably less.

Contrary to the opinion entertained by many, it does not appear needful to agitate the catalyst primarily for the purpose of contacting it with hydrogen. Once the catalyst is wetted with the oil there can no longer be any actual contact with the gas. Hydrogen reaches the catalyst only through solution in the oil. The forces of adhesion effectually seal the catalyst surface from the gas, and no measure of agitation by ordinary mixing apparatus will

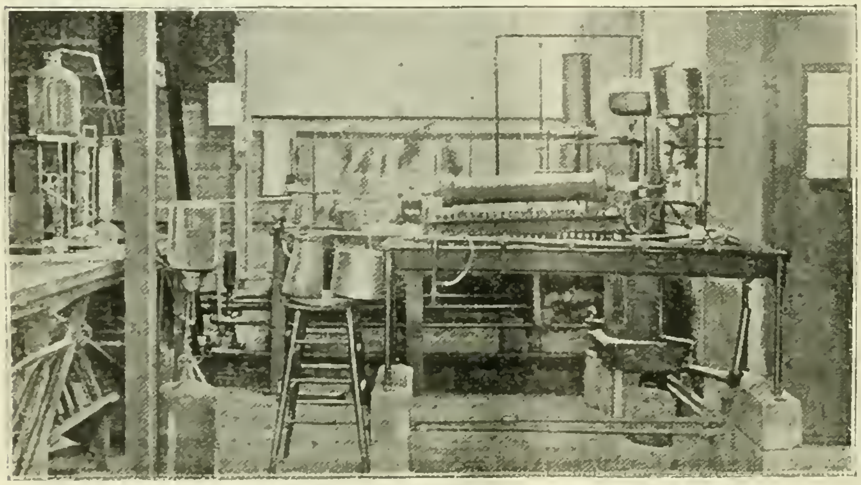

FIG. 21.

dislodge the film of oil. Of course agitation secures the rapid replacement of more saturated by less saturated portions of the oil, but this replacement under certain conditions may proceed just as rapidly, simply by diffusion.

Catalysts.

Catalysts—those bodies which modify reaction velocity without stoichiometrical participation in the reaction—are destined to find another important industrial application in the hardening of oils.

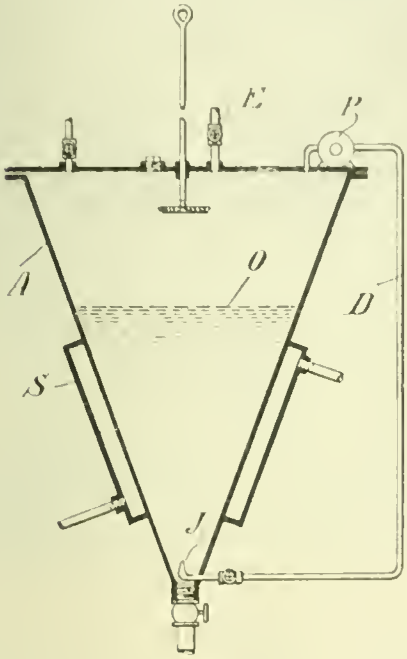

Fig. 22.

The previous illustrations show the variety of methods proposed for mingling oil, hydrogen, and catalyst. Among these are several of excellent efficiency. But, after all, the virility, so to speak, of the process depends on the catalyst. With a powerful catalyst the hydrogenation of oils becomes a rapid, simple procedure almost, it sometimes seems, independent of the nature of the hydrogenating apparatus.

Catalysts recognised as useful for the purpose are nickel and palladium, although platinum, copper, iron, and other metals have been used to some extent. Nickel oxide, as stated, has been employed by Bedford and Ipatiew. Wimmer recommends organic salts of nickel such as the formate, acetate, or lactate.

As nickel is probably the most important of these catalysts, in view of its efficiency and relatively low cost, it will be first considered.

The preparation of an effective nickel catalyst requires considerable care. The oxide or hydroxide of nickel is first obtained by ignition of nickel nitrate or precipitation of nickel hydroxide from say a nickel sulphate solution by the addition of an alkali. Obtained in this or in any other suitable manner, the next step is the reduction to metallic nickel. For this purpose the nickel is placed in a receptacle which may be heated controllably and hydrogen gas is passed over the mass at a temperature ranging from 250° to 500° C. or so, until water is no longer evolved.

The most sensitive catalysts are obtained by reduction at the lowest possible temperatures. Nickel begins to reduce below 220° C., but at 270° C. the reduction is not complete even after long duration of exposure to hydrogen. A temperature of 300° to 325° C. gives fairly complete reduction and is a satisfactory working temperature. The lower the temperature at which the nickel is reduced, the more sensitive it is to various external influences, hence the preparation of this catalyst should be conducted not only with respect to degree of activity, but also with respect to longevity.

Nickel is easily poisoned by chlorine and by sulphur in the sulphide form. We have had no unfavourable results from the use of hydrogen passed through a wash bottle containing concentrated sulphuric acid and then conveyed directly to the catalyst and oil. Traces of the acid were entrained by the gas, but the catalyst remained in active condition during about two weeks' usage under these conditions. Copper is much less sensitive to poisons than nickel, but, on the other hand, it is much less active.

Catalyst made from the oxide without supporting material, weight for weight, is hardly as efficient as when the active surface is increased by the use of a carrier. Hence we find many proposals for the production of catalysts with a great diversity of carriers, ranging from pumice stone and kieselguhr to charcoal and sawdust.

After nickel has been reduced as described above, it should be kept out of contact with air, as it is extremely pyrophoric and quickly loses its efficiency on exposure to the air. Consequently, when treating oil with such a catalyst, it is advisable to free the treating apparatus from air by flushing with hydrogen, also it is well to heat the oil and bubble hydrogen through it for a short time prior to the introduction of the catalyst.

Several methods of producing catalysts have been the subject of patents as, for example, that to Crosfield (Eng. Pat. 30,282 of 1910; this J., 1911, 1461) in accordance with which kieselguhr, asbestos, and the like is impregnated with a solution of nickel sulphate and the impregnated material treated with alkali hydroxide to precipitate nickel hydroxide on the porous material. The product is then well washed, dried, and reduced. If kieselguhr is used the powder should contain about 30 per cent. of metallic nickel.

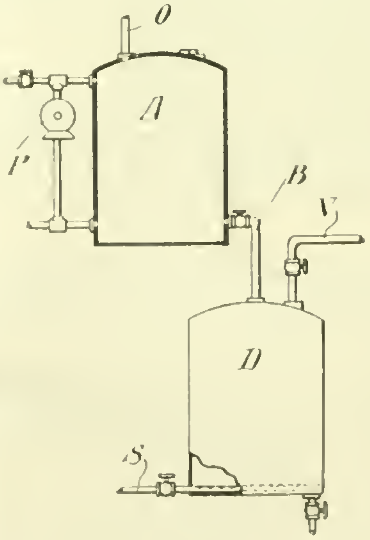

Fig. 23.

A similar procedure is the subject of a patent by Kayser (U.S. Pat. 1,004,034 of Sept 26, 1911; this J., 1911, 1266). In this case, however, the nickel sulphate or other nickel salt in concentrated solution may be used in an amount to saturate kieselguhr while leaving it in an apparently dry condition, when it is incorporated with a molecular proportion of powdered sodium carbonate and the mixture thrown into boiling water, dried, and reduced.

Seeking to overcome the disadvantage of ready oxidation in the air possessed by normal catalytic nickel, Kayser (U.S. Pat. 1,001,279 of Aug. 22, 1911; this J., 1911, 1219) reduces the nickel oxide or equivalent material at a temperature of 500° to 600° C. and then passes through the reduced material a brisk current of carbon dioxide until the escaping gas proves no longer inflammable. By this method it is claimed that a catalyst is secured which will remain perfectly cool on exposure to the air, and even may be exposed for days without losing any of its catalytic energy.

Wilbuschewitsch (U.S. Pat. 1,016,864 and Fr. Pat. 426,343; this J., 1911, 966) proposes to secure more rapid reduction of catalyst by agitating it in the presence of hydrogen in a heated rotary drum. The temperature during the treatment is stated to be 500° C. The same inventor (1,022,347 of April 2, 1912 and Fr. Pat. 426,343; this J., 1911, 966) has patented a process of regenerating spent catalysts of the nickel type involving extraction with benzine, treating with alkali solution, acidifying, treating with sodium carbonate solution and reducing.

As a catalyst in this field, palladium has received considerable study, for in spite of high first cost, its pronounced effectiveness, together with its ability to effect hydrogenation at relatively low temperatures, makes it particularly attractive.

Many years ago, Fokin (Chem.-Zeit., 1906, 758; 1907, 324; see this J., 1906, 935; 1907, 1149) stated he regarded palladium as the most powerful of all catalysts, he having found that reduction takes place readily at 80° to 90° C., while with nickel a temperature of 180° to 200° C. was necessary for practical hydrogenation. Fokin's experiments at that time were concerned with electrolytic reduction. By this means he reduced linseed, wood, castor, and cod liver oil. He found while palladium-black would reduce oleic acid completely to stearic acid, that platinum-black under the same conditions gave only 24 per cent. of stearic acid.

Paal (Ber., **41**, 2282; this J., 1908, 864) worked with colloidal palladium preparations and hydrogenated castor, olive, fish oil, and animal fats. He found that sesamé oil after hydrogenation showed the Baudoin reaction only very faintly, while cotton-seed oil no longer responded to the Becchi and Halphen reaction.* Skita has worked with palladium incorporated with a protective colloid.

Karl (Inaugural Dissertation, Erlangen, 1911) has studied with considerable care and in quantitative way, the action of palladium supported on various bodies. He found that palladium precipitated on finely divided nickel or magnesium proved effective catalytically, while, precipitated on lead, aluminium, iron, or zinc, little or no hydrogenation was effected, owing to the anti-catalytic action of these metals. While metallic zinc is anti-catalytic, zinc oxide and carbonate have no such effect. In these investigations Karl worked principally with fish, cotton, and castor oil and oleic acid.

Hydrogen.

One of the problems in the hydrogenation field is that of a cheap supply of pure hydrogen. The demand for hydrogen in various directions has increased of late and undoubtedly this will lead to improvement in the manufacture of the gas.

The two methods now most favoured in the hydrogenation of oils are the iron sponge steam process and the electrolytic method. For very large plants the iron sponge steam process is preferred, but it is relatively complicated and scarcely to be recommended for plants calling for 1,000 cubic feet of hydrogen, or less, per hour.

Lane's process is based upon the passage of steam over reduced iron, and involves the generation of water gas to reduce and heat the iron oxide employed. For each cubic foot of hydrogen produced, about three cubic feet of water gas are required. The water gas has to be freed from sulphur, as otherwise the hydrogen would take up sulphur from the iron sponge and poison the catalyst. This requires the purification of three volumes of water gas, from which as stated a yield of only one volume of hydrogen is obtained. The cost of hydrogen made in this manner is about one dollar per 1,000 cubic feet. The process is now installed in the works of a large soap manufacturer in England. Fig. 24 shows the Lane process as installed at a plant near Paris. A plant having a capacity of about 5,000 cubic feet per hour, costs between $40,000.00 and $50,000.00, erected.

In the electrolysis of brine to make caustic soda and bleach there exists a by-product of hydrogen sufficient in amount to treat an enormous quantity of oil. To-day a good portion of this hydrogen is allowed to waste. Eventually it may be used, to some extent at least, for hydrogenation purposes.

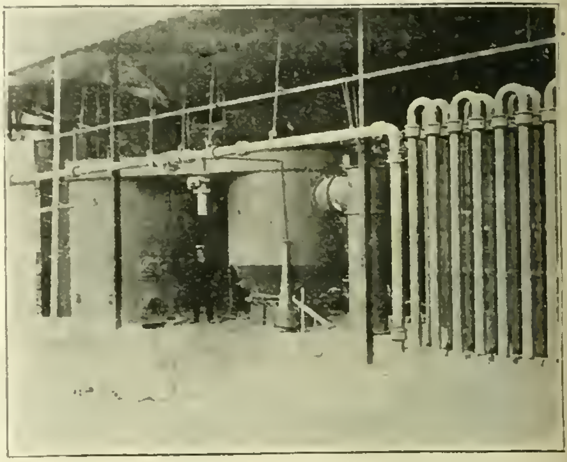

Fig. 24.

Generators for the production of hydrogen and oxygen by the electrolysis of water are furnished by the International Oxygen Co. A generator of the type shown by Fig. 25, has an output of 130 cubic feet of hydrogen and 65 cubic feet of oxygen, per day, giving about 7 cubic feet of hydrogen per kilowatt hour. At two cents a kilowatt the hydrogen costs about one-fourth of a cent per cubic foot, if one disregards the value of the evolved oxygen. The electrolytic process is simple and clean and is to be recommended, especially for plants of moderate requirements. Fig. 26 shows a battery of generators used for the production of oxygen and hydrogen.

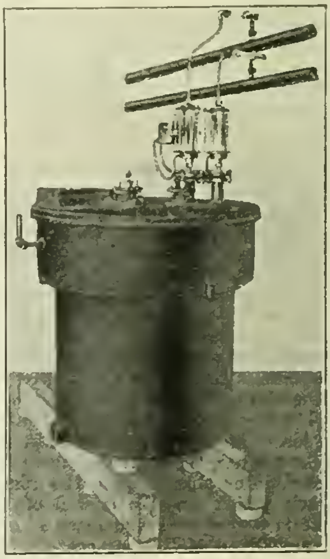

Fig. 25.

We have for some time used hydrogen made in this way, and find it suitable for hydrogenation purposes without resorting to any extensive purification.

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* See also U.S. Pat. 1,023,753 of April 16, 1912, and Fr. Pat. 434,927; this J., 1912, 346.

In Europe, electrolytic cells capable of furnishing hydrogen at high pressure are obtainable, but are very costly.

Very promising methods for the production of hydrogen are: (1) The removal of the carbon monoxide and hydrocarbon from water gas by liquefaction, (2) decomposition of petroleum at high temperatures, and (3) the passage of water gas and steam at a temperature of 500° C. over lime containing an iron catalyst.

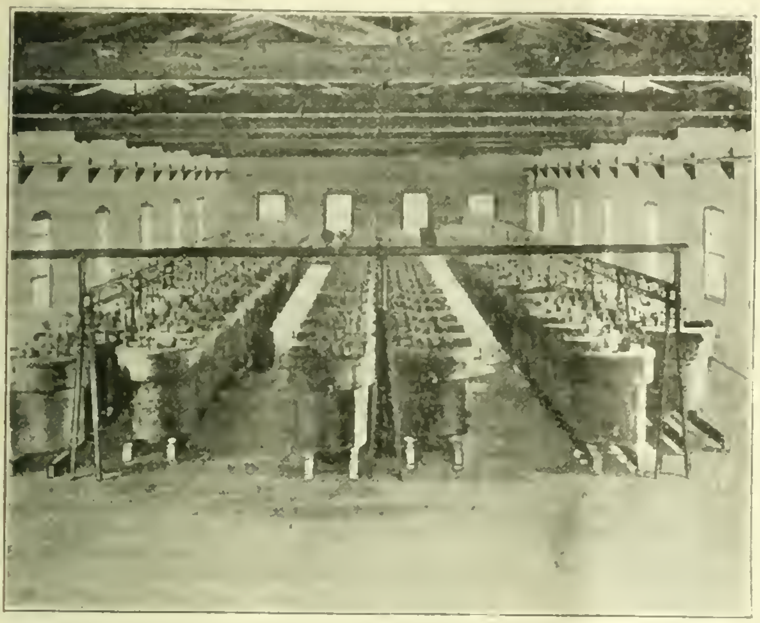


FIG. 26.

One of the difficulties met with in the handling of hydrogen has been the loss by leakage of the gas. Under pressure and at a temperature of 150° or 200° C. hydrogen is surprisingly penetrating. A treating tank having an oil capacity of about one ton was tested to 150 lb. air pressure and found to be tight, but when hydrogen was introduced at 60 lb. pressure, the leakage was tremendous.

A stuffing box tested at 120 lb. steam pressure emulated a whistle, with hydrogen at one-half the steam pressure. Autoclaves with welded seams are desirable for high pressure and high temperature work. Moving parts should be avoided as far as possible.

Uses of Hydrogenated Oils.

The ability to prepare from ordinary liquid fatty oils a fatty body of almost any desired degree of consistency, renders hydrogenation especially attractive in the production of edible fats and soap making materials. These are, undoubtedly, two of the most important applications, although hydrogenated oils are likely to have rather wide use in the arts. In the manufacture of lubricants, for example, the hydrogenated fats may be used to advantage.

Uses of hydrogenated oils in the soap industry.—By hydrogenation, oils which formerly made soaps only of soft consistency, now yield the more valuable hard soaps. This has led to a very rapid development of the art with respect to the production of soap making fats. In particular fish and whale oils have been made use of, because these oils may be completely deodorized by the addition of hydrogen.

According to Tsujimoto, the odour of fish oil is due almost entirely to a fatty constituent and not to so-called impurities. This fatty constituent is clupanodonic acid, having the formula, $C_{18}H_{28}O_2$, which, therefore, by the addition of 8 hydrogen atoms becomes stearic acid. When hydrogenated down to an iodine number of about 50, fish oil has the consistency of hard tallow and the odour of fish oil is wholly absent. Even the fishy taste is then scarcely in evidence.

For soap making this product is satisfactory as it complies with the test for a deodorised fish oil suitable for soap making in that the odour of the original oil is not apparent when laundried goods on which such soaps are used are ironed. If, however, the hydrogenation is not carried on to a point where the iodine number is approximately 50 or less, there is some danger that the fishy odour will become apparent during the ironing operation.

Crosfield and Sons (Eng. Pat. 13,042 of 1907; Fr. Pat. 378,528; this J., 1907, 1150) have patented in some countries the use of hydrogenated oil in the manufacture of soaps. They claim the hardened or hydrogenated fats have the advantage that a weaker brine suffices to separate the soap from the glycerin; further that the soap produced from such hydrogenated fats is exceedingly hard: for instance, soap made from hydrogenated cotton-seed oil is about 12 times as hard as that made from untreated cotton-seed oil. This, of course, enables the admixture of a larger proportion of rosin, which naturally would be looked upon as a decided advantage.

In contrast to this, a German writer (Seifensieder Zeit., **39**, 660) states that the hardened oils form soaps which are too hard to have good lathering properties. Since soaps are made almost invariably of mixtures of fats, it is under the control of soap makers to use such an amount of hydrogenated fat as would give the requisite degree of hardness, so the foregoing criticism seems to be without great weight.

It suffices to state that hydrogenated fats for soap making purposes are being made abroad by a number of firms and are giving good satisfaction. The Germania works at Emmerich, Germany, offers on the market three grades of hardened oil.

In this country satisfactory results are being obtained commercially in the manufacture and use of hydrogenated oils in soap making. Several plants are operating on the large scale.

Edible hydrogenated oils.—Since the addition of less than 1 per cent. of hydrogen suffices to convert cotton-seed oil or other vegetable oils into a fatty body of the consistency of lard, it follows that manufacturers of ordinary lard compound (that is to say a mixture of 80 to 85 per cent. of refined cotton-seed oil and 15 to 20 per cent. of oleostearin) have promptly turned their attention to the production of compound by a self-thickened cotton-seed oil. The high cost of oleostearin makes the method a very attractive one, and the hydrogenated product from cotton-seed oil has the advantage, if properly made, of being very stable in character.

I believe, however, that for best results it is desirable to hydrogenate the entire body of oil to a fatty acid titre of 36 or 38, or whatever consistency may be required, rather than to take 20 per cent. or so of the oil and harden to a titre of 52 or over and incorporate with unhydrogenated oil.

It appears that the hydrogenation of the total body of the oil by transforming the linoleic and linolenic compounds and the like, has a tendency to improve the oil as regards its edibility and certainly gives it greater stability.

Edibility of hydrogenated oils.—It seems to be generally accepted by those who have investigated the matter carefully, that the hydrogenated oils have as desirable a degree of edibility as the oils from which they are derived.

It is even claimed that by destroying traces of certain unsaturated bodies thought to be slightly toxic in nature, hydrogenation renders the oil better adapted for human consumption.

A question of serious import has, however, arisen in the use of nickel catalyst. Apart from the fact that by careless filtration traces of the suspended nickel may be present in the product, there is the more serious problem of the actual solution of nickel to form nickel soaps which cannot be easily removed.

According to Bömer (Chem. Rev. Fett- und Harz.-Ind., 1912, 221; this J., 1912., 996) nickel is dissolved by oils during the hydrogenation treatment only when the oil contains free fatty acid in considerable amounts. A sample of hydrogenated sesamé oil containing 2·5 per cent. of fatty acid was found to contain 0·01 per cent. ash with 0·006 per cent. nickel oxide. Whale oil containing 0·6 per cent. fatty acid, yielded 0·006 per cent. ash and 0·0045 per cent. nickel oxide. Such an amount of nickel presumably would not be tolerated in a product intended for edible purposes.

The Bureau of Animal Industry of the Department of Agriculture is now investigating the matter, and I am told intend to determine the relative degree of toxicity of the traces of nickel in the form existing in improperly made hydrogenated oil. I may add that, so far as I can learn, the Department looks kindly upon the advent of hydrogenated oil, in view of the likelihood that it is destined to prove a very acceptable substitute for higher priced animal fats, and does not propose, according to my understanding, to venture any ruling until the matter has had protracted scrutiny.

It is my belief that the use of nickel in the form of an oxide, or the use of nickel catalyst containing more than traces of oxide, is undesirable from the point of view of solubility in oil. Nickel in the metallic state cannot combine with a fatty acid to produce a soap, except with the elimination of hydrogen; and in the presence of an atmosphere wholly of hydrogen such reaction would not be likely to take place, because of mass action. On the other hand, nickel in the form of oxide would yield water on combining with fatty acid which would be yielded practically into a vacuum as regards the vapour pressure of water.

Hence it seems to me that, in the manufacture of products intended for edible purposes, care should be taken to maintain conditions such that the catalyst, if of the nickel type, is preserved almost wholly in the metallic state. Also it is desirable not to force the reaction too rapidly, with the consequent danger of breaking down the carboxyl group and setting free water, which would react to produce fatty acid.

Finally, it may be stated, by partial saturation of glycerides, we have the possibility of preparing from triolein the oleodistearin or the dioleostearin. Dioleopalmitin would give either oleostearopalmitin or distearopalmitin. From triolein we may have the two isomeric oleodistearins—α- and β-oleodistearin as well as α- and β-dioleostearin. Which of these we may be able to produce controllably and which may prove best from the edible standpoint are problems for the future to solve.

Nottingham Section.

Meeting held at Nottingham on Wednesday, October 30th, 1912.

MR. S. R. TROTMAN IN THE CHAIR.

THE MEASUREMENT OF THE ABSORPTION OF OXYGEN BY SEWAGE EFFLUENTS.

BY HENRY J. S. SAND AND SAMUEL R. TROTMAN.

In the fifth report of the Commission on Treating and Disposing of Sewage, Appendix 6, Letts and Adeney have recommended the adoption of a method of examination which is based upon the rate at which oxygen from the air is absorbed by a sample of the effluent, laying particularly great stress on the "*rate*" of aerobic fermentation. The apparatus employed by them is described on page 438. The authors having very carefully tested this process, have come to the conclusion that the *rate* of absorption is incapable of accurate measurement in the manner described, since it is almost impossible to control the rate of agitation and therefore what one really measures is the rate of agitation and not the rate of absorption. If the rate is required either the rate of agitation must be very accurately controlled or the liquid must be exposed in a thin layer without agitation. Even in the first case the depth of the column of effluent exercises an important bearing upon its breaking up by agitation and thus at best the process can only be an arbitrary one.

The reaction undoubtedly takes place essentially between the organic matter of the sewage effluent—which is probably colloidal in nature—and the dissolved oxygen. The latter is removed with comparatively great rapidity, and the velocity of the reaction thus simply depends on the rate at which this oxygen is replaced in the liquid. In the layer in immediate contact with the air, replacement will take place comparatively rapidly, but unless agitation of the liquid is resorted to, or vigorous convection currents take place, the interior of the liquid is dependent for the replacement of its oxygen on the process of diffusion alone. This latter process is so slow in its effect at any appreciable distance from the surface that it cannot cope with chemical changes taking place with a measureable velocity. The rate at which oxygen is absorbed thus depends, for a moderate degree of agitation, simply on the intensity of this agitation. It cannot be stated *a priori* whether it will be at all practically possible to attain so vigorous a rate of shaking or stirring as would maintain the liquid saturated with oxygen. If this were possible, then the rate at which oxygen disappears would be a true measure of the velocity of the chemical reaction.

Adeney so far as we can see does not appear to regard these points as of importance. Thus he nowhere mentions that the rate of absorption is affected by the rate of agitation and in one place even suggests an occasional shaking by hand as being sufficient in the case of a fairly good effluent.

The apparatus as supplied by makers in accordance with Adeney's specification is certainly not very successful. Adeney apparently attaches great importance to the elimination from his results of slight variations which might be due to the absorption of air by the water as such, as distinct from the organic matter contained in it, and also to the automatic elimination of the effect of variations of temperature and pressure.

To do this he employs an arrangement of two bottles fitted with a large number of tubes and taps, and he also makes use of distilled water which would have to be carefully saturated with air before the experiment if it is not to introduce new errors, a point to which attention is not drawn in the report. As a result the apparatus is unsuitable for putting in the shaking machine and without shaking no determination we have carried out in this apparatus has ever reached completion and no two experiments could be got to agree. That the "rate" of absorption measured, does not bear any direct relation to the "chemical" absorbing power of the effluent, but is simply a measure of fortuitous convection currents in the liquid of the apparatus, has already been stated.

Being unable to obtain any information about the process beyond that given in the report, we tried the following much simpler method: The sample of effluent was shaken in a shaking-machine for several hours in a bottle of about 300 c.c. capacity which was closed by a rubber cork holding a tap. The amount of oxygen absorbed was subsequently measured by connecting the bottle with a nitrometer of specially narrow bore graduated to tenths of a c.c. which contained water.

We found that in this way, provided the "rate" be neglected and only the total amount of oxygen absorbed be measured, and the temperature be maintained constant, or carefully readjusted before measurement, reliable results could be obtained. We subsequently found that Adeney had himself originally started on this method but seems to have subsequently discarded it.

It is not therefore necessary to say more than that we consider that while this first idea, ridded of the incubus of "rate of absorption," contained the essentials of a useful process his subsequent modifications have made the method progressively more unreliable.

Obituary.

GEORGE B. NEAVE.

Members will regret to learn of the death of Dr. G. B. Neave, Hon. Secretary of the Scottish Section and Senior Lecturer in the Chemistry Department of the Royal Technical College, Glasgow, which took place on November 8th, following upon a serious operation. G. B. Neave was born in Dundee in 1876, and was educated at the High School there and at St. Andrews University. In 1898 he graduated M.A., B.Sc., and in the same year was awarded the Berry Scholarship in Chemistry. In the following year he worked at a research in organic chemistry under Professor Purdie, F.R.S., and subsequently proceeded to the University of Aachen, in order to make a special study of electro-chemistry under Professors Borchers and Classen and Dr. Danee1.

On returning from Germany Neave was engaged as private assistant to Professor Purdie, and in 1901 was appointed Lecturer and Demonstrator in Chemistry in the Glasgow and West of Scotland Technical College under Professor Henderson. He spent his leisure from college duties in making fresh researches, and in 1905 presented a thesis to the University of St. Andrews, for which he was awarded the degree of D.Sc. His investigations appeared in various chemical journals, and at the time of his death one or two of importance were almost completed.

EDWARD CHARLES SPURGE.

Edward Charles Spurge, general manager of the Ozone Vanillin Company of Niagara Falls, N.Y., died on November 6th, in the laboratory of that company, in consequence of inhaling fumes of hydrocyanic acid with which he was conducting some experiments.

Born in Witham, in Essex, he was a B.Sc. of the University of London, and a Fellow of the Institute of Chemistry. For several years he pursued research work in Germany, France, and Italy. He went to the United States in the summer of 1904 and settled at Niagara Falls.

Journal and Patent Literature.

Patent Specifications may be obtained by post by remitting as follows :—

English.—8*d.* each, to the Comptroller of the Patent Office, W. Temple Franks, Esq., Southampton Buildings, Chancery Lane, London, W.C.

United States.—1*s.* each, to the Secretary of the Society.

French.—1 fr. 05 c. each, as follows: Patents dated 1902 to 1907 inclusive, Belin et Cie, 56, Rue des Francs Bourgeois, Paris (3e.); Patents from 1908 to date, L'Imprimerie Nationale, 87, Rue Vieille du Temple, Paris.

German.—1 mark each (with full particulars) to Kaiserlich Patentamt, Berlin, Germany.

I.—GENERAL PLANT; MACHINERY.

Patents.

Gases and vapours; Apparatus for treating —— with liquids. C. H. Fowler and E. A. Medley, Liverpool. Eng. Pat. 23,864, Oct. 28, 1911.

In apparatus of the type described in Eng. Pats. 22,282 of 1902 and 27,391 of 1907 (this J., 1903, 1121; 1908, 1196), for treating gases with liquids, the liquid is sprayed by means of groups of discs mounted upon a vertical rotating shaft, the lower disc of each group being imperforate and the upper discs having central openings progressively increasing in size. Within the openings in the discs series of straight or helical vanes carried by the shaft are arranged. The liquid is fed to the uppermost group of discs, which spray it outwards upon the walls of the casing, where it is deposited and fed by radial channels to the centre of the group of discs next below. —H. H.

Washing gases or vapours; Method of —— and apparatus therefor. A. H. Lymn, London. Eng. Pat. 11,452, May 14, 1912.

In gas-washing apparatus of the "Feld" type, the fixed collecting cones have their lower diameter nearly equal to the diameter of the rotating or distributing device. The fixed cones are so formed, either by having serrations at their lower edges, or by being provided with guiding strips, that the film of liquid, which flows from them is very thin, and they are fixed at such a distance above the rotating distributing devices, that the gas passing upwards completely atomises the film of liquid, and throws it, in an atomised condition, on to the rotating distributing devices.—W. H. C.

Gases; Apparatus for cleaning, cooling, and washing ——. H. E. Theisen, Munich, Germany. U.S. Pat. 1,042,840, Oct. 29, 1912.

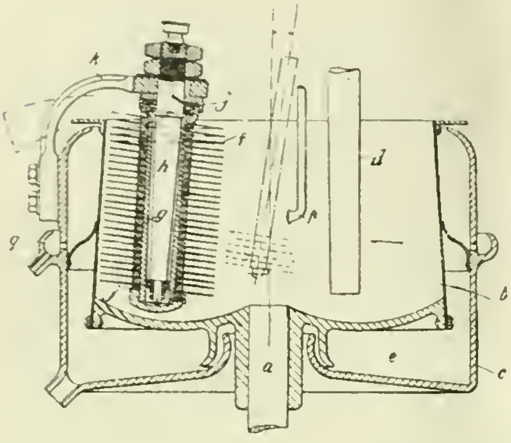
The apparatus is in the form of a flat cylindrical casing in the centre of which rotates a disc carrying blades projecting from both sides and having perforations near the points of attachment to the disc. Fixed baffles attached to the sides of the casing alternate with the blades. The gases enter, together with the washing spray of liquid, through a central opening at one side of the casing and leave at the opposite side. Any solid particles entering with the gas collect in pockets formed in the blades and are discharged from separate conduits in the periphery of the casing.—H. H.

Separation by the action of centrifugal force; Method of —— and apparatus therefor. W. J. Gee and The Hydraulic Separating and Grading Co., Ltd., London. Eng. Pat. 24,803, Nov. 7, 1911.

In a centrifugal separator for slimes and similar mixtures, the outer drum or casing is provided with narrow blades upon its inner surface and is rotated at about one-half of the speed of the inner rotary vanes. The particles of solid pass into the annular body of liquid rotating in contact with the casing and become deposited as a solid cake, which may be removed as described in Eng. Pat. 21,421 of 1909 (this J., 1910, 1239).—H. H.

Separators; Centrifugal ——. E. A. Sperry, New York. Eng. Pat. 24,783, Nov. 7, 1911.

The perforated basket, *b*, is mounted on and rotated by the shaft, *a*, and is surrounded by an outer casing, *c*. The mixture to be treated is fed into the basket through the pipe, *d*, and the solids are deposited on the inner surface of b, the liquid portion passing through into the lower portion, e, of the casing, from which it is finally discharged. A number of discs, f, are mounted on a sleeve, g, which is carried on ball bearings, j, by the shaft, h. The latter is carried by the adjustable bracket, k, from the outer casing, c. A number of these shafts are spaced around the basket; they are inclined to the vertical and as the basket revolves, the discs press against the solid deposit, and are rotated by friction with it on the shafts, h, cutting into the deposit and gradually elevating it to the upper edge of the basket, over which it is discharged. If it is desired to wash the deposit, washing liquid is introduced through the pipe, p, the washings collected separately in the gutter, q.—W. H. C.

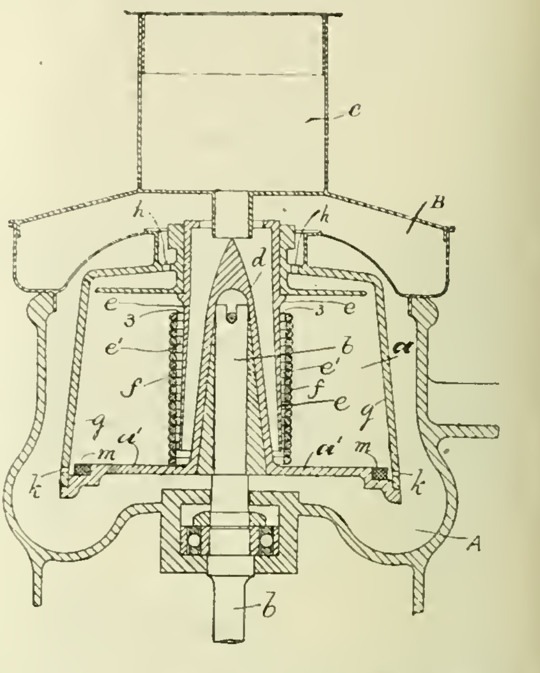


Separating from liquids, matters contained therein; Centrifugal apparatus for ——. Fawcett Preston and Co., Ltd., and A. McA. Lang, Liverpool. Eng. Pat. 2420, Jan. 30, 1912.

The mixture to be separated is introduced under pressure into a chamber, within which it is subjected to the centrifugal action of a rotating vertical perforated drum, carried on a hollow shaft. The solid particles are driven to the periphery of the chamber, in consequence of the centrifugal force, and enter a recess or chamber where they are not subjected to the centrifugal force, and have time to settle into a pipe, from which they are discharged through a rotating valve. The liquid passes into the interior of the basket, and is discharged through the hollow shaft. A scum-cock is provided in the upper part of the chamber. —W. H. C.

Separating solid matter from liquids; Centrifugal apparatus for ——. M. Coplans, Leeds. Eng. Pat. 23,115 of 1912, date of Appl., Nov. 9, 1911.

The mixture to be separated enters the drum, a, mounted on and rotated by the shaft, b, from the container, C, and flows down over the cone, d, between it and the sleeve, e, until it reaches the bottom, a', of the drum. The mixture then ascends the annular space, e', between the sleeve, e, and the spiral spring, f, which is attached to the base of the drum, but is free to move above. The centrifugal force imparted to the mixture, when the machine is running at a suitably high speed, causes it to force its way between the coils of the spring and to pass horizontally to the wall, g, of the drum. The solids are deposited on the wall, g, and the liquid portion passes upwards, and is discharged through the openings, h, into the receiver, B. When sufficient solid matter has accumulated on the inner surface of the wall, g, of the drum, the speed of rotation is reduced, and in consequence of the decrease in centrifugal force, the rubber or spring-controlled valves, m, which at the higher speed closed the openings, k, are withdrawn by their own resiliency, leaving the openings, k, free. At the same time and owing to the same cause, namely the reduced centrifugal force developed, the liquid flowing up the annular space, e', is no longer able to force its way between the coils of the spring, f, but is compelled to flow over the top of the coil at 3. The mixture then rushes to the wall, g, and out of the openings, k, carrying with it the solid matter deposited on the wall, g, into the receiver, A, from which they are removed, leaving the drum clean and ready for a fresh deposit, when the speed is again increased. —W. H. C.



Evaporating apparatus for obtaining triple and other effects; Apparatus for automatically controlling the level of the liquor or juice in ——. G. G. Francis, Isis, Queensland, Australia. Eng. Pat. 25,869, Nov. 20, 1911.

The flow of the liquid from "effect" to "effect" of a system of evaporators is controlled by a valve of the equilibrium type, which is fitted in a separate valve-box, interposed in the pipe connecting each pair of evaporators. The valve is controlled by a float chamber, situated between each pair of evaporators, and having its upper and lower extremities connected respectively with the upper and lower extremities of the previous evaporator. The float chamber is provided with sights or tappets, to enable the movement of the float to be observed. So long as the level of the liquid in the evaporators remains normal, a constant flow of liquid is maintained between the effects, but any alteration in the levels at once causes the float to rise or fall and thus open or close the valve to a corresponding degree.—W. H. C.

Slimes; Apparatus for separating and washing ——. S. Hunter and Simon-Carvès Bye-Product Coke Oven Construction and Working Co., Ltd., Manchester. Eng. Pat. 27,528, Dec. 8, 1911.

An apparatus for separating and washing slimes under pressure comprises a closed chamber having a cylindrical upper portion and a conical lower portion with horizontal inlet and outlet pipes at the top and sloping baffles to prevent the entering liquid from passing straight across the chamber. A jet of water entering the lower portion of the chamber serves to assist the passage of the lighter slimes and to wash the heavier deposited slimes, which are removed through a valve and discharged by a conveyer. —H. H.

Drying manure, tan waste and other materials; Apparatus for ——. A. E. Boardman, Warrington. Eng. Pat. 11,028, May 9, 1912.

The apparatus consists of a steam-jacketed chamber with a central shaft carrying a device for agitating the material within the chamber. There is a feeding hopper at one end of the chamber, provided with a continuously rotating screw for feeding in the material to be dried, and a discharge screw and hopper at the other end. The apparatus may be connected with a jet condenser or vacuum pump or with a chimney.—D. J. L.

Drying apparatus. W. T. Hoofnagle, Glen Ridge, N.J., Assignor to C. F. Frothingham, New York. U.S. Pat. 1,043,011, Oct. 29, 1912.

The articles to be dried are subjected to currents of air directed upon them simultaneously from both sides by means of a perforated U-shaped pipe which may be oscillated so as to cause the air jets to impinge upon a wide area. An automatic valve admits air to the pipe only when the article to be dried is in position.—H. H.

Dry-kiln. H. Hunter, Indianapolis, Ind. U.S. Pat. 1,043,235, Nov. 5, 1912.

A chamber heated by a coil is arranged over the drying chamber, and the heated air passes through a passage in which there is a pan containing heated water, to the drying chamber. The air leaves the drying chamber by a pipe, which passes from the bottom of the drying chamber upwards, and across the coil of the heating chamber to the atmosphere. Fresh air is introduced from without through a pipe, which leads upwards through the drying chamber, and terminates beneath the coil of the heating chamber.—W. H. C.

Drying apparatus. T. Suzuki, Tokyo, Japan. U.S. Pat. 1,043,982, Nov. 12, 1912.

The materials to be dried are placed on a series of superposed trays, and conveyed through a tunnel-like chamber. The drying medium is forced into a chamber, on one side of the tunnel, and passes through a series of ports, just above each row of trays, across the material, and is exhausted through corresponding ports on the opposite side of the trays, into a chamber on the opposite side of the tunnel.—W. H. C.

Dryer; Cylindrical ——. F. A. Rundle, Assignor to Whiting Foundry Equipment Co., Harvey, Ill. U.S. Pat. 1,044,084, Nov. 12, 1912.

A horizontal cylinder is mounted so as to be rotated on friction wheels, and is provided at the feed end with a centrally-disposed box-shaped member, attached to the wall of the cylinder by blades, which serve as stirrers. The material to be dried, contained in a series of charging spouts, is fed into and passes through the space between the box and the shell. At the further end of the cylinder the central box is dispensed with, and the blades meet at the axis of the cylinder. The materials are dried by furnace gases, which enter the discharge end of the cylinder.—W. H. C.

Filtering apparatus. J. M. Neil, New York. Eng. Pat. 14,388, June 19, 1912.

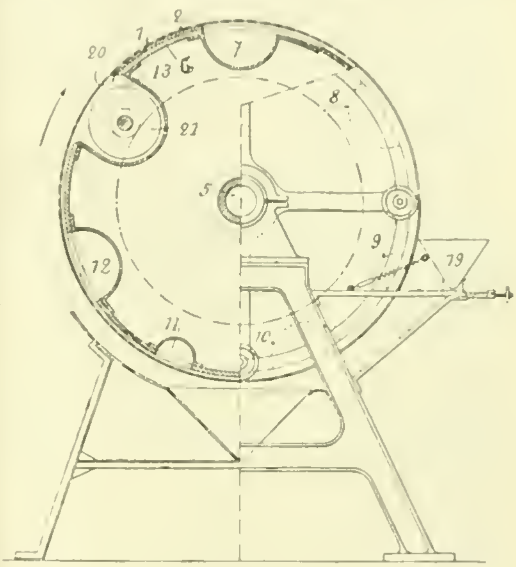
In suction or pressure filters, which are immersed in the mixture to be filtered and lifted out to remove the deposit formed on the surfaces of the filter, the deposit is liable to fall off and be returned to the vessel. To obviate this inconvenience, movable retainers are provided, which are hinged to the upper part of the filter and provided with means by which they are moved away from the filtering surfaces, when the filters are lowered into the mixture to be filtered, and caused to move towards the filters, and support the deposit, when the filters are removed.—W. H. C.

Filtration; Process of ——. J. M. Neil, Toronto, Canada. U.S. Pat. 1,043,455, Nov. 5, 1912.

The mixture to be filtered is fed into a tank, and kept agitated by a circulating pump. A porous filter medium connected with a pump, is immersed in the mixture, the clear liquid being sucked through, and discharged, whilst a deposit of solid material forms on the surface of the filter. At intervals the suction pump is reversed, and the deposited solids discharged from the outer surface of the filter into the tank.—W. H. C.

Filter-press; Continuous ——. F. Verbièse and E. Darras-Verbièse. Second Addition, dated May 15, 1912, to Fr. Pat. 427,901, June 7, 1910 (this J., 1911, 1148).

The present Addition relates to a device for washing the solid matter separated in the continuous filter-press described in the chief patent. The residue from the filter-press, mixed with a suitable washing medium, is fed under a slight pressure into the channel, 7, and is forced on to the interior surface of a cylinder of metallic gauze, 2, supported by an outer cylinder, 1, of perforated sheet metal. The two cylinders are rotated in the direction indicated by the arrow around a fixed cylindrical frame, 6. The solid matter forms a thin cake on the inner surface of the gauze, and the liquid passes through to the exterior of the metal cylinder, and is finally collected in the gutter, 19; as the cylinder rotates the deposit is successively brought opposite the channels, 8, 9, 10, 11, 12. Compressed air is forced into 8, and passes through the deposit, displacing the liquid, a fresh supply of washing liquid is forced into the deposit from 9, compressed air again at 10, and so on, washing liquid and air being forced alternately through the deposit, which is finally detached by the scraper, 20, and discharged through the conveyor channel, 13, 21.
—W. H. C.



Kilns; Burner for rotary ——. P. T. Lindhard, Assignor to F. L. Smidth and Co., New York. U.S. Pat. 1,042,576, Oct. 29, 1912.

A mixture of powdered fuel and air produced by a compressed air injector is delivered to a second injector where it is mixed with a further supply of air and then passed to an injector nozzle which injects it into the kiln together with heated air supplied from a pit into which the material from the kiln is discharged. The flame in the kiln is varied by admitting a regulated quantity of inflammable gas such as producer gas.—H. H.

Channel furnaces. N. V. Hansell, Bloomfield, N.J., Assignor to American Grondal Co., New York. U.S. Pat. 1,043,695, Nov. 5, 1912.

A channel furnace consisting of a preheating chamber and a combustion chamber, the latter being provided with a "vestibule" for the introduction of fresh trucks, is so arranged that a combustion gas is separately introduced into the upper part of the combustion chamber, and a cooling gas into the lower part, below the trucks. The gases are kept apart during their passage through the combustion chamber, by horizontal shields, interposed between the trucks, and the cooling gas alone is conducted from the combustion chamber through the preheating chamber.—W. H. C.

Distilling apparatus. E. Beaucondray and W. G. Biery, Covington, La. U.S. Pat. 1,043,894, Nov. 12, 1912.

A cylindrical carrier is supported within a heating chamber. The carrier has its lower half formed of a single sheet of metal, and its upper half in hinged sections, formed of longitudinal and transverse strips. Grate bars are mounted in the lower section. The outer chamber has an opening at one end closed by a suitable door, and has also outlets formed in the upper portion. It is provided with nozzles through which water can be discharged into the chamber.—W. H. C.

Roasting materials that frit easily. Stahlwerk Thyssen A.-G. Fr. Pat. 445,087, June 17, 1912.

In order to prevent the fusion of the fritted product, the materials to be treated are caused to traverse the zone of the furnace, where the fritting takes place, at a higher speed than that at which they traverse the other parts of the furnace. This is attained by giving a conical form to the fritting zone of the rotary furnace.—W. H. C.

Absorbing columns and other similar apparatus; Filling material for ——. A. A. Manbre. Fr. Pat. 445,140, June 18, 1912.

The rectangular or cylindrical packing pieces, which may be solid or hollow, are formed with externally projecting ribs.—W. H. C.

Evaporating and distilling apparatus. W. Weir. Fr. Pat. 444,949, June 14, 1912. Under Int. Conv., Feb. 3, 1912.

See Eng. Pat. 2813 of 1912; this J., 1912, 708.—T. F. B.

Chemical vessel. Chemical apparatus. U.S. Pats. 1,043,579 and 1,043,581. *See* XXIII.

IIa.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal resources of Canada; Undeveloped ——. D. B. Dowling. J. Canadian Min. Inst., 1911, 14, 326—346.

The author gives a brief detailed review of the area and probable coal content of the coalfields of Canada, based on the information available at the present time. The figures given refer, as far as possible, to the coal available under ordinary mining conditions. The following table contains a summary of the data :—

		Million tons of:			
District.	Area.	Anthracite.	Bituminous.	Sub-bituminous.	Lignite.
	sq. miles.				
Yukon	413	9	82	—	800
Mackenzie......	400	—	—	—	1,000
Br. Columbia...	1,351	61	39,674	490	—
Alberta	29,908	400	30,250	79,000	—
Saskatchewan ..	6,000	—	—	8,000	10,400
Manitoba	48	—	—	—	160
Ontario	10	—	—	—	25
New Brunswick.	119	—	161	—	—
Nova Scotia....	313	—	3,224	—	—

A. S.

Coal dusts; Relative inflammability of ——. Second Report of Explosions in Mines Committee. [Cd. 6431.] Price, 7½d.

For comparing the inflammability of different coal dusts, a glass cylinder, 8 cm. diam. and 140 cm. long, open at both ends was used. A platinum coil of 32-gauge wire, wound closely on a thin-walled capillary quartz tube, passed diametrically across the cylinder, 40 cm. from one end, and a platinum-platinum-rhodium thermo-couple was disposed inside the quartz tube. A uniform cloud of coal dust, produced by a special device described in the report, was blown across the platinum spiral (17 mm. long, 1·5 mm. diam.), which was heated electrically, and the temperature was determined at which inflammation of the dust took place. The results obtained indicate that there is a relationship between the inflammability of a coal dust and the proportion of matter soluble in pyridine contained in the coal (see this J., 1908, 147; 1911, 606). Admixture of incombustible substances raised the ignition temperature of coal dust; with sodium bicarbonate no general inflammation of the dust cloud took place, even when only as little as 2 per cent. was added. Experiments were also carried out in an apparatus similar to that employed at the experimental station of the *Comité Central des Houillères de France* at Liéven (see this J., 1911, 479), and it was found that under constant experimental conditions, the size and type of the flame obtained from a given coal remained remarkably constant in different experiments. It is stated that with this method of testing the inflammability of dusts, success depends upon the proper adjustment of the temperature to the time of passage of the dust cloud through the heated tube. Determinations of the relative ignition temperature and the proportion of matter soluble in pyridine afford a valuable means of discriminating between different coals in regard to the sensitiveness of their dusts to ignition, but it is pointed out that once inflammation has been effected, the ultimate violence produced by the explosive combustion of a combustible dust and air will depend upon the calorific value of the dust, and hence the dust of anthracite or wood charcoal would when once inflamed, ultimately produce a more violent explosion than the dust of bituminous coal. There are three appendices to the report: (1), an account of a research on the volatile constituents of coal by R. V. Wheeler and M. J. Burgess (this J., 1910, 1291; 1911, 606): (2) the method of extracting coals with pyridine; and (3) a table of analyses of coals and their relative ignition temperatures.—A. S.

Manufacture of chemicals by gas companies. Report of the Select Committee. J. Gas Lighting, Dec. 17, 1912. [T.R.]

The following is the text of the report issued of the Joint Select Committee of the House of Lords and the House of Commons on "Gas Authorities (Residual products)":—

1.—The Committee were appointed to consider whether any, and if any, what restrictions should be imposed on gas authorities with respect to the purchase and manufacture of the residual products resulting from the manufacture of gas by other gas authorities, or of other chemicals.

2.—The following bodies were represented by Counsel before the Committee:—

The Alkali Manufacturers' Association, and
The Gas Companies' Protection Association.

These bodies were found sufficient to represent the opposing interests before the Committee; the Association of Municipal Corporations having combined their case with that of the Gas Companies' Protection Association.

3.—This inquiry has arisen owing to proceedings before certain committees of both Houses of Parliament during the present session, where objection was raised by those interested in the chemical trade to the manufacture and sale of chemical products by gas undertakings.

4.—The manufacture of gas necessarily involves the production of certain residual substances. These substances are coke, ammoniacal liquor, tar, and spent oxide. Ammoniacal liquor and spent oxide respectively contain ammonia and sulphur in large quantities.

In the disposal of these products, two courses are open to the gas undertakings. Either they may sell them in their raw state or themselves work them up into other substances—as, for instance, ammoniacal liquor into sulphate of ammonia, or spent oxide into sulphuric acid. In the case of raw products, the principal purchasers have been the chemical manufacturers. In at least one case, however, a gas undertaking has set up a large plant with the object not only of converting its own residuals, but also of buying up those of other undertakings to convert in addition to its own.

This practice does not appear hitherto to have become a general one; but it is opposed by the chemical manufacturers, who apprehend that it may be extended.

5.—The right so to purchase and manufacture the residual products of other undertakings is governed in most instances by the Private Act authorising each particular body.

These Acts vary greatly in their terms; and no fixed rule can be deduced from them—the reason being that in most cases the point was not material when the Act was passed. Speaking generally, however, the practice of Parliament up to the present session was to allow the purchase of residuals by one gas undertaking from others; and this is evidenced by the terms of the Model Clause which is ordinarily inserted in every unopposed Bill. As a result, however, of the decisions of the several Committees of both Houses above referred to, this clause has now been amended so as to prohibit the purchase by one gas undertaking of the residuals of another; and this prohibition can be put upon existing undertakings who now have powers to purchase, if they have cause to come to Parliament for further private legislation.

It is in order to ask for a definite decision on the subject that the parties appear before the Committee.

6.—The contention of the chemical manufacturers is that they rely almost entirely on gas undertakings for their raw material; that they would lose their main source of supply; and that a gas company, like a railway company, has a definite scope, and exists for an object to which it should be limited, and which does not include the business of a trader in and general manufacturer of chemicals.

They contend also that gas undertakings are specially favoured by Parliament, since they have a monopoly of the supply of gas in their areas, and consequently, if they are Statutory Companies, can raise their capital on easy terms, while if they are Local Authorities they have the assistance of the rates.

While they are prepared to concede to the gas undertakings the right to manufacture their own residual products and raise no objection to their purchasing (either from each other or in the open market) materials and chemicals required for such manufacture, they strongly resist any claim on the part of the undertakings to buy from each other raw materials for the purpose only of working them up.

They allege that a gas undertaking, by reason of its favoured position, and because its main object is the making of gas, from which it derives its main revenue, can afford to cut the profits on what is only a subsidiary branch of its business, and will either pay excessive prices for raw materials bought from other undertakings or will sell its resulting products at an unduly low price, in both cases competing unfairly with outside traders.

7.—The gas undertakings, on the other hand, argue that in most cases, under the sliding scale which controls the price of gas, any reduction in the cost of manufacture mainly benefits the consumer, and that cheap gas is of great benefit to the public; and they contend that by selling to each other residuals in order that they may be worked-up, a larger profit is secured both to the selling and to the buying undertaking.

They contend further that while the restriction of gas undertakings to working up their own residuals might not damage seriously the larger undertakings, which produce residuals in quantities sufficient to render possible manufacture on a large scale, it would seriously injure the smaller undertakings, whose production is often too small to justify them in setting up for themselves the various plants required for converting residuals.

They contend, lastly, that if the competition of gas undertakings as purchasers is eliminated from the market, the price of the material will be fixed by the traders only; and, further, the heavy cost of railway carriage on bulky substances, such as gas residuals, makes it desirable from all points of view that they should be worked up near home, which is impossible in the case of gas-works situated far away from the works of chemical manufacturers.

8.—The Committee have heard many witnesses and the arguments of Counsel on behalf of each party. They think that some restrictions should be imposed upon gas undertakings, but are not prepared to grant all the restrictions asked for by the chemical manufacturers.

9.—It was admitted by the chemical manufacturers that gas undertakings should be allowed to work up their own residuals, and to buy—whether from other gas undertakings or elsewhere—the materials required to work up such residuals; and the Committee support this.

10.—They consider further that one gas undertaking should be allowed to purchase the residuals of other gas undertakings, in order to manufacture other products of the same kind as the purchasing undertaking is manufacturing from its own residuals; but this is subject to the qualification contained in paragraph 12.

11.—They further consider that gas undertakings should, in addition to buying residuals from other gas undertakings, be authorized to buy, from gas undertakings or elsewhere, the materials required to work up the purchased residuals.

12.—They consider, however, that gas undertakings should not be allowed to manufacture chemicals exclusively from raw materials bought from sources other than gas undertakings, or in the manufacture of which the use of residuals produced by themselves or bought from other gas undertakings is merely subsidiary.

13.—The Committee have not dealt with the suggestion made that gas undertakings might make the trade of chemical manufacture their more important business, since no evidence was produced to lead them to anticipate such action. To this they would be opposed; but they are satisfied that this point could be better dealt with as it arose.

Petroleum production in the Maikop district. Board of Trade J., Dec. 5, 1912. [T.R.]

The "Viestnik Finansov" (St. Petersburg) of 24th November publishes a statement showing the production of petroleum in the Maikop district in 1911 as 7,937,243 pouds, of which 3,933,213 pouds were obtained from the oil springs, and the remainder by the process of pumping. The output of petroleum amounted to 32,680 pouds in 1907, 58,088 pouds in 1908, 572,385 pouds in 1909, 1,304,801 pouds in 1910, 7,937,243 pouds in 1911, and for the first six months of 1912 the total output amounted to 5,670,000 pouds. On the 1st January last, 211 petroleum wells had been bored in the Maikop district, and of these 44 have been found to be productive, 62 show traces of petroleum, and the remainder have been abandoned as unproductive. At the beginning of 1910 and 1911 the number of wells totalled 38 and 80 respectively. Note: 1000 pouds = 16 tons (about).

Patents.

Peat; Process for the commercial utilisation of ——. N. Testrup, London, T. Rigby, Dumfries, Scotland, and O. Söderlund, London. Eng. Pat. 17,610, Aug. 3, 1911.

The process has for its object the production of ammonia and fuel from peat, and consists in subjecting the peat to wet carbonisation by the Ekenberg process (Eng. Pats. 10,834 and 20,420 of 1903; see this J., 1904, 14), then removing the bulk of the water by pressure transmitted internally, as in a filter-press, removing a further quantity of water either by pressure applied externally or by using the waste heat of products of combustion from apparatus employed in the process, and finally gasifying the partially dried peat in producers adapted for the recovery of ammonia, the amount of peat gasified in the producers being at least sufficient for the fuel requirements of the process, and a balance of gaseous or solid fuel being obtained. The partially dried peat not supplied to the producers may be briquetted, or it (or the briquettes) may be converted into charcoal or coke in by-product recovery ovens. The producer gas may be burned under boilers and the steam used to furnish the heat and power required in the treatment of the peat. Five examples are given of methods of working, which embody features of the invention. (Eng. Pats. 12,010 of 1909, 6041, 12,013, 13,391, and 13,656 of 1910, and 4684, 5467, 9105, 11,554, 13,281, 14,131, 14,624 and 16,958 of 1911 are also referred to: see this J., 1909, 1026; 1911, 883, 1105, 1200; and 1912, 323, 631, 675, 677, 1021, 1114.)—A. T. L.

Peat fuel or coke; Process for producing —— and apparatus therefor. W. L. St. J. Prioleau, Boncath, S. Wales, and J. R. H. Prioleau, London. Eng. Pat. 28,145, Dec. 14, 1911.

The peat is first passed in a finely divided condition, and in a thin layer, through an externally heated flue or chamber or series of flues or chambers, where it is subjected to a temperature not exceeding 120° C. By this means the moisture content of the peat is reduced to about 40 per cent. The hot, still moist peat, is then formed into soft briquettes in a suitable machine, and the briquettes are slowly dried at a temperature of about 35° C. in suitable chambers, through which the warm moist air from the preliminary heating chamber is passed. By the use of this warm, moist air, at a comparatively low temperature, it is stated that the peat blocks or briquettes can be dried down to about 2 to 10 per cent. of moisture, without becoming disintegrated. The peat briquettes may then be used for fuel or may be coked in suitable ovens for the production of peat coke and recovery of by-products. If the briquettes are coked, the preliminary drying chamber is heated by the waste heat from the ovens.—W. H. C.

Coking of coal; Shaft furnace for the ——, with external and internal heating. J. Lütz. Ger. Pat. 250,576, June 27, 1911.

The coking chamber is in the form of an annular column or tower heated both externally and internally by means of heating flues. It is closed below by a conical bottom plate, which surrounds, but is sealed against, the central portion of the furnace, and is movable vertically.—A. S.

Heat, heat-radiating flame and inflammable gases; Method of producing —— by fractionate combustion, and apparatus therefor. A. G. Meeze, Painswick, Gloucester. Eng. Pat. 2941, Aug. 8, 1911.

The fuel, in a heating or smelting furnace, a water-gas plant, gas producer, cupola, or blast-furnace, is burnt by the aid of an air blast with which is introduced finely pulverised fuel. By altering the degree of fineness of the pulverised fuel, the temperature produced by the blast can be varied at will. The finer the pulverisation of the fuel used, the higher is the temperature obtained.—W. H. C.

Producer gas power installations; Operating ——. T. W. S. Hutchins, Stockton-on-Tees. Eng. Pat. 29,200, Dec. 28, 1911.

The steam required for the producer is withdrawn from the condensing steam engine, or turbine, at such a point that its pressure is sufficiently high for the purpose required. The remainder of the exhaust steam is passed to the condenser.—W. H. C.

Gas generators; Revoluble grate for ——. Deutsche-Hüttenbau-Ges. m. b. H., Düsseldorf, Germany. Eng. Pat. 9589, April 23, 1912. Under Int. Conv., Nov. 27, 1911.

The grate is of conical form and the surface is divided into sectors by vertical curved partitions. Each sector of the grate comprises a series of inclined plates, which overlap like the laths of a Venetian blind, and the blast penetrating into the charge on the grate surface, passes out between these plates in a direction opposite to that in which the grate revolves.—A. T. L.

Gas from petrol and other hydrocarbons; Generators for production of —— and materials to be employed. A. Reis. Fr. Pat. 444,264, May 25, 1912.

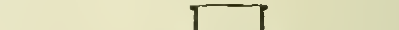
A mixture of hydrocarbon, air, and water or steam is injected into a horizontal retort arranged above a horizontal chamber which receives the gas generated in the retort. In the lateral walls of this chamber are longitudinal slots and above these are flanges of refractory material projecting upwards, one on either side of the retort. The apparatus is placed inside a furnace. The gas burns on issuing from the slots mentioned above, and serves to heat the retort and any objects placed in the furnace. A suitable mixture consists of 1000 grms. of hydrocarbon, 675 grms. of water containing 1 per cent. of sodium nitrate, and 9 cub. metres of air.—H. H.

Gas producers. E. Pineau. Fr. Pat. 444,620, June 5, 1912. Under Int. Conv., June 6, 1911.

In a gas producer of the type in which the charge is fed from below by means of an Archimedean screw working in a vertical passage opening into the centre of the hearth, (1) the action of the screw is made regular, and clogging is prevented, by means of two rotary devices arranged on opposite sides of the screw and carrying discs which move in a plane passing through the axis of the screw and project between the helices thereof, so as to prevent the fuel from slipping down; (2) the height of the grid which constitutes the hearth is adjusted by means of supporting screws passing outside the producer; (3) the steam, which is generated in an annular channel in the top of the producer, is superheated, prior to admission to the producer, by passing it through a pipe fitted inside the gas discharge pipe.—H. H.

Producer gas; Production of —— from a mixture of fine and lump coal. G. F. Matt. Ger. Pat. 251,238, Aug. 12, 1911.

The gas-eduction pipe, *c*, is enclosed in a bell, *a*, above which is a conical distributor, *b*. The fuel from the hopper, *d*, falls on to *b*, and then into the body of the producer, the dust being drawn into the bell, *a*, as shown by the arrows. The mouth of the gas-eduction pipe, *c*, is close to the incandescent fuel, so that the dust drawn into the bell, *a*, is carbonised or burnt. The incandescence zone of the producer is connected with the charging hopper by the conduit, *i*, so that the cloud of dust produced



when the hopper is filled, is drawn into the producer chamber. The bell, *a*, may be provided with an opening through which fresh fuel may be introduced for the purpose of enriching the gas.—A. S.

Acetylene; Process for preparing —— in the dry way and apparates therefor. G. F. Jaubert. Fr. Pat. 444,883, Aug. 19, 1911.

The process consists in locally heating a mixture of powdered calcium carbide and a solid capable of liberating water vapour on heating, such as hydrated calcium sulphate. The mixture is placed in a cylindrical container hermetically sealed at one end and having a filter for the gas and a discharge opening at the other, and is heated by means of a metal rod passing through the side of the container into the centre of the mass. Upon strongly heating the exterior portion of the rod, the mixture becomes locally heated and a steady liberation of acetylene takes place.—H. H.

Gas; Purification or enrichment of —— by means of an upward spray of liquid. A. Bayer and L. Fabre. Fr. Pat. 444,295, May 21, 1912.

Gas to be freed from tar and naphthalene is led into the lower end of a vertical cylindrical tank having a slightly conical bottom containing a layer of tar oil freed from naphthalene and having a boiling point of 120° to 180° C. A compressed air jet sprays the oil vertically so that it mixes with the gas to be purified, which is carried to the top of the tank and over into a second tank containing perforated iron trays where the oil separates in liquid form holding the tar and naphthalene in suspension. A similar process is employed for separating ammonia, hydrogen sulphide, cyanogen, or other impurities from gases, suitable spraying liquids being used in each case and a number of tanks arranged in series where necessary. —H. H.

Hydrocarbon oils; Solidification of ——. J. T. Armstrong, London, and J. Mordan, Hughenden, Bucks. Eng. Pat. 18,300, Aug. 12, 1911.

About 81·6 parts of petroleum are thoroughly mixed with about 10 parts of water, about 4·5 parts of glue or other suitable nitrogenous binder are added, and the mixing is continued. A further addition is then made of about 0·9 part of iron sulphate, and 3 parts of coal dust. The mixing is continued until solidification takes place, or it may be continued at a slightly higher speed until the solidified material crumbles into small pieces.—W. H. C.

Oils soluble in water [from hydrocarbon oils]; Process for manufacturing ——. L. Hirschberg, Halensee, Assignor to Chemische Fabrik Westend, Charlottenburg, Germany. U.S. Pat. 1,042,915, Oct. 29, 1912.

A hydrocarbon is heated with about half its weight of fuming sulphuric acid containing a quantity of sulphur trioxide equal to not less than 2·5 per cent. of the weight of the oil. The temperature is kept at 100° to 130° C. until the reaction products separate into two layers on cooling, the upper layer, which is "emulsifiable" with water, being separated and neutralised.—H. H.

Benzene hydrocarbons from saturated [gas] washing oils; Process for distilling the ——. C. Still. Ger. Pat. 251,562, Aug. 9, 1911.

Above the distilling column is mounted a reflux condenser, wherein the vapours are cooled sufficiently to condense only the naphthalene and the constituents of the washing oils; the condensate is then run off to another condenser where it is further cooled until no more naphthalene separates.—T. F. B.

Coking and gasifying coal; Furnace for —— with external and internal heating. J. Lütz. Fr. Pat. 445,405, June 25, 1912. Under Int. Conv., June 26, 1911.

See Ger. Pat. 250,576 of 1911; preceding.—T. F. B.

Distillation of bituminous coal and the like. A. G. Glasgow, London. From J. M. Rusby, Philadelphia, U.S.A. Eng. Pat. 9292, April 19, 1912.

See U.S. Pat. 1,030,333 of 1912; this J., 1912, 711.—T. F. B.

Gas producing apparatus. G. A. Loehlein, Albany, Minn., U.S.A. Eng. Pat. 673, Jan. 9, 1912.

See Fr. Pat. 438,823 of 1912; this J., 1912, 632.—T. F. B.

Gas-generating furnace; Regenerative —— with constant direction of the heating flames. Stettiner Chamotte-Fabrik A.-G. vorm. Didier. Fr. Pat. 445,344, June 24, 1912. Under Int. Conv., July 10, 1911.

See Eng. Pat. 14,702 of 1912; this J., 1912, 975.—T. F. B.

Oils or oil residues; Process for solidifying [mineral] ——. G. Calvert. Fr. Pat. 445,708, July 2, 1912.

See Eng. Pat. 14,656 of 1912; this J., 1912, 1071.—T. F. B.

Washing gases and vapours and apparatus therefor. Eng. Pat. 11,452. *See* I.

Preparation of emulsified products composed of asphaltum, pitch, tar, resins, oils, etc. Fr. Pat. 444,739. *See* III.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

Patents.

Metallic filaments; Cement for ——. K. Farkas, Assignor to G. V. Williams, New York. U.S. Pat. 1,044,156, Nov. 12, 1912.

A cement for tungsten filaments is composed of finely powdered tungsten oxides with 2 to 3 per cent. of powdered aluminium and sufficient sodium silicate to impart the proper consistence to the mixture.—A. T. L.

Wires of refractory metals [e.g., tungsten]; Process for pointing the ends of ——. J. Pintsch A.-G. Ger. Pat. 251,836, Nov. 21, 1911.

In the preparation of drawn wire metal filaments for electric lamps, the end of the wire is pointed, preparatory to introducing it into the die, by heating it in the air or in gases containing oxygen, until the diameter is reduced to the desired extent by oxidation of the metal.—A. S.

III.—TAR AND TAR PRODUCTS.

Patents.

Asphaltum, pitch, tar, resins, oils, hydrocarbons, cresols, and similar bodies or mixtures of these bodies; Preparation of emulsified products composed of ——. Chemische Fabriken Dr. K. Albert. Fr. Pat. 444,739, June 7, 1912. Under Int. Conv., June 12, 1911.

The residual lye obtained in the manufacture of sulphite cellulose is neutralised by means of chalk and utilised, after concentration, as an emulsifying agent for asphaltum, tar, pitch, resins, balsams, oils, waxes, paraffins, hydrocarbons, sulphur, cresols, and other bodies insoluble or difficultly soluble in water, in place of the soap, resins, or alkalis usually employed. It is stated that 5 parts of the sulphite lye are sufficient to emulsify 95 parts of tar. The emulsion is not affected by the addition of such materials as mercuric chloride solution, formaldehyde, or tannins, so that it may be employed in conjunction with these substances in the preparation of disinfectants, preservatives, etc. In an example 200 grms. of tar oil, 200 grms. of creosote oil, and 100 grms. of gas tar are emulsified with 100 grms. of sulphite lye, 100 grms. of 40 per cent. formaldehyde and 125 grms. of water.—H. H.

v-m-Xylidine (*1-amino-2.6-dimethylbenzene*); *Process for preparing* ——. W. Winkelhausen. Ger. Pat. 251,334, Oct. 29, 1911.

The sulphate of 1-amino-2.6-dimethylbenzene is readily soluble in water in presence of the sparingly soluble sulphates of the 1.2.4- and 1.2.5-aminodimethylbenzenes. The mixture of the xylidines may therefore be separated by heating with the necessary quantity of aqueous sulphuric acid to convert it into sulphates: the sparingly soluble sulphates are separated by fractionation, the mother liquor is evaporated to a syrupy consistence, and the sulphate of the *v-m*-xylidine is separated by cooling and converted into the free base by heating with an alkali or alkaline earth.—T. F. B.

Aminobenzoyl compounds of aminobenzoyl-2-amino-5-naphthol-7-sulphonic acid; Process for preparing ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 252,159, Feb. 9, 1911. Addition to Ger. Pat. 240.827, April 20, 1910.

Aminobenzoic acids are condensed with nitrobenzoyl halogenides, the acid halogenides of the condensation products are condensed with 2-amino-5-naphthol-7-sulphonic acid, and the resulting compounds reduced.
—T. F. B.

[*Tetra*]*nitro derivative of aniline and process for the manufacture of same.* B. J. Flürscheim, Fleet. U.S. Pat. 1,045,011, Nov. 19, 1912.

See Eng. Pats. 3224, 4701, 9477, and 11,478 of 1910; this J., 1911, 275.—T. F. B.

Preparation of paints, impregnating compositions, and the like. Eng. Pat. 10.958. *See* XIII.

IV.—COLOURING MATTERS AND DYES.

Patents.

[*Hydr*]*oxyanthraquinones; Manufacture of* ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 24,642, Nov. 6, 1911.

In the process of converting anthraquinone into alizarin described in Ger. Pat. 241,806 and Fr. Pat. 435,118 (this J., 1912, 223, 278), the anthraquinonesulphonic acids or the sulphites may be replaced by products which, by the action of alkali, are converted into sulphites, *e.g.*, other sulphonic acids, sodium nitrilosulphonate, thiosulphuric acid or polythionic acids or their salts, or sulphides. *Example.* A mixture of 40 parts of sodium thiosulphate, 75 parts of anthraquinone, 42 parts of sodium nitrate, and 1460 parts of 17 per cent. caustic soda lye, is heated in an autoclave for 3 to 4 days at 185°—195° C.; the product is dissolved in water, and air is passed through the solution, which is then filtered and the alizarin separated from the filtrate in the usual manner.—T. F. B.

Anthraquinone-dithiazoles; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 1970, Jan. 24, 1912.

Anthraquinone-dithiazoles are obtained when 2.6-diaminoanthraquinone-1.5-dimercaptan or 2.7-diaminoanthraquinone-1.8-dimercaptan is condensed with an aldehyde, or with the corresponding ω-dihalogen-methyl compound of the benzene series, or with the corresponding carboxylic acids or their anhydrides, esters, halogenides, amides, etc. When carboxylic acids or their derivatives are used, the dithiazoles are usually obtained directly, but if an aldehyde is employed it is necessary to oxidise the resulting product, or to prolong the reaction in presence of an oxidising agent or an excess of the aldehyde. In some cases it is possible to use the corresponding dihalogen-diaminoanthraquinones in place of the dimercaptans, if the condensation is carried out in presence of a polysulphide or other substance which can replace the halogens by sulphur or by SH-groups. The products may be used as vat dyestuffs.—T. F. B.

Aminoanthraquinone-carboxylic acids, their substitution products, and dyestuffs derived therefrom; Process for producing ——. Badische Anilin und Soda Fabrik. Third Addition, dated May 23, 1912, to Fr. Pat. 425,859, Jan. 19. 1911. Under Int. Conv., Feb. 16, 1912 (see this J., 1911, 947, also Ger. Pat. 247,411; this J., 1912, 764).

The esters of 2-anthraquinone-carboxylic acid, the 1-position of which contains a negative substituent, readily react with ammonia or primary or secondary amines, especially in presence of copper or its salts and of an agent which combines with mineral acid. The products generally consist of the esters of 1-aminoanthraquinone-2-carboxylic acid (or its amino-substitution products), but occasionally other products, possibly amides, are also formed. The esters can be converted into the free acids described in the principal patent by saponification.—T. F. B.

[*Azo*] *dyestuff; Manufacture of a red wool* ——. Farbwerke vorm. Meister, Lucius, und Bruning, Höchst on Maine, Germany. Eng. Pat. 21,729, Sept. 24, 1912. Under Int. Conv., Dec. 6, 1911.

A dyestuff which dyes wool red shades very fast to milling, is obtained by combining the tetrazo compound of *m*-tolidine with two mols. of 2-naphthol-6-sulphonic acid.
—T. F. B.

Indigo; Process for preparing finely-divided —— analogous to colloids. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 445,803, July 5, 1912. Under Int. Conv., July 19, 1911.

When indigo is treated with sulphuric acid for a short time at a sufficiently low temperature, it is converted into an amorphous sulphate, which is blue when seen in thin layers, and which differs essentially from the brownish crystalline sulphate formed according to Eng. Pat. 23,122 of 1899 (this J., 1900, 1009); on dissociation with water, with or without addition of other substances, the indigo is obtained in a very finely-divided, almost colloidal condition, resembling that produced according to Eng. Pats. 18,761 and 20,321 of 1910 (this J., 1911, 1047, 1110). Example: 100 kilos. of indigo are added, with stirring, to 700 kilos. of sulphuric acid of 60° B., cooled to 5° C. or lower; after a short time, depending on the temperature, a thick magma of the new sulphate separates, and is decomposed by adding 700 kilos. of ice, and the indigo is separated and washed.—T. F. B.

Indigo similar to natural indigo and readily made into paste; Process for preparing dry ——. Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 445,850, July 6, 1912. Under Int. Conv., July 29, 1911.

The colloidal indigo pastes prepared as described in Eng. Pats. 18,761 and 20,321 of 1910 (this J., 1911, 1047, 1110) and Fr. Pat. 445,803 (see preceding abstract), can be dried *in vacuo* or in air, at the ordinary or at raised temperatures, without losing their characteristic properties. It is desirable to add a diluent such as kaolin, glucose, etc.
—T. F. B.

Derivatives of indophenols and sulphide dyestuffs; Process for producing ——. Farbwerke Mühlheim vorm. A. Leonhardt und Co. Fr. Pat. 445,060, June 15, 1912. Under Int. Conv., July 2 and 12, 1911, Jan. 1, 6, and 22, and March 21, 1912.

When indophenols are condensed with aromatic amines or their substitution products, new compounds are produced which, on conversion into sulphide dyestuffs in the usual manner, give products which dye extremely fast shades, generally much deeper than those produced by the dyestuffs from the original indophenol. Thus, the dyestuff obtained from 1-amino-5-naphthol and carbazole-indophenol dyes cotton deep bluish-black shades. The conversion of the condensation products into dyestuffs is best effected by means of alkali polysulphides, with or without addition of copper.—T. F. B.

2.4-Dinitro-1-chlorobenzene and the leuco-indophenols derived from carbazole; Preparation of condensation products of ——. L. Cassella und Co. Ger. Pat. 252,642, July 23, 1911.

2.4-Dinitro-1-chlorobenzene is condensed in presence of alkali and a suitable solvent, with the leuco-indophenols obtained from *p*-nitrosophenols and carbazole or its N-substitution products. The products are converted into dyestuffs by heating with alkali polysulphides. —T. F. B.

Vat [anthracene] dyestuffs. P. Thomaschewski, Vohwinkel, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pats. 1,044,602 and 1,044,603, Nov. 19, 1912.

See Eng. Pats. 7699 and 12,865 of 1912; this J., 1912, 809, 1025.—T. F. B.

Triphenylmethane dye. M. Weiler, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,044,836, Nov. 19, 1912.

See Fr. Pat. 437,667 of 1911; this J., 1912, 529.—T. F. B.

[Azo] dyestuffs for cotton; Process for producing black ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 445,400, June 25, 1912. Under Int. Conv., Sept. 9, 1911.

See Eng. Pat. 20,608 of 1911; this J., 1912, 978.—T. F. B.

Vat [anthracene] dyes; Yellow and orange-yellow ——. A. Lüttringhaus, E. Schwarz, and H. von Diesbach, Mannheim, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pats. 1,044,673, 1,044,674, and 1,044,675, Nov. 19, 1912.

See Addition of June 30, 1911, to Fr. Pat. 425,859 of 1911; this J., 1912, 119.—T. F. B.

Vat dye of the anthracene series; Process for the manufacture of a sulphuretted ——. B. Mayer and L. Weil, Assignors to Soc. of Chem. Industry in Basle, Switzerland. U.S. Pat. 1,044,797, Nov. 19, 1912.

See Eng. Pat. 11,422 of 1911; this J., 1911, 1204.—T. F. B.

Vat dyes of the anthracene series; Process of making ——. F. Singer, Offenbach, Assignor to Chem. Fabr. Griesheim-Elektron, Frankfort on Maine, Germany. U.S. Pat. 1,044,933, Nov. 19, 1912.

See Fr. Pat. 430,439 of 1911; this J., 1911, 1306.—T. F. B.

Nitro dyestuffs of the rhodole [phthalein] series; Mordant —— *and process of making them.* Manuf. de Mat. Col. ancien. L. Durand, Huguenin, et Cie. Fr. Pat. 445,326, June 22, 1912. Under Int. Conv., July 17, 1911.

See Ger. Pat. 245,231 of 1911; this J., 1912, 481.—T. F. B.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Paper from Hedychium coronarium. Kew Bulletin, 1912, No. 9. [T.R.]

An illustrated account is given of *Hedychium coronarium*, Koen., and allies, as a source of material for paper-making. The plant, a member of the natural order *Zingiberaceae*, is a native of India, being distributed from the Himalayas to Ceylon and Malacca. It is also found in the West Indies, New Zealand, and elsewhere, and it covers large tracts of swamps in Brazil. Experiments have been made with specimens sent from San Paulo, and papers of exceptional tensile strength, exceeding that of Manila paper, have been produced from the fibre. Owing to a semi-gelatinous constituent the new paper is said to be practically "natural parchment." Samples of the paper and fibre have been placed in the Museum of the Royal Botanic Gardens, Kew. Besides possessing self-sizing qualities, the fibre is capable of being worked very quickly on the paper-making machine. (See Eng. Pat. 29,582 of 1910; this J., 1911, 485; also this J., 1912, 870). Another plant, *Amomum hemisphericum*, for brown-paper-making, is also described.

Alcohol for German manufacture of artificial silk. Chem. World, Dec., 1912. [T.R.]

German artificial silk manufacturers have obtained a valuable concession from the "Berliner Spiritus-Zentrale" for the season 1912-1913, in that the average price of industrial alcohol to the manufacturers of artificial silk will be about the same as that which their foreign competitors have to pay. This may enable the German makers of nitrocellulose artificial silk to compete more successfully with imported goods. Almost from the beginning of the industry the makers of silk by the "nitro" process have been handicapped by the high prices of industrial alcohol, and their efforts to obtain a reduction have been unsuccessful for nearly seven years. The intervention of the Government and a good potato crop in Germany helped to bring about the desired result.

A new nitro-derivative of cellulose. Tassart. *See* XXII.

Reputed existence of a hydrate of nitrocellulose. Chandelon. *See* XXII.

Manufacture of sugar from wood and its economic importance. Zimmermann. *See* XIXa.

Patents.

Cotton yarns or thread suitable for basting or tacking purposes. P. Tanenbaum, London. Eng. Pat. 9505, April 22, 1912.

Cotton thread which is used for tacking or similar temporary purposes and has to be subsequently removed, is treated, preferably in the form of skeins, with a very dilute solution of sulphuric acid (6—12 oz. per gallon) and then dried without heat. After use it is only necessary to pass a heated iron over the temporary tacking to effect the complete destruction and removal of the thread. —J. F. B.

Cocoons of the silk worm; Process and apparatus for obtaining thread from the ——. B. Loewe, Paris. Eng. Pat. 14,255, June 18, 1912. Under Int. Conv., June 19, 1911.

The cocoons previous to winding are immersed in a dilute alkaline solution which will loosen the gummy matter from the fibre without injuring the silk. To accelerate the loosening, soap solution may be added to the bath. The cocoons are then preferably washed with acidulated water and wound, the bobbins being placed at such a distance from the washing tank that the filament is dry when it reaches the bobbins. To prevent entanglement each cocoon is placed in a small perforated ball before the degumming process.—P. F. C.

Collodion-cotton; Preparation of solutions of ——. C. Massmann. Ger. Pat. 250,421, April 13, 1910.

A mixture of alcohol with benzene or its homologues is used as solvent. The solutions are suitable for the preparation of artificial silk, as vehicles for printing colours, as varnishes, etc.—A. S.

Absorbent bandaging material, paper, surgical plugs, dress shields and the like; Process for manufacturing ——. R. Marcus, Frankfurt on Maine, Germany. Eng. Pat. 17,873, Aug. 5, 1911.

The materials to be used for the above purposes are impregnated, filled, mixed or prepared with an artificial chemically pure silicic acid for the purpose of absorbing and desiccating fluids of any kind. The silicic acid may be prepared by precipitation of an alkali silicate, or preferably from silicon tetrachloride, the product being purified by subjecting it to osmosis.—J. F. B.

Cellulose ester solutions; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pats. 3869, Feb. 15, 1912, and 7292, March 25, 1912.

SEE Fr. Pat. 440,733 of 1912; this J., 1912, 828.—T. F. B.

Cellulose: Alkaline precipitating baths for cupro-ammoniacal solutions of —— for making artificial silk threads or the like. E. G. Legrand. Fr. Pat. 445,896, Sept. 16, 1911.

SEE Ger. Pat. 250,357 of 1911; this J., 1912, 1120.—T.F.B.

Pulp from vegetable and textile fibres, waste paper, wood, and the like; Apparatus and process for making ——. L. Herz, Munich, Germany. Eng. Pats. 25,255, Nov. 13, 1911, and 19,334 of 1912, dated Nov. 13, 1911. Under Int. Conv., Nov. 12, 1910.

SEE Fr. Pat. 422,490 of 1910; this J., 1911, 533.—T. F. B.

Paper pulp; Method of producing —— from old paper, and removing ink or colour from the old paper to be so treated. C. Kurtz-Hähnle, Reutlingen, Germany. Eng. Pat. 26,019, Nov. 21, 1911.

SEE U.S. Pat. 1,026,577 of 1912; this J., 1912, 584.—T.F.B.

Fibrous substances; Apparatus for disintegrating, dissolving, washing, and mixing ——. H. Strieth, Nuremberg, Germany. Eng. Pat. 12,188, May 23, 1912. Under Int. Conv., May 23, 1911.

SEE Fr. Pat. 444,045 of 1912; this J., 1912, 1120.—T. F. B.

Preparation of emulsified products composed of asphaltum, pitch, tar, resins, oils, etc. Fr. Pat. 444,739. *See* III.

Preparation of varnishes from cellulose esters or celluloid. Ger. Pat. 251,351. *See* XIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

PATENTS.

Dyeing wool and other similar substances; Apparatus for ——. A. Murray. Fr. Pat. 445,580, June 29, 1912. Under Int. Conv., June 28, 1911.

A DYE-VAT is provided with a perforated false bottom on which rests a cage. This cage has bearings in which are mounted perforated vertical spindles which are connected with a pump. The pump is also connected with the space below the false bottom of the dye-vat. The cheeses of yarn are mounted on the spindles and the dye-liquor is forced radially through them.—P. F. C.

Dyeing leather; Process of ——. Act.-Ges. für Anilin-Fabrikation. Fr. Pat. 445,624, July 1, 1912. Under Int. Conv., June 4, 1912.

CHROME-TANNED leather is dyed with direct dyestuffs which are subsequently diazotised and developed. The process is carried out in the following manner. Suitably prepared chrome-tanned leather is dyed at 50° C. with 1 per cent. of Paranil Yellow G. It is then washed and treated for 20 minutes at 10°—20° C. with a solution of *p*-nitrodiazobenzene prepared from 5 grms. of *p*-nitraniline, 15 grms. of hydrochloric acid of 22° B. (sp. gr. 1·180), 3·3 grms. of sodium nitrite, and 300 c.c. of a 10 per cent. solution of sodium acetate for each kilo. of leather.—P.F.C.

Dyeing under pressure; Process of ——. E. Lefévre. Fr. Pat. 445,707, July 2, 1912.

FEATHERS, or other animal, vegetable or mineral materials, are introduced into a dye-bath in a steam-tight tub, steam being introduced to create a pressure and at the same time raise the temperature of the bath. The pressure may be produced independently of the heating, or the heating may be omitted.—B. N.

Dyeing furs, hair, feathers and similar materials; Process of ——. Act.-Ges. für Anilin-Fabrikation. Fr. Pat. 445,880, July 8, 1912. Under Int. Conv., Mar. 19, 1912.

THE material is treated with a solution of a nitro-2.4-phenylenediamine having an alkyl or alkoxyl group or an atom of chlorine in the 1-position, in the presence of an oxidising agent. Example: The fur after the ordinary preparation is immersed in a bath containing 1 grm. of nitro-2.4-diaminoanisol and 20 grms. of a 3 per cent. solution of hydrogen peroxide in a litre. After 6 hours the fur is washed and dried. The shade obtained is a deep yellow of great fastness to light and wear.—P.F.C.

Grey shades on textile fabrics; Production of fast ——. P. A. Newton, London. From Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. Eng. Pat. 9510, April 22, 1912.

FAST grey shades can be obtained from vat dyestuffs prepared from isatins (in which the oxygen of the alpha-keto group has been replaced by easily movable substituents), and 1-naphthol or 1-anthrol or their derivatives, by printing these dyestuffs with a chromium compound and then steaming the printed fabric. Example: A paste containing 150 parts of the dye obtained from 5·7-dibromoisatin chloride and 1-anthrol, 600 parts of tragacanth mucilage, 100 parts of chromium acetate (20° B., sp. gr. 1·162) and 150 parts of water is printed on the material, which is then steamed for one hour and washed.—P. F. C.

Discharging agents; Production of aldehydic derivatives and their applications as ——. Badische Anilin und Soda Fabrik. Fifth Addition, dated June 3, 1912, to Fr. Pat. 350,607, Jan. 7, 1905. Under Int. Conv., Aug. 21, 1911.

BY treating the formaldehyde-bisulphites or the formaldehyde-hydrosulphites of the alkali metals with powdered zinc in the presence of oxide, hydroxide or carbonate of zinc, alkali formaldehyde-sulphoxylates are readily formed. Example: A solution of 152 kilos. of sodium formaldehyde-bisulphite ($NaHSO_3,CH_2O,H_2O$) in 150 litres of water is heated to 70° C. and 120 kilos. of zinc dust (containing 90 per cent. of zinc) and 50 kilos. of zinc oxide previously mixed with a little water are added to and mixed with the solution. The mixture is heated for two hours at 100°—105° C. with vigorous stirring and is afterwards filtered. The filtrate is then evaporated *in vacuo*. By this method a 98 per cent. yield of formaldehyde-sulphoxylate is obtained.—P. F. C.

Extracting moisture from piece goods in open width; Machine for ——. P. Bailey, Dewsbury. Eng. Pat. 25,828, Nov. 20, 1911.

IN this type of machine the moisture is withdrawn from the wet fabric as it passes at full width over a longitudinal slit which is connected with a pump. If air can be drawn through the fabric the vacuum is partly destroyed and the extraction is inefficient. To prevent this the patentee uses a perforated or "reticulated" hollow roller mounted in self-adjusting bearings and fitted so as to rest upon that portion of the fabric which passes over the slit, and revolving loosely with the traverse of the fabric. The roller is covered with a porous fabric such as felt and is fitted with a sleeve for adjusting the perforations to the width of the fabric under treatment.—P. F. C.

"Benzine" and analogous cleansing agents of chemical laundries; Process and apparatus for purifying and decolourising impure —— with recovery of soaps in solution with the cleansing agent. Martini und Hüneke Maschinenbau-A.-G. Fr. Pat. 445,866, July 8, 1912. Under Int. Conv., July 26, 1911.

The liquid to be purified is filtered through fullers' earth, Florida earth, clays, silicious chalk, infusorial earth, etc., substances, such as alum, baryta, salts and oxides of magnesium, strontium, calcium, etc., being added, which will produce coloured lakes or difficultly-soluble salts. The mass used for filtering may be regenerated by washing with running water, then drying it and heating to incandescence. The lighter "benzine" (or benzene, etc.) separates from the wash water and may be recovered. The clarifying agent is disposed between two layers of felt or other similar substance, each layer being arranged between sieves, the distance between which may be varied. The felt may be covered on one or on two faces by layers of tow, etc., the whole being placed inside suitable towers, and the lower sieves are each inclined towards an opening in the wall of the tower. Several towers are connected by conduits, the latter being provided with valves, so that they may be coupled up in series in various ways.—B. N.

[*Textile materials*] *Impermeable; Improved process of rendering ——.* G. M. Anderson and Anderson Anderson and Anderson, Ltd. Fr. Pats. 445,884 and 445,885, July 8, 1912. Under Int. Conv., Nov. 28, 1911.

(1) A layer, composed of caoutchouc and impalpable powdered cork intimately mixed, is applied to the material, which is then calendered and vulcanised. Caoutchouc, or a supplementary sprinkling of cork powder, may be applied as another layer before calendering. (2) The base of caoutchouc and powdered cork, either separately or mixea, is applied to two layers of materials, and the layers are then superposed, so that the impermeable layer is between the material. The latter is passed through rollers to provide a homogeneous structure, calendered and vulcanised.—B. N.

Dyeing fibrous materials; Process for ——. W. R. Smith and J. D. Larkin. Buffalo, U.S.A. Eng. Pat. 8595, April 11, 1912.

See U.S. Pat. 1,025,323 of 1912; this J., 1912, 533.—T.F.B.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Acetic acid; An unusual impurity in dilute ——. K. Enz. Apoth.-Zeit., 1912, 27, 942.

A supply of dilute acetic acid of sp. gr. 1·041 used by the author for the preparation of pharmaceutical products was found to contain aluminium acetate: 100 grms. of the acid yielded 0·095 grm. of alumina.—W. P. S.

Tartaric acid in tartars and lees; Method of determining the total ——. A. Kling and D. Florentin. Ann. Falsif., 1912, 5, 518—522.

The racemate method, with the addition of ammonium citrate, for the determination of tartaric acid (see this J., 1912, 951) was found to yield accurate results even in the case of materials also containing considerable quantities of iron and aluminium oxides. The results obtained are, in certain cases, somewhat higher than those found by the usual methods, this being due to the fact that the racemate-citrate method gives the whole of the tartaric acid present. —W. P. S.

Potash from kelp in the United States. Board of Trade J., Dec. 12, 1912. [T.R.]

Two attempts are now being made in the United States to extract potash from seaweed on a commercial scale. One company treats about 40 tons of kelp daily, obtaining about 20 to 30 per cent. of potash from it. The kelp is gathered from the beach, dried, and burned in an open hearth. The residue is then converted into sulphate. The results afford good reason for thinking the process may be made profitable. The other method consists of gathering the kelp in the water by a special cutting device carried on a barge. The kelp is treated in closed retorts heated by petroleum. One ton of dried seaweed is estimated to produce about 550 lb. of chloride of potash, 200 lb. of sulphate of potash, 5 lb. of iodine, 200 lb. of fertiliser, and 45 lb. of gum, creosote, and waste. It is intended to equip the factory, at which the kelp is treated, with an apparatus for the production of cyanide and chlorate of potash.

Sodium carbonate; Discovery of —— in Africa. Oil, Paint, and Drug Rep., Nov. 25, 1912. [T.R.]

A discovery of sodium carbonate is reported near Hamans Kraal, Africa. A Johannesburg syndicate has leased the property from the government, and is putting down bore holes, which so far have proved the deposit to extend to millions of tons.

Sodium hypochlorite; Electrolytic production of ——. P. H. Prausnitz. Z. Elektrochem., 1912, 18, 1025—1080.

The author gives a survey of the modern theories of the electrolysis of alkali chloride solutions, and the details of a large number of experiments designed to elucidate certain points in the process. The increase in the maximum hypochlorite concentration with increasing anodic current density has been studied with both smooth and platinised platinum anodes, using a 5*N*-sodium chloride solution in a closed cell. With a short smooth straight wire electrode, a concentration of 88 grms. of combined chlorine per litre was obtained using a current density of 14·3 ampères per sq. cm. The energy consumption for this yield is of course much higher than for smaller concentrations. The form of the anode as well as the current density is of importance in determining the hypochlorite concentration which can be attained. Massive anodes in the form of foil are superior in this respect to wire gauze of the same surface. The reason for this superiority is to be found in the better diffusion layer which is formed at the massive electrode, so that it is only when the concentration of hypochlorite in the electrolyte is comparatively large that the hypochlorite ions begin to take part in the discharge processes. Anodes platinised with platinum black are superior to smooth anodes only up to 0·44 ampère per sq. cm. and then only when the electrodes are massive. With black electrodes a yield of 48 grms. of active chlorine per litre can be obtained with a density of 91 per cent. With higher current densities, particularly when gauze or grating electrodes are employed, the evolution of oxygen begins relatively early, so that the concentration attained is lower than that for smooth massive platinum electrodes with the same current density. The advantage of platinised platinum is found to be greatest after previous cathodic polarisation, and a defective platinised electrode can be regenerated by a short temporary reversal of the current. At 30° C. the concentrations attained are less than at ordinary temperatures. At 0° C. with 0·11 ampère per sq. cm. there is no marked increase over the corresponding values for 15° C., since other processes, such as the crystallisation of chlorine hydrate, interfere with the hypochlorite formation, and the coating is detached from platinised electrodes. Mechanical stirring produces a pronounced reduction of the maximum concentration, 400 turns per minute reducing the attainable concentration from 34 to 19·5 grms. per litre. The author's experiments show that the evolution of gas is not alone sufficient to reduce the diffusion layer at the anode to a minimum. By reducing the concentration of sodium chloride to 2*N* and to 1·1*N*, the maximum concentration and the current efficiency are notably reduced. The limiting current density at which platinising is of advantage is lower in more dilute solutions. On the other hand in a 1·1*N* solution a rise in temperature from 17° to 45° C. has very little effect on the production of hypochlorite. The effect of additions to the electrolyte with a view to diminishing cathodic reduction was studied with two platinum wire gauze electrodes. The results showed that the addition of chromate gave the best protection against reduction. The use of calcium hydroxide and Turkey red oil (Ger. Pat. 205,087; this J., 1909, 96), is actually accompanied by as much as 20 per cent. more reduction, but the attainable hypochlorite concentration is as much as 33 per cent. greater than that attainable when chromate is added. The Turkey red oil probably acts at the anode, forming a protective layer and producing a virtual increase in the current density. The effect of the Turkey red oil increases with the amount added, and for a high concentration of hypochlorite with a good current efficiency it is desirable to add both chromate and Turkey red oil. By this method 62 grms. of active chlorine per litre can be obtained from 5*N* salt solution with a density of 62 per cent. By the use of Portland cement as structural material for the cell, the conditions at the cathode and the anode are both so improved that the yield of hypochlorite is increased. When a model of a technical apparatus of the older Kellner type is used, the maximum hypochlorite concentration is less by 12 to 20 per cent. than in the experimental apparatus, owing partly to the movement of the electrolyte and partly to the introduction of carbon dioxide resulting in the formation of chlorate. In a model of the newer Kellner apparatus (this J., 1906, 482), with horizontal bipolar electrodes of wire gauze, the concentrations attained were to a large extent independent of the current, the circulation of the electrolyte and the temperature. It is important however that the anode should be underneath the cathode. The original concentration of the chloride and the nature of the additions have both an effect on the yield in the direction indicated by the experiments in the closed cell. Working under technical conditions the author obtained results very similar to those actually obtained on the large scale. Using chromate and Turkey red oil however, 68 grms. of active chlorine per litre with 41 per cent. efficiency were obtained from 5*N* sodium chloride—results which are better than any yet known in industry.

In a model on the Schuckert principle, with carbon cathodes and platinum foil anodes, using 10 per cent. brine, the current density was almost without influence. The addition of chromate produced better results than calcium chloride and colophony which are usually employed in the Schuckert process (Fr. Pat. 326,958; this J., 1903, 796). The yields obtained with the model were not quite so good as those usually obtained on the large scale, probably owing to the short duration of the experiments and to minor constructive defects.

The last tests were carried out in an original apparatus of E. Weichert designed for work on a relatively small scale in the textile industry. The cell is not yet fully described but works with vertical bipolar platinum foil anodes. In this case using dilute brine (5·5° Bé., sp. gr. 1·04), with chromate added, the concentration of active chlorine reaches 8 to 10 grms. per litre, the current yield being 70 to 90 per cent. At 14 amps. and 95 volts, this requires 3·6 to 4 kilowatt-hours per kilo. of active chlorine with a circulation of 40 litres of electrolyte per hour. The brine solution being dilute, rise of temperature has no disturbing effect and no cooling is necessary. —W. H. P.

Carbon monoxide; Determination of small quantites of ——. O. Brunck. Z. angew. Chem., 1912, 25, 2479—2481.

THE gas to be tested is collected in an Erlenmeyer flask of known volume, and shaken with a solution of palladium chloride containing excess of sodium acetate. The metallic palladium ($CO+PdCl_2+H_2O=Pd+CO_2+2HCl$), which separates, is filtered off and weighed. 1 grm. of palladium corresponds to 210 c.c. of carbon monoxide at N.T.P. It is necessary to use sodium acetate in order to prevent the hydrochloric acid from redissolving the finely divided metal in the presence of oxygen. The author gives figures illustrating the reliability of the method for percentages of carbon monoxide varying from 0·12 to 1·0 by volume, using about a litre in each determination. The method is not available in the presence of hydrogen or unsaturated hydrocarbons.—W. H. P.

Nitric oxide; New method of determining ——. O. Baudisch and G. Klinger. Ber., 1912, 45, 3231—3236.

IN a gas-pipette is contained a little moist stick caustic potash, the rest of the pipette being completely filled with mercury. The measured volume of gas containing nitric oxide is brought over into the pipette, and is followed by a measured volume of air, more than sufficient to convert the nitric oxide into nitrogen trioxide. As fast as the nitrogen trioxide is formed it is absorbed by the caustic potash, forming potassium nitrite, and no nitrogen peroxide is formed. The gas is now brought back into the measuring vessel, and the diminution of volume measured. Four-fifths of this is equal to the volume of the nitric oxide ($4NO+O_2=2N_2O_3$; $2N_2O_3+4KOH=4KNO_2+2H_2O$). This reaction can also be used to determine oxygen, if excess of nitric oxide be first brought into the caustic potash pipette, and the oxygen-containing gas be then admitted. If the nitric oxide be brought into excess of oxygen standing over caustic potash, there is always some formation of nitrogen peroxide.—J. T. D.

PATENTS.

Sulphur-burner; Automatic ——. G. W. Fortier, Assignor to E. B. Berwick, Grand Falls, Newfoundland. U.S. Pat. 1,044,369, Nov. 12, 1912.

THE sulphur-burner consists of a casing divided into an upper and a lower section. The lower section constitutes the combustion chamber and is provided with alternately arranged, horizontal shelves, extending from one wall of the chamber nearly to the opposite wall. The upper section of the casing is divided by a median, vertical partition into two parts; one part consists of three communicating compartments, of which the first communicates with the combustion chamber, the third with the atmosphere, and the intermediate one with each of the others; the other part of the upper section comprises a compartment containing a heating coil and a charging opening, and a compartment containing a regulating valve communicating with the combustion chamber, the two compartments being separated by a perforated wall.—O. R.

Formic acid; Process for the preparation of —— from the reaction mixture of formates and mineral acid. J. Weise, Wiesbaden, Assignor to R. Koepp und Co., Oestrich-on-the-Rhine, Germany. U.S. Pat. 1,043,985, Nov. 12, 1912.

A CURRENT of gas, which is indifferent to the reaction mixture, is caused to circulate from the still, through the condenser into the receiver and thence back to the still. The whole system is closed, and the same gas is used continuously and serves to carry the vapour of formic acid from the still to the receiver.—W. H. C.

Ammonia; Preparation of —— from its elements by the aid of a catalyst [*ruthenium*]. Zentralstelle für wissenschaftlichtechnische Untersuchungen Ges. m. b. H. Ger. Pat. 252,997, May 1, 1912.

THE claim is for the use of ruthenium or a ruthenium compound as catalyst, whereby it is stated that at 450° C., and under a pressure of only 80 atmospheres, a reaction product containing 11–12 per cent. by volume of ammonia can be regularly obtained.—A. S.

Silicon carbide; Process of producing ——. F. J. Tone, Niagara Falls, N.Y. U.S. Pat. 1,044,295, Nov. 12, 1912.

A CONTINUOUS, solid resistance-core, consisting of a series of jointed, shaped resistance pieces, is embedded in a charge of silicious and carbonaceous material, so as to form a circuitous path between the terminals of an electric furnace, and an electric current is passed through the conductor so formed.—O. R.

Alumina; Method of manufacturing crystalline ——. F. J. Tone and T. B. Allen, Assignors to The Carborundum Co., Niagara Falls, N.Y. U.S. Pat. 1,044,296, Nov. 12, 1912.

Pure amorphous alumina is fused in an electric furnace with sufficient iron oxide to prevent the formation of aluminium carbide or suboxide.—O. R.

Carbon dioxide; Process of making ——. H. B. Hunter, New York. U.S. Pat. 1,044,531, Nov. 19, 1912.

The current of gas containing carbon dioxide is brought into contact with a medium for removing impurities, and then subjected to pressure, during this time being brought into contact with a continuous stream of "absorbing medium." Some of the pressure is utilised for removing the absorbing medium to a chamber, where it is again heated to drive off the carbon dioxide, whilst another part of the pressure is employed to restore the regenerated solvent to the absorption chamber, thus making the supply of gas and the movement of the solvent continuous. —B. N.

Zinc values from sal-ammoniac-flux skimmings; Reclaiming ammonium and ——. J. McFetridge, Vandergrift, Pa., Assignor to American Sheet and Tin Plate Co., Pittsburgh, Pa. U.S. Pat. 1,044,557, Nov. 19, 1912.

The flux skimmings are digested with water and steam, during the time they are being ground, in order to dissolve the soluble zinc and ammonium salts. The mass is settled, filtered, and the insoluble oxide and oxy-chloride of zinc mixed with lime, the latter being in quantity equivalent to the chlorine in the oxy-chloride. The mixture is heated in a furnace to decompose the oxy-chloride and form zinc oxide and calcium chloride. The latter is dissolved in warm water, and filtered off from the insoluble zinc oxide.—B. N.

Marine plants; Process of treating —— with a view to extracting their constituents [iodine, mucilage, and the like]. M. P. P. Gloess. Fr. Pat. 445,771, July 4, 1912.

Marine plants are first treated with a solution containing about 0·1—0·5 per cent. of sodium peroxide, or with an alkaline solution of calcium or sodium hypochlorite, whereby the iodine present in the green plants goes into solution. The residue after the first operation is treated with a stronger solution containing about 0·5—2·5 per cent. of sodium peroxide, whereby the organic matter, other than the residual cellulose, goes into solution, its viscosity being simultaneously increased. The resulting mucilaginous material is claimed to find application: (*a*), as a gum; (*b*), as a waterproofing agent for textile fibres in conjunction with an aluminium salt; (*c*), as a waterproofing agent for lime-mortar and calcareous cement; (*d*), as a material for preventing the formation of boiler-scale. If, after the extraction of the iodine, the material be treated with a still stronger solution containing 2·5—5 per cent. and above of sodium peroxide, a product is said to be obtained, which possesses detergent properties and which can be used as a soap. It is finally claimed that the "soap" so obtained forms soluble compounds with magnesium salts, and can therefore be used for washing and bleaching with sea-water.—O. R.

Calcium nitrate solution; Process of solidifying ——. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. Fr. Pat. 445,826, July 6, 1912. Under Int. Conv., July 11, 1911.

The concentrated solution of calcium nitrate is strongly cooled and agitated, with the formation of a mass of solid particles suspended in the saturated fluid, and the viscous mixture is run in a thin layer over the surface of a cooled, rotating drum, provided with a scraper, whereby solid calcium nitrate is continuously removed in the form of fine flakes.—O. R.

Sodium bitartrate; Process for preparing ——. J. Matausch, jun. Ger. Pat. 251,804, Oct. 16, 1910.

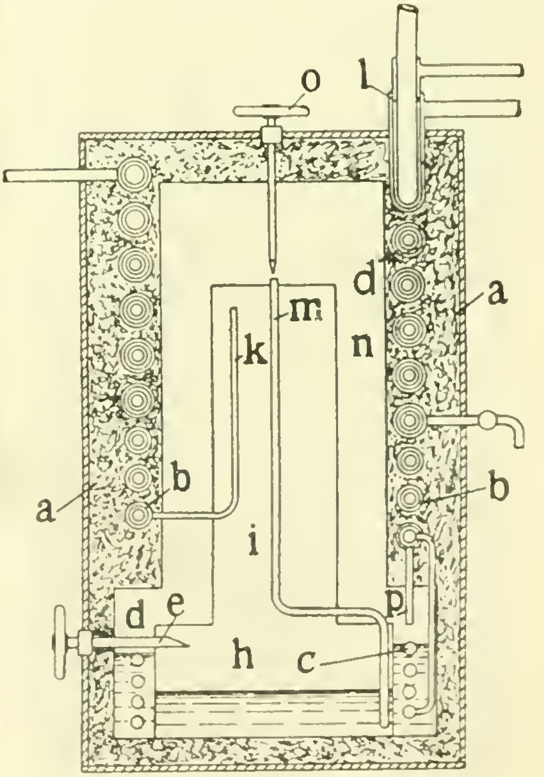
The bisulphite liquor obtained as waste product in the manufacture of cream of tartar, is neutralised with tartaric acid, the sulphur dioxide being recovered. It is stated that chemically pure, crystalline sodium hydrogen tartrate is thus produced.—T. F. B.

Potassium and sodium compounds from silicates; Process for obtaining ——. Chem. Fabrik Rhenania and A. Messerschmitt. Ger. Pat. 252,278, May 24, 1911.

In the working up of silicate minerals, such as felspar, phonolite, mica, etc., alkaline mixtures of potassium and sodium compounds are obtained. In order to obtain pure potassium and sodium compounds from such mixtures, they are treated with nitrates, the bases of which are precipitated in alkaline solution, *e.g.*, calcium nitrate, or with nitric acid or nitrous gases. The resulting solution of alkali nitrates is concentrated and subjected to fractional crystallisation. If the proportion of sodium to potassium in the mixture be high, a quantity of calcium nitrate (or nitric acid, etc.) equivalent only to the potassium is added, and from the solution, potassium nitrate is recovered by crystallisation; or an excess of calcium nitrate (or nitric acid, etc.) may be used, and then a corresponding quantity of the original mixture of sodium and potassium compounds added to precipitate the foreign bases present and leave a solution of alkali nitrates.—A. S.

Hydrogen and carbon monoxide; Apparatus for obtaining ——. Maschinenbau-Anstalt Humboldt. Fr. Pat. 445,883, July 8, 1912.

Water-gas is compressed until the carbon monoxide is liquefied, impurities such as carbon dioxide are removed in the usual manner, and the mixture of hydrogen and carbon monoxide is introduced into the separator, *a*, from which it passes through the tubular system, *b*, in counter-current to the separated cold gases, to the worm, *c*, situated in the evaporator, *d*, which is partly filled with liquid carbon monoxide. The mixture expands by way of the valved injector, *e*, into the condenser, *h*, at the bottom of which the liquid carbon monoxide accumulates, whilst the gaseous hydrogen rises into the upper, shaft-like prolongation, *i*, where accompanying carbon monoxide vapour descends



by virtue of its greater density, allowing pure hydrogen to pass by way of the overflow-pipe, *k*, into the tubular system, *b*, and out of the separator at *l*. The liquid carbon monoxide, which accumulates in *h*, passes through the overflow-pipe, *m*, controlled by the regulator, *o*, down the shaft, *n*, into the evaporator, *d*, leaving in the upper part of *n* any accompanying hydrogen, which may be withdrawn by means of a suitable regulating appliance. The liquid carbon monoxide, which accumulates at the bottom of *d*, is evaporated by the worm, *c*, and the gaseous carbon monoxide escapes by way of the pipe, *p*, through the tubular system, *b*, and out of the apparatus at *l*. By making the shafts, *i* and *n*, of the required height, the two gases may be obtained in any desired degree of purity.
—O. R.

Sulphuric acid ; Apparatus used in the manufacture of ——. R. Moritz, Wasquehal, France. Eng. Pat. 13,175, June 4, 1912.

See Fr. Pat. 444,474 of 1912 ; this J., 1912, 1124.—T.F.B.

Alkali amide ; Manufacture of ——. G. B. Ellis, London. From Chem. Fabr. von Heyden Akt.-Ges., Radebeul, Saxony. Eng. Pat. 25,891, Nov. 20, 1911.

See Fr. Pat. 438,487 of 1911 ; this J., 1912, 641.—T. F. B.

Cream of tartar and other tartaric products ; Production of ——. H. P. Cornette and L. C. E. Faucheux, Paris. Eng. Pat. 5759, March 7, 1912.

See Fr. Pat. 435,915 of 1911 ; this J., 1912, 386.—T. F. B.

Nitrides and ammonia from nitrogen ; Process for the manufacture of ——. Soc. Générale des Nitrures, Paris. Eng. Pat. 5795, March 7, 1912. Under Int. Conv., March 9, 1911.

See Fr. Pat. 438,248 of 1911 ; this J., 1912, 641.—T.F.B.

Ammonium sulphate ; Process and apparatus for treating gases in the production of ——. F. W. Burstall. Fr. Pat. 445,162, June 19, 1912. Under Int. Conv., June 19, 1911.

See Eng. Pat. 14,440 of 1911 ; this J., 1912, 230.—T. F. B.

Acids or acid salts and perborates containing water of crystallisation ; Process for rendering stable mixtures of anhydrous ——. Pearson und Co. Ges. m. b. H. Fr. Pat. 445,172, Jan. 8, 1912. Under Int. Conv., Feb. 27, 1911.

See Eng. Pat. 1578 of 1912 ; this J., 1912, 722.—T. F. B.

Hydrogen free from carbon monoxide ; Production of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 1759, Jan. 22, 1912.

See Fr. Pat. 439,262 of 1912 ; this J., 1912, 722.—T. F. B.

Silicon articles ; Process for making ——. The Carborundum Co. Fr. Pat. 445,029, June 15, 1912. Under Int. Conv., June 26, 1911.

See U.S. Pat. 1,037,713 of 1912 ; this J., 1912, 923.—T. F. B.

Process and apparatus for roasting zinc blende. Fr. Pat. 445,233. *See* X.

Electric furnace for producing oxides of phosphorus from natural phosphates. U.S. Pat. 1,044,957. *See* XI.

VIII.—GLASS ; CERAMICS.

Glass ware ; Apparatus for testing liability to breakage of ——. H. J. Reiff. Sprechsaal, 1912, 45, 719—720.

Seebeck found that glass which had been strongly heated and quickly cooled produced double refraction in the polariscope, owing to the strains which had been set up. This principle is used to detect the liability to breakage of glass in an apparatus specially adapted to the purpose.
—H. H. S.

International Plate Glass Convention. Times, Dec. 4, 1912. [T.R.]

Negotiations have recently been concluded whereby the present International Plate Glass Works Convention is to be definitely renewed for a period of ten years—namely, from August 17, 1914, until August 17, 1924. The object of the convention is to regulate in all markets the prices and conditions of sale of finished plate glass, and to limit the output of the different works in order to equalise production and consumption. Competition at present is practically limited to packing, quality, and time of delivery. Almost all the plate glass works in Europe have adhered to the convention, except the Société des Glaces de Courcelles (Belgium) and the firm of Pilkington Brothers at St. Helens, (Lancs.), but whilst not being bound by any formal engagement, these two works are nevertheless observing the prices set forth by the convention, and it is reported that negotiations are now pending with Messrs. Pilkington Bros. for a limitation of output.

It has been decided to form a trust of the plate glass industry, under the name of "Union Internationale et Commerciale des Glaceries," the purpose being to centralise at Brussels all the commercial services of the different works, and to form a *comptoir de ventes* of the plate glass industry. This combination is not destined to take the place of the International Plate Glass Convention. It will really act as a big exporter, buying the output, at a given price, of all the works in proportion to the orders received, and re-selling it at the prices and conditions fixed by the convention. It is proposed that the trust shall have a capital of two million francs (£80,000), to be subscribed by the different companies. It is claimed that the main advantage of this organisation will be the complete suppression of all competition, not only as regards prices and conditions of sale, but also as to the conditions of packing and the quality of plate glass.

Lead poisoning in American potteries. Oil, Paint, and Drug Rep., Nov. 25, 1912. [T.R.]

In a study of lead poisoning in potteries, tile works, and porcelain enamelled sanitary ware factories, recently made for the Federal Bureau of Labor, it was found that, compared with British potteries, American potteries, with less than one-half of the workpeople, show almost twice as many cases of lead poisoning. Even these figures, unfavourable as they are to American establishments, do not tell the whole truth, for in the absence of legal requirements for the recording or reporting of cases of lead poisoning at the time of the investigation, it was impossible to make a complete census of the cases which had occurred during the last two years. Among the 1100 men employed in the potteries and tile works investigated, eighty-seven cases of lead poisoning occurred in 1911, and among the 393 women fifty-seven cases. Among the 1012 men engaged in the porcelain enamelling of iron sanitary ware 187 cases of lead poisoning were found in 1911.

Patents.

Porous objects ; Manufacture of ——. B. Schwerin. First Addition, dated June 22, 1912, to Fr. Pat. 426,072, Feb. 15, 1911 (this J., 1911, 942).

Materials, which are non-plastic in ordinary circumstances, are very finely powdered, suspended in water, and made to assume the colloidal state by the addition of acids or bases, according as the materials are electro-positive or electro-negative respectively. The colloidal solution is removed from any precipitated impurities, and the colloidal substance, after removal of the electrolyte, will be sufficiently plastic in character to be used, either alone or in combination with non-colloidal matter, as a substitute for the carborundum or corundum of the principal patent.—O. R.

Enamel; Manufacture of white ——. Verein Chem. Fabr. Landau, Kreidl, Heller und Co. First Addition, dated June 6, 1912 (under Int. Conv., June 8, 1911), to Fr. Pat. 429,665, May 12, 1911 (this J., 1911, 1213).

Zirconium compounds, free from silica, (as, for example, the zirconium oxide) are mixed with an equal weight of silicic acid or a silicate, and heated with the hydroxide or carbonate of an alkali or alkaline-earth metal, with the subsequent removal of the soluble silicates and free alkaline matter. The products are used as opacifying agents in the preparation of white enamels. —O. R.

Fire bricks; Process for manufacturing light ——. M. Hanabusa, Tokyo. Eng. Pat. 3309, Feb. 9, 1912.

See Fr. Pat. 439,970 of 1912; this J., 1912, 723.—T. F. B.

IX.—BUILDING MATERIALS.

Lime-mortar; Corrosion of lead by —— and the disinfecting power of calcium hydroxide. W. Vaubel. Z. angew. Chem., 1912, 25, 2300—2301.

The author observed that lead pipes, which had been in contact with lime-mortar, became deeply pitted and covered with a coating of basic lead carbonate. The corrosive action as regards lead of aqueous solutions containing oxygen, especially in the presence of alkaline substances, is well known, but the powerful action of calcium hydroxide, in the absence of appreciable quantities of moisture, called for further explanation. The author traced this activity of calcium hydroxide to the absorption of atmospheric oxygen with the formation of peroxide compounds, possibly HO.Ca.O.OH, and $Ca(O.OH)_2$, which gave up oxygen when acted upon by an acid or carbon dioxide. Calcium hydroxide, prepared from pure marble and dried in the air, invariably gave a blue colouration with potassium iodide-starch; the solution of the air-dried substance in dilute hydrochloric acid did not yield the reactions for either hydrogen peroxide or ozone, nor did the dry material give evidence of the presence of nitrous acid. The iodide-starch reaction could therefore only have been brought about by a compound having the nature of calcium peroxide. The author attributes the well-known, powerful disinfecting action of slaked lime to the same cause, bacteria, fungi, and lower organisms being destroyed not by the action of hydroxyl ions, *i.e.* alkalinity, but owing to the formation of calcium perhydroxide and the evolution of oxygen on carbonation of the calcium compound. Two specimens of calcium hydroxide were examined; one was prepared from marble and air-dried for 14 days, the other was a hydraulic lime which had been stored for many months. Each sample was treated with dilute hydrochloric acid and potassium iodide, the liberated iodine being determined by titration and showing the same result in each case, namely about 0·125 part of oxygen calculated on 100 parts of calcium hydroxide. Pure, precipitated calcium carbonate was found to contain no peroxide, and the quantity of oxygen absorbed by calcium hydroxide was small enough to allow of its being neglected in the technical analysis of lime-mortars.—O. R.

Portland cement; New substance for increasing the strength of ——. F. M. Meyer. Tonind.-Zeit., 1912, 36, 1883—1885.

The author investigated the action of blast-furnace flue-dust on the strength of Portland cement, and found that both the coarse and the fine dust, which were deposited in the conduits between the furnace and the gas-filters, had a weakening action when mixed with cement. These specimens of dust were rich in insoluble residue, poor in soluble silica and lime, and contained no alumina. On the other hand the very fine dust, which collected in the gas-filters themselves, contained only 0·6 per cent. of insoluble residue, and 29·8, 20·1, and 22·5 per cent. of soluble silica, alumina, and lime respectively. This filter-dust possessed weak setting properties of its own, and added to Portland cement in quantities of 10, 20, and 30 per cent., effected a marked increase in the tensile and crushing strengths; even 40 per cent. of added filter-dust increased the 7-days (in air) and scarcely affected the 28 days (under water and in air) tensile and crushing strengths of 1 : 3 cement-sand mortars. The dust in question was so fine as to leave no residue on a 5000 mesh (per sq. cm.) screen, its specific gravity was 2·37, and its volume weight was 265 grms. per litre. The latter seemed to be the only characteristic which would enable one to detect its presence as an adulterant of Portland cement, for the volume-weight of Portland cement averaged about 1140 grms., whereas that of a mixture containing 90 parts of cement and 10 parts of filter-dust would be only 791 grms.—O. R.

Asbestos; Types and modes of occurrence of —— in the United States. J. S. Diller. J. Canadian Min. Inst., 1911, **14**, 93—106.

The paper is mainly of a geological character and deals with the nature of the asbestos deposits of the United States. Only two of the four different types of deposits are worked commercially, viz., (1) cross fibre veins of chrysotile asbestos in serpentine derived from peridotite in Vermont; and (2) mass fibre amphibole (anthophyllite) asbestos in Georgia and Idaho. In the manufacture of products containing asbestos, the United States has been pre-eminent for many years, but only recently has the mining of asbestos attained any importance in that country. At present the production of asbestos in the United States (over 3000 tons) is about 5 per cent. of the Canadian production, which constitutes by far the largest part of the world's total output.—A. S.

Cement in Egypt. Ch. of Comm. J., Dec., 1912. [T.R.]

The "Bulletin Commercial," of Brussels, states that Egypt now offers an important market for cement. In 1911 the imports were 106,670 tons, valued at £E162,751, as compared with 87,503 tons in 1910. The great vogue for buildings of ferro-concrete has largely contributed to the development of the import trade in cement, and this trade seems likely to be maintained. The extensive port works recently commenced at Port Said, and those projected at Alexandria, will necessitate the provision of large quantities of cement. The Belgian imports were the largest in 1911, amounting to 50,257 tons, followed by those from England, 35,192 tons. The remainder of the imports came from Austria, France, and Germany. The Government Laboratory makes tests of samples of lime and cement which are submitted, at an average charge of £2 12s. per sample. Artificial cement (slow hardening) is imported in barrels of 150, 180, and 200 kilos. gross for net. Sacks are taking the place of barrels owing to the rapidity with which the cement is used. There are, however, cases where barrels are preferred. Natural cement (rapid or semi-slow hardening) is used principally by the natives and also for certain masonry work; it comes mainly from Belgium. This cement is imported in barrels of 140 to 150 kilos. gross for net, and in sacks of 45 to 50 kilos., sacks invoiced. Empty sacks are invoiced to the importer by the manufactory; if he takes care of them, or returns them only in a bad condition, they are carried to his account. Cement users, however, do not readily agree to these conditions, and the importer eventually suffers the loss. English manufacturers are in the habit of shipping cement in very light bags, which are strong enough for one voyage and are not charged for. This method has given excellent results.

Patents.

Timber; Process and appliance for drying or seasoning ——. S. Elliott, Reading. Eng. Pat. 21,763, Oct. 3, 1911.

Timber is stacked inside a rectangular chamber, which is heated at the bottom by a system of steam pipes, mounted on a concrete floor underneath a grating, the heating chamber being also provided with a direct steam inlet, and with a perforated outlet pipe leading to a fan. After the heating chamber has been charged with timber, steam is admitted to the heating pipes and also directly into the chamber; after about 10 hours the supply of direct steam is cut off, and the temperature of the chamber is maintained at about 110° F. (43° C.) for a desired period. After 1—2 months, according to the thickness of the timber, the fan is set in operation and is kept running until the exhaust air ceases to be moist, when the chamber is opened and the timber taken out.—O. R.

Wood; Process of preserving ——. E. Kuhn. Fr. Pat. 445,244, June 20, 1912.

Wood is impregnated for 24—36 hours in the hot, waste ammoniacal liquors produced in the recovery of ammonia from coal-gas and the like. To obtain a greater degree of preservation, the wood, whilst it is still hot and wet after the above process, may be introduced and allowed to cool completely in a bath of ordinary preservatives, such as mixtures of crude creosote with zinc chloride, or the like. —O. R.

Cement kilns; Heat-regenerator for ——. B. Bruhn, Charlottenburg, Germany, Assignor to The Commercial Research Co., New York. U.S. Pat. 1,043,901, Nov. 12, 1912.

The claim is for regenerative chambers in combination with rotary cement kilns, the regenerators being suitably connected with the kilns, and containing cement clinker to absorb and deliver heat.—O. R.

Slaking lime and burning gypsum; Process and apparatus for ——. H. Laborbe. Fr. Pat. 445,373, June 25, 1912.

In a vertical apparatus an upper, conical section rests on two cylindrical sections, these constituting a heating, a slaking, and a cooling chamber respectively. Each section is composed of a double-walled, sheet-steel cylinder, the annular space between the walls serving for the circulation of cold water, hot water, or steam under pressure, as required, the inside walls of the cylinders constituting heating or cooling surfaces. Each section is divided into a number of subdivisions by means of horizontal partitions, through the centre of which passes a vertical shaft which drives the moving parts of the apparatus, and which is surrounded by openings in the partitions, which afford communication between successive subdivisions. Horizontal arms, attached to the vertical shaft, rotate slowly between fixed arms and baffle plates situated inside the subdivisions, ensuring the regular distribution, penetration and downward movement of material, which is fed in at the top of the apparatus. The conical form of the upper section allows for the expansion of the material under treatment, and hot water, deriving its heat from the material in the cooling chamber, circulates round the upper section and imparts heat to the material in those cases when the heat of the reaction does not itself suffice, as in the treatment of lean and hard-burnt limes, cement clinker, or the like, and in the preparation of plaster from gypsum. In the latter case water passes from the cooling chamber to the pre-heating section and thence to a boiler, which provides the steam for the median burning section. —O. R.

Wood; Process of preserving and colouring ——. C. J. Faller, Zürich, Switzerland. U.S. Pat. 1,043,582, Nov. 5, 1912.

See Fr. Pat. 405,234 of 1909; this J., 1910, 214.—T. F. B.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Case-hardening of special steels. A. Sauveur and G. A. Reinhardt. Trans. Amer. Inst. Min. Eng., 1912, 1335—1341.

Starting with pearlitic steel, by increasing the carbon content or the nickel content, or both, the metal becomes martensitic and eventually austenitic, and remains so after slow cooling, *i.e.*, it is self-hardening. It should therefore be possible to manufacture case-hardened objects of nickel-steel and of some other special steels having pearlitic, *i.e.* soft and tough, cores, and martensitic or austenitic cases, without quenching. A number of tests made showed the practicability of producing martensitic cases and even, in presence of sufficient nickel, austenitic cases. Micrographic examination clearly shows the results obtained. An obvious application is the production of tough pieces of machinery with hard wearing surfaces without the distortions and strains produced by quenching.—R. W N.

Chromium and aluminium; Determination of —— *in ferrochrome alloys.* K. Müller. Stahl u. Eisen, 1912, 32. 2049.

The following methods are given for the determination of chromium and aluminium in pure chromium or in high percentage ferrochrome alloys. *Chromium.* One gram of the metallic powder is dissolved in 100 c.c. of dilute sulphuric acid and the boiling solution treated with 1 or 2 c.c. of dilute nitric acid and diluted to 250 c.c. 50 c.c. of this solution are diluted to 200 c.c., heated to boiling, and treated with concentrated potassium permanganate (25 grms. per litre) until a permanent opacity is produced. The solution, after a further addition of 2 c.c. of the permanganate solution, is boiled for 10 min. longer, any remaining permanganate colour being removed by the addition of a drop or two of manganese sulphate solution, and then filtered through an asbestos filter. The precipitate is washed and then treated with a hot sodium hydroxide solution (2*N*) and this filtrate is allowed to run into dilute sulphuric acid and if showing any yellow colour is added to the main filtrate which is then titrated with ferrous sulphate and potassium bichromate or permanganate. A sample of chromium prepared by the Goldschmidt thermit process was shown by this method to contain 98·75 per cent. of chromium and then after the determination of silicon, iron, and aluminium gave 98·8 per cent. of chromium by difference. *Aluminium.* 2 grms. of the powdered metal are dissolved in dilute hydrochloric acid, the solution evaporated to a syrupy consistence, and the silica removed. The filtrate is neutralised with sodium peroxide (free from aluminium) and then boiled with an excess of the peroxide and filtered. A solution containing sodium aluminate and chromate, and a precipitate of iron oxide containing small quantities of alumina are obtained and these are treated separately. The filtrate (a) is acidified with dilute sulphuric acid, neutralised with ammonia, excess being avoided, and boiled. The precipitate, after settling, is filtered off, washed with hot water and then dissolved in dilute sulphuric acid and the solution made alkaline with sodium peroxide in slight excess in order to remove any adherent chromium as chromate, and the aluminium in the acidified solution precipitated by ammonia and ammonium nitrate. The oxide of iron precipitate (b) is dissolved in dilute nitric acid and neutralised with sodium hydroxide free from aluminium. The solution is then added to a boiling sodium hydroxide solution (1 : 3) in a nickel dish and heated for 5—10 min. The iron and aluminium can only be separated by adding an already neutralised solution to the boiling sodium hydroxide solution. The acidified filtrate is then neutralised with ammonia, and the aluminium hydroxide obtained mixed with that obtained from (a), dissolved in dilute nitric acid, reprecipitated in presence of ammonium nitrate, washed, and ignited.—A. H. C.

Titanium; Notes on —— *and its cleansing effect on cast-iron.* B. Stoughton. Trans. Amer. Inst. Min. Eng., 1912, 1245—1269.

Following on sections devoted to the history of titanium, its occurrence, physical and chemical properties, and production, a review is given of its employment in the metallurgy of pig-iron, steel, and the non-ferrous metals. Numerous tests are described in detail, and figures given from which it appears that the strength of iron may be increased 30 to 50 per cent. by the cautious use of titanium. To accomplish such results, however, it is necessary to use suitable proportions of titanium, to incorporate it thoroughly with the molten metal, and to cast at the right temperature. It is noteworthy that the titanium does not, generally speaking, remain in the finished product; having performed its work it passes out of the metal. There are, however, true titanium-alloy steels, though these are little known as yet. A very full bibliography is given.—R. W. N.

Gold bullion; Two new methods of weighing cornets in the assay of ——. A. O. Watkins. Chem. News, 1912, **106**, 248—249, 259—260.

At the Perth (Western Australia) mint bullion assays are made in duplicate, one by weighing the cornets by a modification of Foord's compensating weight method, and the other by a direct-weight system. It has been found that under the conditions of work employed, there is the same difference in surcharge for equal differences in fineness, so that the surcharge of a cornet can be resolved into two parts: one, a correction proportional to the fineness of the bullion (or proof) but constant for all fires, and the other, a correction constant for all cornets in a fire, but varying in different fires. The first correction is made by adjustments applied to the weights and ordinary rider used, and the second by placing an extra ("surcharge") rider in the requisite position on the beam. The balance reading thus gives the fineness directly, corrected for surcharge.—R. W. N.

Slags; Copper losses in ——. T. Kiddie. J. Canadian Min. Inst., 1911, **14**, 487—489.

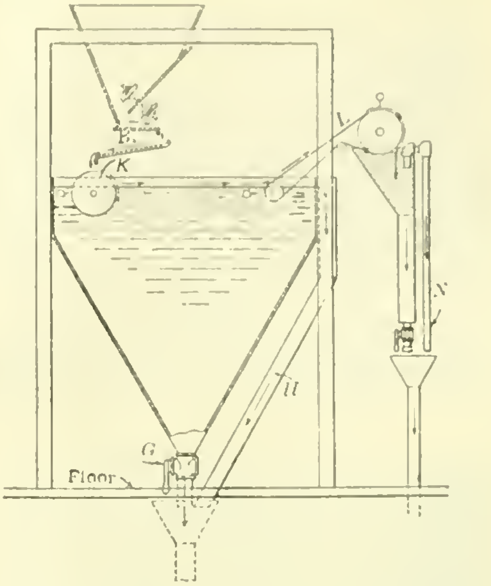
The author has regularly determined, for some years past, the copper existing as oxide (or silicate) and as sulphide in slags high in copper, and the results have shown that, in general, increase in the copper content was due to increase in the proportion present as oxide and not to that present as sulphide. For example in a slag containing 0·075 per cent. of copper, only 20 per cent. was present as oxide, whereas in one containing 0·45 per cent. of copper, 66 per cent. was present as oxide. These results confirm those of L. T. Wright (see this J., 1909, 1136). When the proportion of oxidised copper in a slag is high, an effective means of reducing the copper content is to run the molten settled slag over or through a bath of low-grade matte in a second settler, when the copper oxide is reduced by the ferrous sulphide present in the matte.—A. S.

Brass; Behaviour of —— on heating in hydrogen at temperatures below the melting point. E. A. Lewis. Chem. Soc. Proc., 1912, **28**, 290—291.

It was observed that, on heating brass in pure dry hydrogen to between 700° and 800° C., zinc volatilised to a large extent. Experiments were made, in which the brass was heated for three, six, nine, and twelve hours. It was found that the whole of the zinc could not be driven off even after twelve hours' heating, 3 or 4 per cent. remaining behind. It was further found that if small quantities of tin were present in the brass it did not volatilise, but lead was found to be practically completely volatile. The metal, after heating, did not become brittle. A piece of sheet brass, heated in hydrogen until a large proportion of its zinc had volatilised, was found when cold to be quite soft and not in the least brittle like a cast and rolled copper sheet would become under the same treatment, due to loss of oxygen. It may now be considered as proved that chemically combined oxgyen is not an essential constituent of alloys of copper and zinc as it is of copper.

[Ore concentration] Flotation process; The Wood ——. H. E. Wood. Trans. Amer. Inst. Min. Eng., 1912, 1227—1244.

Small grains of mineral sulphides float readily on water. In the Wood process this property alone is utilised. There are three types of machines used: the principle in each is as follows: the ore, crushed to from 10- to 40-mesh size (or finer in some cases) is gently deposited on a flowing sheet of water. The gangue sinks, while the floating film of sulphides is collected and removed. The most efficient type of machine is shown in the adjoining figure. The ore drops from the vibrating plate, B, on to a corrugated rubber or canvas-covered cylinder, K, revolving in water, and which carries upon its surface sufficient water to wet the gangue. The floating film of sulphides crosses the tank and is forced by water jets on to an endless canvas belt, L, the water draining back into the tank, and carrying with it any suspended gangue. The concentrate is deposited in another tank, the automatic siphon, N, preventing any overflow of concentrate. The tailing from G and H usually passes to Wilfley tables, though this is not always necessary. The concentrate from this type of machine is much freer from gangue than with the other types. About 0·5 ton per hour of an average quartz ore can be treated with a 3-ft. feed roll and a 4-ft. canvas belt.



During the tests made with the process, many points of special interest have been noted with different ores. To obtain a maximum flotation with copper ores, freshly crushed material must be taken, as an amount of oxidation which is otherwise imperceptible exerts a very marked deleterious effect on the floating property of the sulphide grains. With galena and blende this is not the case. Bornite and chalcocite do not float so well as chalcopyrite. Most of the magnetic minerals sink. Unnecessarily fine pulverisation is disadvantageous. Attention has been paid also to the treatment of minerals containing molybdenite and graphite. The examples of tests quoted show good results.—R. W. N.

Sulphuric anhydride; Determining —— in flue gas [from smelting and roasting furnaces]. F. G. Hawley. Eng. and Min. J., 1912, **94**, 987—988.

Advantage is taken of the fact that sulphuric anhydride is a solid at ordinary temperatures, to retain it in a filter prepared by placing a double Munktell's filter-paper No. 0 between the large ends of two 3-in. glass funnels, placed together. A strip of indiarubber or electrician's tape is used to make the joint air-tight. The filter-paper should be moist but not wet. Four to ten litres of the flue-gas are drawn through, at the rate of one litre per minute, followed by one litre of air to displace and expel any sulphur dioxide present. The paper is then removed and placed in a beaker, into which the funnels and tubes of the apparatus are rinsed. The contents are diluted to about 100 c.c., methyl orange is added, and titration effected with $N/10$ sodium carbonate solution. The action of the sulphuric acid on the filter-paper does not affect the result unless a dry paper be used and allowed to stand after large amounts of sulphuric anhydride have been caught. No amount likely to be found in flue-gas will cause trouble in this way if a moist paper be used and placed in water afterwards. Quantitative tests of this method showed good results, and the author considers it satisfactory, as being simple, rapid, and giving uniform results.—R. W. N.

Hardness (of metals); Comparison of five methods used to measure ——. R. P. Devries. U.S. Bureau of Standards, Technical Paper No. 11. J. Franklin Inst., 1912, **174**, 583—584.

As the result of determining the hardness of a series of metals and alloys by the methods ordinarily employed, it was found possible to obtain rational values by means of the static tests (cone and Brinell sphere), the results indicated by the dynamic tests (Shore scleroscope, Brinell sphere and Ballantine test) being generally not in agreement with these values. The results of the determinations are shown in the following table :—

Metal or alloy.	Shore scleroscope.	Brinell sphere.		Cone test.		Ballantine test.
		$\frac{P}{2\pi t R^1}$	$\frac{P}{t}$	90° cone.	60° cone.	
Carbon steel	86·1	641	4550	—	—	3·2
Silicon steel	33·6	261	865	331	130	3·0
Manganese steel	29·5	179	641	368	124	3·3
Cast iron No. 1	33·3	149	538	191	68	3·2
Cast iron No. 2	32·9	172	590	231	79	3·3
Bessemer steel	26·6	188	428	260	76	3·3
Tool steel	37·8	289	1230	—	—	3·3
Copper-tin alloy 1	42·4	110	460	130	50	3·1
Copper-tin alloy 2	25·5	105	323	149	54	3·2
Copper-tin alloy 3	22·1	94	289	122	48	3·4
Copper 4	15	89	235	114	38	3·2

—W. E. F. P.

Mineral production of India in 1911. Board of Trade J., Dec. 5, 1912. [T.R.]

The official "Indian Trade Journal" (Calcutta) of 14th November publishes particulars taken from the report of the Director of the Geological Survey of India, of the values of the chief minerals produced in 1911 as compared with the values for 1910, as shown in the subjoined statement. In the year 1909 there was a fall, for the first time since 1898, in the total value. This fall, which amounted to 4·6 per cent., was converted into a small rise in 1910, which, however, has again given place to a fall of about ½ per cent. in 1911. The fall was due, in the last instance, to the greatly reduced production of manganese ore and salt.

—	1910.	1911.
	£	£
Coal	2,455,544	2,502,616
Gold	2,202,486	2,238,143
Petroleum	835,927	884,398
Manganese ore	849,455	648,701
Salt	565,078	469,235
Saltpetre	223,762	220,012
Mica	177,152	188,642
Lead ore and lead	163,022	181,989
Tungsten ore	38,873	99,989
Ruby, sapphire, and spinel	58,849	67,594
Iron ore	9,811	44,487
Jadestone	64,747	41,660
Tin ore and tin	18,578	24,931
Silver	4,968	11,575
Graphite	20,479	9,425
Chromite	2,315	5,072
Alum	2,869	2,792
Garnet	1,842	1,845
Corundum	323	1,660
Magnesite	1,382	1,047
Diamonds	590	478
Amber	283	133
Other	604	837
Total value	£7,698,939	£7,657,261

Production of lead, zinc, and cadmium in 1911. Chem. Trade J., Dec. 14, 1912. [T. R.]

Lead.—The following table shows the world's production of lead, in short tons, during the years 1909-11 inclusive :—

Country.	1909.	1910.	1911.
Australia	85,098	108,907	109,789
Austria-Hungary	15,432	19,290	21,605
Belgium	44,423	44,864	33,951
Canada	22,928	16,535	11,795
France	29,652	22,266	25,353
Germany	185,076	176,258	177,801
Great Britain	31,085	32,628	29,872
Greece	16,865	18,519	15,763
Italy	24,361	15,983	18,408
Japan	3,748	3,858	3,858
Mexico	130,071	133,048	132,276
Russia	882	1,323	1,102
Spain	202,823	211,531	189,155
Sweden	220	441	2,866
Turkey in Asia	13,338	13,999	13,668
Other countries	6,393	17,306	20,944
United States (domestic)	354,188	372,227	392,842
Total	1,166,583	1,208,983	1,201,048

Zinc.—The world's production of spelter in 1911 was again the largest in history, exceeding that of the record output of 1910 by 85,549 tons, or 9·6 per cent. The greatest increase was contributed by Germany, which exceeded its production of 1910 by 24,962 tons. Belgium made a gain of 24,817 tons, and the United States 17,342 tons. The following totals, apportioned according to the country where smelted, and not according to the source of the ore, show the world's production, in short tons, during the years 1909–1911 inclusive :—

Country.	1909.	1910.	1911.
Australia	—	560	1,904
Austria and Italy	13,931	14,666	18,602
Belgium	184,194	190,233	215,050
France and Spain	61,859	65,191	70,791
Germany	242,594	251,046	276,008
Great Britain	65,422	69,531	73,803
Holland	21,548	23,121	25,059
Poland	8,758	9,514	10,952
United States	255,760	269,184	286,526
Total	854,066	893,046	978,695

Cadmium.—The chief output of cadmium comes from the zinc-producing regions of Silesia, Germany, where it is recovered as a by-product in the distillation of zinc. Recently in the United Kingdom a little cadmium has been recovered in the purification of zinc sulphate in the manufacture of lithopone. The German production of cadmium during 1911 totalled 93,961 lb., valued at £10,675, against 90,516 lb., valued at £7,863, in 1910.

PATENTS.

Iron or steel; Treatment of ——, *for preventing oxidation or rusting.* F. R. G. Richards, Coventry. Eng. Pat. 17,563, Aug. 2, 1911.

The clean metal is immersed for from 30 to 90 minutes in a boiling solution composed of ½ gallon of concentrated phosphoric acid (sp. gr. 1·5), 3 lb. of manganese dioxide and 120 gallons of water.—W. E. F. P.

Iron; Apparatus for the electro-deposition of ——. G. Tischenko, St. Petersburg. Eng. Pat. 5854, March 8, 1912.

In an apparatus for the electrolytic production of metallic wall coverings, the cathode consists of a closed, hollow cylinder or drum mounted upon a horizontal, hollow, rotatory axle through which a heating medium (preferably steam) is adapted to be admitted to, and discharged from, the interior of the cylinder.—W. E. F. P.

Iron and other ores; Process and apparatus for nodulising of finely divided ——. A. Heckscher. Fr. Pat. 444,983, May 24, 1912.

The ore (magnetite, burnt pyrites, etc.) is slowly charged into the upper end of an inclined, cylindrical, rotatory furnace fired from the lower end. It is claimed that at the temperature prevailing in the nodulising zone of the furnace, particles of ferric oxide become coated with magnetic iron oxide and that agglomeration is effected by the incipient fusion of the latter compound. Provision is made for the injection of a stream of water into the lower end of the furnace for the purpose of breaking up such annular accumulations of agglomerated ore ("salamanders") as may be formed around the lower part of the nodulising zone during operation; and the discharge end of the furnace is provided with a detachable section for facilitating repair.—W. E. F. P.

Iron ore; Process for the reduction of —— *to spongy iron.* H. Hinden. Ger. Pat. 253,084, Jan. 22, 1910.

To reduce ore by means of hot producer gas, chambers mounted on a tilting frame, are arranged around the producer, and these chambers are connected with one another and with the producer in such a way that individual chambers can be cut out and reintroduced into the circuit as desired. When the ore in a particular chamber is completely reduced, this chamber may be cut out of the circuit, the spongy iron discharged directly into a melting furnace, and fresh ore charged into the chamber, which is then again introduced into the circuit.—A. S.

Steel; Manufacture of silicon sheet ——. H. R. Connell, Brackenridge, Pa., U.S.A. Eng. Pat. 7095, March 22, 1912. Under Int. Conv., March 24, 1911.

With the object of improving the magnetic properties of silicon steel employed in the manufacture of electrical and other apparatus, the pack of sheet metal—when of nearly the required thickness—is heated to not lower than the ordinary reheating temperature and is then reduced to the desired thickness by one or two passages between suitable rolls, the operations being so conducted that the pack is discharged at about the temperature of recalescence of the metal.—W. E. F. P.

Steels: Process for hardening carbon ——. M. P. P. Gloess. Fr. Pat. 445,739, July 3, 1912.

The steel—at a dull cherry-red heat—is quenched in a bath consisting of a concentrated aqueous solution of magnesium sulphate or chloride.—W. E. F. P.

Silver and other metals; Method of cleaning articles made of ——. A. Rosenberg, London. Eng. Pat. 17,150, July 26, 1911.

An electrochemical method in which, instead of using a plate of an electropositive metal, as heretofore, such electropositive metal is present in a pulverulent form in the alkaline solution, thus giving a larger surface in contact, and giving rise to numerous intense local chemical reactions producing nascent hydrogen. Aluminium is preferred, but other metals or alloys of metals, or particles of one metal coated with another, may be used. The pulverulent metal and the alkaline reagent may be intimately mixed and formed into blocks or paste. The proportion of comminuted electro-positive metal to alkali may vary; one part by weight of aluminium to 125 parts of alkaline reagent will produce good results.—R. W. N.

Precious metals; Process for producing ——. A. G. Bloxam, London. From A. Verley, Paris. Eng. Pat. 28,595, Dec. 19, 1911.

Iron or steel, in a magnetic field, or in a magnetised state, when brought into contact with water and an electrolyte, is claimed to yield "a substance soluble in water, volatile with water vapour, and able to transform itself into gold, silver, and platinum." On evaporating such a solution in presence of an inert powder, precious metals can be extracted by known processes from the residue.—R. W. N.

[*Gold and silver*] *Metal; Machine for separating* —— *from ores.* C. Ross, Denver, Colo. U.S. Pat. 1,045,083, Nov. 19, 1912.

The apparatus consists of a horizontal vessel provided with a continuous undulating bottom from front to rear and adapted to be supplied with a stream of ore pulp from an elevated receptacle at one end and to be continuously discharged at the opposite end, the feed and discharge being regulable and the flow directed across the undulations of the bottom. The troughs of the latter are charged with mercury, and from the bottom of each a vertical partition—provided with openings at the lower end—extends towards the top of the vessel, which is thus divided into a series of communicating, parallel compartments. The latter are charged with amalgamated metal shavings supported upon perforated shelves above the bottom of the vessel and are thus adapted to be flooded to any desired height by the pulp passing through the vessel in the form of an undulating stream.—W. E. F. P.

[*Lead and zinc*] *Sulphide ores; Treatment of* ——. E. A. Ashcroft, London. Eng. Pat. 24,170, Oct. 31, 1911.

In a process operated in conjunction with the electrolysis of alkali chlorides and the production of ammonia and ammonium compounds, the sulphide ore, suspended in fused zinc chloride, is subjected to the action of electrolytic chlorine, whereby metal chlorides and free sulphur (or volatile sulphur compounds) are produced. Lead and silver having been removed by any known means, the melt is treated with a small quantity of water, and ammonia is passed into the solution until the hydroxides of manganese and zinc at first precipitated with the ferric hydroxide are re-dissolved. After removal of the latter by filtration, and treatment of the solution with chlorine to separate the manganese, the precipitation of the zinc as hydroxide is effected by heating the liquid to expel the excess of ammonia or by adding a further quantity of zinc chloride. The ammonium chloride produced is recovered from the solution by crystallisation and may be treated with lime for the production of ammonia, or converted into ammonium sulphate, the sulphuric or sulphurous acid required in the latter case being obtained from the sulphur evolved during the initial treatment of the ore. (Reference is directed to Eng. Pats. 14,278 of 1899, 12,377 of 1903 and 228 of 1910; this J., 1902, 349; 1904, 25; 1911, 489.)—W. E. F. P.

Sulphide ores; Process for smelting —— *in a shaft furnace.* A. H. Brauss und Co. Ger. Pat. 251,968, April 19, 1910.

The ore is subjected in the furnace to a blast pressure of several atmospheres.—A. S.

Crucibles used in metallurgical and similar furnaces. S. N. and E. R. Brayshaw, Manchester. Eng. Pat. 15,628, July 4, 1912.

With the object of directing the heating gases to the interior of the crucible, the latter is provided with a loose cover or lid having a central aperture around which are arranged a number of projections or feet by which the cover rests upon the rim of the crucible. The diameter of the cover being only slightly less than that of the heating chamber, the flame, or hot gases, entering at the bottom of the chamber are caused to pass through the spaces between the feet of the cover and thence through the above-mentioned central aperture of the lid, before reaching the flue.—W. E. F. P.

Furnace; Air-cooled, open-hearth ——. H. Knoth, Monterey, Mexico. U.S. Pat. 1,044,788, Nov. 19, 1912.

In an open-hearth steel furnace having air- and gas-ports separated by an arch, the latter is perforated by a number of transverse air cooling passages which extend to the front wall of the furnace and through each of which the circulation of air is separately controlled. —W. E. F. P.

Furnace; Mechanical [roasting] ——. Metallbank und Metallurgische Ges. Akt.-Ges. Fr. Pat. 445,527, June 27, 1912.

In a roasting furnace of the type in which the charge is propelled from the highest to the lowest of a series of superposed hearths, the ore is conducted from one hearth to the next by means of tubes or shoots, the latter being attached to the central shaft and preferably inclined. —W. E. F. P.

Copper; Recovering —— from compounds containing the same. U. Wedge, Ardmore, Pa., Assignor to The Furnace Patent Co., Philadelphia, Pa. U.S. Pat. 1,043,490, Nov. 5, 1912.

Oxides, carbonates, silicates or other compounds of copper are heated in an atmosphere containing sulphurous gas (without direct access of the heating gases to such compounds), whereby copper sulphate is formed, and the copper is subsequently recovered therefrom.—R. W. N.

Copper; Process for precipitating —— from its solutions by iron. A. Ramén. Ger. Pat. 252,723, Oct. 31, 1911.

In order to avoid, as far as possible, contact of the precipitated copper with the solution, the precipitating vessel is divided, by means of vertical perforated partitions, into an inner compartment for the scrap iron, and two outer compartments, the latter communicating by one or more horizontal gutters, the bottoms of which are below the liquid level. Devices, such as paddle wheels, are placed in the gutters to produce a circulation of the liquid. At first, the liquid circulates throughout the whole height of the vessel, but as the copper is precipitated, it settles and gradually fills the perforations in the lower part of the partitions, and thus restricts the circulation of the liquid to the upper portion of the vessel.—A. S.

Clad [coated] metals and process for making same. B. E. Eldred, Bronxville, N.Y. U.S. Pat. 1,043,576, Nov. 5, 1912.

Platinum is united with strong metals such as nickel by assembling contacted surfaces of the two metals, raising the temperature by heating through the platinum until the nickel superfically liquefies, forming a wetting union with the platinum, and then cooling. Any metal of the iron group may be used in place of nickel.—R. W. N.

Compound metal bodies: Method of and apparatus for producing ——. B. E. Eldred, Bronxville, N.Y. U.S. Pat. 1,043,577, Nov. 5, 1912.

Compound bodies of a metal of the platinum group melting above 2900° F. (1593° C.), and a ferrous metal melting below 2900° F. (1593° C.) are produced by heating the ferrous metal nearly to the melting-point of the metal of the platinum group, and allowing it to solidify in contact with the latter. The process is performed by placing one metal within one branch of a U-shaped mould, and pouring the other, molten metal through such branch and against the surface of the object therein, into the other branch of the U-tube and allowing it to solidify. The U-shaped mould may also contain a "wiping material" in addition to the solid metallic object, before the other metal is poured in.—R. W. N.

Compound metal body and process of making same. B. E. Eldred, Bronxville, N.Y., Assignor to The Commercial Research Co., New York. U.S. Pat. 1,043,578, Nov. 5, 1912.

Compound metal bodies composed of a metal of the platinum group united to a ferrous metal, are produced by pouring a molten metal of high melting-point between the platinum and the ferrous metal, which are raised to a high temperature but are in the solid state. The ferrous metal may first receive a coating of a non-ferrous metal of high melting-point.—R. W. N.

[Metallic] Catalytic body. B. E. Eldred, Bronxville, N.Y., Assignor to The Commercial Research Co., New York. U.S. Pat. 1,043,580, Nov. 5, 1912.

A catalytic body comprising a core of heat-conducting material or metal provided with a continuous filmiform coating layer of catalytic metal, together with heat-controlling means in "thermal relationship" to the catalytic body. The catalytic layer may be platinum, and may be united to the heat-conducting metal core by means of an intermediate layer of another metal.—R. W. N.

Nickel; Process of extracting ——. H. L. Wells, New Haven, Conn., Assignor to M. H. King, East Orange, N.J. U.S. Pat. 1,044,316, Nov. 12, 1912.

Finely powdered, unroasted matte containing nickel sulphide is agitated with successive quantities of dilute hydrochloric acid (18—25 per cent. strength) at a temperature ranging from 110° to 212° F. (43°—100° C.). —W. E. F. P.

[Tungsten and molybdenum] Metals; Process for rendering —— ductile. The Westinghouse Metal Filament Lamp Co., Ltd. Fr. Pat. 445,208, June 7, 1912. Under Int. Conv., June 7, 1911.

In a process for rendering metals (*e.g.* tungsten and molybdenum) which are ordinarily brittle and fragile in the cold state, ductile and malleable, the metal is moderately heated and slowly cooled under pressure. This is effected by immersing the metallic mass in a relatively large quantity of suitable molten material—or enclosing the metal in a relatively massive, hot mould—and allowing the whole to cool slowly, the metal being in either case subjected to a gradually increasing pressure during cooling.—W. E. F. P.

Zinc blende; Process and apparatus for roasting ——. A. L. J. Queneau. Fr. Pat. 445,233, June 20, 1912. Under Int. Conv., July 19, 1911.

The roasting is conducted in an electrically-heated, horizontal, cylindrical, rotatory chamber having a central opening at one end for the admission of air and a similar opening at the opposite end (connected with a dust-collecting chamber) for the escape of the sulphurous gases, the waste heat of which is utilised for heating the air employed. The horizontal sides of the chamber are doubly lined, first with silicious refractory material and then with a layer of electrically-resisting refractory material (composed of 75 per cent. of magnesite and 25 of graphite), the latter extending to, and being in electrical contact with, the vertical ends of the metal outer casing, which ends are otherwise lined with blocks of magnesia. The charge is introduced and removed through openings in the sides and at one end of the chamber, these openings being closed during the roasting operation. It is claimed that the high temperature necessary to ensure complete decomposition of the zinc sulphate produced in the early stages of the roasting is easily attainable in this apparatus; and that owing to the limited amount of air employed, the furnace gases may be profitably utilised for the manufacture of sulphuric acid.—W. E. F. P.

Furnace for roasting zinc blende and similar ores. L'Union des Produits Chimiques d'Hemixem, Soc. Anon. Ger. Pat. 253,051, July 25, 1911.

The furnace consists of an inclined cylinder or drum, provided with heating flues and muffle chambers, and adapted to oscillate around its longitudinal axis, so that the charge, which travels continuously through the furnace, is maintained in the form of a thin layer with a constantly changing surface exposed to the hot air passing through the furnace in the opposite direction. The muffle chamber extends longitudinally through the furnace in about the middle thereof, and its floor is provided with longitudinal grooves or corrugations, to cause the particles of ore to turn over when the furnace is oscillated. Above and below the muffle-chamber are the heating flues. Below the lower heating flue is a conduit in which air is preheated, this air then passing through the muffle chamber. The air for the combustion of the heating gases is preheated in a conduit above the upper heating flue.—A. S.

Zinc oxide ; Process and furnace for obtaining —. P. Schmidt und Desgraz Ges. m. b. H. Ger. Pat. 250,414, Feb. 12, 1911.

The process is carried out in a furnace provided with two separate hearths. The material, for example, low grade ore, slag, etc., is melted on one hearth, and is then transferred to the second hearth, where the requisite reducing agents (coke, charcoal) and other substances (lime, limestone) are added. The waste gases from the first hearth are used to heat the second hearth, the reverberatory arch over the latter ending near the first hearth, so that of the waste gases issuing therefrom, the quantity required to maintain the temperature in the second hearth, passes under the arch and directly over the charge, whilst the remainder passes over the arch or is led away directly.—A. S.

Distillation furnace for obtaining zinc or other metals volatile at the reduction temperature. Rheinisch-Nassauische Bergwerks- u. Hütten-A.-G. Ger. Pat. 250,775, Jan. 29, 1911. Addition to Ger. Pat. 236,759, Dec. 16, 1909 (see Eng. Pat. 27,467 of 1910 ; this J., 1911, 630).

The furnace described in the chief patent is modified in that a reduction chamber of large capacity is used, provided with a number of permeable cores or perforated tubes, for the withdrawal of the zinc vapour. The whole of the cores are connected with a common condensing chamber, which extends the whole length of the reduction chamber, and the floor of which has a depressed portion immediately over the heating flues.—A. S.

Tin ; Process for extracting ——*. from work-lead.* B. C. Besley. Fr. Pat. 445,510, June 28, 1912. Under Int. Conv., July 19, 1911.

The work-lead is melted with litharge or red-lead, under cover of a fused salt, for the production of purified lead and a mixture of tin and lead oxides. After being allowed to settle, the melt is either cooled—the metal, mixed oxides and salt being then detached from one another—or the molten lead is drawn off and the mixed oxides smelted for the production of a lead-tin alloy.—W. E. F. P.

Alloys of lead and tungsten ; Manufacture of ——. H. Leiber. Ger. Pat. 251,262, Jan. 9, 1912.

The two metals are atomised by known methods and caused to mix while in the finely divided condition.—A. S.

Tungsten or other refractory metals ; Manufacture of vessels and shaped articles of ——. E. A. Krüger. Ger. Pat. 253,079, Jan. 24, 1912.

A support of iron, nickel, steel, firebrick, asbestos, or other suitable material is formed into the desired shape, and the tungsten or other refractory metal, is packed and pressed around this support, after which the whole is subjected to a burning and sintering process.—A. S.

Agglomerating and briquetting fine materials, ores of all kinds, pyrites cinder, flue dust, and waste metallurgical products. E. Ritter von Schwarz and L. Lourié. Ger. Pat. 252,958, March 10, 1912.

As binding agent is used a mixture of granulated blast-furnace slag, Glauber's salt, and Portland cement (" iron Portland cement ") or cement clinker made from blast-furnace slag.—A. S.

Ores ; Process for burning —— *in two chambers or retorts arranged in series.* E. Menne. Ger. Pat. 253,450, July 4, 1911.

The process is intended for ores which yield a valuable gas (carbon dioxide, oxygen) on heating. In the first chamber the ore is heated only to a temperature at which no notable quantity of the valuable gas is evolved, and then the ore is transferred to the second chamber, where the temperature is raised in order to complete the process. The transferring device is provided with gas-seals.—A. S.

Ingot iron and the like ; Process for improving the properties of ——. T. Goldschmidt A.-G., Essen on Ruhr, Germany. Eng. Pat. 10,117, April 29, 1912. Under Int. Conv., Nov. 28, 1911.

See Fr. Pat. 443,652 of 1912 ; this J., 1912, 993.—T. F. B.

Refractory metallic [tungsten] bodies and their manufacture. W. D. Coolidge, Schenectady, N.Y., U.S.A. Eng. Pat. 18,467, Aug. 15, 1911. Under Int. Conv., Aug. 15, 1910.

See Fr. Pat. 433,131 of 1911 ; this J., 1912, 118.—T. F. B.

Pyrophorous metal alloys. Elektrochemische Werke, Berlin. Eng. Pat. 3350, Feb. 9, 1912. Under Int. Conv., March 28, 1911.

See Fr. Pat. 439,058 of 1912 ; this J., 1912, 648.—T. F.B.

Alloy. J. F. Duke, Manchester. U.S. Pat. 1,044,761, Nov. 19, 1912.

See Fr. Pat. 430,966 of 1911 ; this J., 1911, 1393.—T. F. B.

Copper alloys ; Manufacture and refining of ——. W. S. Rockey and H. Eldridge. First Addition, dated May 25, 1912, to Fr. Pat. 440,457, Feb. 21, 1912.

See U.S. Pat. 1,017,629 of 1912 ; this J., 1912, 287.—T.F.B.

Metal articles ; Process for covering oxidisable —— *with a penetrating, protective metallic coating.* The Lohmann Co. First Addition, dated July 1, 1912, to Fr. Pat. 427,861, March 29, 1911.

See U.S. Pat. 1,039,978 of 1912 ; this J., 1912, 1039.—T.F.B.

Crucibles or melting pots. The Morgan Crucible Co., Ltd. Fr. Pat. 445,219, June 19, 1912. Under Int. Conv., Dec. 15, 1911.

See Eng. Pat. 28,235 of 1911 ; this J., 1912, 729.—T. F. B.

Furnace for roasting blendes or other sulphide ores ; Rotary ——. L'Union des Produits Chimique d'Hemixem Soc. Anon. Fr. Pat. 445,276, June 21, 1912.

See Ger. Pat. 253,051 of 1911 ; preceding.—T. F. B.

Ores ; Process for treating sulphide, oxide, and other ——. N. H. M. Dekker. Fr. Pat. 445,768, July 4, 1912. Under Int. Conv., Aug. 16, 1911.

See Eng. Pat. 18,488 of 1911 ; this J., 1912, 930.—T. F. B.

Reclaiming ammonium and zinc values from sal-ammoniac flux skimmings. U.S. Pat. 1,044,557. *See* VII.

Chemical vessel. Chemical apparatus. U.S. Pats. 1,043,579 and 1,043,581. *See* XXIII.

XI.—ELECTRO-CHEMISTRY.

Electrolytic production of sodium hypochlorite. Prausnitz. *See* VII.

Patents.

Dynamo brushes, shaft and other bearings ; Materials for ——. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, N.Y. Eng. Pat. 27,621, Dec. 8, 1911.

The material, suitable for bearings or dynamo brushes, is made from copper and a metal, such as tin, which can be alloyed with it, and with these is incorporated sulphide of molybdenum or tungsten. The material may be prepared by combining molybdenum sulphide with cuprous or cupric and tin oxides, together with carbon or graphite for the reduction of the oxides on heating.—B. N.

Furnaces; [Electric] Induction ——. H. G. Solomon, London. Eng. Pat. 1839, Jan. 23, 1912. Addition to Eng. Pat. 9031, April 11, 1911 (this J., 1912, 496).

The furnace described in the main patent is adapted to be situated at or below the floor level, and means, operated by power, are provided below the floor level for raising the crucible out of the furnace when required.—B. N.

Furnace; Electric ——. T. P. Sharts, Assignor to M. W. Spaulding and W. E. Hall, North Adams, Mass. U.S. Pat. 1,044,088, Nov. 12, 1912.

The furnace is provided with a base on which is mounted a stationary electrode, and carrying also a slide which may be moved laterally towards and from the stationary electrode. The slide carries a rotatable disc on which is mounted a post, the latter being provided with a guide-way and sliding block. A lever, fulcrumed on the post, is connected at one end with an electrode holder, and at the other end with the sliding block, which may be adjusted vertically in the guide-way.—B. N.

Furnace; Electric —— for producing oxides of phosphorus from natural phosphates. F. S. Washburn, Nashville, Tenn. U.S. Pat. 1,044,957, Nov. 19, 1912.

The furnace is provided with a gas-tight chamber, and a hearth at the base. The electrodes are surrounded with a granular carbon packing, which is contained in tubes passing through the walls of the chamber, so that the electrodes and packing enter the chamber above the hearth. A vertical feed tube, closed at the top by a cup and cone valve, extends into the chamber to a point just above the hearth, and is adapted to deliver a charge of finely-divided phosphate rock, silica, and carbon to the hearth. Air is admitted to the chamber above the lower end of the feed tube for oxidising the evolved gases without igniting the carbon in the feed tube, and the oxidised gases are continuously withdrawn through a suitable outlet tube.—B. N.

Furnace; Electric fusion ——. I. Rennerfelt. Fr. Pat. 444,947, June 14, 1912. Under Int. Conv., June 15, 1911.

The furnace is of a cylindrical form with a horizontal axis, the diameter of the cylinder being equal or approximately equal to the horizontal length of the furnace, with the object of diminishing losses of heat, or it may be in the form of a sphere, double cone, ellipsoid, parallelepiped, etc. It is movable around the horizontal axis, one or more electrodes being arranged approximately perpendicularly to the cover of the furnace, and one or more electrodes disposed perpendicularly to the lateral walls of the lower part of the furnace. The upper electrodes are in the same plane at right angles to the axis of rotation or passing through it, the axes of these electrodes constituting the generators of a conical or cylindrical surface. The horizontal projections of the lower or lateral electrodes form an angle one with the other, or may be in the same straight line, and are inclined slightly to the horizontal with the object of facilitating the passage of the arc to the material. The electrodes may be raised or lowered or may be turned in a vertical plane by means of supporting shields fixed to the furnace. By the co-operation of the electrodes, the arcs are made to bend towards the material to be melted. One or more electrodes are attached to the intermediate point of a diphase system, and the other electrodes, *e.g.*, the lateral ones, to the extreme points of the two phases, or the upper electrode may be attached to the zero point of a system with three conductors for continuous current. Each lateral electrode is made in two parts, the adjacent ends being screwed into a conductive refractory muff of diameter greater than the electrodes, and the external part of each electrode is supported by a collar, or other suitable arrangement, which may be movable or fixed to the electrode when the latter is introduced into the furnace. By adjustment of the electrodes, gaseous resistance, or this in combination with a solid or liquid resistance, may be employed as the source of heat. The base of the furnace is provided with one or more projections, in order to mix the material when the furnace is turned.—B. N.

Electrode for electric furnaces; Carbon ——. Planiawerke, A.-G. für Kohlenfabr., Ratibor, Germany. Eng. Pat. 14,267, June 18, 1912. Under Int. Conv., July 21, 1911.

The carbon electrode is provided with a cast metal core to diminish its electrical resistance, the core and the bore of the electrode being wholly or partly of single or double conical form. Metal or metal alloy is cast in the bore of the electrode to form the core, and owing to the shape of the bore, the contraction on solidification causes the metal to be firmly pressed against the surrounding wall of the electrode. The core may be provided with mechanical means, such as a bolt and nut, so that after the solidification and contraction, it may be brought into more intimate contact with the carbon.—B. N.

Electrodes employed in electric furnaces; Manufacture of carbon ——. Soc. Française des Électrodes. Fr. Pat. 445,859, Sept. 14, 1911.

The electrodes, for use in electro-metallurgical work or for the manufacture of chlorine and caustic soda, are graphitised by embedding them in a layer of carbonaceous material heated in an electric furnace. The latter is of the resistance type, shields of iron and asbestos envelopes, cooled or not by a current of water, being employed to prevent the combustion of the electrodes which supply the current. The graphitised electrodes are rapidly withdrawn from the furnace, and during the cooling are surrounded by powdered material such as coke in a sheet-iron oven.—B.N.

Carbons [electrodes]; Preparation of cored ——. Planiawerke A.-G. für Kohlenfabr. Ger. Pat. 251,019, March 21, 1912.

The carbon tube after being filled with the mass which is to form the core, is closed at one or both ends, before being dried or ignited. The closing may be effected with short cylindrical plugs, of slightly smaller diameter than the bore of the tube, which are pressed into the soft mass forming the core. The closing plug for the working end of the electrode is formed of the same material as that used for the core, but of a firmer and harder consistence. —A. S.

Resistance; Electrical ——. C. A. Mudge, New York, Assignor to The Cutler-Hammer Manufacturing Co., Milwaukee, Wis. U.S. Pat. 1,044,562, Nov. 19, 1912.

The resistance is formed from an alloy containing 4·2 per cent. of carbon, 2·5 per cent. of aluminium, 2·4 per cent. of silicon and 90·9 per cent. of iron.—B. N.

Electrolytic treatment of organic compounds; Process for the ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 252,759, June 25, 1911.

Lead containing a small quantity of copper constitutes the electrodes in this process; such electrodes are much more durable than those made of pure lead, and are stated to have the further advantage, when used for the reduction of organic compounds in acid solution, of producing purer products, the secondary reactions being prevented to a large extent.—T. F. B.

Resistance-furnace; Electrical ——. O. Serpek, Assignor to Soc. Générale des Nitrures, Paris. U.S. Pat. 1,044,927, Nov. 19, 1912.

See Eng. Pat. 12,601 of 1910; this J., 1911, 361.—T. F. B.

Furnace; Revolving electric —— with resistances arranged diametrically. O. Serpek, Assignor to Soc. Générale des Nitrures, Paris. U.S. Pat. 1,044,928, Nov. 19, 1912.

See Eng. Pat. 29,299 of 1910; this J., 1911, 905.—T. F. B.

Electrodes for treating liquids or perishable substances by electrolysis. D. L. V. Browne. Fr. Pat. 445,094, Aug. 25, 1911.

See Eng. Pat. 21,332 of 1911; this J., 1912, 744.—T. F. B.

Carbon electrode for electric furnaces. Planiawerke Akt. Ges. f. Kohlenfabr. Fr. Pat. 445,390, June 25, 1912. Under Int. Conv., July 21, 1911.

See Eng. Pat. 14,267 of 1912; preceding. T. F. B.

Lighting high tension flame arcs for producing reactions in gases; Apparatus for ——. Salpetersaure Ind.-Ges. Fr. Pat. 445,489, June 7, 1912. Under Int. Conv., Oct. 24, 1911.

See U.S. Pat. 1,029,886 of 1912; this J., 1912, 691.—T.F.B.

Producing silicon carbide. U.S. Pat. 1,044,295. *See* VII.

Manufacturing crystalline alumina. U.S. Pat. 1,044,296. *See* VII.

Cultivation of crops. [*Application of atmospheric electricity.*] Eng. Pat. 8903. *See* XVI.

XII.—FATS; OILS; WAXES.

Cockle wool-fat; Note on ——. H. R. Procter. Collegium, 1912, 686.

When sheep are suffering in spring from the skin affection known as "Cockle," a greasy matter of a greyish or yellowish white colour exudes upon the wool and in bad cases the ordinary skin-fat disappears almost completely. The disease seems to be one of the sebaceous glands which become swollen with fat of a cholesterol type. Some of the exudation collected from wool during the shearing season was examined by the author. The wool yielded about 1 grm. of fatty matter on extraction with petroleum ether. The solvent was clear during extraction, but on cooling, 2·97 per cent. of solid matter separated, probably a coagulated protein. The following constants were obtained for the "fat," the corresponding figures for ordinary wool fat obtained by Lewkowitsch being added for comparison:—

	Cockle-fat.	Ordinary wool-fat.
Sp. gravity	1·0548	0·9413
Iodine value	57·6	17·1
Acid value	10·2	
Saponification value	53·1	102·4
Unsaponifiable matter	4·1 per cent.	13·1 per cent.
Fatty acids	60·4 per cent.	59·8 per cent.
Suspended in aqueous layer after separation	19·2 per cent.	
Mean molecular weight of acids	514·7	327·5

The saponification was made with $N/2$ alcoholic potash, not under pressure. The fatty matter extracted by petroleum ether was totally soluble in alcohol with the exception of the insoluble portion which deposited on cooling and which could not be dissolved by any solvent. A further extraction of the wool with absolute alcohol yielded 6·14 per cent. of soluble matter which was not further examined. It is seen that the substance does not bear any close relation either to ordinary skin-fat, which is a mixture of olein, stearin and palmitin, or to the wool-fat normally produced from the sebaceous glands, nor even to the actual cockle-fat directly extracted from the latter in the diseased state, and it is questionable whether the substance is a true fat at all.—D. J. L.

Chinese wood oil; Studies of ——. β-Elæostearic acid. R. S. Morrell. Chem. Soc. Trans., 1912, 101, 2082—2089.

On exposing Chinese wood [tung] oil to the light in glass bottles there was a gradual formation of crystals, amounting in a year to about 6 per cent. of the original oil. When these were separated, after treatment with acetone, and the filtrate freed from acetone by distillation in a current of carbon dioxide, a fresh crop of crystals was produced in a few days. The crystals melted at 61° to 62° C., and could be recrystallised from benzene (to which alcohol had been added) in the form of rosettes of rounded plates. They had an iodine value of 183, molecular weight of 879; saponification value of 191·5, and on elementary analysis gave results corresponding to the formula $(C_{18}H_{29}O_2)_3C_3H_5$ or $(C_{18}H_{31}O_2)_3C_3H_5$. The fatty acid, β-elæostearic acid, in this polymerised glyceride melted at 72° C. and gave iodine values ranging from 175·4 to 183·5. As in the case of the glyceride the very rapid oxidation rendered it impossible to determine exactly the elementary composition, analyses indicating either $C_{18}H_{32}O_2$ or $C_{18}H_{30}O_2$. The acid yielded a small quantity of a tetrabromide (m. pt. 115° C.), but the main product of bromination was an oily tetrabromide. Several of its salts were prepared, most of them characterised by their great insolubility in water. The ethyl ester was also obtained. It could be distilled under reduced pressure and gave reactions indicating that it contained only two double bonds in its molecule (see this J., 1909, 316; 1912, 998).—C. A. M.

Soaps; Contributions to the study of ——. A. Reychler. Bull. Soc. Chim. Belg., 1912, 26, 485—495 (this J., 1912, 649).

II. *Mother liquors from the crystallisation of acid sodium palmitates.*—A series of experiments with two approximately neutral sodium palmitates on the lines previously described (*loc. cit.*), followed by determinations of the amounts of acid sodium palmitate and of the free alkali in the filtrate showed that Krafft's assertion of the absence of fatty acids in the mother liquors requires some modification. On the other hand, his statement that the composition of these mother liquors was quasi-constant was completely verified (see this J., 1896, 206). In a series of determinations in which 1 grm. of sodium palmitate was treated with quantities of water ranging from 200 to 900 c.c., the concentration of the sodium hydroxide in the mother liquors decreased simultaneously with the "global" concentration of the systems in question, but tended to become constant when it had fallen to a value approximating 0·002 millimole per c.c. In the case of the fatty acids in the filtrates the concentration became fairly constant at about 0·00035 millimole per c.c. The quasi-constant composition of the mother liquors supports the view that the acid palmitates are formed by superposition in layers at intervals of temperature, and that those layers which are in equilibrium with the mother liquors are probably enveloped in superficial layers of similar composition.

III. *Extraction of solutions of sodium palmitate and oleate by means of toluene.*—On extracting a solution of 1 grm. of sodium palmitate in 700 c.c. of water with 200 c.c. of toluene at about 80° C., 68 per cent. of the palmitic acid present was removed, after emulsification, whilst free alkali was left in the aqueous layer. Similar extraction with cold toluene removed only 0·07 grm. of fatty acid (*i.e.*, the acid not combined in the crystalline soap) without emulsification. In the case of sodium oleate solutions, extraction with hot toluene for three days with constant agitation removed 70 per cent. of the oleic acid, whilst similar treatment with the cold solvent removed 0·207 grm. of the acid. To obtain abundant extraction of sodium palmitate the solution ought to be treated at a temperature above its crystallisation point, whilst for the same reason sodium oleate may readily be extracted (with emulsification) from its solutions at a low temperature. Extraction of a solution of sodium oleate with toluene increases the specific electrical conductivity of the solution in question.

IV. *Mechanism of degreasing.*—The experiments cited support Krafft's view that degreasing does not consist essentially in a saponification of the fats present, but in a simple emulsification. A more or less rancid (acid) fat may be directly emulsified in a soap solution of suitable concentration, whereas a perfectly neutral fat has to go through the stage of acquiring acidity by taking from the soap solution a part of its fatty acid.—C. A. M.

Oil emulsion; Neutral —— as a model of a suspension colloid. R. Ellis. Faraday Soc. Proc., Nov. 26, 1912. [Advance proof.]

The interfacial potential at the surface of the oil globules of an emulsion was measured by means of a microscopic slide apparatus. The interface potential was found to be little affected by organic impurities in the oil but to be altered enormously by acids, and to a lesser degree by alkalis. The maximum interface potential was found to correspond to a concentration of about 0·001N alkali, and this was found to be the point of maximum stability of the emulsion. Surface tension measurements showed that the stability did not depend on the surface tension, but on the interface potential. Determinations were made of the concentrations of salts with uni-, di-, and tri-valent cations required to just neutralise the charge on the oil globules. The ratio of these concentrations was found to form a geometrical series agreeing with that obtained by coagulation experiments. The coagulation of oil emulsions by colloidal ferric hydroxide was next tried, and it was found that the oil was completely precipitated within two well-defined limits on either side of the iso-electric point of the oil emulsion. The coagulation appears to be due to surface precipitation effects taking place between the oil globules somewhat analogous to the condensation of water-vapour on surfaces of various curvatures. F. G. Donnan pointed out that no distinction could be made between "suspensions" and "emulsions" if based merely on the liquid or solid state of the disperse medium. The author's oil emulsions behaved as typical suspensions, forming a very striking model of a suspension colloid.

Explosion at an oil factory. Chem. Tr. J., Dec. 7, 1912. [T.R.]

On November 27 an apparatus at Ronbaix for the extraction of oil from wheat by means of trichlorethylene exploded while a jet of steam was being put upon it for the recovery of the solvent. The roof of the factory fell in and two men were injured. If a similar accident had occurred to a benzine extractor, the vapours would have caught fire and a further explosion, which might have destroyed the whole works and caused great loss of life, would have taken place.

Patents.

Oils and greases; Hydrogenating ——. C. Ellis, Montclair, N.J. U.S. Pat. 1,043,912, Nov. 12, 1912.

The material, and especially foul oil or grease, is subjected to the action of hydrogen or gas containing hydrogen, with or without the aid of pressure, and in the presence of a catalytic agent. The objectionable gaseous products formed in the hydrogenation of the unsaturated bodies are subsequently removed, *e.g.*, by means of a current of steam.—C. A. M.

Fats and oils; Process for the extraction of valuable —— from effluents and residues obtained in the clarification of such effluents. F. Graf. Fr. Pat. 445,077, June 17, 1912. Under Int. Conv., Jan. 18, 1912.

The residues from the clarification of trade effluents, etc., are treated with ethylene chlorides ("*trichlorethyles*") and the crude extracted fat is purified by agitation at a high temperature with a hydrosilicate, followed by filtration. The residue in the filter-press is also extracted with ethylene chlorides, and the recovered fat is added to that already refined.—C. A. M.

Oil; Process and apparatus for extracting —— from oleaginous fruits containing stones. F. Krupp Aktienges. Grusonwerk. Fr. Pat. 445,587, June 29, 1912. Under Int. Conv., June 30, 1911.

The fruit is subjected to the simultaneous action of dry heat and agitation, and the separated stones removed through an outlet in the side of the apparatus, whilst the pulp and liberated oil are withdrawn together through another opening. The oil is then decanted, and the residual pulp is pressed. Or the oil may be withdrawn from the heating apparatus prior to the removal of the pulp and stones. A special form of apparatus claimed, has three series of outlets and contains a central agitator, which may be constructed in the form of a conveyor. —C. A. M.

Soap; Insecticidal ——. H. Gouthière et Cie and P. Ducancel. Second Addition, dated Sept. 4, 1911, to Fr. Pat. 444,021, July 27, 1911 (this J., 1912, 1138).

An addition of colloidal copper is made to the "pyridine oleate" by adding cupric compounds dissolved in ammonia or pyridine.—C. A. M.

Solutions of organic compounds; Solid or liquid —— giving emulsions with water. R. Vidal. Fr. Pat. 445,053, July 8, 1911.

The alkali soaps prepared from castor oil are used to "dissolve" various organic compounds, the solutions obtained furnishing stable emulsions with water. *Example:* A soap prepared by treating 75 kilos. of castor oil with 10 kilos. of caustic soda and 100 litres of water can be mixed with 2½ times its volume of oil of turpentine, petroleum, etc., with or without addition of phenols, aromatic amines, etc., forming homogeneous, emulsifiable liquids.—T. F. B.

Reduction or hydrogenation of organic compounds, such as fatty acids and their compounds; Process for the ——. K. H. Wimmer, Holzhafen, Germany, and E. B. Higgins, Wallasey. Eng. Pat. 25,326, Nov. 14, 1911. Under Int. Conv., March 11, 1911.

See Fr. Pat. 441,097 of 1912; this J., 1912, 826.—T. F. B.

Process for manufacturing oils soluble in water [from hydrocarbon oils]. U.S. Pat. 1,042,915. *See* IIa.

Preparation of emulsified products composed of asphaltum, pitch, tar, resins, oils, etc. Fr. Pat. 444,739. *See* III.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Patents.

Paints, impregnating compositions and the like; Method for the preparation of ——. J. Petersen, Vedbygaard, Denmark. Eng. Pat. 10,958, May 8, 1912.

"Coal tar extract," (which consists of the upper layer which separates on treating coal tar with three times its volume of petroleum oil) is incorporated with petroleum, varnish, ochre, and suitable pigments. If intended for preserving sails, ropes, etc., the coal tar extract is incorporated with yellow and red ochres, petroleum and oil of turpentine, whilst for impregnating wood an addition of wood tar and petroleum is made to the coal tar extract, and the pigments are omitted.—C. A. M.

Coating and impregnating; Preparation of compositions for ——. C. Roth. Ger. Pat. 251,710, Feb. 9, 1912.

Natural or refined mineral pitches or the solid residues from the distillation of tars from fossilised bitumens are finely ground and subjected, at a temperature below their melting point, to the action of acid or alkaline liquids or to both in succession. Those portions of the bituminous substance not resistant to acid or alkaline liquids are, in this way, so acted upon that they remain as an insoluble residue on treating the material with the usual solvents for the production of coating compositions. For example the finely powdered pitch or other bituminous material is treated for 2 months at about 25° C. with hydrochloric acid of sp. gr. 1·125, or sulphuric acid of sp. gr. 1·116, or nitric acid of sp. gr. 1·054, in order to obtain a product resistant to dilute acids, or with caustic soda solution of sp. gr. 1·1, or a 25 per cent. solution of ammonia, or milk of lime, in order to obtain a product resistant to dilute alkalis.—A. S.

Coatings; Preparation of rapidly drying masses suitable for the production of protective and insulating —— and for impregnating purposes. K. Winkler. Ger. Pat. 252,139, Aug. 28, 1910.

Oils and fats, with or without siccatives and diluents, such as benzene, toluene, xylene, and oil of turpentine, are heated with amorphous phosphorus to temperatures above 150° C., preferably under pressure. Phenol may be added to the amorphous phosphorus, and the inflammability of the product may be diminished by the introduction of combined nitrogen, *e.g.*, albuminous materials. After drying, the products form tough, elastic, infusible masses, which are attacked only slightly or not at all by acids and alkalis. They are insoluble in organic solvents and have excellent insulating properties.—A. S.

Varnishes from cellulose esters or celluloid; Preparation of ——. Badische Anilin und Soda Fabrik. Ger. Pat. 251,351, Sept. 6, 1911.

The claim is for the use, as solvents, of the esters of completely hydrogenised phenols, with or without addition of other solvents or substances. These esters, *e.g.*, cyclohexanol formate or acetate, methylcyclohexanol formate, are cheap, not readily inflammable, and are good solvents of cellulose esters; the solutions evaporate or dry with sufficient rapidity, and leave the cellulose ester in the form of a resistant, very elastic coating, which scarcely alters the appearance of the underlying surface.—A. S.

Fatty inks for graphic printing; Preparation of ——. Badische Anilin und Soda Fabrik. Ger. Pat. 252,052, June 9, 1911.

Solutions of organic colour bases in fatty acids, when applied to paper, penetrate the latter, and also have the disadvantage of being soluble in water. According to the present patent, these defects are obviated by the addition of a resin to the fatty ink. For example on adding a sufficient quantity of rosin to a solution of the colour base of Methyl Violet in oleic acid, not diluted with hydrocarbons, the fatty ink becomes insoluble in cold water and loses its power of penetrating the paper.—A. S.

Mounting [microscopic preparations]; Production of compositions for ——. R. Jonas. Ger. Pat. 252,053, Dec. 10, 1910.

Resins, such as dammar, copal, and amber are melted and heated with paraffin oil to a high temperature, if necessary under pressure, in order to expel the more easily volatile constituents of the resins. By this treatment the brittleness of the resins is destroyed, and masses of any desired degree of hardness and refractive power, suitable for mounting microscopic preparations can be obtained. Masses liquid at the ordinary temperature can be obtained by adding suitable solvents to the mixture of resin and paraffin oil.—A. S.

Resin substitute similar to hard resins; Preparation of a ——. C. Knüppel. Ger. Pat. 253,437, May 2, 1912.

The products of the polymerisation of coumarone and indene are treated for 3—5 hours with a vigorous finely divided current of air at a more or less elevated temperature, according to the character of the product desired.—A. S.

Oils and pigments. E. W. Enequist, Brooklyn, U.S.A. Eng. Pat. 24,961, Nov. 9, 1911.

See U.S. Pat. 1,009,708 of 1911; this J., 1911, 1443.—T. F. B.

Pine oil; Process for purifying crude ——. J. Schindelmeiser. Fr. Pat. 445,446, June 26, 1912.

See Eng. Pat. 4775 of 1912; this J., 1912, 784.—T. F. B.

Erratum.

This Journal, 1912, 31, 1138, first column, last line, *for* "1 per cent." *read* "0 per cent."

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

[Rubber] Latex; Chlorogenic and saccharic acids in ——. K. Gorter. Rec. Trav. Chim. Pays Bas, 1912, **31**, 281—286.

Organic acids have already been found in latices. The author has shown that the latex of *Castilloa elastica* contains chlorogenic acid (also present in coffee). The latex was treated with alcohol and water; the filtrate was evaporated to dryness and extracted with water. The acid was isolated by decomposition of the lead salt with hydrogen sulphide, and was proved to be chlorogenic acid. It can be detected without isolating it, by boiling the latex for one hour with dilute hydrochloric acid, extracting with ether and washing with dilute sodium bicarbonate and water. The ethereal solution is treated with a dilute solution of ferric chloride (one drop of 5 per cent. solution in 4 c.c. of water). In a few minutes a fine violet colour appears in the aqueous layer, on shaking. The test is very sensitive, if the ethereal solution is not too strong. The acid was also detected in the latex of *Ficus elastica*. This latex also contains the magnesium salt of a tetrahydroxyadipic acid, identified by distilling the salt mixed with ammonium chloride, when pyrrol was evolved. This acid proved to be a-saccharic acid, which has hitherto not been observed in nature.—H. E. P.

[Rubber latex;] Observations on acetic acid coagulation [of ——]. P. Schidrowitz and H. A. Goldsbrough. India-rubber J., 1912, **44**, 1117—1148 and 1198.

The authors have investigated the effect of varying the quantity of acetic acid used in coagulating *Hevea* latex upon the properties of the rubber obtained, both before and after vulcanisation. Of the two series of samples of raw rubber examined, one (represented by samples 20 and 21 in the table) was obtained from young trees, the other (Nos. 22—28) from a considerable number of mature trees, about half of which were about 6 years old, the others 10—12 years old, all being situated in the same section of an estate in the Federated Malay States. Every sample of a series was prepared on the plantation on the same day from the same batch of latex, and consisted of a sheet about 1 mm. thick and of "commercial" dimensions. In the table is shown the relative quantity of acetic acid used for coagulation, the appearance of the sample on arrival in London, and its acidity. The acidity was determined by twice boiling 20 grms. of the finely divided rubber with 200 c.c. of water and titrating with $N/100$ sodium hydroxide.

Serial No.	Relative quantity of acetic acid for equal vols. of latex.	Appearance of sample.	Acidity per cent.
20	0·5	Light buff sheets, both decidedly "mouldy"	0·055
21	2·0		0·046
22	24	Light buff sheet—a few spots	0·012
23	12	Rather cleaner and brighter than 22	0·010
24	6	Rather lighter in colour than 23	0·011
25	3	Very similar to 24	0·012
26	2	Similar to 25, but (mould) spots rather more in evidence	0·026
27	1	Similar to others, but mould spots much more numerous	0·031
28	"Patent" powder.	Rather darker than 22—26. Otherwise similar	[0·074]

It is noteworthy that samples with a very low acidity can be obtained by appropriate treatment of mature latices, and that the acidity tends to increase as the amount of acid used in coagulating diminishes. This may perhaps be explained by the greater "tightness of mesh" in the case of the higher concentrations of acid, resulting in a greater expression of interstitial liquid. The closer texture may also connote a decreased capacity for adsorption. The acidity appears to be higher in the case of the samples from young trees. The extent of development of mould on the samples appears to vary directly with the amount of "free" acid present, i.e., inversely with the amount used in coagulation. Sample No. 27 gave an abnormally high figure for viscosity, the next highest being given by No. 26. Sample No. 21, from young trees, gave low figures, as did also No. 28 (coagulated with "patent powder," apparently burnt alum). Vulcanisation tests indicated that the whole series of samples from mature trees were of very good quality except No. 22, which was very moderate. According to these tests, and judging also by rapidity of cure, elongation-load curves, "absolute" breaking strain (*i.e.*, maximum breaking strain multiplied by elongation), and condition after storage for six months, the order of merit of the samples was No. 27 first, and No. 22 last. The samples from young trees gave less satisfactory vulcanisation results, but the main conclusion, that the quality of the rubber is in inverse ratio to the amount of acetic acid employed during coagulation, was supported by them. Further conclusions drawn are:—(1) that mould formation appears to be checked by the use of an amount of acid which is greater than the maximum desirable from the point of view of quality; but such mould formation does not necessarily have a serious effect upon quality; (2) that from mature, properly handled plantation latices, unsmoked rubber may be prepared which, as regards quality, compares favourably with the finest grades of wild rubber; (3) that hand-pulling tests and even tensile strength tests of the raw rubber are misleading, showing in this instance no essential difference between samples 22 and 27.—E. W. L.

Vulcanised rubber; Desulphurisation of ——. P. Alexander. Chem.-Zeit., 1912, **36**, 1289—1291, 1340—1342 and 1358—1359.

Hinrichsen and Kindscher (this J., 1912, 348, 785) have stated that vulcanised rubber can be desulphurised by treatment with benzene and alcoholic caustic soda in presence of metals. The author points out that their experiments were not made with mixings of known composition and gives his own results with mixings of different coefficients of vulcanisation, prepared by himself. He concludes that under the above conditions, if the amount of caustic soda is insufficient to combine with all the free sulphur, an increase of the coefficient of vulcanisation will result. If excess of caustic soda is present, the percentage of sulphur insoluble in acetone and not combined with mineral matter is lowered somewhat; this diminution is however independent of the presence of metals, and is solely caused by the excess alkali removing sulphur in the form of a modification which was insoluble in acetone. Thus the actual sulphur combined with the rubber is not lowered in amount by caustic soda with or without metals. However, under the conditions of experiment of Hinrichsen and Kindscher the phenomenon may be complicated by a partial decomposition or depolymerisation of the vulcanised rubber under the influence of heat to yield a product soluble in acetone. The author considers that no means have yet been found to remove the sulphur from vulcanised rubber while preserving the rubber molecule intact; he considers that the recent work of Bary (this J., 1912, 888) may be interpreted in a similar manner to the above.—H. E. P.

Patents.

Waterproof fabric [for pneumatic tyres] and method of manufacturing same. J. Hoyle, Hebden Bridge, Yorks, and A. J. Milne-Smith, Sydenham, Surrey. Eng. Pat. 20,297, Sept. 13, 1911.

The yarn which is to compose the warp and weft of a fabric to be employed for making pneumatic tyres is proofed two or three times by passing it through a rubber solution and drying. The treated yarn is then woven. (Reference is directed to Eng. Pats. 1836 of 1863, 4026 of 1874, 2028 of 1881, 850 of 1899, 4631 of 1899, 6798 of 1901, 14,122 of 1902, and 18,988 of 1908.)—P. F. C.

Vulcanising and finishing indiarubber-proofed textures; Process of and means for ——. W. Coulter, Manchester, and R. Bridge, Castleton, Lancs. Eng. Pat. 24,200, Nov. 1, 1911.

Piece goods are proofed with rubber, subjected to a preliminary semi-vulcanising process, printed if desired, and finally completely vulcanised, the two vulcanising processes taking place automatically in a space apart, so that the operators inhale comparatively little of the noxious fumes of the materials used for vulcanising. To that end the fabric, which has been impregnated with a rubber solution, is treated with farina in a room which is separate from the vulcanising room; the fabric passes over guide rollers, combined with one or more scrapers to control the addition of farina, over a flat, drying chest contained in a second room, in order to remove any surplus naphtha, and thence into a separate chamber, where excess of farina is removed by passage over a brushing roller. From this chamber the material passes through a compartment, forming the lower part of the first-mentioned drying chest, in which it is subjected to dry heat in the presence of sulphur chloride fumes, whereby the fabric is partially vulcanised, whereupon it is wound on to a batch roller contained in the first room. The material is then run back into the vulcanising room, where it passes over a roller revolving in a bath of carbon bisulphide and sulphur chloride, which is contained in a vessel capable of being filled and discharged from outside the room; the fabric is then led round a brushing roller and passed through the heating chamber already mentioned, where it is treated with a deodorant, such as ammonia fumes in the presence of steam, after which it is finally wound on to a batch roller in the first room, where a re-brushing of the texture on the back may be simultaneously effected.—O. R.

Rubber-containing product; Method of producing a ——. A. E. Merritt, Gainesville, Ga. U.S. Pat. 1,045,053, Nov. 19, 1912.

Crude rubber is dissolved in a compound solvent, of which one of the constituents acts as a solvent for the rubber and the other for the resins and other impurities. Benzine and acetone are mentioned as examples of the two classes of solvents. The semi-liquid mass, in which all the compounds of the rubber are in solution, is incorporated with a fibrous material and the solvents are removed by drying.
—D. J. L.

Spongy resilient substances; Production of —— in enclosed spaces. R. H. and E. M. Pybus, Derby. Eng. Pat. 25,286, Nov. 14, 1911.

See Fr. Pat. 437,000 of 1911; this J., 1912, 446.—T. F. B.

Flexible composition for use as a substitute for rubber or as an insoluble glue. T. D. Kelly. Fr. Pat. 444,963, April 10, 1912.

See Eng. Pat. 8613 of 1911; this J., 1912, 595.—T. F. B.

Process of rendering [textile materials] impermeable. Fr. Pats. 445,884 and 445,885. *See* VI.

Process for preparing esters of butenols. Ger. Pat. 252,160. *See* XX.

XV.—LEATHER; BONE; HORN; GLUE.

Liming; A new process of ——. E. Guisiana. Le Cuir. 1912, **5**, 639. J. Amer. Leather Chem. Assoc., 1912, **7**, 682.

The swelling effects of the usual mixtures of lime and sodium sulphide are said to be obviated by mixing sodium sulphide with calcium chloride instead of with lime. The resulting sodium chloride is stated to repress the swelling, whilst unhairing proceeds as usual.

$$2Na_2S+2CaCl_2+2H_2O=4NaCl+Ca(OH)_2+Ca(SH)_2$$

The calcium sulphydrate is the active unhairing agent. If swelling is desired it may be obtained by diminishing the proportion of calcium chloride. Magnesium, ammonium or barium chloride, may replace the calcium chloride. For every 3 lb. of commercial sodium sulphide (60—65 per cent.), 5·2 lb. of calcium chloride are taken, or 4·8 lb. of magnesium chloride, or 1·3 lb. of ammonium chloride or 5·9 lb. of barium chloride.—J. R. B.

Pickling process; Note on the ——. H. R. Procter. Collegium, 1912, 687—689.

The author has shown (this J., 1911, 818) that the action of neutral salts in contracting the swelling produced by acids in gelatin may be attributed to the osmotic pressure of the acid-ion common to both salt and acid and it would seem to follow from this that only the salt of the same acid which produced the swelling could be effective. It is however well-known that sodium chloride reduces the swelling caused by any acid and the same is true of any pair of salt and acid. The explanation is given "that any such combination simply leads to a quadruple equilibrium in which each acid is balanced against its own neutral salt." This explanation involves the idea, apparently repugnant to common sense, that the strong acid, hydrochloric, is expelled from its combination with the strong base sodium by the joint action of the weak acetic acid and the very weak base gelatin. The author has shown, however, that a solution of acetic acid, too weak to redden methyl-orange, is rendered capable of doing so by the addition of sodium chloride, thus illustrating the case in point. 1 gram of pure gelatin was treated with *N*/10 pure formic acid, free from hydrochloric acid. When the swelling was complete, sodium chloride was added to saturation and the dehydrated gelatin was again soaked in a saturated solution of common salt in *N*/100 formic acid. The hydrochloric acid in combination with the gelatin was then estimated by the Procter-Searle method (this J., 1901, 287). The results of four determinations gave 1·044, 0·986, 0·903, and 0·988 mgrm-mol. per grm. of dry gelatin, giving an average of 0·98 mgrm.-mol. or 3·58 per cent. of actual hydrochloric acid on the gelatin. The fixed formic acid was not determined but could not have been large, as the hydrochloric acid found approached the maximum which could have been fixed, had hydrochloric acid alone been used for swelling under like conditions. Experiments made with delimed sheep-pelt under the same conditions gave almost identical results. It is clear from this that the advantages of Seymour-Jones' formic acid pickling process (this J., 1904, 720), apart from the antiseptic action of traces of formic acid and formates, consists simply in the avoidance of any excess of a strong acid, and the same results would be obtained more cheaply by preliminary treatment with an insufficient quantity of hydrochloric acid followed by a saturated salt solution containing a small quantity of formic acid. 3 per cent. of actual hydrochloric acid on the dry weight of the skin or 2 per cent. of 30 per cent. hydrochloric acid on the wet weight might be safely employed with the addition to the final salt solution of ½ per cent. of formic acid on the wet weight, or 1 per cent. on the dry. The quantities of sulphuric acid commonly used commercially are greatly in excess of what is really needed. The author has obtained satisfactory results with one-tenth of the quantity used commercially. If a trace of an organic alkali salt such as sodium acetate is introduced into a leather, it will not only neutralise any actual free mineral acid present, but will prevent any of the present analytical processes from detecting acid present as sulphonates or mineral salts decomposable by heat, which sometimes cause apparent free mineral acid to be reported. It is also probable that if a leather acidified with organic acid were treated with sodium sulphate, "free" sulphuric acid would be found in the leather, although none had been employed directly in its manufacture.—D. J. L.

Oropon bates. W. Eitner. Gerber, 1912, 311—313.

"Oropon E.C." is the commercial name of a yellow powder consisting of straw meal moistened with an extract of pancreas, dried and ground. By certain additions the effect of the latter constituent can be so modified that its action may be made similar to the different forms of bate. The trypsin, derived from the pancreas juice, effects the solution of certain albuminoids in the hide, resulting in the resolution of the hide fibres into their finer elements and hence in a loosening of the skin structure. Another constituent of the pancreas juice acts upon the fatty matters of the hide and renders them easily removable after solution or emulsification. The new bate also contains ammonium chloride which acts as a deliming agent without acid reaction. Also, with a fat emulsifying bate like this, the fat is, for the most part, actually removed in the bath and left in suspension in the water. The use of such a bate is particularly suitable with sheep-skins which may contain fat to the amount of 30 per cent. of their dry weight. This fat being unsaponifiable is not removable by the action of alkalis. There is possibility of damage to the goods when "Oropon" is used in conjunction with the dung bate, as the decomposing ferments of the old dung bate may act upon the organic constituents of the "Oropon" and damage to the grain may easily occur. The diastatic action of pancreas juice may modify the bating effect of this bate substitute by giving rise to products of fermentation of vegetable carbohydrates such as starch and sugar. Successful experiments were carried out on the use of this substance for bating ox-hides and pig-skins; after tanning, a sound, soft and full leather was produced. There was no destructive action even after 8 days as would take place with the dung bate, but a somewhat empty leather was the result. Argentine lamb-skins bated for 14 hours at 28° C. also gave satisfactory results. The experiments show that the new bate possesses the active properties of the dung bate without its drawbacks and possibilities of danger.—D. J. L.

Tanning extracts; Decolorisation of ——, by means of metallic resinates. E. Guisiana. Le Cuir, 1912, 5, 611. J. Amer. Leather Chem. Assoc., 1912, 7, 682.

Metallic resinates are used in the dyeing industry, and the author applies a similar process for clarifying tanning extracts. A resin soap is prepared by boiling rosin with sodium carbonate for 3—4 hours; 100 lb. of rosin require from 15 to 18 lb. of anhydrous sodium carbonate. To a liquor of 3—4° Bé. (sp. gr. 1·022—1·029), of chestnut, mangrove or spruce, an amount of resin soap is added, equivalent to 5 grms. of rosin per litre of liquor. On heating to 80° C. a turbidity is produced. The solution is stirred and a solution of a metallic salt, *e.g.*, zinc sulphate, slightly acidified with lactic or acetic acid, is added. A precipitate forms which can be separated by filtration. The amount of zinc sulphate required is 0·8—1 grm. per litre. The decolourised liquor is then concentrated. —J. R. B.

Sulphuric acid in tanning liquors and extracts; Determination of free ——. F. O. Sprague. J. Amer. Leather Chem. Assoc., 1912, 7, 670—672.

Attention is drawn to the method of Parker and Payne (see this J., 1904, 457) for the estimation of free sulphuric acid in tan liquors. It is based on the fact that sulphates are insoluble in 80 per cent. alcohol whilst sulphuric acid itself is soluble. The method was tested with liquors to which were added known quantities of sulphuric acid. After calculating for the amount of acid necessary to replace the organic acids combined with lime (by determining the total calcium in the liquor), the amount of free acid found, agreed very closely with the amount calculated. —J. R. B.

Note on cockle wool fat. Procter. *See* XII.

Patents.

Hides and skins; Tanning and liming of ——. J. Forster, Warrington. Eng. Pat. 2371, Jan. 30, 1912.

The liquor in tanning or liming pits is heated uniformly and without the possibility of local superheating, by means of pipes embedded in the concrete of the bottom or sides of the pits. Hot water is circulated through the pipes and may be derived from the steam engine or heated to any required temperature by blowing steam through while it is on its way to or through the conduit.—D. J. L.

Vegetable tanning extracts; Process of decolourising ——. W. Hildt, Warsaw. Eng. Pat. 18,436, Aug. 10, 1912.

Tanning extracts in general and mangrove-bark extract in particular are considerably clarified by the action of salts of stannous oxide in the presence of small quantities of alkalis. No loss of tannin occurs, as the compounds of tin and tannin are soluble in the presence of alkali in the excess of the extract. Examples: (1) 5 kilos. of sodium carbonate are first gradually stirred into 1000 litres of mangrove extract of 21° Bé. (sp. gr. 1·171), and then 5—6 kilos. of stannous chloride are added. Decolourisation takes place on heating for a short time at 90° C. (2) 1000 litres of quebracho extract of 21° Bé (sp. gr. 1·171) are mixed with 8 kilos. of sodium carbonate and 4—5 kilos. of stannous chloride, and heated for some time to 90° C.—D. J. L.

Oil tannage; Process of ——. W. Fahrion. Ger. Pat. 252,178, Aug. 6, 1911.

A CERTAIN quantity of a metal, preferably lead, manganese, or cobalt, is dissolved, in any suitable manner, in the oils or fatty acids used in the tanning. It is stated that the metals catalytically accelerate the tanning process. —A. S.

Casein compound; Production of a new soluble ——. C. Revis, E. R. Bolton and W. N. Bacon, London. Eng. Pat., 24,662, Nov. 6, 1911.

CURDS obtained from skimmed milk are washed and mixed with a solution of borax; the mixture is then sprayed or atomised into a chamber where it comes into contact with air heated to a temperature considerably above the boiling point of water. A soluble powder of extreme fineness is thus obtained. Ten lb. of powdered borax mixed with from 300 to 500 lb. of wet casein containing from 25 to 30 per cent. of dry substance, will form a concentrated solution which will yield about 100 lb. of dry casein containing about 10 per cent. of borax. The product dissolves easily in water to form a mucilage. —W. P. S.

Skins; Treatment of ——. R. Ribot, Paris. Eng. Pat. 5117, Feb. 29, 1912. Under Int. Conv., March 4, 1911.

SEE Fr. Pat. 442,062 of 1912; this J., 1912, 890.—T. F. B.

Leather board; Process for making an agglutinant for use in preparing ——. Hide-Ite Leather Co. Fr. Pat. 445,279, June 21, 1912.

SEE U.S. Pat. 1,033,538 of 1912; this J., 1912, 890.—T.F.B.

Apparatus for drying manure, tan waste, and other materials. Eng. Pat. 11,028. *See* I.

Process of dyeing leather. Fr. Pat. 445,624. *See* VI.

XVI.—SOILS; FERTILISERS.

PATENTS.

Nitrogenous fertilisers: Treatment of ——. F. W. MacMahon, Warlingham, Surrey. Eng. Pat. 9413, Apr. 20, 1912.

DELIQUESCENT nitrogenous fertilisers are mixed, at a temperature of 40° C., with horn dust, hoof dust, dried blood, fish meal, meat meal, wool waste, leather dust, hair, feathers, rape meal, or seaweed, or mixtures of the same. For instance, calcium nitrate may be mixed with its own weight of horn or hoof dust.—W. P. S.

Nitrolim [crude calcium cyanamide] fertiliser that can be easily distributed; Manufacture of a stable ——. A. Stutzer. Ger. Pat. 252,164, Jan. 27, 1909.

NITROLIM is mixed with calcium nitrate at a temperature not exceeding 50° C., and the mixture is then finely divided in the usual way. By using a quantity of calcium nitrate equal to or one-half of that of the nitrolim, the mixture will sinter at 40° C.—A. S.

Crops; Cultivation of ——. [Application of atmospheric electricity.] P. E. van Musschenbroek, Sedatio, Java. Eng. Pat. 8903, Apr. 15, 1912.

ATMOSPHERIC electricity is collected by means of wires carried on high towers or poles and is conducted to distributing wires arranged horizontally over the growing crops; the distributing wires are provided with points which project downwards. An inductance is fitted between the collecting and distributing wires, and violent electric discharges pass directly to the earth through a spark gap. —W. P. S.

Apparatus for drying manure, tan waste, and other materials. Eng. Pat. 11,028. *See* I.

Defecating sugar juices, with recovery of substances suitable as fertilisers. Fr. Pat. 445,830. See XVII.

Insecticide composition. U.S. Pat. 1,044,452. *See* XIXB.

Insecticidal soap. Addition to Fr. Pat. 444,021. *See* XII.

XVII.—SUGARS; STARCHES; GUMS.

Saturation scum and of a sugar factory boiler deposit; Analysis of a ——. K. Vorbuchner. Österr.-Ungar. Zeits. Zuckerind., 1912, **41**, 516—518.

(1) AN abnormal saturation scum, which was penetrated throughout with air bubbles, yet was of a dense consistence, was analysed with the following results: Silica, 0·68; iron and aluminium oxides, 0·70; magnesium carbonate, traces; calcium carbonate, 53·56; calcium phosphate, 1·44; calcium sulphate, 0·78; calcium, organically combined, 5·05; calcium oxide, 0·65; sugar, 18·26; protein, 1·37; fat, traces; and organic non-sugar, 17·51 per cent. The cause of the peculiar appearance and composition of this scum, which had not been washed, is to be attributed, not to working unripe or altered roots, but to the use of too low a temperature during defecation and saturation. (2) A dark brown plastic mud found in a boiler was examined and the following figures obtained: Water, 3·33; fat, 24·24; other organic substances, 6·66; matter insoluble in concentrated hydrochloric acid, 1·63; silica, 1·18; cupric oxide, 5·47; iron oxide, 14·35; calcium oxide, 15·05; magnesium oxide, 3·14; sulphuric acid, 15·66; and alkalis, 0·15 per cent. Sugar had entered the boiler with the feed water, had become decomposed owing to the high temperature, with the formation of organic acids, which had attacked the boiler plate and valves, as the amounts of iron and copper indicate.—J. P. O.

[Beet sugar factory;] An incrustation from the triple effect of a ——. O. Fallada. Österr.-Ungar. Zeits. Zuckerind., 1912, **41**, 512—516.

WHEN roots that contain a large amount of nitrogenous non-sugar substances, through being unripe or withered, are being worked in the factory, the deposits on the heating tubes of the effect, instead of consisting largely of calcium carbonate or sulphate, as is the case under normal circumstances, are principally composed of the calcium salts of organic acids. Such a deposit, a greyish brown amorphous mass, has been examined by the author. It was quite free from carbonates and contained only a small amount of sulphates, but was largely composed of an acid-resisting substance, which on investigation was shown to be a compound of calcium with organic acids. Owing to the insolubility of this substance, it was impossible to investigate the nature of the organic acids, which, however, are considered by the author to be tricarballylic and humic acids. As complete an analysis as possible was made, and the following figures were obtained: Water, 4·17; silica, 0·44; iron and aluminium oxides, 0·95; cupric oxide, 2·01; zinc oxide, 0·60; calcium sulphate, 0·70; calcium phosphate, 0·22; calcium citrate, 1·38; calcium oxalate, 0·66; magnesium oxide, 0·08; mineral oil, 6·24; fat, 1·05; amino-acids, 1·25; calcium humate and other organic substances, combined water, and undetermined matter, 80·25 per cent. Deposits of this nature are very difficult to separate from the heating surfaces of the evaporators, and resource must be had only to mechanical means of removal in place of the ordinary treatment with alkalis and acids.—J. P. O.

Sulphurous acid ; Use of —— in making the acid reading in the double polarisation method of determining sucrose. J. P. Ogilvie. Intern. Sugar J., 1912, **14**, 624—630.

Saillard (Suppl. Hebd. Syndic. Fabr. Sucre, 1912, No. 1213) has stated that the use of sulphurous acid for determining the acid direct reading in the double polarisation method of determining sucrose, gives a lower figure than the hydrochloric acid and urea direct reading. It is now pointed out by the author that Pellet's original sulphurous acid process, as used by Saillard in his experiments, does not give correct results, and that a modification must be used to obtain results equal to those given by hydrochloric acid. This modification consists in saturating the 50 c.c. of sugar solution contained in a 100 c.c. flask with sulphur dioxide, or in making up the volume to 100 c.c. with an aqueous sulphurous acid solution containing about 7·5 grms. of sulphur dioxide in 100 c.c. Results of experiments are given showing that the figures thus obtained are equal to those found when hydrochloric acid is used, and that when a lower concentration of sulphurous acid solution than that prescribed is used, the results do not agree with those obtained with hydrochloric acid. It is claimed that this method of working with sulphurous acid in excess solves the problem of making the acid direct reading in the case of beet molasses, and obviates the error due to the optically-active substances other than sucrose. Whereas in the case of hydrochloric acid and urea the rate of inversion is reasonably rapid, with sulphurous acid in excess it is comparatively slow, and the readings remain quite constant for about 30 minutes. For the determination of sucrose in beet molasses by the double polarisation method using the sulphurous acid direct reading, the procedure now recommended is as follows : 200 c.c. of a normal sugar weight solution of the sample, defecated with a slight excess of basic lead acetate solution, and filtered, is prepared. For the direct reading 50 c.c. of this solution are transferred to a 100 c.c. flask, saturated with sulphur dioxide, the flask being immersed in cold water, and made up to volume with water at standard temperature. Or, instead of saturating the assay liquid with sulphur dioxide, the 50 c.c. may be made up to 100 c.c. with a freshly prepared solution of sulphurous acid, as mentioned above. After mixing the liquid treated with sulphurous acid, and adding a little decolourising carbon if necessary, it is filtered, and polarised at 20·0° C. in a 200 mm. water-jacketed tube. For the inversion reading 50 c.c. of the same defecated and filtered normal solution of the molasses as that used for the direct reading are transferred to a 100 c.c. flask, 25 c.c. of water and 5 c.c. of hydrochloric acid (1·19 sp. gr.) added, the liquid inverted according to the Herzfeld procedure, and read in the same 200 mm. water-jacketed tube at 20·0° C. Finally, the percentage of sucrose is calculated from the two readings in the ordinary way, applying, however, the constant from the Herzfeld table appropriate to the particular concentration used. It is pointed out that under these conditions it is unnecessary to take account of the volume of the lead precipitates produced in making the direct and inversion readings ; but that it is advisable in operating the inversion polarisation, especially when examining very impure products, to carry out the determination in duplicate, continuing heating at 69° C. in the second test for 5 minutes longer than in the first. In this way the complete hydrolysis of the sucrose in presence of an abnormally high ash and non-sugar content is ensured.—J. P. O.

Manufacture of sugar from wood and its economic importance. Zimmermann. *See* XIXa.

Patents.

Sugar ; Process for recovery of cane ——. E. E. Battelle, Wailuku, Hawaii. U.S. Pats. 1,044,003 and 1,044,004, Nov. 12, 1912.

Cane juice is treated with 1—5 per cent. of lime, and heated to approximately the boiling point for sufficient time to insure the precipitation or destruction of the greater part of the glucose. The juice is then freed from excess of lime by treatment with carbon dioxide, filtered, and boiled to grain. The residual molasses, which is substantially free from glucose, is diluted to a specific gravity of 1·05—1·06, cooled to 10—12 C., and passed through a mass of "cold oxide of alkali earth." The sucrate thus formed is washed, diluted with hot juice, and added to raw juice, the sugar then being set free by treatment with carbon dioxide. L. E.

Sugar juices ; Process and means for defecating ——, with recovery of substances suitable as fertilisers. W. Guerrero. Fr. Pat. 445,830, July 6, 1912. Under Int. Conv., April 6, 1912.

The crude juice flows into defecating vessels and is there successively treated with 0·5—1 kilo. of lime, 2—5 kilos. of hydrated calcium diphosphate, and, say, 0·5 kilo. of kieselguhr per 1000 litres. After thorough mixing at the ordinary temperature, the juice is run into a back fitted with stirrers, and thence to re-heaters where its temperature is raised to 90°—100° C. The hot juice is collected in a second back provided with stirrers and pumped therefrom to a battery of filter-presses. The filtered juice, which is perfectly clear, is concentrated ; the dried and powdered press-cake which contains 1—2 per cent. of organic nitrogen, 10—16 per cent. of phosphoric acid, and 40—50 per cent. of humus, constitutes a valuable fertiliser for cane crops.—L. E.

Sugar ; Products for use in making —— and process for preparing them. The Simmons Sugar Co. Fr. Pat. 445,461, March 6, 1912.

See U.S. Pats. 1,040,561 and 1,040,562 of 1912 ; this J., 1912, 1089. T. F. B.

Drying starch ; Process and apparatus for ——. Corn Products Refining Co. Fr. Pat. 445,289, June 21, 1912.

See U.S. Pat. 1,035,302 of 1912 ; this J., 1912, 1089.
—T. F. B.

Apparatus for automatically controlling the level of the liquor or juice in evaporating apparatus for obtaining triple and other effects. Eng. Pat. 25,869. *See* I.

Treating marine plants wih a view to extracting their constituents [iodine, mucilage, etc.]. Fr. Pat. 445,771. *See* VII.

XVIII.—FERMENTATION INDUSTRIES.

Alcoholic fermentation ; Mechanism of ——. II. A. v. Lebedeff and N. Griaznoff. Ber., 1912, **45**, 3256—3272. (See also this J., 1911, 973.)

Yeast juice prepared by maceration (see this J., 1911, 147) ferments glyceraldehyde, and yields alcohol and carbon dioxide. The concentration of the aldehyde must be less than 2 per cent., otherwise coagulation of the yeast juice occurs. The glyceraldehyde employed by the authors was an optically inactive mixture. Assuming, what is very probable, that only one of the optically active components is fermentable, this component, in concentrations up to 1 per cent., is fermented as completely as sucrose, but less rapidly. The fermentation is not affected by addition of phosphates (cp. Harden and Young, this J., 1912, 553). In the fermentation of sucrose solutions by yeast juice, the production of alcohol is not affected, to any considerable extent, by addition of acetaldehyde (*e.g.*, 1 per cent.). In absence of sugar, however, acetaldehyde is reduced to alcohol by the active yeast juice, and this reduction appears to be enzymic, for it is not effected by boiled yeast juice. In view of these facts the authors suggest that the following transformations occur during the fermentation of hexoses :—The hexose is first decomposed into equal quantities of the two trioses, glyceraldehyde and dihydroxyacetone. This decomposition is probably reversible, and only becomes progressive owing to the continuous decomposition of the glyceraldehyde into alcohol and carbon dioxide, and conversion of the dihydroxyacetone into phosphoric ester. The glyceraldehyde loses hydrogen and yields pyruvic acid or an isomeride of this compound. The latter, in accordance with the reaction discovered by Neuberg (see this J., 1911, 1179, 1465), is transformed into carbon dioxide and acetaldehyde, which subsequently, by taking up the same amount of hydrogen as was lost by the glyceraldehyde, is reduced to ethyl alcohol. The dihydroxyacetone, on the other hand, is first converted into a trioso phosphoric ester, which polymerises to hexose diphosphoric ester. This undergoes hydrolysis and yields phosphoric acid and hexose, and the cycle commences again with the decomposition of this hexose into glyceraldehyde and dihydroxyacetone.—I. H. L.

Beer; Colouration of —— by yeast. E. Moufang. Z. ges. Brauw., 1912, **35**, 549—550.

It has been observed that if beer, when ready for racking into cask, is exposed to daylight for 2—3 weeks, it may acquire a perceptibly violet tint and thereby become paler. The phenomenon, which has been chiefly noticed in the case of pale beers, cannot be ascribed to the action of foreign organisms since it is exhibited by beers prepared with pure yeast, and it is not directly due to the action of light since it is found that the beer acquires a violet tint when kept in the dark, though not so rapidly. The colouration appears to be essentially due to decomposition products of dead yeast cells, since experiment shows that unfiltered beer, *i.e.*, beer containing an abundance of old and dead cells, shows a greater tendency to become coloured than filtered beer. Further, under certain conditions, even dark beers are much affected in respect of colour by addition of dead yeast.—L. E.

Manufacture of sugar from wood and its economic importance. Zimmermann. *See* XIXA.

PATENTS.

Water; Impts. in industries such as brewing and malting for which —— is used, and in products thereof. E. Jalowetz, E. Richter, and A. Schückher. Fr. Pat. 444,962, Mar. 30, 1912. Under Int. Conv., April 1, 1911.

Water is rendered suitable for malting, brewing, etc., by the removal of calcium and magnesium carbonates, etc. These compounds are precipitated by simultaneously boiling and vigorously stirring the water; if the water is of relatively high carbonate-content, it is boiled under pressure, preferably with stirring. The stirring may be effected mechanically or by means of steam. When precipitation is as complete as possible, the water is decanted or filtered, this operation being preferably executed immediately after boiling. According to this process, unlike that described in Fr. Pats. 391,701 of 1908. and 440,763 of 1912 (this J., 1912, 837), the crystals constituting the precipitate should be as large as possible in order to facilitate the separation.—L. E.

Brewing and other similar processes; Impts. in ——. A. Shelmerdine and F. C. Lewis. Fr. Pat. 445,170, June 19, 1912. Under Int. Conv., Feb. 29, 1912.

Claim is made for an electrochemical process of sterilising wort, or beer or other beverage. The liquid, *e.g.*, wort on its way from the cooling back to the fermentation vat, flows through a sinuous channel about 12 mm. wide and formed by a series of parallel diaphragms made of some non-metallic substance such as carbon, and projecting alternately from opposite sides of the containing vessel. During its passage, the wort is subjected to the action of an electric current, the diaphragms serving as electrodes, and of an antiseptic substance produced in the liquid itself by electrolysis, *e.g.*, of sodium chloride. It is found that with electrodes of 325 sq. cm. total surface, a current of 0·5—3 ampères and about 200 volts suffices to sterilise 200 c.c. of wort in 1—5 minutes.—L. E.

Hop extract; Improved process for preparing ——. L. A. von Horst. Fr. Pat. 445,465, April 19, 1912. Under Int. Conv., Jan. 9, 1912.

Hops are disintegrated and sifted in order to separate the lupulin. The residue of leaves and stalks is digested with water for 1—3 hours or more, or with concentrated or dilute alcohol for 1—4 hours or more; water is preferably used if the hop oil is a more important constituent of the residue than the hop resin, whilst alcohol is best used in the reverse case, and the extracts obtained from residues of different qualities may be mixed in any suitable proportions. The extract is concentrated and mixed with lupulin or with a concentrated extract of the same. The latter extract is prepared by heating lupulin (454 grms.) with alcohol (4543 c.c.) in a closed vessel for 1—4 hours or until all the hard and soft resins are dissolved, the solution then being concentrated; the residue from this extraction may be further extracted with the leaves and stalks.—L. E.

Glycerin: Extraction of —— from distillery residues (vinasses). Watrigant Frères et Cie. Fr. Pat. 445,895, Sept. 16, 1911.

The residues are dried as completely as possible and extracted with various liquids in which the glycerin is insoluble under the conditions of the treatment, after which they are washed with hot amyl alcohol, and from this extract the dissolved glycerin separates on cooling. For example, acetone may be used in the preliminary washing to dissolve potassium malate, whilst ethyl acetate is subsequently employed to dissolve the betaine. Or ethyl acetate or a cold saturated solution of glycerin in amyl alcohol may be used to extract both potassium malate and betaine.—C. A. M.

Fermentation; Process for the promotion of ——. E. Pohl, Rhondorf on Rhine, Germany. Eng. Pat. 25,570, Nov. 16, 1911. Under Int. Conv., Nov. 17, 1910.

See Fr. Pat. 436,477 of 1911; this J., 1912, 454.—T. F. B.

XIXA.—FOODS.

Starch in meat food products; Method for the determination of ——. T. M. Price. U.S. Dept. Agric., Bureau of Animal Industry, Circular No. 203, Sept. 18, 1912.

The following method is recommended; it is a combination of Perrier's method (Bull. Sci. Pharmacol., 1908, 305) with the modification of Mayrhofer's method proposed by Bigelow (U.S. Dept. Agric., Bureau of Chem., Bull. 13, Part 10). Ten grms. of the finely divided meat product are heated on a water-bath with 75 c.c. of an 8 per cent. solution of potassium hydroxide in 95 per cent. alcohol until all the meat has dissolved. An equal volume of 95 per cent. alcohol is then added, the mixture is cooled, and, after the lapse of 1 hour, poured through an asbestos filter. The insoluble residue is washed twice with a warm 4 per cent. solution of potassium hydroxide in 50 per cent. alcohol, and then twice with warm 50 per cent. alcohol. The insoluble residue is now treated with 40 c.c. of water and 25 c.c. of concentrated sulphuric acid, allowed to stand for 5 minutes, diluted with 40 c.c. of water, heated just to boiling, and transferred to a 500 c.c. flask. Two c.c. of a 20 per cent. solution of phosphotungstic acid are added, the mixture is cooled, diluted with water to the mark, and filtered. Fifty c.c. of the filtrate are neutralised and the dextrose is determined with Fehling's solution. When dealing with starches alone, the following methods yield accurate results:—(1) Conversion of the starch with hydrochloric acid, and titration with Fehling's solution. (2) Conversion with nitric acid, and polarisation. (3) Modification of No. 2, the starch being first brought into solution by means of oxalic acid. (4) Conversion of the starch with salicylic acid, and polarisation. (5) Precipitation of the starch with barium hydroxide, and determination of the excess of the latter by titration with standard acid. In the presence of such interfering substances as pentosans, the starch should be first brought into solution by the action of diastase.—W. P. S.

Examination of sesamé oil-cake. Grégoire and Carpiaux. *See* XII.

Sugar [cattle food] from wood, Manufacture of —— and its economic importance. A. Zimmermann. J. Roy. Soc. Arts, 1912, **61**, 69–81.

"Sacchulose" is the commercial name given to the product obtained by treating wood sawdust by the Classen process with a solution of sulphurous acid under a pressure of 90—100 lb. per sq. in. The product contains about 25 per cent. of sugars derived from the wood, whilst the wood-residue itself is considerably modified both physically and chemically. The residue consists of a friable substance of great porosity filled with the sugar produced in the process. Owing to the porosity and consequent fine distribution of the sugar, the crude product is relatively unstable in the air, oxidation of the sugars and shrinkage of the woody substance taking place very readily. To prevent this, when the product is to be used as a fodder, substances such as molasses or fatty matters are stirred into the "sacchulose" immediately the acid vapours have been discharged from the digester and before the pores have had time to contract. Chemically the residual lignocellulose is so changed that not only are soluble sugars produced, but the equilibrium of the remainder is so disturbed that it is susceptible to a rapid breakdown under the action of the digestive juices of animals. The mixture of "sacchulose" and molasses has been used with considerable success as fodder. Working horses were fed for six months on a ration in which 4 lb. of the usual oats were replaced by 4 lb. of the special mixture. During the first month a loss in body-weight was recorded, but as the animals became accustomed to the new diet, they rapidly put on flesh, and gains ranging from 30 to 80 lb. in body-weight were registered at the end of the period of observation. A large number of other results of a successful nature are cited. The fodder has been criticised in Germany on the basis of feeding experiments carried out over short periods, with the statistical analysis of the rations and excrements. The author points out that results obtained with animals in captivity are likely to be abnormal, that the period allowed was too short to enable the subjects to become accustomed to the diet and, above all, the German critics took no account of the substantial gain in body-weight which they registered as the result of the "sacchulose" diet. The author states that the original intention of the manufacturers of "sacchulose" was the production of cheap commercial alcohol, possibly for use as a motor fuel. The sugar present in the product is fermentable to the extent of about 80 per cent., and a maximum yield of about 30—35 proof gallons of spirit has been obtained per ton of wood. The restrictions imposed by the Spirit Act of 1880 made this proposition impracticable, and the development in this direction is suspended until some legislative relief can be obtained. It is claimed that a factory treating 200 tons of sawdust per week could produce 300,000—400,000 gallons of proof spirit per annum, and that the by-products would include some 50 tons of acetic acid, 10 tons of furfural and 2000 gallons of methyl alcohol; the spirit produced is of high quality, free from fusel oil.—J. F. B.

Patents.

Nutritive substances contained in fish; Method of extracting and utilising the ——. A. Danilevsky, St. Petersburg. Eng. Pat. 18,365, Aug. 14, 1911.

Fish are cleaned, cut up into small pieces, and heated to 50° C. with a 0·1—0·2 per cent. solution of an alkali hydroxide or carbonate, or with a 0·1—0·2 per cent. solution of hydrochloric acid; the extract thus obtained is neutralised and the precipitated proteins are collected. The portion of the fish remaining undissolved by this treatment is then heated to 80° C. with an excess of a 0·5—1·5 solution of alkali until the flesh becomes disintegrated; the mixture is now passed through a sieve, the proteins obtained previously are added, and the whole is heated to 100° C., after the addition of twice its weight of a 1 per cent. solution of sodium carbonate. The mixture is then cooled to 40° C., neutralised, and utilised as a food. It may be mixed with milk to form a "cheese," concentrated and cooked in oil, prepared as a broth, etc. (See also Eng. Pat. 12,686 of 1900; this J., 1901, 738.) —W. P. S.

Food; Preparation and preservation of ——. J. Hargreaves, Widnes, Lancs. Eng. Pat. 24,722, Nov. 7, 1911.

The phosphates (bones) in animal substances are rendered soluble by treating the substance with hydrochloric acid or chlorine; for instance, fish is treated with 1 per cent. of hydrochloric acid of sp. gr. 1·15. A quantity of sodium carbonate, sufficient to neutralise the acid, is then added, and the substance is dried, baked, and stored in sterilised receptacles. Vegetable foods may be treated similarly. (Reference is directed to Eng. Pats. 921 of 1866, 2568 of 1870, 17,732 of 1893, 6496 of 1896, 9653 of 1901, 4759 of 1903, and 22,655 of 1909; this J., 1897, 329; 1902, 558; 1904, 382; 1910, 1123.)—W. P. S.

Food preparations. A. Hartley, Emsworth, Hants. Eng. Pat. 25,078, Nov. 10, 1911.

A preparation for use as an ingredient of other foodstuffs comprises a mixture of malt flour with precipitated phosphates such as iron, calcium, and magnesium phosphates.—W. P. S.

Food product and process of making the same. H. B. Hunter, Norfolk, Va. U.S. Pat. 1,043,839, Nov. 12, 1912.

A mixture of earthnut (arachis) oil and water is added to a paste prepared by adding water to cocoa from which a portion of the fat has been removed, and the whole is heated to a temperature above 70° C.—W. P. S.

Milk; Methods for concentrating or desiccating ——. H. I. Andrews, Darien, Conn., U.S.A. Eng. Pat. 27,778, Dec. 11, 1911.

See U.S. Pat. 1,012,578 of 1911; this J., 1912, 148.—T.F.B.

Sterilisation of milk or other liquids; Apparatus for the ——. T. G. Mollinger, The Hague. Assignor to General Sterilising Co., Wilmington, Del. U.S. Pat. 1,045,056, Nov. 19, 1912.

See Eng. Pat. 24,162 of 1910; this J., 1911, 1083.—T. F. B.

Yeast; Process for increasing the raising power of dry ——. P. D. H. Ohlhaver. Fr. Pat. 445,793, July 5, 1912.

See U.S. Pat. 1,021,700 of 1912; this J., 1912, 406.—T.F.B.

Production of new soluble casein compound. Eng. Pat. 24,662. *See* XV.

XIXb—WATER PURIFICATION; SANITATION.

Sewage and sewage effluents discharging into rivers and streams; Standards and tests for ——. Royal Commission on Sewage Disposal. Eighth Report. Vol. I., Nov. 4, 1912.

The tests which have been considered have been mainly the amount of ammoniacal nitrogen present, the amount of oxygen absorbed from permanganate in 4 hours, and the amount of dissolved oxygen taken up in 5 days. Of these, it is considered that the last forms the most trustworthy chemical index of the condition of a stream, and the amount of 0·4 part of dissolved oxygen per 100,000 of river water taken up in 5 days was found to be the limit above which signs of pollution would be evident in the stream. It was found that this figure would represent a "fairly clean" river, and that a result of 0·2 part would represent a "clean river," and 0·1 part a "very clean" river. For fixing a standard, a figure of 0·2 part may be taken as representing the condition in which a river ought to be to receive a sewage effluent. Further, the dilution which the effluent will receive in the river is important as a measure of the amount of purification which may be safely left to the river. The Commission have previously fixed a standard of 3 parts of suspended matter per 100,000 as a standard for an effluent, and they now fix the further standard of 2 parts of dissolved oxygen per 100,000 taken up in 5 days at 65° F. (18·3° C.) by the effluent including its suspended solids. This is fixed as the general standard for an effluent and relaxation from it should only be allowed in special circumstances. With regard to the question of discharging crude sewage or partly purified sewage into streams, the Commission say that this is permissible provided sufficient dilution is obtained. The dilutions which will be required, in order to maintain the condition of the stream and prevent deoxygenation, by sewage liquids of varying degrees of purity have been worked out, and tables of the results are given. In these cases the dissolved oxygen test may be omitted and the suspended solids taken as the standard. For a chemically precipitated tank effluent the dilution in the river should amount to 150 to 300 volumes and the standard for suspended solids is fixed at 6 parts per 100,000. For both sedimentation and septic tank effluents the dilution should amount to 300 to 500 volumes and the suspended solids be 15 parts. For crude sewage a dilution of over 500 volumes is required and any other test may be omitted. The Commission recommend that the above standard for effluents should be enacted by law, and that variations from it and any relaxed standards for dilution should be prescribed only by the Central Authority which the Commission have previously recommended should be set up.—J. H. J.

Water-mains; Corrosion of ——. R. Kržižan. Z. öffentl. Chem., 1912, **18**, 433—437.

A PORTION of a cast-iron water-main which had been in use 20 years suddenly became defective. It had been asphalted inside and out, but the corrosion went right through. A number of conical holes were scattered irregularly over the surface and were surrounded by graphite-like material containing particles of metallic iron. A complete analysis of this material showed that it had the following percentage composition: metallic iron 5·98, ferric oxide and hydroxide 34·09, ferrous phosphate 9·63, ferrous silicate 37·16, ferrous sulphate 0·47, total carbon 11·42, sulphur 0·097, manganese 1·362, copper 0·296. There was nothing in the water passing through the pipe to account for this formation. The clay in which the pipe lay contained crystals of gypsum distributed irregularly in it. The corrosion is attributed to local currents set up by contact between the graphite particles and the iron in the presence of a solution of calcium sulphate at the points round the pipe where the crystals of gypsum were contained in the clay.—J. H. J.

Determination of small quantities of carbon monoxide. Brunck. *See* VII.

Corrosion of lead by lime-mortar and the disinfecting power of calcium hydroxide. Vaubel. *See* IX.

PATENTS.

Water or other liquids; Apparatus for purifying ——. M. Coplans, Leeds. Eng. Pat. 24,936, Nov. 9, 1911.

THE water passes into a chamber where it is treated with a powdered reagent delivered in regulated quantity from a rotating drum situated in the upper part of the chamber; stirring devices are provided for mixing the powder with the water. The treated water then enters a tank fitted with partitions over and under which the water flows successively, and finally passes through a filtering chamber. The filter or strainer in the latter consists of animal hair, preferably horsehair, packed between movable horizontal plates; when it is desired to clean the filter, these plates may be moved apart and the hair stirred by a suitable apparatus while a current of water is passed through the chamber.—W. P. S.

Sedimentation tanks for the treatment of sewage and other foul waters. W. J. Dibdin, London. Eng. Pat. 26,927, Dec. 1, 1911.

THE plates employed in sedimentation tanks such as those described in Eng. Pat. 16,851 of 1903 (this J., 1904, 201) may be provided on their under-surface with a ridge adapted to retain air, in order that a much larger volume of air should be present in the tanks than that usually trapped beneath the plates used originally.—W. P. S.

Water: Apparatus for the sterilisation of —— *by means of quartz mercury-vapour lamps immersed in the water.* P. G. Triquet. Second Addition, dated Aug. 30, 1911, to Fr. Pat. 434,069, Nov. 14, 1910 (this J., 1912, 253, 948).

EACH lamp employed in the apparatus is mounted separately, and is put in operation by means of an external handle; the latter extends through a stuffing-box in the wall of the tank holding the water and is attached to the frame in which the lamp is fixed.—W. P. S.

Liquids; Processes and apparatus for the purification of —— *by centrifugal action.* A. Dahlhaus. Fr. Pat. 445,216, June 19, 1912.

THE liquid, such as sewage, etc., is introduced into a rapidly rotating drum, and the solids, separated by the centrifugal action, pass into a casing surrounding the drum and are discharged from the same in a practically dry condition. The liquid leaves the top of the drum and collects in a channel from which it is discharged in any suitable manner. Various forms of the apparatus are described.—W. P. S.

Water and other liquids; Filtration of ——. R. N. Lennox, Fr. Pat. 445,368, June 25, 1912. Under Int. Conv., Dec. 21, 1911.

THE water is introduced under pressure through an injector device into the lower portion of a chamber containing a number of filter-candles; sand is placed in the interior of the chamber and is caused to circulate rapidly therein, a central tube being provided to aid in mixing the sand with the inflowing water. The movement of the sand keeps the surfaces of the filter-candles clean and prevents them from becoming clogged with solid matters separated from the water. After being filtered through the candles, the water is discharged from the bottom of the chamber.—W. P. S.

Insecticide composition. A. S. Halland, Buffalo, N.Y., Assignor to Niagara Sprayer Co., Middleport, N.Y. U.S. Pat. 1,044,452, Nov. 12, 1912.

EQUAL parts of sulphur and sodium carbonate are fused together at a temperature of about 250° C., and then cooled.—W. P. S.

Antiseptic. J. Wittlin, Vienna, Assignor to S. Schlewinger, New York. U.S. Pat. 1,044,840, Nov. 19, 1912.

PURIFIED cresol is mixed with about 0·4 per cent. of ammonium fluoride; picric acid, chloropicrin, formaldehyde, and soap solution may also be added.—W. P. S.

Evaporating apparatus for sea water. W. Weir. Fr. Pat. 444,948, June 14, 1912. Under Int. Conv., Feb. 3, 1912.

SEE Eng. Pat. 2812 of 1912; this J., 1912, 792.—T. F. B.

Sewage waters; Apparatus for depositing and recovering the light constituents of ——. R. Körner. Fr. Pat. 445,281, June 21, 1912. Under Int. Conv., June 22, 1911.

SEE Eng. Pat. 14,644 of 1912; this J., 1912, 949.—T. F. B.

Plants, human beings, and domestic animals; Preparation of a product for destroying parasites of ——. R. Zimmermann. Fr. Pat. 445,106, June 17, 1912. Under Int. Conv., Aug. 26, 1911.

SEE Ger. Pat. 249,469 of 1911; this J., 1912, 1050.—T. F. B.

Preparation of emulsified products composed of asphaltum-pitch, tar, resins, oils, etc. Fr. Pat. 444,739. *See* III.

Extraction of valuable fats and oils from effluents and residues obtained in the clarification of such effluents. Fr. Pat. 445,077. *See* XII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Opium powder and its preservation. Debourdeaux. J. Pharm. Chim., 1912, **6**, 491—493.

The presence in opium powders of morphine insoluble in water and neutral liquids having already been indicated (this J., 1911, 1029), the present investigation is mainly concerned with the effects of fine-grinding and storage upon these products. Three samples, ground to pass a "No. 11" sieve, were found to contain respectively 13·1, 13·65 and 12·73 per cent. of total, and 12·0, 12·6 and 11·71 of soluble, morphine, the average difference (on the basis of the total morphine present) being about 8 per cent. After being kept for from 3 to 9 months, the samples were mixed in unknown proportions and the mixture was found to contain 13·41 per cent. of total, and 11·76 of soluble morphine—a percentage difference of 12·3. This mixture, after being ground to pass a "No. 37" sieve, was kept for six months in an ordinary glass stoppered bottle and was then found to have acquired a greyish yellow tint; on analysis the material was found to contain 3·8 per cent. of water, the total and soluble morphine (calculated on the dry material) being respectively 12·75 and 11·09 per cent.—a difference of 13·1 per cent. on the total morphine. Although not regarding the fact as definitely established, the author concludes that opium powders, by ageing, undergo a change which results in a decrease of the total, and an increase in the insoluble, morphine content; this change, being most apparent in the more finely divided powders, is attributed mainly to atmospheric oxidation and the influence of light.

—W. E. F. P.

Morphine glucoside. C. Mannich. Annalen, 1912, **394**, 223—228.

An alkaline solution of morphine was shaken with acetobromoglucose dissolved in ether. A large proportion of the morphine separated out, but the ethereal solution was found to contain morphine tetra-acetylglucoside, $C_{17}H_{18}NO_3.C_6H_7O_5(CH_3CO)_4.H_2O$. This substance forms white needles when crystallised from dilute alcohol and melts at 154°—156° C. The hydrochloride crystallises from water and melts with decomposition at 220° C. The condensation can also be effected in acetone solution, and the yield is thereby improved. Morphine glucoside, $C_{17}H_{18}NO_3.C_6H_{11}O_5.H_2O$, is readily obtained by hydrolysing the acetylglucoside with a cold solution of sodium hydroxide. It can be crystallised from dilute alcohol and forms fine needles with a bitter taste. The melting point is between 183° and 193° C. The glucose condenses with the phenolic hydroxyl of the morphine as the glucoside is insoluble in sodium hydroxide solution and does not react with ferric chloride. Boiling with hydrochloric acid resolves the glucoside into glucose and morphine.—F. Shdn.

Aconitine; Constitution of ——. (*Preliminary note.*) O. L. Brady. Chem. Soc. Proc., 1912, **28**, 289—290.

On treating aconitine with concentrated nitric acid a vigorous action takes place, and from the reaction mixture a compound can be obtained, which crystallises readily from alcohol, and melts and decomposes at 200°—205° C. This compound gives a strong nitroso-reaction: the solution in aqueous potassium hydroxide, on warming, becomes brown, and the substance cannot be reprecipitated with acids. By distillation with potassium hydroxide, dimethylamine was obtained. From the mother liquor, after acidifying, acetic and benzoic acids were isolated, indicating that the benzoyl and acetyl groups of the aconitine remain in this compound. So far as can be judged, this compound is a simple benzenoid substance containing at least one methoxy- and one carboxyl group, and the dimethylamino-, nitroso-, acetyl, and benzoyl groups.

An aqueous solution of chromic acid precipitates from an acid solution of aconitine an insoluble *dichromate*, $C_{34}H_{47}O_{11}N,H_2Cr_2O_7$. This substance on warming with dilute sulphuric acid gives a viscid mass, which was not further investigated. By the action of potassium permanganate in acid solution a crystalline substance is obtained, which is identical with that to which Carr (this J., 1912, 1145) has given the name oxonitin. The suggestion that the substance is a carboxylic acid seems unlikely in view that it is insoluble in cold alkalis; it seems probable that the compound is a ketone or an aldehyde, as there is some indication of the formation of a semicarbazone, but the preparation is rendered difficult owing to the insolubility of the compound. This substance has also been obtained in much better yield by the action of potassium permanganate in neutral solution. From the mother liquors after separation of oxonitin a crystalline *bromo*-compound was obtained melting above 300° C.

Taraxacum root; Constituents of ——. F. B. Power and H. Browning, jun. Chem. Soc. Proc., 1912, **28**, 285.

The material employed for this investigation consisted of the air-dried fresh roots of taraxacum (*Taraxacum officinale*, Wiggers), collected in the autumn from plants grown in England. The root was found to contain an enzyme which slowly hydrolysed amygdalin, and an alcoholic extract of the root, when distilled with steam, yielded a small amount of a yellow essential oil. From the portion of the alcoholic extract which was soluble in water the following compounds were isolated: (i) *p*-hydroxyphenylacetic acid, $C_8H_8O_3$; (ii) 3:4-dihydroxycinnamic acid, $C_9H_8O_4$; and (iii) choline, $C_5H_{15}O_2N$. The aqueous liquid also contained a quantity of sugar, which apparently consisted chiefly of lævulose. The portion of the alcoholic extract which was insoluble in water consisted of a soft, oily resin, amounting to 1·8 per cent. of the weight of the root. From this material the following compounds were obtained: (i) Two new monohydric alcohols, *taraxasterol*, $C_{29}H_{47}\cdot OH$, and *homotaraxasterol*, $C_{25}H_{39}\cdot OH$, from which several derivatives were prepared; (ii) cluytianol, $C_{29}H_{46}O(OH)_4$; and (iii) palmitic, cerotic, and melissic acids, together with a mixture of unsaturated acids consisting chiefly of oleic and linolic acids. The so-called "taraxacin" and "taraxacerin" of earlier investigators are regarded as indefinite mixtures.

Pareira root; Alkaloids of ——. M. Scholtz. Arch. Pharm., 1912, **250**, 684—691.

A criticism of the work of Faltis on the alkaloids of Pareira root (see this J., 1912, 838). It is pointed out that the commercial bebirine sulphate may contain transformation products of the original alkaloids which are difficult to crystallise. The author considers that the β-bebirine of Faltis is identical with his bebirine, which can be readily crystallised from methyl alcohol. The formula, $C_{18}H_{21}NO_3$, agrees better with the results of both the author and Faltis than the formula, $C_{21}H_{23}NO_4$, proposed by the latter. The author still regards the formula, $C_{18}H_{21}NO_3$, as the correct one for isobebirine, which is very probably a racemic bebirine.—F. Shdn.

Carpiline; a new Jaborandi alkaloid. E. Léger and F. Roques. Comptes rend., 1912, **155**, 1088—1091.

The mixture of bases extracted from *Pilocarpus microphyllus* was converted into nitrate or hydrochloride. The mother liquors contain a number of bases from which a new alkaloid, *carpiline*, was isolated. This has the composition $C_{16}H_{18}N_2O_3$. It crystallises from alcohol in well-formed colourless prisms melting at 184°—185° C. (corr.). In absolute alcohol at 20° C. it has $[\alpha]_D = +24{\cdot}0°$. The salts with mineral acids can be crystallised from alcohol, and are not attacked by permanganate solution. The base is monacid, and it also behaves as a lactone, forming a stable potassium carpilinate, $KC_{16}H_{19}N_2O_4$. A monobenzoyl derivative was also prepared. When heated with water to 140° C., benzaldehyde and two amorphous bases are produced. (See also Pyman, this J., 1912, 1145.)—F. SHDN.

Essential oils; Constituents of ——. The sesquiterpene, selinene, and its derivatives. F. W. Semmler and F. Risse. Ber., 1912, **45**, 3301—3307.

THE oil obtained from celery seeds contains a sesquiterpene, selinene. The crude hydrocarbon was distilled over sodium and then boiled at 136°—139 C. at 17 mm. This was dissolved in ether and treated with gaseous hydrochloric acid with the formation of selinene dihydrochloride, m.pt. 72°—74° C. after purification. The pure sesquiterpene, selinene, $C_{15}H_{24}$, can be prepared by treating the dihydrochloride with potassium hydroxide dissolved in methyl alcohol. The characters are: b.pt. 128°—132° C. at 11 mm., sp. gr. 0·9190 at 20° C; n_D = 1·50920. α_D = +61° 36′. In structure it is bicyclic and doubly unsaturated. Tetrahydroselinene can be produced by the reduction of the dihydrochloride by means of sodium and alcohol, or by reducing selinene with hydrogen in the presence of finely divided platinum. The characters are: b.pt. 125°—126° C. at 10 mm., sp. gr. 0·8889 at 20° C., n_D = 1·48375, α_D = +1° 12′. The bicyclic singly unsaturated selinenol, $C_{15}H_{26}O$, was obtained by boiling the dihydrochloride with milk of lime. It boils between 155° and 163° C. at 19 mm., has the sp. gr. 0·9627 at 20° C., n_D = 1·50895 and α_D = +52° 36′. When reduced by means of hydrogen and finely divided platinum, dihydroselinenol, $C_{15}H_{28}O$, is produced, which can be crystallised from a mixture of glacial acetic acid and water, and then melts at 86°—87° C.—F. SHDN.

Rose culture and the manufacture of oil of roses in Bulgaria. P. Siedler. Ber. Deut. Pharm. Ges., 1912, **22**, 473—494.

WHITE and red roses are grown, the former being the more easy to cultivate but giving only about half as much oil of an inferior quality. The individual growers distil their own oil, 12—15 kilos. of roses being distilled with 60 kilos. of water until 12 kilos. of distillate are obtained: about 8 or 9 such lots are united and re-distilled into flasks with long necks in which the oil collects on standing. 1 kilo. of oil is obtained from 3000 kilos. of roses, of which 400 weigh one kilo. The roses are gathered in the early morning and distilled the same day; usually a mixture of the two kinds is used. The pure oil from the various districts shows variations in odour and physical properties, and it is therefore skilfully blended by the distributing houses before sale. The oil is very generally adulterated by the peasants, who use ginger-grass oil, palma rosa oil, geranium oil and a variety of other products. In 1910, 3148 kilos. of oil were produced.—E. F. A.

Formaldehyde, ammonia, and antipyrine; Condensation product of ——. C. Mannich and W. Krösche. Arch. Pharm., 1912, **250**, 647—667.

IT has been found that formaldehyde, ammonia, and substances of the antipyrine series condense to form derivatives of the hypothetical trimethanolamine, $N(CH_2{\cdot}OH)_3$. Solutions of antipyrine and hexamethylenetetramine in water were mixed and treated with concentrated hydrochloric acid. A crystalline hydrochloride separated out which melted at 178° C. after crystallising from alcohol. The substance dissolves with great difficulty in water. The free base, tris-antipyryl-tris-methylenamine, $N(CH_2{\cdot}C_{11}H_{11}ON_2)_3$, is obtained by treating the alcoholic solution of the hydrochloride with aqueous sodium hydroxide solution. It can be crystallised from methyl alcohol and then melts at 259°—260° C. When hydrolysed by means of hydrochloric acid, formaldehyde, methylenebisantipyrine (m. pt. 179° C.), and ammonium chloride are formed. Sulphurous acid solution, which is without action upon methylenebisantipyrine, gives rise to antipyrine when boiled with tris-antipyryl-tris-methylenamine. By means of a similar reaction tris-tolypyryl-tris-methylenamine was prepared, and melted at 214°—215° C. after crystallising from dilute methyl alcohol. Methylenebistolypyrine melts at 183°—186° C. after crystallising from 80 per cent. alcohol. Tris-homoantipyryl-tris-methylenamine crystallises from methyl alcohol and then melts at 280° C. Methylenebishomoantipyrine melts between 120° and 130° C.—F. SHDN.

Heat developed on mixing ether and chloroform. Mme. Marcelet and H. Marcelet. Bull. Sci. Pharmacol., Nov., 1912, 676. Pharm. J., 1912, **89**, 711.

THE authors refer to the disengagement of heat observed on mixing ether and chloroform during the estimation of total alkaloids of ipecacuanha, by the French Pharmacopœia method; the heat developed is quite perceptible to the hands. In following up the subject for the purpose of discovering the effects on mixing the two liquids in varying proportions, they used chloroform which had been carefully freed from alcohol. The two liquids were kept in separate flasks at the same temperature. In a mixture of 5 c.c. of ether and 45 c.c. of chloroform, the temperature rose from the initial figure of 16·55° to a maximum of 21·5° C.; a mixture of 10 c.c. and 40 c.c. respectively rose from 16·6° to a maximum of 25·5°; 15 c.c. and 35 c.c. from the same temperature rose to 27·6°; 20 c.c. and 30 c.c. to 29·65°; and 25 c.c. and 25 c.c. to 30·3° C. With higher proportions of ether the rise diminished from 29·4° C. almost by the same gradations until 21·6° C. was reached with 45 c.c. of ether and 5 c.c. of chloroform. That is to say, the elevation and decrease corresponded exactly.

An unusual impurity in dilute acetic acid. Enz. *See* VII.

PATENTS.

Hydrogen peroxide and urea; Process for producing a compound of ——. Farbenfabr. vorm. F. Bayer und Co. Second Addition, dated June 17, 1912, to Fr. Pat. 436,095, Nov. 8, 1911. Under Int. Conv., July 29, 1911.

THE compound of hydrogen peroxide and urea prepared as described in the principal patent (this J., 1912, 409, 1008) can be rendered more stable to high temperatures by addition of starch, dextrin, amylose, glycogen, or similar substances.—T. F. B.

Organic per-acids; Process for preparing ——. J. D'Ans. Ger. Pat. 251,802, Sept. 7, 1911.

ORGANIC per-acids may be obtained by the action of hydrogen peroxide on organic acids in presence of an accelerator such as sulphuric acid or other mineral acid, or their salts. Instead of using the organic acid alone, mixtures of acids and per-acids, such as may be obtained by treating the anhydrides with hydrogen peroxide, can be used. In the specification is described the preparation of per-acetic acid from 1 mol. of 95 per cent. hydrogen peroxide, 1 or 2 mols. of glacial acetic acid, and 1 per cent. of nitric or sulphuric acid.—T. F. B.

4·4′-*Dihydroxy*-3.3′-*diaminoarsenobenzene; Process for making stable preparations of the alkali salts of ——.* Farbwerke vorm. Meister, Lucius, und Brüning. Fr. Pat. 445,325, June 22, 1912. Under Int. Conv., Jan. 16, 1912.

THE dialkali salts of 4.4′-dihydroxy-3.3′-diaminoarsenobenzene are precipitated from their aqueous solutions by alcohol, ether, etc., in presence of hydrosulphites, sulphoxylates, or similar substances which are precipitated by alcohol and ether, and which are capable of absorbing oxygen so energetically that they prevent the oxidation or autoxidation of the alkali salt of the arseno-compound.
—T. F. B.

Aromatic arsinic acids; Process for preparing reduction products of substituted ——. Farbwerke vorm. Meister, Lucius, und Brüning. Ger. Pat. 251,571, Sept. 20, 1910.

AROMATIC arsinic acids which contain nitro-, amino-, hydroxy-, carboxyl, or substituted amino-groups, or the corresponding arsenoxides or arseno-compounds, are treated with strong reducing agents, such as tin, zinc, or iron in strongly acid solution, with or without the aid of heat. The substituted phenylarsines thus produced are comparatively non-toxic and stable, and possess powerful bactericidal and antiseptic properties, especially towards trypanosomes.—T. F. B.

Dinitrodiphenyl-mercuridicarboxylic acids ; Process for preparing ——. Verein. Chemische Werke A.-G. Ger. Pat. 251,332, May 28, 1911. Addition to Ger. Pat. 249,725, Dec. 4, 1910 (this J., 1912, 953).

The compounds obtained by heating mercuric salts with nitrobenzoic acids to about 200° C., are reduced in alkaline or neutral media in such a manner that two atoms of hydrogen react with two mols. of the nitro compound: under these conditions the nitro group is not reduced, but nucleus-substituted mercury compounds, $Hg[C_6H_3(NO_2)(COOR)]_2$, are produced. They possess powerful antiseptic properties.—T. F. B.

Halogen-formic acid esters ; Process for preparing ——. E. Merck. Ger. Pat. 251,805, Jan. 21, 1912.

Halogen-formic esters of aliphatic, aromatic, or hydroaromatic hydroxyl compounds are obtained by treating the hydroxyl compounds with phosgene or its equivalent in non-aqueous solution, the hydrogen halogenide formed during the process being neutralised as soon as it is produced, *e.g.*, by addition of organic bases or of inorganic alkaline substances in presence of dehydrating agents, such as mixtures of fused sodium sulphate and anhydrous sodium carbonate.—T. F. B.

Acid chlorides from organic acids and phosphorus trichloride ; Process for preparing ——. R. Scheuble. Ger. Pat. 251,806, Dec. 17, 1911.

An organic acid is heated with phosphorus trichloride in an autoclave or similar closed vessel, and a small quantity of hydrochloric acid is added, preferably at the beginning of the reaction. This may be effected, for example, by adding a small quantity of water to the reacting mixture, or by employing the organic acid in a moist state. The chloride is said to be obtained free from anhydride, and in theoretical yield.—T. F. B.

Esters from isovaleric acid and therapeutically active alcohols ; Process for preparing odourless or only slightly scented ——. J. D. Riedel A.-G. Ger. Pat. 252,157, June 20, 1911.

Odourless or nearly odourless esters of isovalerylglycollic acid, which are very resistant to saponification by acid substances, are obtained by esterifying isovaleric acid in the usual manner with acidylated glycollic esters of menthol, borneol, isoborneol, etc.—T. F. B.

Esters of butenols ; Process for preparing ——. Chem. Fabr. auf Actien, vorm. E. Schering. Ger. Pat. 252,160, Jan. 13, 1911.

1.3-Butadienes of the formula, $CH_2:CR.CH:CH_2$, where R represents hydrogen or alkyl, are converted into esters of the corresponding butenols by treatment with fatty acids in presence of suitable condensing agents ; the butenols may be readily obtained from the esters by saponification. The products serve for the preparation of isoprene derivatives and also as perfumes.—T. F. B.

Metal adsorptions ; Process for preparing ——. Ges. f. Elektro-osmose m. b. H. Ger. Pat. 252,372, Jan. 9, 1912.

Carborundum, clay, carbon, alumina, kaolin, amorphous silica, and other substances in a finely divided condition, are capable of adsorbing colloidal metals, forming bodies which may be used as catalysts, medicinal powders, etc. The substance which is to serve as adsorbent may be brought into a state of sol-suspension in water or other suitable liquid, a solution of a metallic salt added, and the metal precipitated by reduction.—T. F. B.

Thiophen and other hydrocarbons containing sulphur ; Process for preparing —— from acetylene. W. Steinkopf and G. Kirchhoff. Ger. Pat. 252,375, July 20, 1911.

When acetylene is passed over pyrites or other sulphide which readily gives up sulphur, at a temperature of about 300° C., a considerable proportion of it is converted into thiophen and other hydrocarbons containing sulphur. —T. F. B.

Theobromine ; Process for preparing acidyl compounds of ——. Knoll und Co. Ger. Pat. 252,641, Sept. 16, 1911.

The acidyl derivatives of theobromine may be obtained by treating its alkali, alkaline-earth, or heavy metal salts with the usual acidylating agents. They possess more marked acidic properties than theobromine itself, and may be used in place of theobromine in medicine.—T. F. B.

2-Phenylquinoline-4-carboxylic acid and its homologues ; Preparation of derivatives of ——. Chem. Fabr. auf Actien, vorm. E. Schering. Ger. Pat. 252,643, Sept. 29, 1911.

The amides of 2-phenylquinoline-4-carboxylic acid and of its homologues, are prepared according to the known methods ; they are tasteless.—T. F. B.

Carbonic acid esters [of glycerol] ; Process for preparing ——. Chem. Fabr. Dr. R. Scheuble und Dr. A. Hochstetter. Ger. Pat. 252,758, Aug. 29, 1911.

Glycerol carbonates are obtained by heating glycerin with ethyl carbonate, phenyl carbonate, or other carbonic ester, or by the action of phosgene on glycerin in presence of pyridine, quinoline, triethylamine, or other suitable substance which combines with hydrochloric acid. The glycerol carbonates are insoluble in cold water and in the usual fat solvents, and may be used as ingredients of explosive mixtures. The tricarbonate is stable, solid, and non-hygroscopic, and, being non-poisonous, may be used as a vehicle for pills, powders, etc.—T. F. B.

β-Iminazolylethylamine from histidine ; Process for preparing ——. F. Hoffmann-La Roche und Co. Ger. Pats. 252,872 and 252,873, Oct. 29, 1911.

(1.) β-Iminazolylethylamine may be prepared by decomposing histidine by means of the specific ferments from thymus glands ; the decarboxylating action is stated to be complete in four to six days, when the product may be isolated by precipitation as picrate. (2.) In place of using histidine itself, the hydrolysates from albuminous substances, rich in histidine, and freed as far as possible from amino-acids, may be used. For example, blood is hydrolysed by means of sulphuric acid, the acid is removed by adding baryta, and the amino-acids separated by fractional crystallisation.—T. F. B.

1.3-*Butadiene and derivatives thereof ; Manufacture of* ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. Eng. Pat. 27,387, Dec. 6, 1911.

See Fr. Pat. 441,619 of 1911 ; this J., 1912, 951.—T. F. B.

Cascara sagrada ; Process of preparing a refined extract of ——. A. Diefenbach, Bensheim, Germany. Eng. Pat. 2161, Jan. 26, 1912. Under Int. Conv., Feb. 8, 1911.

See Ger. Pat. 240,407 of 1911 ; this J., 1911, 1470.—T. F. B.

Aceto-acetic anilide and its homologues ; Process for producing substitution products of ——. Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 445,321, June 22, 1912. Under Int. Conv., July 21, 1911.

See Eng. Pat. 16 928 of 1912 ; this J., 1912, 1023.—T. F. B.

2-*Phenylquinoline-4-carboxylic acid ; Process for preparing* ——. Chem. Fabr. auf Actien, vorm. E. Schering. Fr. Pat. 445,529, June 27, 1912. Under Int. Conv., July 5, 1911.

See Eng. Pat. 15,684 of 1912 ; this J., 1912, 953.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Patents.

Colour photography and printing. G. Baugé, A. Dumez, and A. de Seauve, Paris. Eng. Pat. 20,251. Sept. 12, 1911. Under Int. Conv., Sept. 13, 1910.

A set of three colour filters is prepared by the use of the following solutions, the quantities being those required for one sq. metre :—*Red*, 64 c.c. of 1 per cent. Erythrosin solution or 10 c.c. of 1 per cent. Bengal Pink solution ; *yellow*, 115 c.c. of 1 per cent. Tartrazine solution ; *blue*, 5 c.c. of 1 per cent. Carmine Blue and 1 c.c. of 1 per cent. Naphthol Green solution ; each filter is also impregnated with about 10 grms. of potassium nitrate per sq. metre. In conjunction with these filters are employed positive films which can be sensitised with bichromate, the red film consisting of gelatin stained with madder lake and spread on paper to the extent of 8·5 grms. per sq. metre ; the yellow film is impregnated with cadmium sulphide and spread to the extent of 12·8 grms. per sq. metre, and the blue film is obtained by precipitating a solution of a ferric salt, *e.g.*, by means of ferrocyanide, and mixing the precipitate with gelatin, about 6 grms. per sq. metre of this mixture being used. A series of scales of primary colours and of grey, which are photographed at the same time as the subject of the pictures, is also used to check exposures and development of the photographs. The positive films are prepared on paper which has been parchmentised by means of sulphuric and nitric acid and subsequently dipped in a solution of gum-lac in alcohol.
—T. F. B.

Photography of colours ; Processes for the ——. E. C. G. Caille. Fr. Pat. 445,787, July 5, 1912. Under Int. Conv., July 6, 1911.

In the preparation of colour photographs by means of three- or four-colour screens covered by gelatino-bromide emulsions, the "masking" of the undesired colours is obtained by converting the reduced silver of the image into a double ferricyanide of silver and lead : this is effected by treating the developed and fixed screen and emulsion with an aqueous solution containing lead acetate, potassium ferricyanide, and a small quantity of acetic acid.—T.F. B.

Photographic images ; Development of ——. W. H. Caldwell. Fr. Pat. 445,067, June 17, 1912. Under Int. Conv., June 21, 1911.

See Eng. Pat. 14,744 of 1911 ; this J., 1912, 747.—T. F. B.

Surfaces sensitive to light ; Process for preparing ——. Neue Photographische Ges. Fr. Pat. 445,631, July 1, 1912.

See Ger. Pat. 250,183 of 1911 ; this J., 1912, 1054.—T. F. B.

XXII.—EXPLOSIVES ; MATCHES.

Nitrocellulose. H. Tedesco. Z. ges. Schiess- und Sprengstoffw., 1912, 7, 474—477.

The experiments were carried out with cotton wool and wood cellulose, and mixed acids made from nitric acid of two different strengths (87·7 and 97·84 per cent.), sulphuric acid (92·2 per cent.), and fuming sulphuric acid (103 per cent.). The ratio of cellulose to mixed acid was 1 to 40. The time of nitration was 3 hours, and the temperature 23° C. Using these acids with a ratio of H_2SO_4 to HNO_3 of 2 to 1, the nitrogen content of the nitro-cotton varied from 11·84 to 12·44 per cent., the lowest result being obtained when fuming sulphuric acid was used. With a ratio of 3 to 1 the nitrogen content of the product varied from 11·19 to 12·21 per cent. With a ratio of 1 to 1 the nitrogen content was 12·53 per cent. whilst nitration *in vacuo* gave 12·7 per cent. Similar results were obtained with wood cellulose, but in the case of the mixtures, with the higher ratio of sulphuric acid to nitric acid, the nitrogen content of the resulting nitrate was somewhat lower. The samples, after boiling for 5 hours and drying at 40° C., had their stabilities determined by the Will test. The results obtained, inclusive of the 80 minutes required to raise the temperature from 45° to 135° C., and the 90 minutes at the latter temperature, varied from 5·8 to 13·3 c.c. of nitrogen evolved, and there were several explosions during the course of the experiments. The wood cellulose products showed relatively inferior stabilities. The temperature of explosion in the case of the cotton wool nitrates lay between 181° and 190° C., whilst the wood cellulose nitrates exploded between 138° and 153° C.—G. W. McD.

Cellulose ; A new nitroderivative of ——. Tassart. Bull. Soc. Chim., 1912, 11, 1009—1011.

By the successive action on cotton, of cold sulphuric and nitric acids, a new nitro-derivative provisionally called *a*-nitrocellulose, containing about 13·5 per cent. of nitrogen, is obtained. It is white, is easily powdered, insoluble in water, soluble in methyl and ethyl alcohols, and in acetaldehyde, acetone, etc. An alcoholic solution of caustic soda renders it completely soluble in water. It is very unstable, exploding by percussion. Heated on the water bath, it turns viscid, gives off nitrous fumes and then fires spontaneously after some minutes. This spontaneous combustion is excited by *p*-phenylenediamine, and is retarded by diphenylamine, glucose, *a*-naphthylamine, etc. The same method of nitration applied to glucose and starch gives compounds having similar properties.
—G. H. F.

Nitrocellulose ; Reputed existence of a hydrate of ——. T. Chandelon. Bull. Soc. Chim. Belg., 1912, **26**, 495—502.

From the results of experiments described in detail the conclusion is drawn that the increased solubility of moist nitrocellulose is not due to the presence of a hydrate, but merely to the fact that the water present dilutes the mixture of ether and alcohol. Practically the same results are obtained whether a moist nitrocellulose is used or whether water is previously added to the solvent. Hence in order to obtain collodions with a constant viscosity at a definite temperature, it is essential that the quantities of dry nitrocellulose, solvent and water should remain constant.—C. A. M.

Powder and explosives ; Improvements in the conditions of manufacture of ——. Courtois-Suffit. Mém. Poudres et Salpêtres, 1911-1912, **16**, 87—204.

The report of a Commission appointed by the Under Secretary of State for War (France) to investigate possible improvements in the hygienic conditions in the French explosives industry. The Commission consider these conditions to be generally satisfactory. The chief alterations suggested are : the recovery of solvent (ether and alcohol) in the manufacture of the French Service Powder B, the prevention of dust by keeping the material moist with water to the extent of about 5 per cent. in the manufacture of melinite and cresylite, and the removal of steam from the boiling and washing houses in the manufacture of guncotton. It is suggested that this last should be effected by passing hot air over the tops of the vats and troughs and removing it by a ventilating fan placed on the opposite wall.—G. W. McD.

(1) *Explosive Titanite.* (2) *Gelatin-dynamite containing nitroglycol.* (3) *Explosive Minelite.* H. Dautriche. Mém. Poudres et Salpêtres, 1911-1912, **16**, 212—214, 214—215, 224—229.

(1) Six different samples were investigated by the French Commission on explosives. The compositions varied as follows : Ammonium nitrate (78 to 83 per cent.), curcuma charcoal (2 to 10), trinitrotoluene (4 to 13·5), dinitrotoluene (0 to 4), and salt (0 to 3 per cent.). The samples con-

taining salt were intended to be used as safety explosives. The explosives were found to be somewhat more sensitive to detonation than the Favier type, but the introduction of curcuma charcoal renders them less suitable as safety explosives. (2) The composition was nitroglycerin (66·4 per cent.), nitroglycol (16·6), nitrocotton (5), potassium nitrate (10), and cellulose (2 per cent.). The Commission decided to authorise the manufacture of this explosive provided the nitrocotton content was not below 5 per cent. (3) The samples investigated had the following compositions :—

	A.	B.	C.
Potassium chlorate	90	90	80
Heavy petroleum	3	—	—
Vaseline	—	3	4
Paraffin	7	7	5
Rosin	—	—	2

The explosives ignited in the open with difficulty. The expansion in Trauzl block tests was very similar in all cases, *i.e.*, about 74, taking picric acid as 100. The velocities of detonation, in metre-seconds, in copper tubes (20 to 22 mm. diameter) were as follows :—(*a*) 2800 to 3350 ; (*b*) 2350 to 3180 ; and (*c*) 3125. The charging densities varied from 0·87 to 1·3. Failure to detonate took place at densities beyond 1·3. In paper tubes (29 mm. diameter) sample (*a*) gave velocities of detonation from 2670 to 2895 metre-seconds, and failed to detonate at a density of 1·2.—G. W. McD.

Coal dusts : Relative inflammability of —. *See* IIa.

Patents.

Smokeless powder ; Envelopes for —— *which protect the powder against deterioration and serve to indicate decomposition and thus prevent accidents arising therefrom.* E. Bouchaud-Praceiq. Fr. Pat. 445,770, July 4, 1912.

The charges for guns are enclosed in envelopes, well gummed down, of cellulose or its derivatives. Viscose, collodion, and the acetates and formates of cellulose are mentioned as being suitable. The envelope is impregnated with some substance which will indicate the presence of oxides of nitrogen, arising from the decomposition of the powder.—G. W. McD.

Nitrating cotton ; Method and apparatus for —— *in vacuo.* L. Dumons. Fr. Pat. 445,833, July 6, 1912.

The cotton is contained in a perforated basket which is enclosed in an iron casing provided with an aluminium lid. A pipe with a cock delivers the mixed acid for nitrating through the top of the casing, and a pipe provided with a cock leads from the bottom of the casing to a tank which can either be exhausted or placed under the pressure of compressed air. The upper cock being closed, the whole apparatus and the lower tank are exhausted. The cock on the acid supply pipe is then opened and a stream of acid flows through the cotton in the perforated basket and into the tank below, where it can be revivified, pumped up again into the upper supply tank, and passed once more through the cotton. When nitration is completed the perforated basket is removed to a centrifugal and the excess of acid expelled. It is claimed that this process, in view of the exhaustion of air from the cotton fibre and the large quantity of mixed acid used, produces a more highly nitrated and uniform product than is obtained by the usual methods.—G. W. McD.

Match splints ; Process and art of treating ——. W. A. Fairburn, Short Hills, N.J., and F. V. D. Cruser and W. Green, Barberton, Ohio, Assignors to The Diamond Match Co., Chicago. U.S. Pats. 1,044,153, 1,044,154, and 1,044,445, Nov. 12, 1912.

(1) The splints are impregnated with a solution of chemicals capable of preventing glowing of the wood after ignition of the flame, and are then immersed in a bath of material impervious to water (*e.g.*, melted paraffin wax), which is kept at a temperature sufficient to expel the solvent from the splints, after which the paraffin wax, etc., is allowed to solidify and become incorporated with the wood. (2) The splints are dipped in a bath of "unctuous material capable of transmitting the flame," whilst a substance capable of preventing the after-glow is meanwhile kept in suspension in the liquid. Thus the bath may consist of paraffin wax heated to above 212° F. (100° C.) and containing in suspension or solution a soap consisting of a compound of a metallic oxide with a fatty anhydride. (3) The bath of "unctuous material" with the fatty soap in solution may consist of about 90 parts of paraffin wax kept at a temperature above 212° F. (100° C.) and containing in solution about 10 parts of the soap.—C. A. M.

Smokeless explosive ; Apparatus for mixing and pressing ——. Fortuna-Werke Albert Hirth, Cannstatt-Stuttgart, Germany. Eng. Pat. 25,359, Nov. 14, 1911. Under Int. Conv., Jan. 23, 1911.

See Fr. Pat. 438,081 of 1911 ; this J., 1912, 663.—T. F. B.

Explosive. B. J. Flürscheim, Fleet. U. S. Pat. 1,045,012, Nov. 19, 1912.

See Eng. Pats. 3907, 4700, 5338, and 10,433 of 1910 ; this J., 1911, 385.—T. F. B.

Preparation of solutions of collodion-cotton. Ger. Pat. 250,421. *See* V.

Process for preparing carbonic acid esters [of glycerol]. Ger. Pat. 252,758. *See* XX.

XXIII.—ANALYTICAL PROCESSES.

Barium and strontium ; Method for the systematic qualitative detection of ——. L. J. Curtman and E. M. Frankel. J. Amer. Chem. Soc., 1912, **34**, 1493—1497. (See also this J., 1911, 713.)

Small amounts of barium and strontium are detected as follows :—The filtrate from the precipitation of the silver group is neutralised with ammonia, 5 c.c. of strong hydrochloric acid are added, followed by 8 c.c. of 20 per cent. sulphuric acid, and the solution is boiled. An equal volume of 95 per cent. alcohol is added when cold, the precipitate formed, is allowed to settle, and, after washing by decantation, the lead sulphate is dissolved out with a hot solution of ammonium acetate. The precipitate is then boiled with a 20 per cent. solution of sodium carbonate, to convert the alkaline earth sulphates into carbonates, the well-washed residue is dissolved in acetic acid, and the solution examined in the usual way.—F. Sodn.

Determining the total tartaric acid in tartars and lees. Kling and Florentin. *See* VII.

Determination of small quantities of carbon monoxide. Brunck. *See* VII.

New method of determining nitric oxide. Baudisch and Klinger. *See* VII.

Determination of chromium and aluminium in ferrochrome alloys. Muller. *See* X.

Two new methods of weighing cornets in the assay of gold bullion. Watkins. *See* X.

Determining sulphuric anhydride in flue gas. Hawley. *See* X.

Determination of starch in meat food products. Price. *See* XIXa.

Patents.

Chemical vessel. Chemical apparatus. B. E. Eldred, Bronxville, N.Y., Assignor to The Commercial Research Co., New York. U.S. Pats. 1,043,579 and 1,043,581, Nov. 5, 1912.

(1) A crucible or chemical vessel of a ferrous metal completely enveloped and sealed in by a surface layer of a metal of the platinum group, or other noble metal, welded to the ferrous metal. The layer of noble metal may be made thicker about the mouth of the vessel. (2) A vessel composed of a lining of a noble metal, and a strong body of a ferrous metal, the two being "metallically united," and of an exterior coating adapted to receive heat. The lining layer may extend over the edge. The exterior coating may be a metal welded at all points to the ferrous body.—R. W. N.

Gas mixture; Device for the automatic determination of a single constituent of a flowing ——. W. Knöll. Ger. Pat. 248,318, June 21, 1908. Addition to Ger. Pat. 238,503, Jan. 22, 1908.

In order to maintain a constant working pressure in a receptacle through which the gas mixture flows, an electrical manometer and an electro-magnet are provided in the same circuit. The pressure of the gas mixture acting on the manometer thus controls the electro-magnet, the armature of which is connected with a device for regulating the flow of water to a water-pump by which in turn the gas pressure is regulated.—A. S.

Specific gravity of gases; Apparatus for determining the ——. A. Dosch, Charlottenburg, Germany. Eng. Pat. 15,787, July 5, 1912. Under Int. Conv., July 5, 1911.

See Ger. Pat. 242,704 of 1911; this J., 1912, 305.—T. F. B.

Air or other gases; Apparatus for testing ——. M. Arndt, Aix-la-Chapelle, Germany. U.S. Pat. 1,044,969, Nov. 19, 1912.

See Fr. Pat. 422,883 of 1910; this J., 1911, 714.—T. F. B.

XXIV.—MISCELLANEOUS ABSTRACTS.

Methylglucoside; Hydrolysis of α- and β- —— by Aspergillus niger. A. W. Dox and R. E. Neidig. Biochem. Zeits., 1912, **46**, 397—402.

Whereas β-methylglucoside is a favourable source of carbon for *Aspergillus* and *Penicillium* species, there is only very little growth in presence of α-methylglucoside. *Aspergillus niger* mycelium in presence of chloroform very readily hydrolyses β-methylglucoside, but has only slight action on the α-isomeride. Mycelium from an *Aspergillus* culture which has been grown for some time in presence of the α-glucoside does not show any increased activity towards the α-methylglucoside; *i.e.*, there is no evidence of accommodation to environment.—E. F. A.

Trade Report.

Uruguay Customs duties on certain chemicals. Board of Trade J., Dec. 5, 1912.

A Uruguayan Law, published in the "Diario Oficial" of the 26th October, grants exemption from, or reduction of, Customs duty in respect of certain articles destined for industrial purposes, as follows:—

1. Articles to be free of Customs duty when imported for industrial purposes include borate of lime, felspar and quartz; arsenious acid or commercial arsenic; sulphuric acid; old iron for casting and iron in ingots; sulphur candles for fumigating; metals of all kinds in ingots; sand and stone ballast; extracts of any substance, mineral, animal, or vegetable, as also compounds for tanning; logwood; crude tar, or pitch; and kaolin.

2. The undermentioned articles are to pay percentage rates of duty, as shewn below:—

Twenty-five per cent. (when introduced for industrial purposes): Carbonic acid; bisulphite of soda; "*calci fugo*"; animal charcoal; formal; glycerin; oilcloth for binding books, weighing not more than 325 grms. per square metre; celluloid thread; "*oropón*" (a chemical substance used for tanning purposes); tinfoil; filter paper, in sheets and "*pasta*"; salt of antimony; clarifying Cadiz earth.

Fifteen per cent.: Gum (*gomo del pais*).

Ten per cent.: Acetate of lead; lubricating oils; liquid ammonia; acetate of soda; β-naphthol; steel cylinders for compressed gases (when imported full, they are to pay, in addition, the duty applicable to the contents); celluloid in sheets; hyposulphite of soda; nitrite of soda; resin or rosin; sulphide of soda; crystallised sulphide of soda; sulphate of alumina; chloride of magnesium; tartar emetic; turpentine; yolk of eggs.

Five per cent.: Coal oil; coal waste or dust; cocoanut, palm, and castor oils, denatured; sulphate of lime; cyanide of silver, pure; chloride of gold; acetate of copper; phosphate of soda; nitric, oxalic, and lactic acids; chrome alum; aniline, all kinds; pyroligneous acid; hydrochloric acid; common alum; Turkey red oil; butyric and formic acids; bichromate of potash or soda; catechu; sulphate of soda; carbonate of ammonia; commercial carbonates of soda; carbonate of potash; colours for paints; hematin; crude carbolic acid; gold in leaves; oxide of manganese; prussiate of potash; caustic potash; caustic soda; resin for varnishes; natural rock asphalt; borate of magnesia; sulphate of iron or of copper; sulphocyanide of ammonia or of potash; potato starch; English salt; chloride of lime; trichlorethylene; calcium fluoride; cryolite in powder; nitrate of potash or of soda; lead oxide; cresylic acid; Vienna lime; nickel sulphate; fluxing salts for metals; polishing paste for metals.

The foregoing exemptions and reductions of duty are to remain in force so long as State protection is not solicited for national establishments founded to produce such materials under conditions approved by the Executive. As soon as the materials are so produced in the country, the Executive will re-establish the duties now abrogated.

The Executive is to establish valuations for, and frame a tariff classification of, the primary materials included in the present Law.

3. Cotton-seed oil is to pay on importation a specific duty of 15 centesimos (7½d.) per kilogramme, except in the case of crude oil.

Books Received.

Experimental Researches on the Specific Gravity and the Displacement of some Saline Solutions. By J. Y. Buchanan, M.A., F.R.S. Reprinted from the Transactions of the Royal Society of Edinburgh, 1912, **49**, Part 1. Neill and Co., Ltd., Bellevue, Edinburgh. Price 7s. 6d.

Large quarto volume of 225 pages containing 124 tables of results of determinations of the specific gravities and displacements of solutions of a number of salts. The work is divided into 16 sections, and concludes with two appendices and a subject index.

Summary Report of the Mines Branch of the Department of Mines (Canada) for 1911. No. 142. Ottawa.

This volume contains a report by the Director-General of the Mines Branch, reports on field work, chemical and metallurgical laboratories, fuel testing plant, etc., and two appendices, dealing with the mineral production of Canada in 1911, and on the use of explosives in Canada

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1888. Adriance, Dr. John S., Williams College, Williamstown, Mass., U.S.A., Analytical Chemist.
1899. Adrot, Léon, 16, Palmer Avenue, Port Richmond, N.Y., U.S.A., Chemist.
1886. Aitken, J. B., Gerard's Fold Chemical Works, Widnes, Chemical Manufacturer.
1910. Aitken, Dr. J. M., St. Catherine, Bishopton, Renfrewshire, Chemist.
1883. Albright, G. S., Bromesberrow Place, Ledbury, Chemical Manufacturer.
O.M. Albright, W. A., 29, Frederick Road, Edgbaston, Birmingham, Chemical Manufacturer.
1906. Alcock, Frank H., 9, Broad Street Corner, Birmingham, Analyst.
1907. Alcock, J. E., 51, Gill Street, Moston Lane, Blackley, Manchester, Chemist.
1902. Alden, Frederick W., 500, Madison Street, Waukesha, Wis., U.S.A., Chemist.
1898. Alden, John, Chemical Laboratory, Pacific Mills, Lawrence, Mass., U.S.A., Chemist.
1890. Aldrick, Edwin John, 53, Alpha Road, West Ferry Road, Millwall, E., Works Sub-Manager.
1909. Alén, Dr. J. E., Stadskemistens Laboratorium, Göteborg, Sweden, Public Analyst.
1899. Alexander, D. Basil W., 1000, Date Street, Los Angeles, Cal., U.S.A., Chemist.
1900. Alexander, Jerome, c/o National Gum and Mica Co., 502–510, West 45th Street, New York City, U.S.A., Chemist.
1883. Alexander, W. T., Crumnock, Eccles, Manchester, Drysalter.
1906. Allan, David, c/o Price's Patent Candle Co., Ltd., Belmont Works, Battersea, S.W., Chemist.
1891. Allan, F. H. Tielke, Donaghmore, Co. Tyrone, Ireland, Technical Chemist.
1898. Allan, John, 77, Northen Grove, West Didsbury, Manchester, Chemist.
1909. Allan, Maurice, 95, Burford Street, Nottingham, Soapmaker.
1907. Allard, M. L., c/o Century Rubber Trading Co., Plainfield, N.J., U.S.A., Chemist.
1902. Allbright, Wm. B., 4937, Madison Avenue, Chicago, Ill., U.S.A., Chemical Engineer.
O.M. Alldred, C. H., 8, St. Margaret's Road, Plumstead Common, Woolwich, S.E., Analytical Chemist.
1898. Alleman, Dr. Gellert, Swarthmore College, Swarthmore, Pa., U.S.A., Professor of Chemistry.
1903. Allen, Chas. A., Overdale, Sunnyhurst, Darwen, Lancashire, Chemist.
1911 Allen, Harold C., Noorooma, Chandos Street, Ashfield, Sydney, N.S.W., Analyst.
1911. Allen, Harry L., Nobel's Explosives Co., Ltd., Stevenston, Ayrshire, Chemist.
O.M. Allen, J., 164, Upper North Street, Poplar, E., Manufacturing Chemist.
1908. Allen, Simeon C., 43, Ambrose Street, Rochester, N.Y., U.S.A., Consulting Chemist.
1893. Allerton, Rt. Hon. Lord, F.R.S. (Journals), Allerton Hall, near Leeds; and c/o W. L. Jackson and Sons, Ltd., Buslingthorpe, Leeds, Tanner.
O.M. Allhusen, A., Gateshead-on-Tyne, Chemical Manufacturer.
1886. Allibon, G. H., Mayfield, Balmoral, Belfast, Ireland, Chemical Works Manager.
1905. Allpass, Jas., c/o The Clayton Aniline Co., Ltd., Clayton, Manchester, Secretary.
1889. Alpiar, Agop, Smyrna, Asia Minor, Morphia Manufacturer.
1899. Alsop, Wm. K., Ridgway, Pa., U.S.A., Chemist.
1904. Alton, W. Lester, 42, The Manor House, Marylebone, London, N.W., Chemist.
1910. Amin, Bhailal D., The Alembic Chemical Works Co., Ltd., Baroda, India, Chemical Agent.
1905. Amory, L. H., c/o Messrs. J. Heathcoat and Co., Tiverton, Devon, Lace Manufacturer.
1910. Anderson, Jas. R. V., School of Mines, Bendigo, Victoria, Australia, Lecturer in Chemistry and Metallurgy.
1900. Anderson, Jas. W., Madras Cement Works, Royapuram, India, Analytical Chemist.
1889. Anderson, Robt. T. R., 42, Roslea Drive, Dennistoun, Glasgow, Technical Chemist.
1894. Anderson, Dr. W. Carrick, 7, Scott Street, Garnet Hill, Glasgow, Consulting Chemist.
1905. Andreae, Dr. E. P., c/o British Glanzstoff Manufacturing Co., Ltd., Flint, North Wales, Chemist.
1907. Andrews, Chas. T. Est. de Miguel Burnier, E.F.C.B., Minas Geraes, Brazil, Chemist.
1889. Andrews, Clement W., c/o The John Crerar Library, Wabash Avenue and Washington Street, Chicago, Ill., U.S.A., Librarian.

1912. Andrews, Ernest R., "Nutfield," Dence Road, Dulwich, S.E., Analytical and Consulting Chemist.

1904. Andrews, Geo. D., c/o J. & J. Colman, Ltd., Carrow Works, Norwich, Chemist.

1903. Andrews, Wm. H., 79, Tonawanda Street, Buffalo, N.Y., U.S.A., Manager (Varnish Works).

1903. Antilogoff, N. A., Christine House, High View Avenue, Grays, and (Journals) Central Wharf, Bow, E., Chemist and Petroleum Refiner.

O.M. Angell, J., 6, Beaconsfield, Derby Road, Withington, Manchester, Chemical Lecturer.

1892. Annandale, C. J. R., Denholme, Sunnyhurst Lane, Darwen, Lancs., Paper Maker.

1883. Annandale, Jas. H., Polton Paper Works, Midlothian, N.B., Paper Maker.

1894. Ansbacher, L. A., 253, Broadway, New York City, U.S.A., Colour Manufacturer.

1902. Anthony, John, 82, Bay Street, Toronto, Canada.

1895. Appleby, Prof. W. R., 911, 5th Street S.E., Minneapolis, Minn., U.S.A., Professor of Mining and Metallurgy.

1907. Appleton, Francis H., jun., P.O. Box 815, Franklin, Mass., U.S.A., Rubber Manufacturer.

1894. Appleton, H. A., 63, Rosedale Road, Forest Gate, E., Analytical Chemist.

1900. Appleyard, Geo. H., Arnold House, Burton Road, Hornsea, East Yorks, Chemist.

1905. Appleyard, Jas. R., Royal Technical Institute, Salford, Lecturer.

O.M. Archbutt, Leonard, The Yews, Madeley Street, Derby, Analytical Chemist.

1899. Archdale, T. Henry, 38, Whitebirk, Blackburn, Manager of Tar and Ammonia Works.

1904. Archdale, Wm., Sandhutton, Hill Lane, Blackley, Manchester, Manager of Chemical Works.

1901. Ardagh, Edw. G. R., Faculty of Applied Science, University of Toronto, Canada, Chemist.

1900. Ardern, Edw., Holm Leigh, Queen's Road, Urmston, Manchester, Chemist.

1907. Armstrong, Chas. F., c/o Cawnpore Sugar Works, Ltd., Marhourah Factory P.O., Chupra, Sarun, India, Technical Chemist.

1902. Armstrong, Edward E., Pennsylvania Salt Manufacturing Co., Natrona, Pa., U.S.A., Manufacturing Chemist.

1905. Armstrong, Dr. E. Frankland, 98, London Road, Reading, Works Chemist.

1899. Armstrong, Richard, Saul Street Soap Works, Preston, Lancashire, Soap Manufacturer.

1905. Armstrong, Theodore, 115, Chestnut Street, Philadelphia, Pa., U.S.A., President, Penn. Salt Manufacturing Co.

1905. Arnold, Frank L., 32, School Street, North Woburn, Mass., U.S.A., Chemist.

1911. Arnold, Prof. J. O., The University, St. George's Square, Sheffield, Prof. of Metallurgy.

1899. Arnott, Dr. G. W. Campbell, c/o Fertiliser Manufacturers' Association, 79, Mark Lane, London, E.C., Agricultural Chemist.

1903. Arnott, J. S., Moros, 42, 2°, Gijon, Spain, Chemist and Metallurgist.

1911. Asahina, Koju, Japanische Botschaftkanzlei, Blumeshof, 12, Berlin, Germany, Chemist.

1901. Asano, K., Ashio Copper Mine, Shimozuke, Japan, Consulting Mining Chemist.

1906. Ash, Chas. S., 180, Townsend Street, San Francisco, Cal., U.S.A., Chemist.

1908. Ashbury, J. W., c/o John Brown and Co., Ltd., Laboratory, Atlas Works, Sheffield, Chief Chemist.

1903. Ashley, Frank R., c/o Western Chemical Manufacturing Co., Denver, Colo., U.S.A., Manufacturing Chemist.

1890. Ashton-Bost., W. D. *See* Bost. W. D. Ashton.

1894. Ashworth, Arthur, Fernhill, Chemical Works, Bury, Lancs., Chemical Manufacturer.

1908. Ashworth, D. Irving, P.O. Box 38, Wappingers Falls, N.Y., U.S.A., Chemist.

1908. Asmus, Grover E., 4011, Hudson Boulevard, West Hoboken, N.J., U.S.A., Chemist.

1907. Aspey, Urban, jun., New Station Soap Works, School Close, and (Journals) 11, Neville Street, Leeds, Works Manager and Chemist.

1898. Aspinall, Thos., 62, Gilnow Road, Bolton, Analytical and Manufacturing Chemist.

1900. Aston, Bernard C., Box 40, P.O., Wellington, New Zealand, Chemist.

1891. Aktins, C. E., Teigngrace, Bycullah Park, Enfield, N., Chronometer Maker.

1885. Atkinson, A. J., 11, Stuart Street, Cardiff, Analytical Chemist.

1911. Atkinson, James E., The Sheffield Testing Works, Ltd., Blonk Street, Sheffield, Analytical Chemist.

1900. Atkinson, Jno. W., 310, Sansome Street, San Francisco, Cal., U.S.A., Manager, Union Sugar Co.

1905. Atteaux, F. E., 176, Purchase Street, Boston, Mass., U.S.A., Dyestuff Importer.

1900. Atwood, Frank W., 216, Milk Street, Boston, Mass., U.S.A., Chemist.

1895. Auchterlonie, Wm., c/o Clark Thread Co., Newark, N.J., U.S.A., Dyeworks Manager.

1901. Auden, Dr. H. A., 13, Broughton Drive, Grassendale, Liverpool, Chemist.

1897. Auger, Chas. L., 425, Park Avenue, Paterson, N.J., U.S.A., Silk Dyer.

1911. Austen, John, 27, High Street, Sheffield, Pharmaceutical Chemist.

1911. Austin, Fred J., 343, Sixth Avenue, Brooklyn, N.Y., U.S.A., Chemist.

1901. Auty, Albert M., c/o John Smith and Sons, Ltd., Field Head Mills, Bradford, Works Chemist.

1902. Avery, D., 461, Barker's Road, Kew, Melbourne, Vic., Australia, Teacher of Chemistry.

1910. Ayers, Gilbert F., Dynamite Factory, Modderfontein, Transvaal, Chemist.

1899. Aylsworth, Jonas W., 223, Midland Avenue, East Orange, N.J., U.S.A., Chemist.

B

1908. Babington, Fred. W., Customs Laby., Customs Dept., Ottawa, Canada, Analyst.

1895. Bacon, Nathaniel T., Peace Dale, Rhode Island, U.S.A., Chemical Engineer.

1897. Bacon, William N., 72, Mercers' Road, Tufnell Park, London, N., Chemist.

1911. Baddiley, James, c/o Levinstein, Ltd., Crumpsall Vale Chemical Works, Blackley, Manchester, Research Chemist.

1897. Badock, Stanley H., Holmwood, Westbury on Trym, near Bristol, Smelter.

1898. Baekeland, Dr. Leo, Snug Rock, Harmony Park, Yonkers, N.Y., U.S.A., Research Chemist.

1903. Bailey, Prof. E. H. S., The Library, Kansas State University, Lawrence, Kas., U.S.A., Professor of Chemistry.

1885. Bailey, Edwin M., Almond Hill, Pumpherston, Mid Calder, N.B., Technical Chemist.

1908. Bailey, F. W., Overstone, Robertson Road, Buxton.

1883. Bailey, Dr. G. H., Kinlochleven, Argyll, N.B., Chemist.

1903. Bailey, Harold J., 10, Park Road, Pendleton, Manchester, Alkali Inspector.

1906. Bailey, Ralph W., 66, Cherry Street, Elizabeth, N.J., U.S.A., Chemist.

1888. Bailey, Dr. T. Lewis, 13, St. Alban's Road, Swansea, H.M. Inspector of Alkali Works.

1910. Baillie, Dr. Thomas B., 16, Birchdale Road, Waterloo, Liverpool, Analytical Chemist (Love Lane Sugar Refinery).

1902. Bain, Prof. Jas. Watson, Faculty of Applied Science, The University, Toronto, Ont., Canada, Chemist.

1911. Bainbridge, Edmund F., c/o American Alkali and Acid Co., Bradford, Pa., U.S.A., Chief Chemist.

1911. Baird, Douglas H., 14, Cross Street, Hatton Garden, London, E.C., Scientific Instrument Maker.

1908. Baird, M. M., 18, Jedburgh Avenue, Rutherglen, Glasgow, Analytical Chemist.

1891. Baird, Wm., c/o Lewis Berger and Sons, Ltd., Homerton, N.E., Technical Chemist.

1895. Baird, W. Raymond, 271, Broadway, New York City, U.S.A., Patent Lawyer.

1890. Bairstow, John, Burley, Queen's Park, Chester, Chemical Works Manager.

1903. Baker, Arthur, 2, Carlton Avenue, Horns Cross, Greenhithe, Kent, Chemist.

1910. Baker, C. Kerslake, 16, Change Alley, Sheffield, Analytical Chemist.

1902. Baker, Chas. F., Technical College, Sunderland, Lecturer in Chemistry.

1901. Baker, F. Guy Stirling, The Brewery, Chiswell Street, London, E.C., Brewer's Chemist.

1909. Baker, Frank, c/o Nobel's Explosives Co., Stevenston, Ayrshire, Chemist.

1883. Baker, Harry, Epworth House, Moughland Lane, Runcorn, Analytical Chemist.

1899. Baker, H. Fenimore, c/o Robt. Garrett and Sons, 506, Continental Trust Building, Baltimore, Md. U.S.A., President.

1904. Baker, John T., c/o J. T. Baker Chemical Co., Phillipsburg, N.J., U.S.A., Manufacturing Chemist.

1892. Baker, Julian L., Stainesbury Holt, Kingston Road, Staines, Brewing and Sugar Chemist.

1909. Baker, Robert P., Ivydene, Bexley, Kent, Technical Chemist.

1886. Baker, Theodore, 705, Du Pont Building, Wilmington, Del., U.S.A., Analytical Chemist.

1910. Baker, Dr. Thos., Westville, Doncaster Road, Rotherham, Chemist and Metallurgist.

1903. Baldwin, F. H., Bergenport Chemical Works, Bayonne, N.J., U.S.A., Superintendent.

1903. Baldwin, Dr. H. B., 927, Broad Street, Newark, N.J., U.S.A., Chemist (Dept. of Public Health).

1903. Ball, S. F., 289, East 201st Street, New York City, U.S.A., Analytical Chemist.

1889. Ballantyne, Horatio, 75, Chancery Lane, London, W.C., Analytical and Consulting Chemist.

1903. Ballantyne, W. H., 111, Hatton Garden, London, E.C., Patent Agent's Assistant.

O.M. Ballard, Edw. G., 6, Grey Friars, Chester, Alkali Works Inspector.

1910. Baly, Prof. E. C. Cyril, 14, Sunnyside, Prince's Park, Liverpool, Professor of Inorganic Chemistry.

O.M. Bamber, H. Kelway, Outram House, Addiscombe, Surrey, Consulting Chemist.

1894. Bamber, H. K. G., Ingress House, Greenhithe, Kent, Cement Works Chemist and Manager.

1898. Bamford, Harry, 70, Duckworth Terrace, Bradford, Yorks, Dyer.

1906. Bancroft, John, Wilmington, Del. U.S.A., Bleacher and Dyer.

O.M. Banister, H. C., Elmhurst, Blundellsands, near Liverpool, Chemical Works Manager.

1890. Banks, Jno. H., c/o Ricketts and Banks, 104, John Street, New York City, U.S.A., Mining Engineer.

1895. Bannan, John F., 59, Court Street, North Andover, Mass., U.S.A., Chemist (Woollen Mill).

O.M. Bannister, W., Burvale, Watford, Herts, Manufacturing Chemist.

1910. Barbary, J. Ewart, "Vellansaundry," Camborne, Cornwall, Explosives Chemist.

1909. Barber, C. Douglas, Great Nelmes, Hornchurch, Essex, Chemist.

1908. Barber, Percy S., The Reform Food Stores, 84, Whitechapel, Liverpool, Chemist.

1901. Barber, Capt. René R., c/o Wm. Barber and Bros., Georgetown, Ont., Canada, Analytical Chemist.

1911. Barclay, Andrew, Oficina Anita, Antofagasta, Chile, Chemist.

1912. Barclay, William R., 50, Upper Albert Road, Meersbrook, Sheffield, Manager of Electroplate Factory and Lecturer in Electro-Metallurgy.

1892. Barden, Alf., Far Bank, Shelley, near Huddersfield, Glue and Size Maker.

1907. Bardorf, C. F., c/o St. Lawrence Sugar Refining Co., Maisonneuve, P.Q., Canada, Chief Chemist.

1902. Barker, Hugh S., 32, Cumberland Avenue, Sefton Park, Liverpool, Laboratory Furnisher.

1905. Barker, Perry, 93, Broad Street, Boston, Mass., U.S.A., Chemist.

1909. Barker, Richard F., Adams, N.Y., U.S.A., Chemist.

1895. Barlow, Clinton W., 84 and 86, Greene Street, New York City, U.S.A., Merchant.

1908. Barlow, Lt.-Col. Sir Hilaro W. W., Bart., R.A., 84, Shooter's Hill Road, Blackheath, S.E. Superintendent (Royal Laboratory, Woolwich).

1901. Barlow, John J., Broadway, Accrington, Calico Printer's Chemist.

1899. Barlow, Wm., 2, Delamere Street, Higher Openshaw, Manchestor, Analytical Chemist.

1908. Barnes, Alfred, Box 556, Pretoria, Transvaal, Dealer in Minerals.

1906. Barnes, A. G., c/o Hasland Coking Co., Grassmoor Collieries, Chesterfield, Colliery Proprietor.

1905. Barnes, F. V., Eastcroft Gasworks, London Road, Nottingham, Superintendent.

1884. Barnes, H. J., Phœnix Chemical Works, Hackney Wick, N.E., Manufacturing Chemist.

1884. Barnes, Jonathan, 301, Great Clowes Street, Manchester, Analytical Chemist.

O.M. Barnes, Jos., Green Vale, Westhoughton, near Bolton, Lancashire, Analytical Chemist.

1912. Barnett, E. de Barry, 9, Collingham Road, South Kensington, S.W., Chemist.

1902. Barnett, Marcus S., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Sugar Works Chemist.

1897. Barnett, Robt. E., 9, Virginia Road, Leeds, Headmaster (Leeds Technical School).

1904. Baron, Wm. Briscoe, c/o Vulcan Boiler and General Insurance Co., Ltd., 26, Pall Mall, Manchester, Chemist.

O.M. Barr, J., Dinting Vale, Dinting, near Manchester, Chemical Manager.

1905. Barraclough, C. E., 2, Wood View Terrace, Manningham, Bradford, Chemist.

1890. Barraclough, Wm. H., Beechwood, Mortomley, near Sheffield, Analytical Chemist.

1890. Barrett, Arthur A., 139, Viale San Martino, Messina, Sicily, Manufacturer of Essential Oils.

1907. Barrett, John H., 111, Adelaide West, Toronto, Canada, Superintendent.

1907. Barrett, Maurice, The Leeds Fireclay Co., Ltd., Burmantofts Works, Leeds.

1910. Barrott, John R., 417, Elk Street, Franklin, Pa., U.S.A., and (Journals) Pangkalan Brandan, Sumatra, Ned Indies, Refinery Superintendent.

1900. Barrow, Jos., 13, The Grove, Bebington, Cheshire, Chemist.

1906. Barrs, Chas. E., 3A, Downshire Hill, Hampstead, N.W., Analyst.

1905. Barry, Eugene, Ayer, Mass., U.S.A., Leather Manufacturer.

1893. Barton, G. E., 227, Pine Street, Millville, N.J., U.S.A., Technical Chemist.

1903. Bartrip, Geo. F., Elmdon, Willow Avenue, Edgbaston, Birmingham, Managing Chemist.

1905. Baruch, Edgar, 805–806, Wright and Callender Building, Los Angeles, Cal., U.S.A., Chemical Engineer.

1910. Barwick, F. W., Chamber of Commerce Testing House, Royal Exchange, Manchester.

1909. Barzano, Carlo, 24, Via Bagutta, Milan, Italy, Patent Agent.

1895. Baskerville, Dr. Chas., College of the City of New York, New York City, U.S.A., Professor of Chemistry.

1910. Bassett, Frank L., 73, St. Julian's Farm Road, West Norwood, S.E., Analyst.

1884. Bassett, H., 26, Belitha Villas, Barnsbury, N.

1908. Bassett, Professor Henry, University College, Reading, Prof. of Chemistry.

1899. Bassett, Wm. H., Main Street, Cheshire, Conn., U.S.A., Chemist.

1890. Bate, William, Upton Villa, Hayle, Cornwall, Technical Chemist (National Explosives Co., Ltd.).

1903. Bateman, A. H., 4, Grove Park Terrace, Chiswick, W., Chemist.

1885. Batty, R. B., Wharncliffe, Erdington, near Birmingham, Nickel Works Manager.
1910. Battye, Horace G., 24, Malvern Road, Beeston Hill, Leeds, Chemist and Works Manager.
1903. Baty, E. J., c/o Brush Electrical Engineering Co., Loughborough, Chemist.
1903. Bauer, Geo. W., 660, Sacramento Street, San Francisco, Cal., U.S.A., Vice-President and Chemist (Hop and Malt Co.).
1900. Baur, Jacob, 440, Wells Street, Chicago, Ill., U.S.A., Liquid Carbonic Acid Manufacturer.
1910. Baxter, F. Stanley, 119, Albert Street, Regent's Park, London, N.W., Chemist.
1898. Baxter, John G., Riverview, Burch Road, Rosherville, Gravesend, Kent, Chemist.
1911. Bayley, E., 196, Weaste Lane, Weaste, Manchester, Chemist and Tar Works Manager.
1912. Bayley, Francis P., c/o F. S. Bayley, Clanahan, and Co., 79, Mosley Street, Manchester, Chemical Merchant.
1911. Bayliss, Thos. R., Belmont, Northfield, Birmingham, Mechanical Engineer and Managing Director.
1899. Bayly, Francis W., Church Cobham, Surrey, Assayer.
1904. Bayly, Harold G., c/o S. Gonçalo, Semaphore, South Australia, Analytical Chemist.
1908. Bayly, Percival G. W., Mines Dept. Laby., Spring Street, Melbourne, Victoria, Government Metallurgical Chemist.
1897. Beadle, Alec A., Donington Dene, Newbury, Berks., Electro-Chemist.
1886. Beadle, Clayton, Oakbank, Lansdown Road, Sidcup, Kent, Consulting Chemist.
1908. Bealey, Herbert C., c/o A. C. Bealey and Son, Radcliffe, near Manchester, Bleacher and Chemical Manufacturer.
1912. Beard, John, 17, Trearddur Square, Holyhead, Assistant Cashier, Marine Dept., L. & N.W.Ry.
1911. Beard, Stanley D., Lederle Antitoxin Laboratories, 449, East 57th Street, New York City, U.S.A., Biological Chemist.
1912. Bearder, Ernest A., "Mayfield," Wythenshawe Road, Sale, Cheshire, Chemist.
1907. Beardsley, Dr. Alling P., 165, Minerva Street, Derby, Conn., U.S.A., Chemist (New Haven Gas Co.).
1909. Bearpark, Arthur F., Delmore, Transvaal, South Africa, Works Manager.
1908. Beasley, Fred. G., 44, Green Street, Smethwick, near Birmingham, Metallurgical Chemist.
1905. Beasley, Jno. K., c/o The Borneo Co., Kuching, Sarawak, Metallurgical Chemist.
1883. Beaven, E. S., 5, Boreham Terrace, Warminster, Wilts., Maltster.
1897. Beaver, Chas. J., Holme Lea, Ashley Road, Hale, Cheshire, Chemist.
1905. Beckers, Dr. Wm., 117, Hudson Street, New York City, U.S.A., Chemist.
1909. Becket, Fredk. M., 31, Sugar Street, Niagara Falls, N.Y., U.S.A., Chief Metallurgist, Electro Metallurgical Co.
1899. Bedford, Alf. C., 26 Broadway, New York City, U.S.A., Chemical Merchant.
1891. Bedford, Chas. S., Rocella, Weetwood, Headingley, Leeds, Manufacturing Chemist.
1891 Bedford, Jas. E., Messrs. Wood and Bedford, Airedale Chemical Works, Leeds, Manufacturing Chemist.
1911. Bedforth, G. E., Aspley Dyeware Mills, Huddersfield, Works Chemist.
O.M. Bedson, Prof. P. Phillips, Armstrong College, Newcastle-on-Tyne, Professor of Chemistry.
1909. Beers, Frank T., Barksdale, Bayfield Co., Wis., U.S.A., Chemist.
1901. Beevers, Clifford J., 12, Parish Ghyll Road, Ilkley, Yorks, Analyst.
1899. Behr, Dr. Arno, 432, Arlington Court, Pasadena, Cal., U.S.A., Chemist.
1903. Behrend, F., 54, Front Street, New York City, U.S.A., Importer of Chemical Stoneware.
O.M. Beilby, Dr. George T., F.R.S., 11, University Gardens, Glasgow, Chemical Engineer.
1912. Belaiew, Captain Nicolas, 45, Rue Washington, Paris (viii.), France, Lecturer in Metallurgy and Chemistry.
1906. Belden, A. W., U.S. Geological Survey, 40th and Butler Streets, Pittsburg, Pa., U.S.A., Coke Expert.
1884. Bell, Sir Hugh, Bart., Middlesbrough-on-Tees, Soda and Iron Manufacturer.
1900. Bell, Hugh P., 17, Tothill Street, Westminster S.W., Chemist.
O.M. Bell, J. Carter, Bank House, The Cliff, Higher Broughton, Manchester, Public Analyst.
1886. Bell, J. Ferguson, Derby Gas Light and Coke Co., Derby, Gas Engineer.
1907. Bell, Marcus, Defence Dept., Melbourne, Victoria, Chemist.
1905. Bell, Miss M. M., Tulane University Library, New Orleans, La., U.S.A., Librarian.
1903. Bell, P. Carter, Millburn, N.J., U.S.A., Chemical Manufacturer.
O.M. Bendix, D., 371, Romford Road, Forest Gate, E., Managing Chemist, British Alizarin Co., Ltd.
1897. Benfey, Dr. Hans, 65, Birchfields Road, Rusholme, Manchester, Manufacturing Chemist.
1907. Bengough, Guy D., The University, Liverpool, and (Jnl.) St. John's Cottage, Chester, Lecturer on Metallurgy.
1903. Benham, Keith, Deans Hill, Stafford, Analytical and Consulting Chemist.
1902. Benjamin, Albert A., 35, Sedgeford Road, Shepherd's Bush, London, W., Bleach and Dyeworks Manager.
O.M. Benjamin, Dr. M., Smithsonian Institution, Washington, D.C., U.S.A., Consulting Chemist.
1899. Bennett, Alex. H., Via Giuseppe La Farina, Messina, Sicily, Chemist.
1901. Bennett, Arnold, c/o Catton and Co., Ltd., Yorkshire Steel Foundry, Hunslet, Leeds, Chemist.
1907. Bennett, H. Garner, 10, Shaftesbury Villas, Beverley, Yorks, Leather Chemist.
1902. Bennie, P. McN., P.O. Box 29, Niagara Falls, N.Y., U.S.A., Consulting Chemist.
1909. Benson, George F., Edwardsburg Starch Co., Cardinal, Ontario, Canada, President and Managing Director.
1906. Benson, Richard W., c/o Geo. Cradock & Co., Wakefield, Yorks, Analytical Chemist.
1901. Bentley, Wm. H., 12, Cromwell Terrace, Irlam, near Manchester, Technical Chemist.
1890. Bentz, Ernest, 30, Manley Road, Whalley Range, Manchester, Technical Chemist.
1905. Berge, Henry vom, c/o Schoellkopf & Co., Perry and Mississippi Streets, Buffalo, N.Y., U.S.A., Manager.
1884 Beringer, J. J., Basset Road, Camborne, Cornwall, Metallurgist.
1893. Berk, Fred. W., 1, Fenchurch Avenue, London, E.C., Chemical Manufacturer.
1907. Berk, Paul F., 1, Fenchurch Avenue, London, E.C.
1908. Berlinerblau, Dr. Joseph, 8, Szpitalna Street, Warsaw, Russian Poland, Industrial Chemist.
1900. Bermingham, Jno., jun., 1404, Humboldt Building, San Francisco, Cal., U.S.A., Superintendent.
1889. Bernard, Jas., jun., Ranipet, North Arcot, Madras Presidency, India, Chemical Works Manager.
1897. Berry, Albert E., Abbotsleigh, Wanstead, Essex, Works Manager.
1911. Berry, Arthur G. V., c/o Messrs. B. and R. Redwood, 4, Bishopsgate, London, E.C., Analyst.
1906. Berry, Arthur J., 5, University Gardens, Glasgow, Chemist.
1883. Berry, E. E., Bordighera, Italy, and (Journals) c/o C. H. Grinling, 17, Rectory Place, Woolwich, S.E., Technical Chemist.
1889. Berry, G. F., 9, Musgrove Road, Jerningham Road, New Cross, S.E., Chemical Works Manager.
1903 Berry, W. G., 329, West 83rd Street, New York City, U.S.A., Chemist.

1909. Beskow, K. J.. Södra Storgatan 19, Helsingborg, Sweden, Head Engineer.
1886. Best, Dr. T. T., Hardshaw Brook Chemical Works, St. Helens, Lancashire, Technical Chemist.
1901. Betts, Anson G., Troy, N.Y., U.S.A., Chemist.
O.M. Bevan, E. J., 4, New Court, Lincoln's Inn, London, W.C., Public Analyst and Consulting Chemist.
1900. Bevan, Jno. W., Morriston Spelter Works, Morriston, R.S.O., Glamorgan, Manager of Metallurgical Works.
O.M. Beveridge, Jas., c/o Miramichi Pulp and Paper Co., Ltd., Chatham, N.B., Canada, Pulp and Paper Manufacturer.
1909. Bewick, R. M., c/o United Alkali Co., Ltd., 30, James Street, Liverpool, Traveller.
1909. Beynon, Donald E., 80, Hogarth Avenue, Toronto, Canada, Chemist.
1898. Bhattacharyya, Haripada, Gun and Shell Factory, Ishapore, Bengal, India, Chemist.
1902. Biach, Dr. Ludwig K., 1, Stetson Avenue, Norwich, Conn., U.S.A., Chemist and Colorist.
1896. Bibby, John, c/o J. Bibby & Sons, Formby Street, Liverpool, Chemist.
O.M. Bickerdike, W. E., Bryer's Croft, Wilpshire, near Blackburn, Manufacturing Chemist.
1907. Bickerstaffe, Robt., c/o Thomas and Green, Ltd., Soho Mills, Wooburn Green, S.O., Bucks., Chemist.
1903. Bierwith, L. W., c/o Du Pont Powder Co., Haskell, N.J., U.S.A., Civil Engineer.
1910. Bigelow, Chas. A., c/o General Chemical Co., Bayonne, N.J., U.S.A., Superintendent.
1912. Bigelow, Edward P., Mellin's Food Library, 221, Columbus Avenue, Boston, Mass., U.S.A., Chemist.
1884. Biggart, J. Wm., 29, Cathcart Street, Greenock, N.B., Analytical Chemist.
1891. Biggart, Wm. L., Rossarden, Kilmalcolm, N.B., Public Analyst.
1911. Biggins, J. E., c/o Gulf Refining Co., Port Arthur, Texas, U.S.A., Chemist.
O.M. Biggs, B., 66, Cannon Street, London, E.C., Chemical Merchant.
1910. Biggs, J. W. H., 318, High Street, Plumstead, S.E., Chemist
O.M. Billing, H. S., 42, Kingsley Road, Mutley, Plymouth, Analytical and Managing Chemist.
1896. Billings, Edgar F., Field's Corner P.O., Boston, Mass., U.S.A., Chemical Specialist.
1896. Billington, Chas., Heimath, Porthill, Longport, Staffordshire, Metallurgist.
1903. Binns, John H., Thornfield, Mystic Pond, Methuen, Mass. U.S.A., Dyer and Finisher.
1896. Bird, Arthur W., c/o S. Berger & Co., Bromley-by-Bow, E., Works Engineer.
1907. Bird, Charles S., jun., East Walpole, Mass., U.S.A., Paper Maker.
1896. Bird, Jno. B., 3, Brookside, Cambridge, Manure Manufacturer.
1895. Bird, Wm. R., (communications) 125, Goddard Avenue; (Journals) Laboratory, G.W.R. Works, Swindon, Wilts., Analytical Chemist.
1902. Bird, W. Robt., 217, Newport Road, Cardiff, Oil Merchant.
1885. Birley, R. K., c/o Chas. Macintosh and Co., Ltd., Cambridge Street, Manchester, India-rubber Manufacturer.
1883. Bishop, A. Conway, Three Mills Lane, Bromley-by-Bow, E., Manufacturing Chemist.
1884. Bishop, Fred., c/o Burmah Oil Co., P.O. Box 67, Rangoon, Burmah, Technical Chemist.
1903. Bishop, Howard B., 1054, Park Place, Brooklyn, N.Y., U.S.A., Chemist.
1903. Bishop, J. T. F., Chemical Club, Victoria Hotel, Manchester, Secretary.
1905. Bixby, Willard G., 46th Street and 2nd Avenue, Brooklyn, N.Y., U.S.A., Blacking Manufacturer.
1905. Bjerregaard, A. P., 10724, Kimberley Avenue, Cleveland, Ohio, U.S.A., Varnish Chemist.
1909. Blacher, Prof. Carl, Polytechnicum, Riga, Russia, Chemical Engineer.
1904. Black, J. Wyclif, 67, Falcon Road, Edinburgh, Analytical Chemist.
1902. Black, W. Geoffrey, St. John's House, Christchurch Road, Norwich, Chemist.
1910. Blackie, Archibald, 223, James Street, Winnipeg, Canada, Chemist.
1894. Blackmore, H. S., 612, F. Street N.W., Washington, D.C., U.S.A., Industrial Chemist.
1896. Blagden, Victor, 4, Lloyd's Avenue, London, E.C., Chemical Merchant.
1883. Blagden, W. G., Down Lodge, East Harting, near Petersfield, Hants, Chemical Merchant.
1897. Blair, Andrew A., 406, Locust Street, Philadelphia, Pa., U.S.A., Analytical Chemist.
1884. Blake, Jas., Thames Sugar Refinery, Silvertown, E., Manager.
1910. Blakeley, A. G., P. and R. Coal and Iron Co., Pottsville, Pa., U.S.A., Chemist.
1890. Blakey, A. J., Dudbridge Mills, Stroud, Gloucestershire, Dyer.
1893. Blears, John, c/o Langworthy Bros. and Co., Ltd., Greengate Mills, Salford, Dyer and Calico Printer.
1908. Blichfeldt, S. H., Merston House, South Road, Southall, Middlesex, Bacteriologist and Fermentation Chemist.
1905. Bliss, H. J. W., United University Club, Pall Mall East, London, S.W., Chemist.
1889. Bloede, Victor G., Station D., Baltimore, Md., U.S.A., Manufacturing Chemist.
1908. Blomeley, Adam Y., c/o Arbuckle Bros., Sugar Refinery, Brooklyn, N.Y., U.S.A., Chemist.
1891. Bloomer, Fred J., Penpont, Clydach, R.S.O., Glamorgan, Nickel Works Manager.
1886. Blount, Bertram, Laboratory, 76 and 78, York Street, Westminster, S.W., Analytical Chemist.
1888. Bloxam, A. G., 105, Birkbeck Bank Chambers, Holborn, W.C., Chemist and Patent Agent.
1890. Bloxam, W. Popplewell, 15, Crescent Mansions, Elgin Crescent, Holland Park, London, Scientific Adviser and Manager (Sulphate of Ammonia Committee).
1903. Blumenthal, Lionel, Ravensholme, Merry Bower Road, Broughton Park, Manchester, Chemist.
1886. Blundstone, E. R., 79, York Street, Westminster, S.W., and (Journals) Heathfield, Park Road, Hampton Hill, Middlesex, Consulting Chemist.
1908. Blyth, Jas. R., c/o Penketh Tannery Co., Penketh, near Warrington, Leather Trades Chemist.
1906. Blyth, M. Wynter, The Lodge, Ardsley, near Barnsley, Yorks, Analytical and Consulting Chemist.
1905. Blyth, Thomas R., Uphall Chemical Works, Ilford, Essex, Analytical Chemist.
1908. Blythe, Fred C., Holland Bank, Church, Lancashire, Chemical Manufacturer.
O.M. Boake, A., Warton Road, Stratford, E., Manufacturing Chemist.
1888. Boake, Edmund J., Widford Lodge, Chelmsford, Essex, Manufacturing Chemist.
1899. Boehm, Fred., 16, Jewry Street, London, E.C., Chemical Agent and Merchant.
1898. Bogert, Prof. Marston T., Department of Organic Chemistry, Columbia University, New York City, U.S.A., Professor of Organic Chemistry.
1903. Boissevain, Chas. E. H., 92, Van Eeghenstraat, Amsterdam, Holland, Chemical Manufacturer.
1903. Bolam, Dr. H. W., Queen Margaret College, Glasgow, Lecturer on Chemistry.
1909. Bolden, Wm., Dalmellington Iron Works, Dunaskin, Ayrshire, Chemist.
1911. Bolsover, Henry, Yorkshire Testing Works, Ltd., St. Peter's Close, Sheffield, Analytical Chemist.
1901. Bolton, E. Richards, 16, Flanchford Road, Shepherd's Bush, W., Manufacturing Chemist.
1905. Bond, John, Crowlands, Southport, Engineer.
1905. Bond, Josiah, Patagonia, Arizona, U.S.A., Mining Engineer.
1905. Bone, Dr. W. A., F.R.S., West House, Lidgett Park Road, Roundhay, Leeds, Lecturer in Chemistry and Metallurgy.

1892. Bookman, Dr. S., 46, East 82nd Street, New York City, U.S.A., Chemist.

1888. Boor, Leonard G., 21, Mincing Lane, London, E.C. Chemical Merchant.

1908. Booth, Jos. W., Atlantic Mills, Providence, R.I. U.S.A., Superintendent.

1904. Booth, N. Parr, Laboratory, Cadbury Bros., Ltd., Bournville, near Birmingham, Chemist

1894. Booth, Robt., 110, Cannon Street, London, E.C., Engineer.

1903. Boral, Robin, Rhodes Mount, Rhodes, near Manchester, Works Manager.

1897. Borland, C. R., Concord, Mass., U.S.A., Smokeless Powder Manufacturer.

O.M. Borland, W. D., Beacon Lodge, Bean, *viâ* Dartford, Kent, Manufacturer of Explosives.

1903. Boroschek, Dr. L., 24, West 82nd Street, New York City, U.S.A., Chemist.

1908. Bose, R., 92–95, Upper Circular Road, Calcutta, India, Chemical Works Manager.

1903. Bossi, Dr. Arnold L., Arnold Print Works, North Adams, Mass., U.S.A., Assistant Manager

1890. Bost, W. D. Ashton, Cartvale Chemical Works, Paisley, N.B., Chemical Manufacturer.

O.M. Bothamley, C. H., Weston-super-Mare, Somerset, County Director of Technical Instruction.

1890. Bott, Dr. W. Norman. *See* Norman-Bott, Dr. W.

1884. Böttinger, Dr. H. T. von, Elberfeld, Germany; and (subs.) c/o The Bayer Co., Ltd., 19, St. Dunstan's Hill, London, E.C., Colour Manufacturer.

1901. Bottomley, Dr. J. Frank, c/o The Thermal Syndicate, Ltd., Neptune Road, Wallsend-on-Tyne, Consulting Chemist.

1906. Bottomley, W., c/o The United Alkali Co., Ltd., Fleetwood Salt Works, Fleetwood, Engineer.

O.M. Boulton, H. E., 64, Cannon Street, London, E.C., Chemical Manufacturer.

O.M. Boulton, Sir Samuel B., Bart., 64, Cannon Street, London, E.C., Chemical Manufacturer.

1883. Boulton, T. S., 14, Freegrove Road, Caledonian Road, London, N., Manager.

1905. Bourne, Lyman M., c/o Goodyear Tire and Rubber Co., Akron, Ohio, U.S.A., Chemist.

1910. Bowater, J. W., Woodville, Beeches Road, West Bromwich, Works Manager.

1905. Bowen, Henry, 804, Richmond Avenue, Buffalo, N.Y., U.S.A., Secretary.

1906. Bowen, Ralph A., c/o National Aniline & Chemical Co., 36, Purchase Street, Boston, Mass., U.S.A.

1885. Bowen, S. B., "Caeffair," Llanelly, South Wales, Chemical Manufacturer.

1888. Bower, Frank, Brewery House, Spitalfields, E., Analytical Chemist.

1909. Bower, Joshua, c/o Kynoch, Ltd., Arklow, Co. Wicklow, Ireland, Chemist.

1897. Bower, Wm. H., 29th Street and Gray's Ferry Road, Philadelphia, Pa., U.S.A., Chemical Manufacturer.

1892. Bowes, Harry, Staveley, Broomfield Road, Heaton Moor, Stockport, Analytical Chemist.

1883. Bowley, Jos. John, Wellington Works, Battersea Bridge, London, S.W., Chemical Manufacturer.

1899. Bowley, J. Plunkett, 36, Argyll Mansions, Chelsea, London, S.W., Varnish Manufacturer.

1908. Bowman, Fred. C., 420, West 118th Street, New York City, U.S.A., Chemist.

1884. Bowman, R., c/o Bowman's Ltd., Lythgoe's Lane, Warrington, Chemical Manufacturer.

1907. Bowman, Richard S., Raglan House, Victoria Road, West Hartlepool, Chemist.

1896. Bowman, Walker, 39, Cortlandt Street, New York City, U.S.A., Chemist.

1911. Bowron, B. R., 2620, Hilgard Avenue, Berkeley, Cal., U.S.A., Chemist.

1904. Boyce, Framroze H., 86, Hugh's Road, Chaupaty, Bombay, India, Technical Chemist.

1893. Boyce, Frank, c/o Goodall, Backhouse, and Co., White Horse Street, Leeds, Technical Chemist.

1910. Boyce, James, 225, West 18th Street, Chicago, Ill., U.S.A., Chemist.

1909. Boyd, Dr. Harold de H., 18, Creechurch Lane, London, E.C., Phosphate Merchant

1909. Boyd, T. P., Jr., Los Mochis, Sinaloa, Mexico, Sugar Refiner.

1899. Boyes, Herb. J., c/o Boyes & Kirk, Fabrica de Tecidos Belemzinho, Sao Paulo, Brazil, Chemist.

1905. Brabrook, G. Hale, Box 333, Taunton, Mass., U.S.A., Manufacturer.

1906. Bracegirdle, Harold W., 13, Alan Road, Withington, Manchester, Chemist.

1910. Bracewell, G. A., 20, Heaton Grove, Bradford, Analytical Chemist.

1885. Bradburn, J. A., 311, Montgomery Street, Syracuse, N.Y., U.S.A., Manufacturing Chemist

1902. Bradbury, S., Ferncliffe, Milton Grove, Glebelands Road, Ashton-on-Mersey, Chemist.

1912. Bradford, Francis L. W., 213, Rotton Park Road, Edgbaston, Birmingham, Chemist and Works Manager.

1895. Bradford, Henry, Strettington, Goodwood, near Chichester, Analytical Chemist.

1896. Bragg, Everett B., 1838, Chicago Avenue, Evanston, Ill., U.S.A., Manufacturing Chemist.

1891. Braithwaite, Isaac, Ghyll Close, Kendal, Westmoreland, Drysalter.

1897. Braithwaite, Jno. O., Holme Lacey, Warren Road, Chingford, Essex, Pharmaceutical Research Chemist.

1903. Brame, J. S. S., 67, Coleraine Road, Blackheath, S.E., Demonstrator in Chemistry.

O.M. Bramham, W., Bank Chambers, 300, Mare Street, Hackney, N.E., Chemical Engineer.

O.M. Bramwell, G. H., Cowley Hill, St. Helens, Lancashire, Alkali Manufacturer.

1904. Brandeis, R., Oesterreichischer Verein f. Chem. und Metall. Produkte, Aussig, Austria, Chemical Manufacturer.

1902. Branegan, Jas. Aug., 712, North 20th Street, Philadelphia, Pa., U.S.A., Chemical Salesman.

O.M. Branson, F. W., Wynneholme, Far Headingley, Leeds, Pharmaceutical Chemist.

1903. Brassard, Fred à, 46, Vicar Lane, Bradford, Yorks, Aniline Dyestuff Importer.

1901. Brearley, Harry, c/o The Amalgams Co., Ltd., Attercliffe Road, Sheffield, Analytical Chemist.

1906. Breckenridge, John E., American Agricultural Chemical Co., Carteret, N.J., U.S.A., Chemist.

1888. Breffit, Wm., Glasshoughton, Castleford, Yorks, Glass Manufacturer.

1908. Bregowsky, Ivan M., c/o Crane Co., 1214, South Canal Street, Chicago, Ill., U.S.A., Chemist.

1900. Brewis, E. T., 31, Belgrave Road, Leyton, E., Chemist.

1894. Breyer, Theodor, 725, Washington Avenue, Wilmette, Ill., U.S.A., Chemist.

1885. Briant, L., 24, Holborn Viaduct, London, E.C., Analytical Chemist.

1890. Brierley, J. T., Highfield, Golden Hill, Leyland, near Preston, Lancs., Analytical Chemist.

1893. Briggs, J. F., Auchmuty Paper Mills, Markinch, Fife, N.B., Technical Chemist.

1885. Briggs, T. Lynton, 188, Central Avenue, Flushing, Long Island, N.Y., U.S.A., Technical Chemist.

1910. Brisbane, James W., c/o The Leather Cloth Co., Ltd., West Ham, E., Analytical Chemist.

1905. Bristol, Dr. H. Stanley, Elmhyrst, Newport, R.I., U.S.A., Chemist.

1886. Bristow, G. W., c/o Walter J. Crook, 10, Eastcheap, London, E.C., Chemical Manager.

1912. Britland, Wm. J., Pear Tree Cottage, Alvanley, near Helsby, Cheshire, Chemist.

1887. Broadbent, H., c/o Goodall, Backhouse, and Co., Sovereign Street, Leeds, Chemist.

1889. Brock, Arthur, Firework Factory, Sutton, Surrey, Firework Manufacturer.

O.M. Brock, J., Gwern-Tyno, Colwyn Bay, North Wales, Chairman of United Alkali Co., Ltd.

1910. Brodribb, Noel K. S., Defence Dept., Victoria Barracks, Melbourne, Victoria, Australia, Chemist.

1912. Bromley, Henry S., Chelten and Wissahickon Avenues, Philadelphia, Pa., U.S.A., Lace Manufacturer.

1909. Bronnert, Dr. E., Dornach, near Mülhouse, Alsace, Germany, Artificial Silk Manufacturer.

1896. Brooke, C. B., jun., Colne House, Brantham, near Manningtree, Xylonite Manufacturer.

1900. Brooke, Jno. R., Government Opium Factory, Singapore, S.S., Superintendent.

1884. Brookes, E. A., c/o The Chilian Mills Co., Ltd., Chiguayante, Concepcion, Chile, Chemist.

1911. Brookfield, Henry M., 2, Rector Street, New York City, U.S.A., Glue Manufacturer.

1895. Brookman, Fred. W., 6, West Street, Rochdale, Manure Works Manager.

1906. Brooks, Cecil J., M. M. Simau, Benkoelen, Sumatra, Ned. Indies, Metallurgist.

1909. Brooks, Theodore, Guantanamo, Cuba, Cane Sugar Manufacturer.

1907. Broome, James S., 18, Seedley Park Road, Pendleton, Manchester, Science Lecturer

1901. Broome, Jos., 315, Chestnut Street, Roselle, N.J., U.S.A., Chemical Engineer.

1911. Brothers, Horace E., 12, St. Mary's Road, Crumpsall, Manchester, H.M. Inspector of Factories.

1909. Brothers, Wm., 8, Mayfield Road, Kersal, Salford, Chemical Manufacturer.

O.M. Brotherton, E. A., City Chambers, Leeds, Ammonia Distiller.

1884. Brown, Prof. A. Crum, F.R.S., 8, Belgrave Crescent, Edinburgh, Professor of Chemistry.

1905. Brown, Prof. Adrian J., West Heath House, Northfield, near Birmingham, Professor of Brewing.

1902. Brown, A. H. M., 133, Kent Street, London, Ont., Canada, Metallurgist.

1891. Brown, Cæsar R., 144, Victoria Avenue, Prittlewell, near Southend, Works Foreman.

O.M. Brown, D., 93, Abbey Hill, Edinburgh, Chemical Manufacturer.

O.M. Brown, D., Donaghmore, Tyrone, Ireland, Soap Manufacturer.

1890. Brown, Edw. Hilton, c/o W. Ropes and Co., St. Petersburg, Russia, Analytical Chemist.

1894. Brown, Geo. E., c/o "The British Journal of Photography," 24, Wellington Street, Strand, London, W.C., Chemist.

1910. Brown, Geo. Winslow, Assabet Mills, Maynard, Mass., U.S.A., Chemist.

1906. Brown, Harry F., Room 917, Du Pont Building, Wilmington, Del., U.S.A., Chemist.

O.M. Brown, Henry, Benskin's Brewery, Watford, Herts., Brewing Chemist.

1899. Brown, Dr. Henry C., The Chemical Works, King's Lynn, Chemical Manufacturer.

O.M. Brown, Dr. Horace T., F.R.S., 52, Nevern Square, Kensington, S.W., Brewing Chemist.

1905. Brown, Hugh B., c/o Jas. Robertson and Sons, Ltd., Thrushgrove Works, Paisley, Chemist.

1905. Brown, Nicol, 4, The Grove, Highgate, N., Mining Director.

1906. Brown, Percy S., c/o B. O. Bowers Co., 6, Harrison Street, New York City, U.S.A., Chemist.

1892. Brown, Reginald B., c/o Badische Co., Ltd., 2, Samuel Ogden Street, Manchester, Technical Chemist.

1901. Brown, Samuel B., Ruthven, Bowden Lane, Marple, Cheshire, Calico Printer.

O.M. Brown, Walter, c/o Jas. H. Dennis and Co., Ltd., Widnes, Technical Chemist.

1900. Brown, Walter B., Victor Chemical Works, Fisher Building, Chicago, Ill., U.S.A., Chemist and General Superintendent.

1901. Browne, Dr. Arthur L., 213, Cortland Street, Baltimore, Md., U.S.A., Analytical Chemist.

1910. Browne, Philpot F., Jubilee Hill, Mount Morgan, Queensland, Chemist.

1906. Browne-Cave, E. J. C. *See* Cave-Browne-Cave, E. J.

1905. Browning, Prof. K. C., Medical College, Colombo, Ceylon, Professor of Chemistry.

O.M. Browning, W., Broad Oak, Accrington, Calico Printer.

1902. Brownsdon, Dr. H. W., King's Norton Metal Co., Ltd., King's Norton, Birmingham, and (Jnls.) 81, Blenheim Road, Moseley, near Birmingham, Works Chemist.

1902. Bruce, Alex., Laboratory, Hyde Park Corner, Colombo, Ceylon, Chemist.

1911. Bruce, Joseph, Jnls. to General Manager, Cape Explosives Works, P.O., Dynamite Factory, West Somerset, Cape Colony, Secretary.

1908. Bruce, Robert, 44, High Street, Leven, Fifeshire, Works Chemist.

1900. Bruce, Wm. T., 3, Lombard Court, London, E.C., Director.

1892. Bruckmann, G. T., 109, 22nd Street, West New York, N.J., U.S.A., Chemical Engineer.

1911. Brunet, Louis, "Revue Générale des Sciences," 18, Rue Chauveau-Lagarde, Paris VIII, France, Chemist and Secretary.

O.M. Brunner, H., Holly Mount, Tarbock Road, Huyton, near Liverpool, Chemical Manufacturer.

1894. Brunner, H. Bertram, The Hollies, Hartford, Cheshire, Chemist and Electrician.

1887. Brunner, J. F. L., M.P., c/o Brunner, Mond, and Co., Ltd., Caxton House, Westminster, S.W., Chemical Manufacturer.

O.M. Brunner, Rt. Hon. Sir J. T., Bart., Silverlands, Chertsey; and (Journals) c/o Brunner, Mond, and Co., Ltd., Northwich, Cheshire, Chemical Manufacturer.

1910. Brunner, Dr. Philipp, 2, Via Ghega, Trieste, Austria, Merchant.

1902. Brunner, Roscoe, The Winnington Hall Club, Winnington, Northwich, Alkali Manufacturer.

1909. Brunner, Rudolph A. J., c/o John Bennet Lawes and Co., Ltd., West Ferry Road, Millwall, E., Engineer.

1894. Brunton, J. Dixon, Wire Mill, Musselburgh, N.B., Wire Manufacturer.

1904. Bryant, Arthur P., c/o Clinton Sugar Refining Co., Clinton, Iowa, U.S.A., Chemist.

1903. Bryant, V. Seymour, Trelawne, Crowthorne, Berks., Analytical Chemist.

1908. Bryce, Chas. C., 43-45 Great Tower Street, London, E.C., Merchant.

1894. Bryce, Thos., Tharsis Mines, Huelva, Spain, Chemist.

1911. Brydone, Gordon R., 29, Stainsby Road, Poplar, London, E., and (Jnls.) 11, Queen Ann's Grove, Bedford Park, W., Metallurgist.

1897. Bryson, Jas., Pumpherston Oil Works, Midcalder, N.B., Oil Works Manager.

1892. Buchanan, D. G., (Subs.) 40, St. Vincent Place, Glasgow, and (Journals) c/o La Associacion Salitrera de Propaganda, Iquique, Chili, Analyst.

1908. Buchanan, Duncan G., 27, Woodlawn Avenue East, Toronto, Canada, Chemist (Rubber Works).

1904. Buchanan, E. F., 128, East Crescent Street, Marquette, Mich., U.S.A., Chemist.

1888. Buchanan, Jas., Caledonia Foundry, Brasenose Road, Liverpool, Engineer.

1904. Buchanan, John L., Braehead, Mill Road, Bromborough, Cheshire, Analytical Chemist.

1904. Buchanan, Joshua D., c/o Nobel's Explosives Co., Ltd., Polmont Station, N.B., Chemist.

1910. Buchanan, Walter G., c/o Summerlee Iron Co., Ltd., Coatbridge, N.B., Chemist.

1897. Buck, Chas. A., 521, Locust Street, South Bethlehem, Pa., U.S.A., Chief Chemist (Bethlehem Iron Co.).

1906. Buckie, Robert H., c/o West Virginia Paper and Pulp Co., Mechanicville, N.Y., U.S.A., Works Chemist.

1911. Budde, Dr. Carl, 1, Belford Road, Sunderland, Chemical Engineer.

1909. Buell, W. H., c/o Winchester Repeating Arms Co., New Haven, Conn., U.S.A., Chemist.

1909. Buggy, Thos., Butte, Montana, U.S.A., Assayer and Chemist.

1902. Bull, Irving C., 100, Maiden Lane, New York City U.S.A., Chemist.

1899. Bult, Herbert J., 18, Billiter Street, London, E.C., Chemist.
O.M. Bumby, H., Bellevue, Sandbach, Cheshire, Iron and Chemical Works Director.
O.M. Bunker, H. E., 19, Napier Street, Toronto, Ont., Canada, Technical Chemist.
1901. Bunting, Henry H., Oficina de Ensayes F. C. C. del P., Callao, Peru, Analyst
1893. Burbridge, Jas., India-rubber Mills, Tottenham, N., India-rubber Manufacturer
1910. Burbridge, Walter N., "Uplands," Foxley Lane, Upper Woodcote, Purley, Surrey Analytical Chemist.
1886. Burdekin, G., jun., 10, Clifton Terrace, St. Helens, Lancashire, Chemical Works Manager.
1896. Burford, Samuel F., The Ridgeway, Rothley, near Leicester, Analytical Chemist.
1889. Bürger, Dr. J., 1, Birch Avenue, Talbot Road, Old Trafford, Manchester, Technical Chemist.
1901. Burgess, Prof. C. F., University of Wisconsin, Madison, Wis., U.S.A., Electro-chemical Engineer.
1889. Burgess, Geo., Sydney Cottage, Halebank, Widnes, Chemist.
1889. Burgess, Wm. T., 20, Priory Road, Bedford Park, London, W., Analytical Chemist.
1902. Burkard, Dr. Ernst, Solothurn, Switzerland, Chemist.
1899. Burkhardt, Dr. G. A., Württembergischestrasse 32, Berlin, W. 15, Germany, Chemist.
1897. Burland, Lt.-Col. Jeffrey H., 824, Sherbrooke Street, and (Journals) c/o Fraser Library, Montreal, Canada, Paper and Card Manufacturer.
1898. Burls, Herbert T., 2, Verulam Buildings, Gray's Inn, London, W.C., Mechanical Engineer.
1901. Burnand, Sydney, Manbré Saccharine Co., Ltd., Hammersmith, W., Manager.
O.M. Burnard, R., Plymouth Chemical Works, Plymouth, Chemical Manufacturer.
1891. Burnet, Henry K., North Brook Vitriol Works, Bradford, Yorks, Sulphuric Acid Maker.
1897. Burnet, Jno. Jas., 18, University Avenue, Glasgow, Architect.
1909. Burnett, Arthur, c/o The Premier Waterproof and Rubber Co., Ltd., Bromley Street, Dantzic Street, Manchester, Chemist.
1893. Burnham, J. C., Cordite Factory, Aruvankad, Nilgiri Hills, India, Analytical Chemist.
1912. Burnley, Harry, corner Cheltenham and Wissahickon Avenues, Germantown, Philadelphia, Pa., U.S.A., Lace Manufacturer.
1900. Burnside, Chas. F., Du Pont Building, Wilmington, Del., U.S.A., Chemist.
1900. Burr, Edmund C., 1722, Vallejo Street, San Francisco, Cal., U.S.A., Manufacturer.
O.M. Burrell, B. A., 8, Springfield Mount, Leeds, Analytical Chemist.
1910. Burrell, Keith, Burrell's Wharf, Millwall, London, E., Analytical Chemist.
1906. Burrough, Ernest J., Cale Distillery, Hutton Road, Lambeth, S.E., Rectifier.
1888. Burrows, Edw., Home Villa, Low Fell, Gateshead-on-Tyne, Alkali Works Manager.
1901. Burton, Alf., Canadian Dyers' Association, 2–16, Liberty Street, Toronto, Canada, Dyer and Finisher.
1903. Burton, Jno., 2, Green Street, Bethnal Green, E., Dye and Chemical Manufacturer.
1904. Burton, T. R., c/o Scott, Greenwood, and Son, 8, Broadway, Ludgate Hill, London, E.C., Technical Journalist.
1889. Burton, Wm., The Hollies, Clifton Junction, near Manchester, Potter's Chemist.
1906. Busby, Fred. E., Arnold Print Works, North Adams, Mass., U.S.A., Chemist.
1897. Bush, J. M., c/o W. J. Bush and Co., Ltd., Ash Grove, Hackney, E., Manufacturing Chemist.
1897. Butler, David B., 41, Old Queen Street, Westminster, S.W., Cement Expert.
1890. Butler, Paul, Lowell, Mass., U.S.A., Ammunition Manufacturer.
1885. Butler, Samuel, The Cedars, Compton, Wolverhampton, Brewer.
1905. Butler, Dr. T. H., c/o Wm. Butler and Co., Ltd., Crews Hole, Bristol, Chemist (Tar and Rosin Distillery).
1886. Butler, W. W., c/o Mitchells & Butlers, Ltd., The Brewery Library, Cape Hill, Birmingham, Brewer.
O.M. Butterfield, J. C., 79, Endlesham Road, Balham, S.W., Analytical Chemist.
1892. Butterfield, W. J. A., 66, Victoria Street Westminster, S.W., Analytical Chemist.
1897. Butters, Charles, 54, New Broad Street, London, E.C., and (Journals) 121, 59th Street, Oakland, Cal., U.S.A., Metallurgist.
1900. Butterworth, Elwell R., c/o Reversible Collar Co., 111, Putnam Avenue, Cambridge, Mass., U.S.A., Chemist.
1902. Butterworth, F. J., 222, Vinewood Avenue, Detroit, Mich., U.S.A., Chemist.
1892. Buttfield, Horace V., 13, Wellington Road, Bush Hill Park, Enfield, N., Chemical Demonstrator.
O.M. Byard, A. G., c/o Burt, Boulton, and Haywood, Apartado 8, Bilbao, Spain, Technical Chemist.
1905. Byrne, F. A., 2, Ludgate Hill, Birmingham, Director of Chemical Co.
1899. Byrnes, Dr. Eugene A., 918, F. Street N.W., Washington, D.C., U.S.A. Patent Lawyer.
1893. Byrom, T. H., Laboratory, Wigan Coal and Iron Co., Wigan, Analytical Chemist.
1887. Bythway, M., 44, Lloyd Street Albert Square Manchester, Drysalter.

C.

1884. Cabot, Godfrey L., 940, Old South Building Boston, Mass., U.S.A., Manufacturing Chemist.
1907. Cabot, Samuel, 141, Milk Street, Boston, Mass., U.S.A., Chemical Manufacturer.
1906. Caddick, Arthur, Minas de Rio Tinto, Huelva, Spain, Works Chemist.
1889. Cadett, Jas., Ashtead, Surrey, Chemical Engineer.
1905. Cain, Dr. J. C., 28, Pembury Road, Lower Clapton, N.E., Colour Chemist.
1891. Caines, G. S. A., 7, Rochester Terrace, Camden Road, London, N.W., Analytical Chemist.
1897. Cairns, Wm., 5, Carlton Place, Glasgow, Plumber.
1907. Caistor, J. W. Y., "Culverhay," Paignton, South Devon, Chemist.
1891. Caldecott, W. A., Box 1167, Johannesburg, Transvaal, South Africa, Metallurgist.
1905. Calder, Prof. Edwin E., Long Meadow, R.I., U.S.A., Professor of Chemistry.
1897. Calder, W. A. S., Ormidale, Little Moor Hill, Smethwick, Birmingham, Chemical Manufacturer.
1908. Caldwell, Dr. Robert J., Coventry House, Wilton Avenue, Southampton, Chemist and Works Manager.
1888. Caldwell, Wm., Murray Street, Paisley, N.B., Drysalter.
1912. Callan, Dr. Thomas, Bridge of Weir Leather Co., Bridge of Weir, [illegible] Technical Chemist.
1902. Calm, Dr. Chas. E., [illegible] Kern Co., Cal., U.S.A., Manufacturing [illegible]
1904. Calvert, Dr. Harry T., West Riding of Yorkshire Rivers Board, Wakefield, Chemist.
1895. Cambier, Jacob, 1401, Carteret Avenue, Pueblo, Colo., U.S.A., Chemist.
1908. Cameron, H. Lovett, c/o Vales and Cameron, 20, Castlereagh Street, Sydney, N.S.W., Assayer.
1904. Cameron, Walter S., 239, West 136th Street, New York City, U.S.A., Manufacturing Perfumer.
1908. Cameron, Wm., 14, Hermon Hill, Snaresbrook, Sugar Refinery Manager.
O.M. Cammack, J., 34, Wolseley Road, St. Helens, Lancashire, Technical Chemist.
1910. Campagne, Emile, c/o Gildermeister et Cie., Petit Ronchin (Nord), France, Chemical Engineer.
1886. Campbell, Andrew, c/o Burmah Oil Co., Ltd., P.O Box 67, Rangoon, Burmah, Works Manager.

O.M. Campbell, Archibald, Fairview, Rugeley, Staffordshire, Technical Chemist.

1908. Campbell, Fred. A., The Working Men's College, Latrobe Street, Melbourne, Victoria, Australia, Principal.

1910. Campbell, James R., 57, Dacre Hill, Rock Ferry, Cheshire, Chemist.

1907. Campbell, John A., c/o British South African Explosives Co., Modderfontein, Transvaal, Chemist.

1912. Campbell, Kennedy, c/o British Dyewood Co., Ltd., Parkhead, Glasgow, Chemist.

1901. Campbell, Kenneth F., M.Inst.C.E., 1, Peel Street, Huddersfield, Civil Engineer.

1911. Campbell, L. E., 5, St. Matthew's Avenue, Surbiton, Chemist.

1908. Campbell, Max E., c/o Union Oil Co. of California, Avila, San Luis Obispo Co., Cal., U.S.A., Chemist.

1909. Campbell, Peter, The Nairn Linoleum Co., Kearney, N.J., U.S.A., Linoleum Manufacturer.

1909. Campbell, Robt., The Nairn Linoleum Co., P.O. Box 32, Newark, N.J., U.S.A., Linoleum Manufacturer.

1911. Campbell, Wm. E., c/o Gutta Percha and Rubber Manufacturing Co., West Lodge Avenue, Toronto, Canada, Industrial Chemist.

1904. Campion, A., Technical College, Glasgow, Chemist and Metallurgist.

1909. Candee, Chas. N., 47, Yonge Street, Toronto, Canada, Rubber Manufacturer.

1897. Canfield, F. D., jun., Gramercy, La., U.S.A., Sugar Refiner.

1908. Canning, Ernest R., 137, Great Hampton Street, Birmingham, Manufacturer.

1909. Cannon, G. Ogston, c/o Halse & Marshall, 20, Cullum Street, London, E.C., Analytical Chemist.

O.M. Cannon, M., 25, Stormont Road, Clapham Common, S.W., Vinegar Works Manager.

1891. Canziani, Enrico, 3, Palace Green, Kensington, W., Civil Engineer.

1891. Carden, Albert J., Dunster House, 12, Mark Lane, London, E.C., Distiller.

1893. Carey, Arthur, The Groves, Grassendale Park, near Liverpool, Chemist.

O.M. Carey, Eustace, The United Alkali Co., Ltd., 30, James Street, Liverpool; and (Journals) The Groves, Grassendale Park, near Liverpool, Chemical Manufacturer.

1906. Carey, W. Gordon, c/o The Salt Union, Ltd., Weston Point, Runcorn, Cheshire, Chemist.

1904. Cargill, J. T., c/o Finlay, Fleming, and Co., Rangoon, Burmah, East India Merchant.

1907. Carlitz, Joseph S., 159, North Second Street, Philadelphia, Pa., U.S.A., Chemist.

1896. Carmichael, Herbert, Bureau of Mines, Victoria, British Columbia, Public Analyst and Assayer.

1884. Carmody, Prof. Patrick, Government Laboratory, Port of Spain, Trinidad, Analytical Chemist.

1897. Carnell, Wm. C., c/o Tacony Chemical Works, Bridesburg, Philadelphia, Pa., U.S.A., Chemist.

1906. Caro, Dr. Nikodem, Meinekestrasse 20, Berlin, Germany, Analytical Chemist.

1893. Carpenter, C. C., South Metropolitan Gas Co., 709A, Old Kent Road, London, S.E., Civil Engineer.

1908. Carpenter, Edwin P., Culvert Works, Sheepcote Lane, Battersea, S.W., Manager of Casein, Ltd.

1900. Carpenter, Frank B., 11, South 12th Street, Richmond, Va., U.S.A., Chemist.

1900. Carpenter, Harry B., c/o Lister's Agricultural Chemical Works, Newark, N.J., U.S.A.

O.M. Carpenter, R. Forbes, 30, Buckingham Mansions, 359, West End Lane, West Hampstead, N.W., Ex-Chief Inspector under the Alkali, &c., Works Acts.

1904. Carr, Francis H., Kelvin, Church Avenue, Sidcup, and (Journals), Burroughs, Wellcome, and Co., Ltd., Dartford, Kent, Manufacturing Chemist.

1907. Carrier, C. F., jun., Sewaren, N.J., U.S.A., Manufacturing Chemist.

1904. Carter, A., Cuba Street, Petone, Wellington, New Zealand, Works Manager.

1905. Carter, Robert A., 4923, Osage Avenue, Philadelphia, Pa., U.S.A., Chemist.

1895. Carter, Stewart F., c/o Garner Printworks and Bleachery Co., Wappingers Falls, N.Y., U.S.A., Technical Chemist.

1903. Carter, Thomas, West End View, Ravensthorpe Dewsbury, Yorks, Works Chemist.

1886. Carter, W. Chas., c/o Dominion Iron and Steel Co., Sydney, C.B., Canada, Analytical Chemist.

1911. Carty, Ronald D., The Laboratories, Survey Dept., Public Works Ministry Gardens, Cairo, Egypt Analytical Chemist.

1889. Carulla, F. J. R., 84, Rose Hill Street, Derby, Chemical Manufacturer.

1906. Carveth, Dr. H. R., Niagara Electrochemical Co., Niagara Falls, N.Y., U.S.A., Works Manager.

1903. Caspari, Dr. W. A., Usines de Persan, Persan-Beaumont, France, Chemist and Physicist.

1899. Castro, J. Paul de, 1, Essex Court, Temple, London, E.C., Barrister-at-Law.

1895. Catlin, Chas. A., 133, Hope Street, Providence, R.I., U.S.A., Chemist (Rumford Chemical Works).

1909. Caulkin, Howard A., Mona Villa, Spencer Road, Belper, Analyst.

1906. Cave-Browne-Cave, E. J., 32, Orrell Lane, Aintree, Liverpool, Works Chemist.

1896. Caven, Robt. M., University College, Nottingham, Lecturer in Chemistry.

O.M. Cawley, G., 82, Victoria Street, Westminster, S.W., Chemical Engineer.

O.M. Cawley, J., 278, Passaic Street, Newark, N.J., U.S.A., Analytical Chemist.

1897. Cawley, Thos. A., British Gelatin Works, Ltd., New Bedford Road, Luton, Gelatin Manufacturer.

1910. Chadsey, Stanley B., 476, Brunswick Avenue, Toronto, Canada, Chemist.

1891. Chadwick, Walter M., Thorneycroft, Westoe, South Shields, Chemical Works Manager.

1910. Chakraborty, J., The Oriental Soap Factory, Goabagan, Calcutta, India, Technical Director.

1910. Challinor, Richard W., Chemical Laboratory, The Technical College, Sydney, N.S.W., Australia, Teacher of Chemistry.

1894. Chaloner, G. W., 26, Eagle Wharf Road, Hoxton, N., Chemical Manager.

1901. Chamberlain, G. E., 103, Waiola Avenue, La Grange, Ill., U.S.A., Chemist.

1910. Chambliss, Prof. Hardee, Dept. of Chemistry, Oklahoma A. and M. College, Stillwater, Oklahoma, U.S.A., Professor of Chemistry.

O.M. Chance, A. M., Chemical Works, Oldbury, near Birmingham, Chemical Manufacturer.

1909. Chance, Edwin M., 1200, Mahantongo Street, Pottsville, Pa., U.S.A., Chemist.

O.M. Chandler, Dr. C. F., Columbia University, West 116th Street, New York City, U.S.A., Professor of Chemistry.

1912. Chandler, Lee L., Research Laboratory, Pittsburgh Plate Glass Co., Creighton, Pa., U.S.A., Assistant.

1893. Chaplin, Dr. Edw. M., Public Analyst's Laboratory, Wakefield, Yorks, Analytical Chemist.

1890. Chapman, A. Chaston, 8, Duke Street, Aldgate, E.C., Analytical Chemist.

1906. Chapman, Arthur J., Baronsmere, Stanhope Avenue, Church End, Finchley, N., Analytical Chemist.

1906. Chapman, E. A., c/o Robert Heath and Sons, Ltd., Norton Works, Stoke-on-Trent, Works Chemist.

O.M. Chapman, Spencer, 36, Mark Lane, E.C., Chemical Manufacturer.

1894. Charlier, A. C. J., 3, Bedford Road, South Tottenham, N., Consulting Chemist.

1912. Charlton, H. W., Patent Office, Dept. of Agriculture, Ottawa, Canada, Chemical Patent Examiner.

1902. Charlton, Thos., 141, South Cherokee Street, Denver, Colo., U.S.A., Manufacturing Chemist.

1900. Chase, March F., c/o Mineral Point Zinc Co., Depue, Ill., U.S.A., Chemist.

1889. Chase, R. L., Arnold Printworks, North Adams, Mass., U.S.A., Manager.

1898. Chattock, Herbert E., 23, Apsley Road, Clifton, Bristol, Oilcake Manufacturer.

1910. Chattopadhava, P.C., 90, Manikatala Main Road, Harrison Road P.O., Calcutta, India, Chemist.

1905. Cheesman, Frank P., 100, William Street, New York City, U.S.A., Paint Manufacturer.

1901. Cheetham, Howard, 18, St. Ann Street, Manchester, Chartered Patent Agent.

1910. Cheke, Thomas W., 7, Elm Grove, Stroud Green, N., Analytical Chemist.

1894. Cheney John P, Messrs. Cheney Bros., South Manchester, Conn, U.S.A., Chemist and Silk Manufacturer.

1905. Chick, Oliver, 31, Auckland Road, Cranbrook Park, Ilford, Essex, Analytical Chemist.

1890. Chorley, Jno. C., Bewsey, Oxford Road, Birkdale, Lancs., Analytical Chemist.

O.M. Christie, J., Levenfield, Alexandria, N.B., Dyer and Printer.

1903. Christie, John, c/o The New Explosives Co., Ltd., Stowmarket, Suffolk, Analytical Chemist.

1908. Christie, Malcolm Ardenlea, Portland Park, Hamilton, N.B., Analytical Chemist.

1910. Christie, Dr. M. G., c/o The Otto-Hilgenstock Coke Oven Co., Tingley, near Wakefield, Assistant General Manager.

1898. Christison, Geo., 2, Kelvinside Gardens, Glasgow, Engineer.

1907. Christopher, George, Walkden Works, Verney Road, South Bermondsey, S.E., Consulting Chemist.

1907. Christopher, J. E., Solvay Coke Works, Kirkless, Wigan, Assistant in Charge.

O.M. Chrystal, W. J., 7, West George Street, Glasgow, Chemical Manufacturer.

1908. Chrystall, E. R., c/o Curtis's & Harvey, Ltd., Cliffe at Hoo, Kent, Research Chemist.

O.M. Church, Sir Arthur, K.C.V.O., F.R.S., Shelsley, Kew, Surrey, Professor of Chemistry in the Royal Academy.

1890. Church, Elihu D., jun., 63, Wall Street, New York City, U.S.A., Soda Manufacturer.

1906. Church, Sumner R., c/o Barrett Manufacturing Co., 17, Battery Place, New York City, U.S.A., Chemical Engineer.

1907. Churchill, Wm., Corning Glass Works, Corning, N.Y., U.S.A., Chemist.

1896. Claflin, Alan A., (Communications) 88, Broad Street, Boston; and (Journals) Littleton, Mass., U.S.A., Manufacturing Chemist.

1909. Claflin, Albert W., 190, Waterman Street, Providence, R.I., U.S.A., Manufacturing Druggist.

1900. Clamer, Guilliam H., 46, Richmond Street, Philadelphia, Pa., U.S.A., Chemist.

1885. Clanahan, H. C., 79, Mosley Street, Manchester, Chemical Merchant.

1901. Clapham, Henry E., 15, St. Julian's Road, Kilburn, N.W., Technical Chemist.

1905. Clapp, Geo. A., 49, Federal Street, Boston, Mass., U.S.A., Chemist.

1891. Clapp, Ralph R., c/o Standard Ammonia Co., Ltd., Sussex Wharf, East Greenwich, S.E., Manager.

1889. Clapperton, J., jun., Analytical Chemist.

1903. Clare, Henry, Heath View, Storrington, Sussex, Teacher of Science.

1905. Clark, Alfred N., 920, North Washington Avenue, Lansing, Mich., U.S.A., Technical Chemist and Engineer.

1906. Clark, Allan J., c/o Homestake Mining Co., Lead, South Dakota, U.S.A., Metallurgist.

1910. Clark, A. W., c/o Heath and Miligan Manufacturing Co., 1832, South Canal Street, Chicago, Ill., U.S.A., Superintendent.

1904. Clark, Arthur W., c/o Johnson and Johnson, New Brunswick, N.J., U.S.A., Chemist and Bacteriologist.

1908. Clark, Chas. T., 1303, Sixth Street, Bay City, Mich., U.S.A., Manufacturing Chemist.

1904. Clark, Prof. Friend E., Central University of Kentucky, Danville, Ky., U.S.A., Professor of Chemistry.

1910. Clark, Henry, 25, Adelaide Crescent, Brighton, Oil Refiner.

1909. Clark, Hubert A., 83, Amherst Street, Montreal, Canada, Canner.

1900. Clark, Jno., Broadway Works, Millwall Dock, London, E., Manufacturing Chemist.

1906. Clark, M. H., c/o Boston Rubber Shoe Co., Melrose, Mass., U.S.A., Chemist

1902. Clark, Robt. M., 138, Bath Street, Glasgow, Chemist.

1906. Clark, Wm. B., 11, Fox Street, Greenock, Chemist.

1907. Clark, Wm. H., Laboratory, Messrs. Armstrong, Whitworth, and Co., Newcastle-on-Tyne, Analytical Chemist.

1904. Clarke, Alfred B., 613-617, Eastern Avenue, Toronto, Canada, Leather Manufacturer.

1908. Clarke, Arthur F., Myrtle Cottage, Guy Road, Beddington, Surrey, Analytical Chemist.

1908. Clarke, Dr. Latham, Boylston Hall, Harvard University, Cambridge, Mass., U.S.A., Instructor in Chemistry.

1903. Clarke, Robt. W., Avon House, Prince's Road, Buckhurst Hill, Essex, Analyst.

1897. Clarke, Wm. B., c/o Edison-Swan U.E.L. Co., Ltd., Ponders End, N., Electro Chemist.

O.M. Claudet, A. C., 6 & 7, Coleman Street, London, E.C., Metallurgist.

1889. Claus, Wm. H., c/o Claus and Co., Ltd., Clayton, Manchester, Manufacturing Chemist.

1911. Clayton, Alf. J., 75, Middleboro' Road, Coventry, Technical Chemist.

O.M. Clayton, E. G., Chemical Laboratory, 23, Holborn Viaduct, London, E.C., Consulting Chemist.

1909. Clayton, Ellis, Hazeldene, Deerpark Road, Belfast, Ireland, Lecturer on Bleaching, Dyeing and Printing.

1895. Clayton, Dr. G. C., Croughton, Upton, near Chester.

1909. Clayton, H., Endcliffe, Maiden Lane, Dartford, Kent, Technical Chemist.

1894. Clayton, Robt. H., 1, Parkfield Road, Didsbury, Manchester, Chemist.

1910. Clayton, Will, Melville House, Accrington, Works Chemist.

1905. Clayton, W. E., Royal Edward Yard, Sydney, N.S.W., Australia, Superintendent.

1907. Clement, Leonard, Beamsley, Fairhaven, near Lytham, Lancs., Chemist.

1893. Clemes, J. H., Cheriton, Newquay, Cornwall.

1884. Clerk, Dugald, F.R.S., 57-58, Lincoln's Inn Fields, London, W.C., Engineer.

1905. Clexton, Thos. J., 285, Congress Street, Boston, Mass, U.S.A., Manager (A. Klipstein and Co.).

1906. Clifford, Jos., Laboratory, Survey Dept., Public Works Ministry Gardens, Cairo, Egypt, Chemist.

1900. Clifford, Wm., Sewage Outfall Works, Wolverhampton, Sewage Works Manager.

O.M. Cloud, T. C., 20, Bucklersbury, London, E.C., Metallurgist.

O.M. Clowes, Dr. F., 40, Craven Street, Charing Cross, W.C.; and the Grange, College Road, Dulwich, S.E., Chief Chemist (L.C.C.).

1891. Clutton, J. H., Fonderie Mines de l'Aude, Villanière par Lastours (Aude), France, Assayer.

1911. Clymer, Wm. R., Publicity Division, National Carbon Co., Cleveland, Ohio, U.S.A., Manager.

1899. Coates, Chas. E., jun., Louisiana State University, Baton Rouge, La., U.S.A., Professor of Chemistry.

1911. Coates, Jos. E., The University, Edgbaston, Birmingham, Lecturer.

1888. Coats, Jno. T., 105, Broughton Street, Edinburgh, Manufacturing Chemist.

1893. Cobb, Jno. W., Farnley Ironworks, near Leeds, Technical Assistant to Managing Director.

1894. Coblentz, Dr. Virgil, 23, Vine Street, Brooklyn, N.Y., U.S.A., Research Chemist (R. R. Squibb & Co.).

1899. Cochran, Alfred, 559, Madison Street, Brooklyn, N.Y., U.S.A., Chemist.

1911. Cochrane, Capt. J. B., Royal Military College, Kingston, Ontario, Canada, Professor of Physics and Chemistry.

1901. Cockburn, John A., Mayville, Stevenston, Ayrshire, Analytical Chemist.
1902. Cocking, Allan T., c/o Kynoch, Ltd., Lion Works, Witton, Birmingham, Ammunition Manufacturer.
1911. Codd, Edgar, Leather Trades Review, 24, Mark Lane, London, E.C., Editor.
1905. Coes, Chas. S., 119, East River Street, Hyde Park, Mass., U.S.A., Oil Chemist.
1909. Coffey, Æneas H., 21, Cardigan Road, Richmond, Surrey, Distiller.
1903. Cofman-Nicoresti, J., 24, St. Gabriel's Road, Cricklewood, N.W., Chemist.
1903. Coggeshall, Dr. G. W., 17, Chestnut Street, Dedham, Mass., U.S.A., Chemical Manufacturer.
1887. Coghill, P. de G., Borax Works, Old Swan, Liverpool, Technical Chemist.
1884. Cogswell, W. B., Syracuse, N.Y., U.S.A., Chemical Engineer.
O.M. Cohen, Dr. J. B., 1, North Grange Mount, Headingley, Leeds, Professor of Organic Chemistry.
1897. Cohn, Alfred I., 122, East 74th Street, New York City, U.S.A., Chemist.
1901. Cohn, Sigmund, 13, Dutch Street, New York City, U.S.A., Metallurgical Chemist.
1904. Cohoe, Prof. W. P., 148, Van Horne Street, Toronto, Canada, Professor of Chemistry.
1903. Colbert, W., British S.A. Dynamite Factory, Modderfontein, Transvaal, Analytical Chemist.
1891. Colby, Albert L., 447, Lehigh Street, South Bethlehem, Pa., U.S.A., Metallurgical Engineer.
1899. Colby, E. A., Baker Platinum Works, Newark, N.J., U.S.A., Metallurgical Chemist.
O.M. Colby, W. H., Carreg-wen, Aberystwith, Wales.
1893. Coleman, W. H., 3, Redclyffe Road, Withington, Manchester, Tar Works Chemist.
1905. Collett, John H., Summercroft, Tuffley, and (Jnls.) The Librarian, Free Library, Gloucester, Chemical Manufacturer.
1887. Collett, J. M., Kimsbury House, Gloucester, Chemical Manufacturer.
1901. Colley, Bernard T., c/o Braden Copper Co., Rancagua, Chile, South America, Superintendent.
1908. Collier, F. C., 457, Lansdowne Avenue, Westmount, Montreal, Canada, Analytical Chemist.
1903. Collier, Pierre, Companhia Industrial Pernambucana, Pernambuco, Brazil, Civil Engineer.
1893. Collin, Dr. C. A., Ferguslie Threadworks, Paisley, N.B., Textile Chemist.
1898. Collingridge, Frank, Highstone, New Road, Llanelly, South Wales, Chemist.
1899. Collins, S. Hoare, Armstrong College, Newcastle-on-Tyne, Agricultural Chemist.
1888. Collins, W. Hepworth. *See* Hepworth-Collins, W.
1899. Collis, Walter T., 89, Greenfield Road, Harborne, Birmingham, Chemist.
1910. Collitt, Bernard, 377, Metcalfe Avenue, Westmount, Montreal, Canada, Chemist.
1910. Colman, Fred. J., c/o Brotherton and Co., Ltd., Wear Tar Works, Sunderland, Chemist.
1891. Colman, Dr. H. G., Woodthorpe, New Malden, Surrey, Analytical Chemist.
1892. Colquhoun, Ludovic, Dynamite Factory, Modderfontein, Transvaal, Analytical Chemist.
1894. Colquhoun, W., Tapton Close, Tapton House Road, Sheffield, Engineer.
1910. Colson, Prof. Albert, 21, Rue Descartes, Paris, France.
1901. Colwell, J. Kear, Finsbury Town Hall, Rosebery Avenue, E.C., Analytical and Consulting Chemist.
1906. Comber, A. W., Dinwaed, Victoria Avenue, Southend-on-Sea, Manager (Magnesite Works).
1900. Comey, Dr. Arthur M., 424, East 13th Street, Chester, Pa., U.S.A., Technical Chemist.
1911. Comey, Robert H., Wenonah, N.J., U.S.A., Bleacher.
1906. Compton, Miss N. J., Library, University of Nebraska, Lincoln, Neb., U.S.A., Librarian.
1901. Connah, Jas., Laboratory, Custom House, London, E.C., Government Analyst.
1905. Conner, Arthur B., 217, West Boulevard, Detroit, Mich., U.S.A., Chief Chemist (Detroit Chemical Works).
1883. Connor, C. C., 10, College Gardens, Belfast, Ireland, Chemist.
1891. Conradson, Pontus H., Galena Oil Works, Franklin, Pa., U.S.A., Analytical Chemist.
1889. Conroy, Dr. Jas. T., 9, The Serpentine, Grassendale, Liverpool, Chemist.
1887. Constable, W. H., Australian Alum Works, Runcorn, Analytical Chemist.
1908. Conyngham, Wm. Boulton, c/o Benger's Food, Ltd., Manchester, Pharmaceutical Chemist.
1909. Cook, E. Bernard, 23, Cross Street, Finsbury, London, E.C., Manufacturing Chemist.
O.M. Cook, H. J., The Firs, Woodford Green, Essex, Soap Manufacturer.
1903. Cook, Jas. W., London and Provincial Dye Works, Hackney Wick, N.E., Dyer.
1899. Cook, Robt. A., Bleecker Place, New Brunswick, N.J., U.S.A., Chemist.
1898. Cook, Thos. Alex., East London Soap Works, Bow, E., Soapmaker.
1899. Cook, Walter G., 9, Hendon Lane, Finchley, N., Analytical Chemist.
1891. Cooke, Arthur W., c/o Brotherton and Co., Ltd., Holmes Street, Dewsbury Road, Leeds, Analytical Chemist.
1907. Cooke, J. J. Verdin, 9, James Street, Liverpool, Salt Manufacturer.
1904. Cooke, W. Ternent, The University, Adelaide, South Australia, Lecturer in Chemistry.
1910. Coombs, Frank A., Technical College, Sydney, N.S.W., Australia, Lecturer on Tanning.
1910. Cooper, Leonard H., c/o Lever Bros., Ltd., Eastern Avenue, Toronto, Canada, Chemist.
1901. Cooper, T. S., 276, Dickenson Road, Rusholme, Manchester, Calico Printing Chemist.
1891. Cooper, Walter J., The Elms, Lavernock, South Wales, Cement Works Manager.
1890. Corcoran, Bryan, 31, Mark Lane, London, E.C., Chemical Engineer.
1899. Cornelison, Dr. Robt. W., 150, West Cliff Street, Somerville, N.J., U.S.A., Consulting Chemist.
1909. Cornell, Fred, 61, St. Sulpice Street, Montreal, Canada, Chemical Merchant.
1889. Corrie, David, c/o Nobel's Explosives Co., Ltd., Polmont Station, N.B., Technical Chemist.
1894. Coste, J. H., 40, Craven Street, W.C., and (Journals) Utopia, Gloucester Road, Teddington, Analytical Chemist.
1911. Cottrell, Henry, E. P., c/o North Western Cyanamide Co., 40, Eastcheap, London, E.C., Manager.
1906. Coupe, Miles, Rosebank, Thornfield Road, Waterfoot, near Manchester, Chemist.
1898. Courtney, Samuel, Bizerta, Knockdene Park, Belfast, Ireland, Manager.
1894. Cousins, W. J., 17, Temple Chambers, Temple Avenue, E.C., Consulting Chemist and Director.
1909. Coventry, Bernard O., Lahore, Punjab, India, Deputy Commissioner of Forests.
1903. Cowan, A. Wallace, Analytical Chemist.
1906. Cowan, George D., Bridge House, Bridge Road, Millwall, E., Manager, Desilverising Works.
1893. Cowan, W. J., 12, Park Avenue, Wood Green, N., [illegible] Manufacturer.
1910. Cowa[illegible] [illegible] F., Municipal School of Technology, Manchester, Lecturer in Chemistry.
1897. Cowburn, Arthur W., 20, Mount Street, Manchester, Chemical Merchant and Analytical Chemist.
1907. Cowburn, J. Robert, 10, Eastwood Road, South Woodford, Essex, Technical Chemist.
1891. Cowper-Coles, Sherard Osborn, 1 and 2, Old Pye Street, Westminster, S.W., Metallurgical Engineer.
1905. Cox, Harold N., c/o Lalance & Grosjean Mfg. Co., Woodhaven, N.Y., U.S.A., Chemist.
1884. Craig, Geo., Chemical Laboratory, 95, Bath Street, Glasgow, Technical Chemist.
1895. Craig, Dr. Thos. J. I., c/o Peter Spence & Sons, Ltd., Alum Works, Manchester, Chemist.
1908. Craig, Wm. J., 4, Killyon Road, Larkhall Rise, Clapham, S.W., Analytical Chemist.

1911. Crake, Ralph V., British South African Explosives Co., Dynamite Factory, Modderfontein, Transvaal, Chemist.

1901. Crane, Fred. D., 28, Hillside Avenue, Montclair, N.J., U.S.A., Consulting Chemist.

1902. Crane, Jasper E., c/o The Arlington Co., Arlington, N.J., U.S.A., Chemist.

1898. Cranfield, Wm., 11, Avondale Place, Halifax, Yorks, Teacher of Chemistry.

1903. Cranmer, Ridgeway, 170, 88th Street, Bay Ridge, Brooklyn, N.Y., U.S.A., Chemist.

1902. Craven, Alfred B., 18, Edinburgh Road, Upper Armley, Leeds, Analytical Chemist.

1906. Craven, J. A., 119, Moorside, Armley, Leeds, Chemist.

1891. Craven, Jno., The Ark, South Bersted, Bognor, Sussex, Chemist.

1906. Craven, John L., 141, Wilmer Road Heaton, Bradford, Chemist and Salesman

O.M. Crawford, D., Langdale's Chemical Manure Co., Ltd., St. Lawrence, Newcastle-on-Tyne, Manager.

1908. Crawford, Lawrence, Lugar Iron Works, Old Cumnock, Ayrshire, N.B., Analytical Chemist.

1890. Crawshaw, E., 25, Tollington Park, London, N., Dye Merchant.

O.M. Cresswell, C. G., Ermyngarth, Ashtead, Surrey; and 9, Bridge Street, Westminster, S.W., Chemist.

1901. Cribb, Cecil H., 136, Shaftesbury Avenue, London W., Analytical and Consulting Chemist.

1909. Crichton, Charles, Kleinfontein Group C.A., Box 2, Benoni, Transvaal, Assayer.

1908. Crighton, Adam M., Wood Cottage, Middleton, Manchester, Calico Printer's Chemist.

1910. Crighton, David T., Nobel House, 195, West George Street, Glasgow, Buying Manager.

1905. Crighton, W. H., c/o Ore Concentration Co., Ltd., Glebe Road, Kingsland Road, London, N.E., Chemist.

1890. Criper, Wm. R., c/o Messrs. D. Waldie and Co., Konnagar, near Calcutta, India, Manufacturing Chemist.

1908. Crites, Bert O., 1341, East 89th St., N.E., Cleveland, Ohio, U.S.A., Chemist.

1911 Croasdell, Jas. F., "Curhar," Cliffe at Hoo, Kent, Engineer.

1901. Cronquist, G. W., Hyllinge-Grufva, Sweden, Fire Brick Works Manager.

O.M. Crookes Sir Wm., O.M., F.R.S., 7, Kensington Park Gardens, Notting Hill, W., Analytical Chemist.

1896. Crosby, Thos., Llanelly Steelworks, Llanelly, South Wales, Metallurgist.

O.M. Crosfield, A. L., 46, Bidston Road, Oxton, Birkenhead: (Journals) c/o Prof. B. Moore, Biochemical Dept., The University, Liverpool, Analytical Chemist and Assayer.

1896. Crosfield, Capt. G. R., Lodge Lane, Warrington, Soap Manufacturer.

1908. Crosland, Percy F., Dyeing Department, The University, Leeds, Technical Chemist.

1884. Cross, C. F., 4, New Court, Lincoln's Inn, London, W.C., Analytical Chemist.

1894. Crossley, Prof. Arthur W., Pharmaceutical Society, 17, Bloomsbury Square, London, W.C., Professor of Chemistry.

1904. Crossley, T. Linsey, 318, Lagauchetiere Street West, Montreal, Canada, Technical Chemist.

1908. Crossley, Watson, c/o Newlands Bros., 2, St. Dunstan's Hill, London, E.C., Chemist.

1908. Croston, Henry, 583, Leonard Street, Brooklyn, N.Y., U.S.A., Foreman.

1894. Crow, Henry W., Hart's Lane, North Street, Barking, E., Tar Distiller.

1884. Crow, Dr. J. K., Ivydene, Westcombe Park Road, Blackheath, S.E., Technical Chemist.

1883. Crowther, Horace W. The Beeches, West Bromwich, Technical Chemist.

1906. Crowther, R. E., c/o Ferguson Bros., Ltd., Holme Head, Carlisle, Chemist.

1884. Crowther, Walter M., Chemical Works, Gomersal, near Leeds, Manufacturing Chemist.

1884 Crumlee, W. D., 146, Washington Street East Orange, N.J., U.S.A., Analytical Chemist.

1906. Cruser, Dr. Fred. Van D., c/o The Diamond Match Co., Barberton, Ohio, U.S.A., Chemical Engineer.

1902. Crush, E. Hope, Mines de Petrole d'Ain Zeft, Saint Aimé, Oran, Algeria, Technical Chemist.

1892. Cullen, Wm., Dynamite Factory, Modderfontein, Transvaal, Chemist.

1903. Cullen, W. H., The Castner Kellner Alkali Co., Ltd., Wallsend-on-Tyne, Engineer.

1897. Culmann, Dr. J., c/o G. Siegle Co., Rosebank, Staten Is., N.Y., U.S.A., Chemist and Colourist.

1905. Culver, Ralph F., Box 162, Norwood, Mass., U.S.A., Chemist.

1883. Cuming, James, jun., Chemical Works, Yarraville, Melbourne, Australia, Chemical and Fertiliser Manufacturer.

1912. Cuming, Wm. F., c/o Cuming, Smith, and Co. Proprietary, Ltd., Yarraville, Victoria, Australia, Manufacturing Chemist.

1907. Cunningham, James E., Minas Peña del Hierro, Provincia de Huelva, Spain, Analytical Chemist.

O.M. Curphey, W. S., 87, Canfield Gardens, South Hampstead, N.W., Chief Alkali Works Inspector.

1898. Curtis, Marvin, 108, Front Street, San Francisco, Cal., U.S.A., Wine Chemist.

1903. Cushing, Robt. P., Olean, N.Y., U.S.A., Chemist.

1902. Cutbush, Chas. G., 59, Byne Road, Sydenham, Kent, Electrical Engineer.

1899. Cutler, Fred. F., 183, Essex Street, Boston, Mass., U.S.A., Publisher.

1904. Cutts, Henry E., c/o Stillwell and Gladding, 181, Front Street, New York City, U.S.A., Technical Chemist.

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O.M Dacie, J. C., 30, Montserrat Road, Putney, S.W., Soap Manufacturer (retired).

1911. Dager, Herman J., 278, Jarvis Street, Toronto, Canada, Dominion Food Inspector.

1906. Dains, Prof. F. B., Washburn College, Topeka, Kas. U.S.A., Professor of Chemistry.

1897. Dains, Herbert H., c/o J. E. Ferguson, 2, Union Court, London, E.C., Analytical Chemist.

1908. Dale, H. Gordon, Belmore, New Barnet, Herts., Analytical Chemist.

1908. Dalton, Leonard V., 17, Gracechurch Street, London, E.C., Geologist (Petroleum).

1908. Dance, Edward L., 20, Lovaine Place, Newcastle-on-Tyne, Chemist.

1884. Daniell, Louis C., (Journals) Royal Standard Brewery, Tamworth, New South Wales; and (subs.) c/o W. T. Allen and Co., 132, Queen Victoria Street, London, E.C., Brewer.

1904 Danker, Dan. J., 247, Atlantic Avenue, Boston, Mass., U.S.A., Dyestuff and Chemical Merchant.

1903. Dannenbaum, Dr. H., c/o National Ammonia Co., Frankford, Philadelphia, Pa., U.S.A., Secretary and Treasurer.

1885. Darby, Jno. H., Howard Chambers, 155, Norfolk Street, Sheffield, Ironmaster.

O.M. Darling, W. H., 26, Dover Street, Manchester, Analytical Chemist.

1887. Davenport, Dr. B. F., 161, Tremont Street, Boston, Mass., U.S.A., Medico-legal Expert.

1911. David, Edward J., 249, Wood Avenue, Tottenville, Staten Is., N.Y., U.S.A., Chemist and Assayer.

1900. Davidson, Alex., 173, Colinton Road, Edinburgh, Analytical Chemist.

1899. Davidson, Charles, 65, Cadder Street, Pollokshields, Glasgow, Analytical Chemist.

1901. Davidson, G. M., Chicago and N.W. Railroad Shops, P.O. Station E., Chicago, Ill., U.S.A., Chemist.

1883. Davidson, J. E., 40, Percy Gardens, Tynemouth, Chemical Manufacturer.

1891. Davidson, Richard, 133, Victoria Road, Dundee, Oil Merchant's Clerk.

O.M. Davidson, R. Holden, c/o United Alkali Co., Ltd., Ammonia Soda Works, Fleetwood, Manager.

1904. Davidson, Robert, c/o Dalgety and Co., Ltd., 15, Bent Street, Sydney, N.S.W., Australia.
1911. Davidson, Thos. A., 57, Strathyre Avenue, Norbury, S.W., Chemist and Varnish Expert.
1905. Davidson, Dr. Wm. B., City Gas Works, Nechells, Birmingham, Chemist.
1889. Davies, G. W., 8, Spring Hill, Stockport, Chemical Lecturer.
1906. Davies, Harry R., 58, Hamilton Street, Readville, Mass., U.S.A., Chemist.
1898. Davies, Herbert E., The Laboratory, 28, Chapel Street, Liverpool, Analytical Chemist.
1907. Davies, James, 221, Malpas Road, Brockley, London, S.E., Scientific Apparatus Maker.
1912. Davies, Jas. Gordon, c/o Curtis's and Harvey, Ltd., Powder Mills, Tonbridge, Kent, Chemist.
1911. Davies, Jas. H., c/o Lever Bros., Ltd., Royal Liver Building, Liverpool, Chemist.
1896. Davies, Llewellyn J., 103, Bute Road, Cardiff, Analytical and Consulting Chemist.
1886 Davies, M. Lloyd, North American Chemical Co., Bay City, Mich., U.S.A., Alkali Works Manager.
1897. Davies, Saml. H., c/o Rowntree and Co., Ltd., Cocoa Works, York, Research Chemist.
1908. Davies, T. H., c/o John Cox and Co's Successors, Stillhouse Lane, Bedminister, Bristol, Tanner.
O.M. Davis, A. R., 27, Wellington Road, Heaton Chapel, Stockport, Analytical Chemist.
1901. Davis, Bernard F., c/o Percy O. Carr, Mazapil Copper Co., Ltd., Saltillo, Coahuila, Mexico, Metallurgical Engineer.
1902. Davis, Charles B., c/o National Brewers' Academy, 402, West 23rd Street, New York City, U.S.A., Technical Chemist.
1902. Davis, Emerson, 203, Webb Avenue, Detroit, Mich., U.S.A., Chemist.
1908. Davis, G. Keville, 265, Strand, London, W.C., Chemical Engineer.
O.M. Davis, H. W., Government Laboratory, Clement's Inn Passage, Strand, W.C., Analytical Chemist.
1907. Davis, Robt. W., jun., P.O. Box 155, Wyandotte, Mich., U.S.A., Chemist.
1906. Davis, V. P., 221, West Exchange Street, Providence R.I., U.S.A., Chemist.
1897. Davis, Wm. A., 2, Ashgrove Road, Bromley Hill, Kent, Chemist.
1911. Davis, Wm. C., 10, Richmond Hill, Langley, near Birmingham, Chemist.
1900. Daw, Fred W., Duffryn House, Ebbw Vale, Mon., Metallurgical Chemist.
1903. Dawes, Arthur W., 3, Madison Place, Albany N.Y., U.S.A., Chemist.
O.M. Dawson, C. A., 32, Elm Hall Drive, Mossley Hill, Liverpool, Technical Chemist.
1886. Dawson, W. Haywood, British Alizarin Co., Ltd., Silvertown, E., and (Journals), 15, Wrottesley Road, Woolwich, S.E., Technical Chemist.
1901. Day, Dr. David T., U.S. Geological Survey, Washington, D.C., U.S.A., Geologist.
O.M. Deacon, H. Wade, 8, Ullet Road, Liverpool; and (Journals) c/o F. W. Wright, 22, Peel House Lane, Widnes, Alkali Manufacturer.
O.M. Deakin, H T., Dewhurst, Egerton, near Bolton, Dyer.
1911. Dean, Arthur L., Sheffield Scientific School, New Haven, Conn., U.S.A., Assistant Prof. of Industrial Chemistry.
1903. Dean, Harry, Oak Villa, Greenhead Road, Huddersfield, Chemist.
1906. Dean, Harry, Armstrong College, Newcastle-on-Tyne, Demonstrator.
1899. Deane, Leopold M., 21, Station Terrace, Abbey Village, Withnell, near Chorley, Lancs., Analytical and Consulting Chemist.
1905. Dearman, E., c/o The Lavers Manufacturing Co., Ltd., Flora Street, Erskineville, Sydney, N.S.W. Australia, Tar Distiller.
1892. Deaville, B., Beech Avenue, Nottingham, Manufacturing Chemist.
1910. Deby, Bedford H., 29, Oak Hill Road, Nether Edge Sheffield, Metallurgist and Chemist.
1899. De Castro, J. Paul. *See* Castro, J. Paul de.
1902. De Cew, J. A., 615, Canadian Express Building, Montreal, Canada, Chemical Engineer.
1893. De Clerck, Maurice, Heule-lez-Courtrai, Belgium.
1884. Deering, W. H., Chichester Lodge, Babbacombe Road, Torquay, S. Devon, Analytical Chemist.
1900. Deerr, Noel F., Experiment Station, Hawaiian Sugar Planters' Association, Honolulu, H.I., U.S.A., Analytical Chemist.
1902. Deghuée, Dr. Jos. A., 247, Harrison Street, Brooklyn, N.Y., U.S.A., Chemist.
1911. Dehn, Dr. Frank B., Atlas Chemical Works, West Ferry Road, Millwall, E., Chemist (J. B. Lawes and Co., Ltd.).
1901. De Jonge, Cornelius, 36, Doughty Street, Brooklyn, N.Y., U.S.A., Pharmaceutical Chemist.
1893 Delahaye, Philibert, 94, Rue St. Lazare, Paris (IX.), Gas Engineer.
1909 De Laire, Edgar, 47, Quai de Moulineaux, Issy, Seine, France, Industriel.
1908. Delaney, Chas. R., c/o J. S. Young and Co., Ltd., Hanover, Pa., U.S.A., Chemical Engineer.
1901. Delany, Chas., c/o Elliott Bros., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Chemist.
1908. Dellschaft, Dr. F. H., Winnington, Northwich, Cheshire, Manufacturing Chemist.
1910. De Meeus, Etienne, c/o Michelin Tire Co., Milltown, N.J., U.S.A., Chemist.
1888. Dempsey, Geo. C., 165, Market Street, Lowell, Mass., U.S.A., Chemist.
1909. Demuth, Rudolph, 68, Salusbury Road, London, N.W., Manufacturer.
1899. Denham, Wm. S., The United College, St. Andrews, N.B.
1891. Denison, Joseph R., c/o Denison, Preussner, and Co., Valley Dyeworks, Bradford, Yorks, Analytical Chemist.
1911. Dennis, Louis, 26, Clapton Mount, Halifax, Yorks, Works Chemist.
1908. Dennis, Martin, 859, Summer Avenue, Newark, N.J., U.S.A., Manufacturing Chemist.
1907. Dennison, Henry S., South Framingham, Mass., U.S.A., Manufacturer.
1898. Dent, Dr. Frankland, Government Analyst's Dept., Singapore, S.S., Government Analyst.
1912. Depierres, Gaston, The Indestructible Paint Co., King's House, King Street, Cheapside, London, E.C., Managing Director.
1905. Derby, Wallace G., c/o Nichols Copper Co., Laurel Hill, New York City, U.S.A., Assayer.
1901. Devas, Dr. Ernest W., Fairview, Hale Grove, Mill Hill, N.W., Technical Chemist.
1906. Deverell, Louis C., 73, King Charles Road, Surbiton, Chief Chemist.
1908. Dew, Joseph A., Woodside, Windsor Road, Wanstead, Essex, Varnish Manufacturer.
1898. Dewar, Alex. H., c/o The Linoleum Manufacturing Co., Staines, Middlesex, Chemist.
O.M. Dewar, Sir J., F.R.S., 21, Albemarle Street, London, W., Professor of Chemistry and Physics.
1889. Dewey, Fred. P., Lanier Heights, Washington, D.C., U.S.A., Metallurgist.
1904. Dewhirst, J. A., Imperial Chambers, Halifax, Yorks, Analyst.
1909. Dewhirst, Wm. B., 8, Janefield Place, Lylesland, Paisley, N.B., Analytical Chemist.
1891. De Wilde, Prof. P., 1, Quai du Léman, Geneva Switzerland, Professor of Chemistry.
1903. Diamond, Wm., c/o John Bowes and Partners, Ltd., Marley Hill Colliery, Swalwell, R.S.O., Durham, Works Manager.
O.M. Dibdin, W. J., 2, Edinburgh Mansions, Howick Place, S.W., Analytical Chemist.
1902. Dick, Jno., Wharf Road, Cubitt Town, London, E., Manager and Chemist.
1904. Dick, W. D., c/o Hugh Baird and Sons, 29, St. Vincent Place, Glasgow, Analytical Chemist.
1898. Dickenson, F. M., c/o Broken Hill Proprietary Co., 3, Great Winchester Street, London, E.C., Secretary.

1904. Dickenson-Gair, C. J. *See under* Gair.
1902. Dickerman, Prof. Judson C., 650, North Central Avenue, Austin, Chicago, Ill., U.S.A., Chemical Engineer.
1893. Dickerson, E. N., 141, Broadway, New York City, U.S.A., Lawyer.
O.M. Dickinson, A. J., 178, Lewisham High Road, Brockley, S.E., Tar Distiller.
1905. Dickinson, Cyril, Southwark Town Hall, Walworth Road, London, S.E., Analytical Chemist
1898. Dickson, Samuel, 2, Broadway, Westminster, S.W., Analytical Chemist.
1899. Dieckmann, Dr. Otto, 1180, Harrison Avenue, Cincinnati, Ohio, U.S.A., Chemist.
1908. Diekman, Dr. George C., 115, West 68th Street, New York City, U.S.A., Professor of Pharmacy.
1894. Diestel, Wm., 117, Hudson Street, New York City, U.S.A., Dyestuff Importer.
1908. Dill, Colby, Perth Amboy, N.J., U.S.A., Chemist.
1906. Dillon, Fred N., 16, Prospect Street, Fitchburg Mass., U.S.A., Engineer.
1898. Dillon, Wm., Pierremont, Denton Road, Ilkley, Yorks, Oil, Colour, and Varnish Manufacturer.
1911. Dissosway, Thurston N., 23, Vine Street, Brooklyn, N.Y., U.S.A., Chemist.
O.M. Divers, Dr. E., F.R.S., 3 Canning Place, Palace Gate, Kensington, W., Professor of Chemistry.
1903. Divine, Robt. E., 325, McLellan Avenue, Detroit, Mich., U.S.A., Chemist.
1899. Dixon, Fred. W., P.O. Box 43, Jamestown, N.Y., U.S.A., Dyer.
1888. Dixon, Prof. Harold B., F.R.S., Owens' College, Manchester, Professor of Chemistry.
1902. Dixon, Wm. A., 97, Pitt Street, Sydney, N.S.W., Australia, Public Analyst and Assayer.
1909. Dixon, W. H., c/o Bryant and May, Ltd., Fairfield Works, Bow, London, E., Match Manufacturer.
1892. Dobb, Thos., c/o J. T. Dobb and Son., West Bar, Sheffield, Pharmaceutical Chemist.
O.M. Dobbie, J. J., F.R.S., Government Laboratory, Clement's Inn Passage, London, W.C., and (Jnls.), 4, Vicarage Gate, Kensington, W., Director.
O.M. Dobbin, Dr. L., Chemical Laboratory, University, Edinburgh, Professor of Chemistry.
1908. Dobbs, Ernest J., 125, St. Asaph Road, Brockley, London, S.E., Analytical Chemist.
1890. Dodd, A. J., Meadholme, Blackheath Park, S.E., Oil Manufacturer.
1907. Dodd, Arthur, Lyndhurst, Woolwich Road, Belvedere, Kent, Assistant Works Manager.
1889. Dodd, W. Ralph, Burton Grange, Goff's Oak, near Cheshunt, Chemical Works Manager.
1906. Dodds, Thos., c/o Reckitt & Sons, Ltd., and (Journals) 7, The Oval, Garden Village, Hull, Works Manager and Chemist.
1900. Dodge, Dr. Francis D., 291, Henry Street, Brooklyn, N.Y., U.S.A., Chemist.
1911. Dods, Henry, 29, Bath Street, Glasgow, Analytical Chemist.
1906. Dodsworth, Walter A., Journal of Commerce, 32, Broadway, New York City, U.S.A., Editor.
1897. Doerflinger, Wm. F., 52, Beaver Street, New York City, U.S.A., Research Chemist.
1897. Dohme, Dr. Alf. R. L., Messrs. Sharp and Dohme, Baltimore, Md., U.S.A., Manufacturing Chemist.
1905. Dolan, H., Westbourne, Belvoir Road, Lower Walton, Warrington, Chemist.
1897. Dolge, Carl B., Westport, Conn., U.S.A., Manufacturer of Instruments and Antiseptics.
1903. Donald, Dr. Jas. T., 318, Lagauchetière Street West, Montreal, Canada, Consulting Chemist.
1906. Donald, Richard A., 16, King Street West, Toronto, Canada, Wood Distiller.
1900. Donald, Wm., Ridgefield Park, Bergen, Co., N.J., U.S.A., Assayer and Chemist.
1902. Donaldson, Thos., c/o British South African Explosives Co., Ltd., Modderfontein, Transvaal, Chemist.
1905. Donnan, Prof. F. G., Muspratt Laboratory, The University, Liverpool, Professor of Physical Chemistry.
1886. Doolittle, Orrin S., 388, Palisade Avenue, Yonkers, N.Y., U.S.A., Chemist.
1905 Doolittle, Roscoe E., 109, Hillside Avenue, Glen Ridge, N.J., U.S.A., Chemist
1890. Dore, Jas., Copper Works, High Street, Bromley-by-Bow, E., Distiller's Engineer.
1911. Dorée, Dr. Charles, 58, Gore Road, South Hackney, London, N.E., Head of Chemistry Department, Borough Polytechnic.
1896. Doremus, Dr. Chas. A., 55, West 53rd Street, New York City, U.S.A., Professor of Chemistry.
O.M. Dott, D. B., Ravenslea Musselburgh, N.B., Analytical Chemist.
1911. Dougall, Jas. S. N., 305, Manufacturers Street, Montreal, Canada, Varnish Manufacturer.
1897. Douglas, Geo., Farfield Hall, Addingham, Yorks., Dyer.
1891. Douglas, Loudon M., 3, Lauder Road, Edinburgh, Chemical Manufacturer.
1909. Douglas, Robt. P., Prudential Buildings, Nelson Square, Bolton, Chemist.
1884. Douglas, William, Diamond Plantation, Demerara, British Guiana, Chemical Engineer.
1900. Doulton, H. Lewis, Royal Doulton Potteries, Lambeth, S.E., Potter.
1900. Dow, Allan W., 24, East 21st Street, New York City, U.S.A., Chemical Engineer.
1898. Dow, Herbert H., Midland, Mich., U.S.A., Manufacturing Chemist.
1908. Dow, John W., 564, Park Avenue West, Mansfield, Ohio, U.S.A., Manufacturing Chemist.
1905. Dowbiggin, James, Craiglands, Albert Park, Lancaster, Chemist.
1885. Dowson, J. Emerson, 39, Victoria Street, Westminster, S.W., Civil Engineer.
1912. Doxey, Carl W., "Castleberg," Strines, near Stockport, Printworks Chemist.
1901. Doxrud, Christian, Technical School, Christiania, Norway, Professor of Chemical Technology.
1907. Doyle, B. W., 11, Pine Street, Leominster, Mass., U.S.A., Manufacturer.
1911. Drackett, H. R., c/o Standard Explosives, Ltd., Vaudreuil Station, P.Q., Canada, Works Superintendent.
1902. Drake, Bryant S., 5830, Colby Street, Oakland, Cal., U.S.A., Chemist.
1911. Drake, Joseph W. D., Three Mills Distillery, Bromley-by-Bow, London, E., Distillery Brewer.
1886. Dreaper, W. P., 14, Old Queen Street, Westminster, S.W., Consulting Chemist.
O.M. Drew, D., Lower House Print Works, near Burnley, Calico Printer.
1906. Drew, W. Newton, Raincliffe, Ecclesfield, near Sheffield, Chemical Manufacturer.
1896. Drewsen, Dr. Viggo B., 5, Beekman Street, New York City, U.S.A., Wood Pulp and Paper Expert.
O.M. Dreyfus, Dr. C., Clayton Aniline Co., Ltd., Clayton, Manchester, Dye Manufacturer.
1904. Dreyfus, Dr. L. A., Maple Avenue, Rosebank, S.I., N.Y., U.S.A., Chemist.
1893. Dreyfus, S., Highfield, Osborne Road, Levenshulme, Manchester, Chemist.
1899. Dreyfus, Dr. Wm., 57, East 96th Street, New York City, U.S.A., Chemist.
1899. Drobegg, G., 11, Bartlett Street, Brooklyn, N.Y., U.S.A., Superintending Chemist.
1911. Drummond, Geo. D., Canada Iron Corporation, Ltd., Midland, Ont., Canada, Superintendent.
1898. Drummond, Dr. Isaac W., 436, West 22nd Street, New York City, U.S.A., Chemist.
1910. Drury, Chas. Dru, Hendon Gas Works, Sunderland, Engineer.
1899. Ducas, B. P., 25-27, South William Street, New York City, U.S.A., Chemical and Dyestuff Importer.
1907. Ducca, Dr. Wilhelm, c/o India Rubber Co., New Brunswick, N.J., U.S.A., Chemist.
1905. Duché, E., 6, Eastcheap, London, E.C., and (Jnls.) Usines Duché, Vilvorde, Belgium, Merchant.
1909. Duchemin, Réné P., 6, Rue Chanoinesse, Paris IV., France, Chemical Engineer.

1897. Duckham, Alex., Phœnix Wharf, West Ferry Road, Millwall, E., and (Jnls.) Vanbrugh Castle, Blackheath, S.E. Chemical Manufacturer.
1908. Duckworth, G. F., North Bay, Ont., Canada, Works Manager.
1905. Duckworth, Harry S., Garner Printworks and Bleachery, Garnerville, Rockland Co., N.Y., U.S.A., Printworks Chemist.
1887. Dudley, Prof. W. L., Vanderbilt University, Nashville, Tenn., U.S.A., Professor of Chemistry.
1899. Duff, Wm. S., Merrie Lands, Westbury Road, Buckhurst Hill, Essex, Manufacturing Chemist.
1905. Duffus, W. B., 118, Braid Road, Edinburgh, Chemist.
1901. Dufty, Lawrence, "Lynwood," Tom Lane, Nether Green, Sheffield, Analytical Chemist.
1905. Duggan, Edw. J., c/o Warner Chemical Co., 141, Broadway, New York City, U.S.A., Vice-President.
O.M. Duggan, T. R., 60, Foyle Road, Blackheath, S.E., Analytical Chemist.
1898. Duisberg, Dr. Carl, The Bayer Co., Ltd. (Journals) Elberfeld, Germany; (subscriptions) 19, St. Dunstan's Hill, London, E.C., Chemist.
1888. Dukes, T. William, Box 10, Vryheid, South Africa, Merchant.
1906. Duncalfe, Roger, Forge Mills, Bestwood Colliery, Nottingham, Glue Manufacturer.
1889. Duncan, Arthur W., c/o J. Woolley, Sons & Co., Ltd., Victoria Bridge, Manchester, Analytical Chemist.
1909. Duncan, Jas., c/o Steel Bros. & Co., Ltd., 6, Fenchurch Avenue, London, E.C., Merchant.
1909. Duncan, John, c/o Burroughs, Wellcome, & Co., Waterloo, Sydney, N.S.W., Works Manager.
1908. Duncan, Prof. Robert Kennedy, 4715, Wallingford Street, Pittsburgh, Pa., U.S.A., Prof. of Industrial Chemistry.
1904. Duncan, W. W., 19, Upland Road, Watertown, Mass., U.S.A., Chemist (Hood Rubber Co.).
1906. Dunford, Jno. H., Trent Side Bone Works, Nottingham, Assistant Manager.
1898. Dunham, Dr. E. K., 35, East 68th Street, New York City, U.S.A., Professor of Bacteriology and Hygiene.
1905. Dunlop, Harry, 231, St. Vincent Street, Glasgow, Chemist.
1892. Dunn, Fred, 193, Collins Street, Melbourne, Victoria, Australia, Analytical Chemist.
O.M. Dunn, Dr. J. T., 10, Dean Street, Newcastle-on-Tyne, Consulting Chemist.
O.M. Dunn, P., Northern Assurance Buildings, Albert Square, Manchester, Chemical Merchant.
1908. Dünschmann, Dr. Max, c/o Meister, Lucius, und Brüning, Ellesmere Port, Cheshire, Manager.
1901. Dunsford, Geo., Laboratory, Wigan Coal and Iron Co., Ltd., Wigan, Analytical Chemist.
1907. Dunstan, A. E., Technical College, East Ham, E., Head of Chemical Department.
1907. Dupré, F. H., 2, Edinburgh Mansions, Howick Place, S.W., Analytical Chemist.
1907. Dupré, P. V., 2, Edinburgh Mansions, Howick Place, S.W., Analytical Chemist.
1897. Durant, H. T., Dunston Metal Works, Dunston-on-Tyne, Metallurgist.
1905. Durfee, Winthrop C., 516, Atlantic Avenue, Boston, Mass., U.S.A., Manufacturing Chemist.
1897. Durkee, Frank W., Tuft's College, Medford, Mass., U.S.A., Professor of Chemistry.
1911. Durkin, Jos. A., c/o Butterworth Judson Co., Newark, N.J., U.S.A., Chemical Superintendent.
1907. Durrans, Thos. H., 10, Titchfield Terrace, Regent's Park, London, N.W., Chemist.
1899. Duryea, Chester B., 120, 85th Street, Brooklyn, N.Y., U.S.A., Starch Manufacturer.
1906. Dushman, Saul, Faculty of Applied Science, University of Toronto, Canada, Electrochemist.
1891. Dvorkovitz, Dr. P., 45, St. Mary Axe, London, E.C., Technical Chemist.
O.M. Dyer, Dr. B., 17, Great Tower Street, London, E.C., Analytical and Consulting Chemist.
1907. Dyes, Dr. W. A., 32, New Bridge Street, London, E.C.
1911. Dyke, F. Montague, Spital Road, Bromborough, Cheshire, Analytical Chemist.
1911. Dyserinck, Vincent, c/o Dyserinck Zonen, Haarlem, Holland, Oil Dealer.
O.M. Dyson, C. E., Flint, North Wales.
1902. Dyson, George W., 24, Clarkehouse Road, Sheffield, Analyst.
1892. Dyson, Septimus, Nyddcombe, Warlingham, Surrey, Manufacturing Chemist.

E

1905. Eager, Chas. E., 77, Pearl Street, Boston, Mass., U.S.A., Merchant.
1912. Eames, A. Spencer, 176, Tower Bridge Road, London, S.E., Registrar, Leathersellers' Technical College.
1904. Eames, Charles J., 99, Water Street, New York City, U.S.A., Consulting Chemist.
1910. Eardley, J. F., Elmsdale, Broomhall Park, Sheffield, Pharmaceutical Chemist.
O.M. Earp, W. R., Preston Brook, near Warrington, Chemical Manufacturer.
1910. Easterfield, Prof. Thomas H., Victoria College, Wellington, New Zealand, Prof. of Chemistry.
1884. Eastick, C. E., 13, King Edward Street, Whitechapel, E., Sugar Works Manager.
1909. Eastick, J. C. N., 49A, Clapton Common, London, N.E., Analytical Chemist.
O.M. Eastick, J. J., 49A, Clapton Common, London, N.E., Analytical and Consulting Chemist.
1890. Eastlake, A. W., Grosmont, Palace Road, Streatham Hill, S.W., Consulting Petroleum Engineer.
1909. Eastlake, William H., 58, St. George Street, Toronto, Canada, Chemist.
1906. Eaton, B. J., Agricultural Dept., Kuala Lumpur, Federated Malay States, Government Chemist.
1909. Eberlin, Leon W., 11, First Street, Rochester, N.Y., U.S.A., Chemist.
1907. Eckenstein, Thos. C., 19, Huskisson Street, Liverpool, Analytical Chemist.
1892. Eddy, Harrison P., 14, Beacon Street, Boston, Mass., U.S.A., Superintendent.
1885. Edge, Anthony, 79, Milton Street, Readville, Mass., U.S.A., Chemist.
1909. Edge, J. Harold, "Great Marld," Smithills, Bolton, Lancashire, Technical Chemist.
1902. Edison, Thos. Alva, Edison Laboratory, Orange, N.J., U.S.A., Inventor and Manufacturer.
1911. Edmondson, Joseph E., 22, Lonsdale Road, Fallowfield, Manchester, Engineer.
1908. Edmunds, Wm. T., c/o Famentina Development Corporation, Chilecito, Argentina, Assayer.
1911. Edwards, Alfred, The Laboratory, Meadow Lane Gas Works, Leeds, Analytical Chemist.
1909. Edwards, George M., 241, Pine Avenue West, Montreal, Canada, Paintworks Manager.
1902. Edwards, H. Seaton, 19, Park Road, Port Sunlight, Cheshire, Analyst.
1906. Egleson, J. E., c/o General Chemical Co., Camden, N.J., U.S.A., Chemist.
1895. Ehrenfeld, Prof. Chas. H., York Collegiate Institute, York, Pa., U.S.A., Professor of Chemistry.
1896. Ehrhardt, Ernest F., Badische Anilin und Soda Fabrik, Ludwigshafen a/Rhein, Germany, Research Chemist.
1910. Eilsberger, Dr. Ersnt, Deutsche Solvaywerke, Bernburg (Anhalt), Germany, Director.
1910. Eisendrath, David B., c/o B. D. Eisendrath Tanning Co., Racine, Wis., U.S.A., Leather Chemist.
1909. Eisenhart, M. H., c/o Eastman Kodak Co., Kodak Park, Rochester, N.Y., U.S.A., Chemist.
1885. Elborough, T., 59, Mark Lane, London, E.C., Manure Manufacturer.
1901. Elkan, Leo A., c/o Gutmann and Co., 10, West Michigan Street, Chicago, Ill., U.S.A., Tanner.
1901. Elkins, Arthur W., 116, Prospect Street, East Orange, N.J., U.S.A., Civil Engineer.

1910. Ellerton, J. G., c/o Brotherton and Co., Ltd., Wear Tar Works, Sunderland, Chemist.

1911. Elliott, Arthur D., 231, North Broadway, Yonkers, N.Y., U.S.A., Chemist.

1884. Elliott, Dr. A. H., 165, Broadway, New York City, U.S.A., Consulting Engineer and Chemist.

1907. Elliott, George K., c/o Lunkenheimer Co., Cincinnati, Ohio, U.S.A., Chief Chemist.

1896. Elliott, Dr. J. F., c/o Grimwade and Co., 6, Trinity Square, E.C.; and (Journals) O'Connell Street, Sydney, N.S.W., Manufacturing Chemist.

1902. Elliott, Victor G., Chemical Works, Rozelle, Sydney, N.S.W., Australia, Manufacturing Chemist.

1905. Ellis, Carleton, 143, Gates Avenue, Montclair, N.J., U.S.A., Chemical Engineer.

1885. Ellis, C. J., Almorah Villa, Milngavie, near Glasgow, Technical Chemist.

1893. Ellis, E. Victor, 7, Hillside Crescent, Edinburgh, Analytical Chemist.

1894. Ellis, G. Beloe, 70, Chancery Lane, London, W.C., Patent Agent.

1912. Ellis, Percival W., 30, Bramham Gardens, South Kensington, S.W., Tanning Material Merchant.

1910. Ellis, Ridsdale, 38, Selborne Street, Liverpool, Patent Agent.

1910. Ellis, Rowland H., c/o Olympia Oil and Cake Co., Barlby Road, Selby, Yorks., Analytical Chemist.

1891. Ellison, Henry, Northfield, Cleckheaton, Yorks., Manufacturing Chemist.

O.M. Elmore, A. S., 72, Gloucester Terrace, Hyde Park, London, W., Electro-Metallurgist.

1907. Elms, Jas. W., c/o E. I. du Pont de Nemours Powder Co., Haskell, N.J., U.S.A., Chemist.

1907. Elsden, A. Vincent, 88, Elliscombe Road, Charlton, S.E., Analytical Chemist.

1911. Elsdon, Geo. D., City Analyst's Laboratory, Council House, Birmingham, Analyst.

1904. Elson, J. Hugh, Monroe Drug Co., Quincy, Ill., U.S.A., General Manager.

1909. Ely, Benjamin, The Limes, Pye Bridge, near Alfreton, Tar Distiller.

1910. Emanuel, Louis V., 165, Rector Street, Perth Amboy, N.J., U.S.A., Metallurgical Engineer.

1910. Embley, Dr. E. H., 245, Latrobe Street, Melbourne, Victoria, Australia.

1902. Emery, Arthur L., c/o Smith, Emery, and Co., 651, Howard Street, San Francisco, Cal., U.S.A., Chemical Engineer.

1911. Emery, Earle C., c/o American Alkali and Acid Co., 43, Main Street, Bradford, Pa., U.S.A., Superintendent.

1899. Emery, E. G., c/o Pacific Coast Condensed Milk Co., Seattle, Wash., U.S.A., Technical Chemist and Engineer.

1907. Emmons, Frank W., c/o Washburn Crosby Co., Minneapolis, Minn., U.S.A., Chemist.

1907. Emslie, B. Leslie, 1102-1105, Temple Building, Toronto, Canada, Agricultural Chemist.

1894. Enequist, John, 3710, Avenue J., Brooklyn, N.Y., U.S.A., Chemical Engineer.

1904. Englehard, Charles, 30, Church Street, New York City, U.S.A., Platinum Importer.

1895. English, Frank H., 21, Shelley Avenue, Manor Park, E., Analytical Chemist.

1899. Enright, Bernard, 233, North 4th Street, Allentown, Pa., U.S.A., Chemist.

1906. Ephraim, Dr. Julius, II, Königgraetzerstrasse 69, Berlin, S.W., Germany, Chemist and Patent Agent.

1911. Epps, James W., Holland Street, London, S.E., Chemist.

1909. Epstein, Harry M., 274, West 140th Street, New York City, U.S.A., Works Manager.

1907. Erdoes, Julius, 1100, Brook Avenue, New York City, U.S.A., Chemical Engineer.

1902. Erhart, Wm. H., 81, Maiden Lane, New York City, U.S.A., Manufacturing Chemist.

1904. Ermen, Walter F. A., 10, Marsden Street, Manchester, Analytical Chemist.

1905. Ernst, C. A., Ridley Park, Pa., U.S.A., Chemist.

1888. Erskine, J. K., P.O. Box 88, Benoni, Transvaal, Analytical Chemist.

1897. Escher, Paul, 1319, Pearl Street, Alameda, Cal., U.S.A., Chemist.

1881. Esilman, A., 38, Norwood Avenue, Southport, Lancashire, Analytical Chemist.

1910. Esslemont, Alfred S., Royal Exchange Buildings, Hood Street, Newcastle-on-Tyne, Electrical Engineer.

O.M. Estcourt, C., 5, Seymour Grove, Old Trafford, Manchester, Consulting Chemist.

1905. Etheridge, Arthur T., 19, Nithdale Road, Plumstead, S.E., Chemist.

1903. Euler, C. G., 18-20, Platt Street, New York City, U.S.A., Chemical Agent.

1883. Evans, Enoch, 660, Coventry Road, Birmingham, Accountant.

1903. Evans, F. Sparke, Avonside Tannery, Bristol, Tanner

1905. Evans, Geo. A., 832, Yonge Street, Toronto, Canada, Pharmacist.

1905. Evans, Jacob V. R., c/o Badger State Tanning Co., Shelboygan, Wis., U.S.A., Chemist.

1905. Evans, John, 67, Surrey Street, Sheffield, Analytical Chemist.

1908. Evans, Prof. Nevil Norton, Redpath Library, McGill University, Montreal, Canada, Associate Professor of Chemistry.

1889. Evans, R. E., Brewery Street, Stratford-on-Avon, Brewing Chemist.

1903. Evans, Wm. J., 91, Fulton Street, New York City, U.S.A., Manufacturing Chemist.

1898. Evans, Wm. Perceval, Canterbury College, Christchurch, New Zealand, Professor of Chemistry.

1909. Everette, Dr. W. E., 3512, South 11th Street, Tacoma, Wash., U.S.A., Consulting Chemical Engineer.

1910. Everitt, William, Gas Works, Ilkley, Yorks., Manager.

1912. Evers, Norman, City Analyst's Laboratory, Council House, Birmingham, Analytical Chemist.

O.M. Evershed, F., c/o Clarke, Nickolls, and Coombs, Hackney Wick, N.E., Chemist.

1907. Eves, Archie P., 762, East Buchtel Avenue, Akron, Ohio, U.S.A., Chemist.

1894. Ewan, Dr. Thos., c/o Cassel Cyanide Co., Shuna Street, Maryhill, Glasgow, Chemist.

1904. Ewing, Dr. A. Ramsay, 2, York Terrace, Shettleston, Glasgow, Technical Chemist.

1905. Eynon, Lewis, 57, Darenth Road, Stamford Hill, N., Chief Chemist (London Beetroot Sugar Association).

F

1898. Fadé, Louis, c/o Dr. F. Stockhausen, Weissfrauenstrasse 7–9, Frankfort a/M., Germany, Chemist and Director.

1902. Faill, Jas., 52, Robertson Street, Glasgow, Technical Chemist.

1902. Fairchild, Benj. T., P.O. Box 1120, New York City, U.S.A., Manufacturing Chemist.

1911. Fairchild, B. Tappen, 74, Laight Street, New York City, U.S.A., Analytical Chemist.

1910. Fairclough, Brereton, Quarry House, Appleton, near Warrington, Cheshire, Miller.

1911. Fairfield, Thos. J., Drury Lane, Solihull, near Birmingham, Analytical Chemist.

1903. Fairhall, E. J., 96, Blackstock Road, Finsbury Park, N., Chemist.

O.M. Fairley, T., 17, East Pararde, and (communications) 8, Newton Grove, Leeds, Analytical Chemist.

1901. Fairlie, Jas., Camelon Chemical Works, Falkirk, N.B., Manufacturing Chemist.

1908. Fairweather, J. H., 62, Wythes Road, Silvertown, E., Analytical Chemist.

1902. Fairweather, Wallace C., 62, St. Vincent Street, Glasgow, Engineer.

1898. Falding, F. J., 55, Broadway, New York City, U.S.A., Chemical Engineer.

1908. Fales, Harold A., 308, Schermerhorn Street, Brooklyn, N.Y., U.S.A., Secretary (The W. N. Fales Co.).
1911. Farey, Frank O., 614, Canadian Express Building, Montreal, Canada, Chemist.
1910. Farr, Harry, Free Library, Cardiff, Librarian.
O.M. Farrant, N., c/o J. Nicholson and Sons, Chemical Works, Hunslet, Leeds, Chemist.
1897. Farrell, Frank J., 15, Sandown Road, Great Yarmouth, Analytical Chemist.
O.M. Farrington, T., 4, Waterloo Place, Cork, Ireland, Chemical Enginer.
1909. Fath, Dr. Arthur, 97, Lueg Allee, Düsseldorf, Obercassel, Germany, Chemical Engineer.
1908. Favre, A., 21, Mincing Lane, London, E.C., Laboratory Furnisher.
1884. Fawsitt, C. A., Atlas Chemical Works, East Nelson Street Glasgow, Chemical Manufacturer.
1903. Fawsitt, Dr. Chas. E., The University, Sydney, N.S.W., Australia, Prof. of Chemistry.
1903. Feilmann, Dr. M. E., 92, Victoria Street, Westminster, S.W., Chemist.
1892. Feld, Walther, Linz a. Rhein, Germany, Chemical Works Director.
1909. Fell, Wm. M. W., 27, Clarendon Road, Garston, Liverpool, Chemist.
1905. Felton, Herbert, L. 516, East Second Street, South Boston, Mass., U.S.A., Distiller.
1900. Ferguson, Prof. Geo. A., 121, West 42nd Street, New York City, U.S.A., Professor of Analytical Chemistry.
O.M. Ferguson, Prof. J., The University, Glasgow, Professor of Chemistry.
1910. Ferguson, Dr. Robert H., 9, North Munn Avenue, East Orange, N.J., U.S.A., Anæsthetist.
1902. Fergusson, Donald M., c/o Acadia Sugar Refining Co., Halifax, N.S., Canada, Analytical Chemist.
1883. Fergusson, H., Prince Regent's Wharf, Victoria Docks, E., Technical Chemist.
1909. Ferrey, Cuthbert E. C., 28, Temple Grove, Golder's Green, N.W., Analyst.
1905. Fiebiger, Peter, Colour Chemist.
1893. Fiebing, John H., 238, Reed Street, Milwaukee, Wis., U.S.A., Leather Trade Chemist.
1911. Field, Allan J., 1121, Bedford Avenue, Brooklyn, N.Y., U.S.A., Chemist.
1885. Field, E. W., Brewer.
1887. Field, S. S., 3, Glenluce Road, Blackheath, S.E., Manufacturing Chemist.
1891. Field, Wm. Eddington, Martin Street, Elsternwick, Melbourne, Victoria, Chemist.
1900. Fillis, Frank, 106, London Road, Neath, South Wales, Cement Works Manager.
1907. Finch, Archibald M., Vitriol and Chemical Works, Cattedown, Plymouth, Chemical Manufacturer.
1904. Finch, Martin L., Vitriol and Chemical Works, Cattedown, Plymouth, Chairman of Directors.
1910. Findlater, James, c/o Price's Patent Candle Co., Ltd., Bromborough Pool, near Birkenhead, Chief Chemist.
1910. Findley, Albert E., Dept. of Applied Science, The University, Sheffield, Lecturer.
1899. Fingland, Jno. J., Kaslo, B. C., Canada, Analytical Chemist.
1911. Fink, F. W., Spencer Arms, 69th Street and Broadway, New York City, U.S.A., Manufacturing Chemist.
1904. Finn, Cornelius P., Hemsworth Colliery, near Wakefield, Yorks., Technical Chemist.
1903. Fischer, Dr. Carl, 213-215, Water Street, New York City, U.S.A., Chemist.
1903. Fish, Chas. C. R., 439, Boylston Street, Boston, Mass., U.S.A., Chemist.
1905. Fish, Chas. H., Garner Printworks and Bleachery, Wappingers Falls, N.Y., U.S.A., General Manager.
1911. Fish, Charles W., Rose Hill, Rawcliffe Bridge, S.O., Yorks, Chemist and Paper Technologist.
1900. Fisher, Henry, 16, East 96th Street, New York City, U.S.A., Teacher of Chemistry.
1895. Fison, Jno., Messrs. Jas. Fison and Sons, Thetford, Norfolk, Chemical Manufacturer.
1904. Fitch, A. J., 1, Summerlands Mansions, Muswell Hill, N., Brewer's Chemist.
1900. Fitz-Randolph, R.B., State Laboratory of Hygiene, Trenton, N.J., U.S.A., Bacteriologist and Chemist.
1896. Flammer, E., c/o Kraemer und Flammer, Heilbronn a/N., Wurttemburg, Germany, Manufacturing Chemist.
1892. Fleming, J. Arnold, Britannia Pottery, 136, Glebe Street, Glasgow, Potter.
1893. Fletcher, E. Morley, 30, Grosvenor Place, Newcastle on-Tyne, Alkali Works Inspector.
O.M. Fletcher, F. W., c/o Fletcher, Fletcher, and Co., Ltd., Holloway, N., Manufacturing Chemist.
1907. Fletcher, H. T., c/o The Bauxite Refining Co., Hebburn-on-Tyne, Works Manager.
1891. Fletcher, R. Jaques, North Geelong, Victoria, Manufacturing Chemist.
1904. Fletcher, Wm. E., 38B, Hunter Street, Tamaqua, Pa., U.S.A., Chemist.
1912. Flürscheim, Dr. Bernhard J., Rushmoor, Fleet, Hampshire, Research Chemist.
1899. Focht, Louis, 12, Atterbury Avenue, Trenton, N.J., U.S.A., Civil Engineer.
1890. Foden, Alfred, 19, Lancaster Avenue, Sefton Park, Liverpool, Metallurgical Chemist.
1900. Foersterling, Dr. H., c/o Roessler Hasslacher Chem. Co., Perth Amboy, N.J., U.S.A., Chemist.
1900. Fogetti, Lucien, 7001, Narrows Avenue, Brooklyn, N.Y., U.S.A., Chemist.
1901. Folsam, Herbert A., Fairmount, Hyde Park, Mass., U.S.A., Chemical and Dyeware Manufacturer.
1900. Forbes, Eli, Lancaster, Mass., U.S.A., Chemist.
1895. Forbes, Paul R., 15, William Street, New York, City, U.S.A., Chemist and Assayer.
1911. Ford, Edward J., 29, Rue Joseph Claes, St. Giles, Brussels, Chemist.
1893. Ford, J. B., jun., Michigan Alkali Co., Wyandotte, Mich., U.S.A., Secretary and Treasurer.
1889. Ford, Jno. S., Abbey Brewery, Edinburgh, Analyst.
1905. Foregger, Dr. R. von, c/o Roessler & Hasslacher Chemical Co., 100, William Street ; and (Journals) P.O. Box 1999, New York City, U.S.A., Chemist.
1885. Formoy, J. Arthur, Chestham, Grange Road, Sutton, Surrey, Oil Expert.
1904. Forrest, Chas. N., Maurer, N.J., U.S.A., Chemist.
1898. Forrest, J. Kerr, 271, Carlisle Street, St. Kilda, Victoria, Australia, Manufacturing Chemist.
1890. Forrester, A. M., c/o Richmond Guano Co., Richmond, Va., U.S.A., Analytical Chemist.
1905. Forrester, H. A., Fabrica de Productos Quimicos, Acevedo 1710, Palermo, Buenos Ayres, S. America, Chemical Works Manager.
1909. Forshaw, Arthur, c/o John Wright and Co., Ltd., Essex Works, Aston, Birmingham, Works Chemist.
1902. Forstall, Alf. E., 58, William Street, New York City. U.S.A., Consulting Gas Engineer.
1901. Forster, Miss E. L. B., King's College, Strand, London, W.C., Analyst.
1902. Forster, Ferdinand E. P., c/o Messrs. Bass and Co., 19, Guild Street, and (Jnls.) The River House, Burton-on-Trent, Chemist.
1907. Forster, Francis, Tyne Lead Works, Hebburn-on-Tyne, Lead Manufacturer.
1899. Forster, Dr. M. O., F.R.S., Royal College of Science, South Kensington, S.W., Demonstrator of Chemistry.
1884. Forster, Sir Ralph C., Bart., c/o Messrs. Bessler, Waechter, and Co., Salisbury House, Finsbury Circus, London, E.C., Chemical Merchant.
1884. Forth, Henry, Stoke Lacy, Marple, Cheshire, Drysalter.
1907. Forward, Charles C., Dept. of Inland Revenue Laby., 317, Queen Street, Ottawa, Canada, Chemist.
1906. Foster, Robt. K., Church Street, Middle Brighton, Melbourne, Victoria, Pharmaceutical Chemist.
O.M. Foster, R. Le Neve, Fulshaw Cottage, Wilmslow, Cheshire, Manufacturing Chemist.
1888. Foster, Wm., St. Martin's Terrace, Newton Park, Leeds, Manufacturing Chemist.

1906. Foucar, J. Louis, 15, Morden Road, Blackheath, S.E., Chemist.
1891. Fowler, Dr. Gilbert J., Broad Oak, Urmston, near Manchester, Consulting Chemist (Manchester Corporation Rivers Committee).
1898. Fowler, Theo.,V., P.O. Drawer 15, Buffalo, N.Y., U.S.A., Chemical Works Manager.
1909. Fowler, Wm., Glenwood, Bearsden, Glasgow, Chemist.
1896. Fox, A. Stanley, Greycote, Westcliff, Herne Bay, Kent, Chemist (Cotton Powder Co., Ltd.).
1912. Fox, Charles P., 395, Doyle Street, Akron, Ohio, U.S.A., Chemist.
1898. Fox, Jno., Varuna, Grappenhall, Cheshire, Analyst.
1911. Fox, Dr. John J., 6, Alkham Road, Stamford Hill, N., Government Analyst.
1909. Fox, J. J., 19, Blackheath Rise, London, S.E., Managing Director, Tidman and Son, Ltd.
O.M. Fox, T., jun., c/o Fox Bros. and Co., Ltd., Wellington, Somerset, Wool Manufacturer.
1905. France, Edward W., Philadelphia Textile School, Broad and Pine Streets, Philadelphia, Pa., U.S.A., Director.
O.M. Francis, E. G., 29, Matheson Road, West Kensington, W., Glucose Works Manager.
O.M. Francis, G. Bult, The British Drug Houses, Ltd., 22–30, Graham Street, City Road London, N., Wholesale Druggist.
O.M. Francis, W. H., 11, Bramham Gardens, South Kensington, London, S.W., Wholesale Druggist.
1903. Francksen, Dr. Aug., 4803, Garden Street, Bridesburg, Philadelphia, Pa., U.S.A., Chemist.
1906. Frank, Prof. Dr. A., Berlinerstrasse 26, Charlottenburg, Germany, Chemist.
1908. Frank, Dr. Fritz, Markgrafenstrasse 88, Berlin, S.W., 68, Germany, Public Analyst.
1894. Frank, Jerome W., 29, Broadway, New York City, U.S.A., Chemist.
1886. Frankenburg, Isidor, Greengate Rubber Works, Salford, Manchester, India-rubber Manufacturer.
1895. Frankforter, Dr. G. B., University of Minnesota, Minneapolis, Minn., U.S.A., Prof. of Chemistry.
1904. Frankl, A., Clothilde Chemical Works, Nagy Bocskó, Hungary, Chief Manager.
O.M. Frankland, H., Streonshalh, The Crescent, Linthorpe, Middlesbrough, Analytical Chemist.
O.M. Frankland, Prof. P. F., F.R.S., The University, Edgbaston, Birmingham, Professor of Chemistry.
1906. Fraps, Dr. Geo. S., Texas A. & M. College, College Station, Texas, U.S.A., Professor of Chemistry.
1901. Frasch, Hans A., 52, Broadway, New York City, U.S.A., Manager.
1900. Frasch, Herman, Whitehall Building, 17, Battery Place, New York City, U.S.A., Oil Refiner.
1910. Fraser, Arthur, Casilla 1464, Valparaiso, Chile, Analyst.
1904. Fraser, Jas. D., 5, Millbrae Crescent, Langside, Glasgow, Chemist.
1891. Fraser, L. McG., Engineering Works, Dagenham, Essex, Chemical Engineer.
1902. Frederick, Geo. E., jun., P.O. Box 762, New York City, U.S.A., Chemical Merchant.
1885. Freear, H. M., Church Square, Ampthill, Beds., Analytical Chemist.
1900. French, Thos., Chemical Works, Busby, near Glasgow, Chemist.
1911. French, Wm., Heron Chemical and Colour Works, Lancaster, Manager.
1903. Frerichs, Dr. F. W., Herf and Frerichs Chemical Co.: and (Journals), 4320, Washington Boulevard, St. Louis, Mo., U.S.A., Manufacturing Chemist.
1907. Freytag, Henry, c/o O. Isler and Co., 35, Dickinson Street, Manchester, Chemical Merchant.
1886. Fries, Dr. Harold H., 92, Reade Street, New York City, U.S.A., Chemical Manufacturer.
1902. Fries, Jno. W., Winston Salem, N.C., U.S.A., Cotton Manufacturer.
1899. Fritzsche, Karl, c/o Schimmel und Co., Miltitz, near Leipzig, Germany, Manufacturer of Essential Oils.
1884. Frost, Joe, Rocky Mount, Somerset Road, Huddersfield, Manufacturing Chemist.
O.M. Fryer, Dr. A. C., 13, Eaton Crescent, Clifton, Bristol, Alkali Works Inspector.
1904. Fryer, Percival J., 45, Burnaby Gardens, Chiswick, W., Analyst.
1906. Fuchs, Herman C., 744, Westminster Road, Brooklyn, N.Y., U.S.A., Dry Colour Chemist.
1903. Fudge, T., 32, West 38th Street, Bayonne, N.J., U.S.A., Chemist.
1889. Fuerst, Jos. F., 17, Philpot Lane, London, E.C., Chemical and Oil Merchant.
1895. Fuerst, W. F., 87, Nassau Street, New York City, U.S.A., Chemical Merchant.
1894. Fuller, Chas. J. P., 603, Chorley New Road, Horwich, near Bolton, Analytical Chemist.
1902. Fuller, Henry C. Institute of Industrial Research, Washington, D.C., U.S.A., Analytical Chemist.
1899. Fuller, Robt. F., Neston Park, Corsham, Wilts, Rubber Manufacturer.
O.M. Fuller, Wm., Vanbrugh Cottage, Maze Hill, S.E., Chemist.
1898. Fulmer, Elton, Pullman, Wash., U.S.A., Professor of Chemistry.
1909. Fulweiler, W. H., c/o United Gas Improvement Co., Broad and Arch Streets, Philadelphia, Pa., U.S.A., Engineer.
1885. Fyfe, Jno., 7, West George Street, Glasgow, Oil Works Director.

G

O.M. Gabbett, E. R., 64, Vanbrugh Park, Blackheath, S.E.; and (Journals) Prince Regent's Wharf, Silvertown, E., Chemical Engineer.
1909. Gaede, Chas. W., c/o National Silk Dyeing Co., Williamsport, Pa., U.S.A., Silk Dyer.
1906. Gagnebin, Chas. L., 140, Oliver Street, Boston Mass., U.S.A., Dyestuff Merchant.
1907. Gaines, Richard H., 147, Varick Street, New York City, U.S.A., Chemist (Board of Water Supply).
1904. Gair, C. J. Dickenson, 39, Cranston Road, Forest Hill, S.E., Analytical Chemist.
1890. Gajjar, T. K., Techno-chemical Laboratory, Girgaum, Bombay, India, Consulting Chemist.
1884. Gall, Henry, 2, Rue Blanche, Paris, France, Technical Chemist.
1905. Gall, J. B., c/o Callender's Cable and Construction Co., Belvedere, Kent, Chemist.
1911. Gallagher, Jas. L., c/o Lever Bros., Ltd., Sydney, N.S.W., Australia, Chemist.
1897. Galletly, J. C., c/o Newlands and Warner, 135, St. Vincent Street, Glasgow, Rubber Chemist.
1901. Gallivan, Dr. Frank B., 23, Bigelow Street, Cambridge, Mass., U.S.A., Chemist.
1903. Gallum, Albert F., 1000, North Water Street, Milwaukee, Wis., U.S.A., Tanner.
1901. Gallup, W. Arthur, Arnold Printworks, North Adams, Mass., U.S.A., Printer.
1901. Galpin, Harry T., 57, West 57th Street, New York City, U.S.A., Chemist.
1891. Galt, Hugh Allen. Columbia Chemical Co., Barberton, Ohio, U.S.A., Works Manager.
1887. Gamble, Jas. N. (Journals) A. E. Anderson, Procter and Gamble Co., Ivorydale, Ohio, U.S.A., Soap Manufacturer and Oil Refiner.
1894. Gane, Eustace H., 91, Fulton Street, New York City, U.S.A., Pharmaceutical Chemist.
1901. Gansser, Dr. A., c/o Messrs. Lepetit, Dollfus & Gansser, Garessio-Ponte (Provincia di Cuneo), Italy, Chemical Engineer.
1911. Garbutt, C. Durham, 2, Hartington Road, Garston, Liverpool, Analytical Chemist.
1911. Garcia-Robles, L., San Rafael Paper Co., Apartado 469, Mexico City, Mexico, Chemist.
1896. Gardair, Aimé, 51, Rue St. Ferréol, Marseilles, France, Director of Chemical Co.
1910. Gardner, Arthur L., 233, Water Street, Perth Amboy, N.J., U.S.A., Chemical Engineer.
1907. Gardner, Edward, The Tryst, Bigwood Road, Meadway, Hendon, N.W., Metallurgical Chemist.

1909. Gardner, Henry A., Institute of Industrial Research, Washington, D.C., U.S.A., Chemist.

1891. Gardner, Prof. Walter M., Technical College, Bradford, Director of Chemical and Dyeing Departments.

1897. Garfield, Jos., Thackley, Bradford, Yorks, Civil Engineer.

1888. Garibaldi, Joachim A., 21, Church Place, Gibraltar, Chemist.

1910. Garland, Charles S., 57, Garratt Lane, Wandsworth, S.W., Chemist and Works Manager.

1907. Garland, Herbert, P.O. Box 417, Cairo, Egypt, Chemist (Government Laboratory).

1905. Garle, John L., 17, John Street, Bedford Row, London, W.C., Consulting Chemist.

1911. Garner, John H., Sewage Works, Deighton, Huddersfield, Chemist.

1890. Garrett, Dr. F. C., Armstrong College, Newcastle-on-Tyne, Teacher of Science.

1900. Garrigues, W. E., Foot of Lieb Street, Detroit, Mich., U.S.A., Chemical Engineer.

1906. Garroway, Major John, 58, Buchanan Street, Glasgow, Chemist.

1908. Garson, Jas. W., 12, Avenue Road, Crouch End, N., Managing Director, Lewis Berger & Sons, Ltd.

O.M. Garton, Sir Richard, Messrs. Hill, Garton, & Co., Southampton Wharf, Battersea, S.W., Glucose Manufacturer.

1886. Gascoyne, Dr. W. J., 27, South Gay Street, Baltimore, Md., U.S.A., Analytical Chemist.

O.M. Gaskell, Holbrook, Erindale, Frodsham, Cheshire, Alkali Manufacturer.

1902. Gaskell, Holbrook, jun., Hillcroft, Church Road, Woolton, near Liverpool, Engineer.

1908. Gatehouse, Frank B., 3, Lawrence Road, Romford, Essex, Chemist and Technical Journalist.

1912. Gates, Alfred E., c/o Messrs. T. Lye and Sons, Luton, Beds., Works Chemist.

O.M. Gatheral, Geo., 174, Soho Hill, Handsworth, Birmingham.

1906. Gaunt, Percy, Macclesfield Corporation Sewage Works, Prestbury, near Macclesfield, Chemist.

1903. Gaylord, Wallace K., Throop Polytechnic Institute, Pasadena, Cal., U.S.A., Professor of Chemistry.

1912. Gee, Wm. J., 48, Kingsmead Road, Tulse Hill, London, S.W., Chemical Engineer.

1907. Geer, William C., 50, Hawthorne Avenue, Akron, Ohio, U.S.A., Chemist.

1891. Geisler, Dr. Jos. F., New York Mercantile Exchange Building, 6, Harrison Street, New York City, U.S.A.. Consulting Chemist.

1901. Gemmell, G. H., 4, Lindsay Place, George IV. Bridge, Edinburgh, Analytical Chemist.

1907. Gemmell, Wm., Walpole House, Church Street, Teddington, Middlesex, Analytical Chemist.

1903. Genssler, Dr. Otto, c/o Kalle und Co., Biebrich am Rhein, Germany, Chemist.

1901 Gent, Percy W., Trentholme, Misterton, near Gainsboro', Chemist.

1897. Gent, Wm. T., Springfield, Misterton, near Gainsboro', Metallurgical Chemist.

1905. George, J. K., 347, Fifth Avenue, New York City, U.S.A., Manufacturer.

1906. Gerkensmeyer, Henry H., 207, Mississippi Avenue, Joliet, Ill., U.S.A., Chemist.

O.M. Gerland, Dr. B. W., 105, Plantation Street, Accrington, Consulting Chemist.

1908. Gianoli, Guiseppe, Piazza Cordusio, 2, Milano, Italy, Chemical Engineer and Editor (L'Industria).

1911. Gibbings, Walter A., c/o Messrs. Scharff, Oil Mills, Shanghai, China, Works Manager and Chemist.

1903. Gibbings, Wm., Woodside, Halebank, Widnes, Works Manager.

1910. Gibbins, Roland B., 18, Wheeley's Lane, Birmingham, Chemical Manufacturer.

1902. Gibbon, Edw., Belvedere, Park Road, Clydach, R.S.O., Glam., Works Chemist.

1904. Gibbs, A. E., Wyandotte, Mich., U.S.A., Manufacturing Chemist.

1883. Gibbs, D. Cecil, City Soap Works, Wapping, E., Soap Manufacturer.

O.M. Gibbs, Wm. P., The Sulphite Pulp Mills, Hjerpen, Sweden, Analytical Chemist.

O.M. Gibson, Dr. J., Chemical Department, Heriot Watt College, Edinburgh, Chemical Lecturer.

O.M. Gibson, J. M., c/o Buckley Brick and Tile Co., Buckley, *viâ* Chester, Brick and Tile Manufacturer.

1905. Gibson, John, 49, Elizabeth Street, Melbourne, Vic., Australia, Concrete Manufacturer.

1905. Gibson, Wm. F., 18, Cautley Avenue, Clapham Common, S.W., Works Chemist.

1899. Gifford, Wm. E., 408, New Jersey Railroad Avenue, Newark, N.J., U.S.A., Chemist.

1892. Gilbard, J. Francis H., 245, Dalston Lane, Hackney, N.E., Analytical Chemist.

1905. Gilbertson, Isaac H., 33, Broad Street, Rhodes, near Middleton, Lancs., Calico Printer.

1903. Gilby, Joseph W., c/o Robinson Bros., Ltd., Ryders Green, West Bromwich, Staffs, Works Chemist.

O.M. Gilchrist, Percy Carlyle, F.R.S., A.R.S.M., M.Inst.C.E. & M.E., Reform Club, Pall Mall, London, S.W., Metallurgist.

1884. Gilchrist, Peter S., Charlotte, N.C., U.S.A., Chemical Engineer.

1900. Gildersleeve, W. H., Johnson City, Tenn., U.S.A., Chemist.

O.M. Giles, W. B., The Grange, Leyton, Essex, Chemical Manufacturer.

1886. Gill, Dr. Aug. H., Massachusetts Institute of Technology, Boston, Mass., U.S.A., Professor of Technical Analysis.

1909. Gill, John H., 16, Premier Road, Gregory Boulevard, Nottingham, Soapworks Chemist.

1901. Gill, Wm. S., c/o Farquhar and Gill, North of Scotland Colour Works, Aberdeen, Colour and Varnish Manufacturer.

1901. Gilles, Wm. S., The Cottage, Bocking, near Braintree, Essex, Technical Chemist.

1910. Gillett, Horace W., c/o The Aluminium Castings Co., Detroit, Mich., U.S.A., Research Chemist.

1888. Gillman, Gustave, Ferrocarril de Murcia á Granada, Aguilas, Prov. de Murcia, Spain, Civil Engineer.

1891. Gimingham, Edw. A., Croyland, Clapton Common, N., Technical Electrician.

1886. Girdwood. Dr. G. P., 111, University Street, Montreal, Canada, Professor of Chemistry.

1906. Girtin, Thomas, H. L. Raphael's Refinery, 48, Thomas Street, Burdett Road, London, E., Bullion Refiner.

1903. Gladding, Thos. S., 181, Front Street, New York City, U.S.A., Analytical Chemist.

1886. Glaeser, F. A., Carpenters' Road, Stratford, E., Varnish Manufacturer.

1906. Glasel, Dr. Chas. J., 1264, Wisconsin Avenue, Washington, D.C., U.S.A., Tanner.

1889. Glaser, Chas., 22, South Gay Street, Baltimore, Md., U.S.A., Consulting Chemist.

1906. Glass, A. Melville, 291, Camden Road, London, N.W., Patent Agent.

1901. Glegg, Robt., Agricultural Laboratory, Marischal College, Aberdeen, Analytical Chemist.

1894. Glen, Chas., Glengowan Printworks, Caldercruix, N.B., Calico Printer.

1884. Glendinning, H., Winnington House, Northwich, Cheshire, Technical Chemist.

1888. Gloag, Robt. F., Lothian Road, Middlesbrough, Secretary.

O.M. Glover, G. T., 23, Craven Hill Gardens, Lancaster Gate, W., Chemical Works Manager.

1896. Glover, H., 6445, Emlen Street, Germantown, Philadelphia, Pa., U.S.A., Chemical Works Superintendent.

O.M. Glover, William, Albareda 27, Seville, Spain, Technical Chemist.

1911. Gmach, Ludwig T., Kew Bridge Label Works, Chiswick, W., Manufacturer.

1911. Goetschius, John M., c/o General Chemical Co., 25, Broad Street, New York City, U.S.A., Sales Manager.

1907. Goldie, J. H. D., c/o Colonial Sugar Refinery Co., O'Connell Street, Sydney, N.S.W., Chemist.

1898. Golding, Jno., Ashby Road, Kegworth, Derby, Agricultural Chemist.

1909. Goldman, M. Leon, 3226, Elgin Avenue, Walbrook, Md., U.S.A., Chemical Engineer.

1906. Goldschmidt, Dr. Karl, Chemical Works, Essen Ruhr, Germany, Manufacturing Chemist.

O.M. Goldschmidt, Dr. S. A., 11, Broadway, New York City, U.S.A., President (Columbia Chemical Works).

1897. Goldschmiedt, Dr. Guido, Wasagasse 9, Wien IX, Austria, Professor of Chemistry, University of Vienna.

1895. Goldsmith, Byron B., 19, East 74th Street, New York City, U.S.A., Vice-President (American Lead Pencil Co.).

1899. Goldsmith, Dr. Jno. N., 67, Chancery Lane, London, W.C.. Chemist.

1906. Goodall, Wm. Leslie, Finboro' Road, Stowmarket, Suffolk, Works Chemist.

1909. Goodban, Leonard, 43, Addison Gardens, Kensington, London, W., Works Chemist.

1912. Gooderham, J. Leys, 42, Elm Avenue, Toronto, Canada, Chemist.

1906. Goodhue, Leonard H., c/o Boston Rubber Shoe Co., Malden, Mass., U.S.A., Chemist.

1904. Gooding, E. Claude, Willow House, Washford, Somerset, Chemist.

1898. Goodrich, Chas. C., Broad Exchange Building, 25, Broad Street, New York City, U.S.A., Rubber Manufacturer.

1884. Goodwin, C. C., Racefield, St. Margaret's Road, Altrincham, Cheshire, Soapmaker.

1894. Goodwin, Dr. W. L., Library Dept., The School of Mining, Kingston, Canada, Professor of Chemistry.

O.M. Goppelsroeder, Prof. Dr. F., Leimenstrasse 51, Basel, Switzerland, Professor of Chemistry.

1884. Gordon, J. G., Queen Anne's Mansions, Westminster, S.W., Steel Manufacturer.

1897. Gossage, W. Winwood, Soap Works, Widnes, Lancashire, Soap Manufacturer.

1909. Gosse, Abel, 122, Boulevard St. Germain, Paris, France, Engineer (Poulenc Frères).

1904. Gotthelf, August H., Hastings-on-Hudson, N.Y., U.S.A., Chemist.

1890. Goulding, Sir Wm. J., Bart., North Wall, Dublin, Manure Manufacturer.

1903. Govers, Francis X., c/o Borden's Condensed Milk Co., 108, Hudson Street, New York City, U.S.A., Chief Chemist.

O.M. Gowland, Prof. W., 13, Russell Road, Kensington, W., Professor of Metallurgy (Royal School of Mines).

1886. Goyder, G. A., 110, Gawler Place, Adelaide, South Australia, Chemist and Assayer.

1890. Grabfield, Dr. J. P., c/o Morris and Co., Chemical Laboratory, Union Stock Yards, Chicago, Ill., U.S.A., Chemist.

1906. Graesser, Norman H., Argoed Hall, Llangollen, N. Wales, Manufacturing Chemist.

O.M. Graham, C. C., Oriel House, Scarborough, Yorks, and (Journals) H. C. Graham, c/o Blundell, Spence and Co., Ltd., Hull, Technical Chemist.

1883. Grandage, H., Lancaster House, 80, Princess Street, Manchester, Dyer.

1897. Granger, Dr. J. Darnell, 25, All Saints Street, Nottingham, Analytical Chemist.

1905. Grant, Alexander, 13, Kilgraston Road, Edinburgh, Baker.

1896. Graves, Geo. H., c/o General Chemical Co., Bridgeport, Conn., U.S.A., Manufacturing Chemist.

1896. Graves, Walter G., 1950, East 90th Street, Cleveland, Ohio, U.S.A., Chemist.

1884. Gray, G. Watson, 8, Inner Temple, Dale Street, Liverpool, Consulting Chemist and Assayer.

1911. Gray, Dr. G. W., c/o The Texas Co., Houston, Texas, U.S.A., Chairman, Manufacturing Committee.

1910. Gray, H. Le Breton, c/o Eastman Kodak Co., Rochester, N.Y., U.S.A., Superintendent, Film Department.

1907. Gray, Henry M., Broompark, Duffield, Derby, Engineer.

1904. Gray, Jas., P.O. Box 5251, Johannesburg, Transvaal, Chemist.

1901. Gray, J. Campbell, The Cottage, Strines, near Stockport, Printworks Chemist.

1886. Gray, Jno., 3, Victoria Drive, Rock Ferry, near Birkenhead, Technical Chemist.

1903. Gray, Jno. Lathrop, c/o Tide Water Oil Co., East 22nd Street, Bayonne, N.J., U.S.A., Assistant Superintendent (Paraffin Works).

1896. Gray, Prof. Thos., Royal Technical College, Glasgow Professor of Technical Chemistry.

1905. Gray, W. B., Messrs. Lever Bros., Durban, Natal, South Africa, Analytical Chemist.

1903. Gray, Wm. S., 76, William Street, New York City, U.S.A., Chemical Merchant.

1908. Gray, Wm. T., Port Credit, Ontario, Canada, Starch Manufacturer.

1891. Greaves, Wm., c/o The Coppée Co., Ltd., 19 Bishop's Road, Paddington, London, W., Chemical Engineer and Chemist.

1909. Greeff, Robert, jun., 20, Eastcheap, London, E.C., Chemical Merchant.

1894. Greeff, R. W., 20, Eastcheap, London, E.C., and (Journals) Broad Oak, Chislehurst, Chemical Merchant.

O.M. Green, Prof. Arthur G., 19, Cardigan Road, Headingley, and Clothworkers' Department, The University, Leeds, Professor of Dyeing.

1907. Green, Clarence, c/o Nicholson's Raincoat Co., Beaumont Works, St. Albans, Herts., Chemist.

1906. Green, Ernest, 98, Cheadle Road, Cheadle Hulme, Cheshire, Science Teacher.

O.M. Green, H., Hayle Mill, Maidstone, Paper Manufacturer.

O.M. Green, L., Lower Tovil, Maidstone, Paper Manufacturer.

1910. Green, Robert M., 351, Blackburn Road, Accrington, Chemist.

1908. Green, Dr. W. Heber, Chemical Laboratory, The University, Melbourne, Victoria, Lecturer in Chemistry.

O.M. Greenaway, A. J., The Orchard, Chertsey, Surrey, Sub-Editor of Chemical Society's Journal.

1909. Greenhough, George D., 21, Mincing Lane, London, E.C., Chemical Broker.

O.M. Greenway, T. J., c/o Potter's Sulphide Ore Treatment, Ltd., 369, Collins Street, Melbourne, Australia, Metallurgist.

1902. Greenwood, Conrad V., Noyna, Dowhills Road, Blundellsands, Liverpool, Cotton Mill Manager.

1907. Greenwood, Herbert W., c/o E. Ridgway, Calle de Comedias, 1, 2, Plaza del Rey, Cartagena, Spain, Metallurgical Chemist.

O.M. Greenwood, Holmes, Regent House, Hartmann Street, Accrington, Technical Chemist.

1897. Gref, Anthony, 117, Hudson Street, New York City, U.S.A., Patent Lawyer.

1909. Gregory, Cecil H., The Morgan Crucible Co., Ltd., Battersea Works, London, S.W., Crucible Manufacturer.

1907. Gregory, Joshua C., 128, Wellington Street, Glasgow, Analytical and Consulting Chemist.

1912. Gresham, Harold E., County Laboratories, 36, Dansie Street, Liverpool, Analytical Chemist.

1890. Griffin, Jno. R., Kemble Street, Kingsway, W.C., Chemical Apparatus Maker.

1886. Griffin, Martin L., c/o Oxford Paper Co., Rumford, Maine, U.S.A., Manager of Chemical and Electro-Chemical Department.

1909. Griffiths, E., Chemical Department, The University, Sydney, N.S.W., Australia, Demonstrator.

1902. Griffiths, Manfred E., Caizley House, Temple Road, Stowmarket, Suffolk, Explosives Chemist.

1894. Griffiths, Thos., The Cedars, Clapham Common, S.W., Manufacturing Chemist.

1902. Grimwade, Wilfrid R., 335—343, Spencer Street, West Melbourne, Vic., Australia, Manufacturing Chemist.

1900. Grimwood, Robt. G., 43, Leaside Avenue, Muswell Hill, N., Analytical Chemist.

O.M. Grindley, J., Upper North Street, Poplar, London, E., Tar Distiller.

1905. Grip, August E., 495, Columbia Street, Brooklyn, N.Y., U.S.A., Chemical Engineer.

1888. Gripper, Harold, Great Central Railway, Gorton, Manchester, Analytical Chemist.

1909. Grist, John M., c/o Curtis's and Harvey, Ltd., Explosives Works, Cliffe-at-Hoo, Kent, Chemist.

1906. Groenewoud, Sidney H., 36, Grosvenor Road, Highbury, N., Analytical Chemist.

O.M. Grossmann, Dr. J., 157, Plymouth Grove, Manchester, Consulting Chemist and Chemical Engineer.

1896. Grosvenor, Dr. W. M., Chemists' Building, 50, East 41st Street, New York City, U.S.A., Consulting Chemical Engineer.

1909. Grove, Daniel, c/o Messrs. Borthwick and Butler, Solicitors, Inverell, N.S.W., Australia, Newspaper Proprietor.

O.M. Groves, C. E., F.R.S., 352, Kennington Road, London, S.E., Chemist (Thames Conservancy).

1907. Groves, J. Stuart, c/o E. I. du Pont de Nemours Powder Co., Georgetown, S.C., U.S.A., Chemist.

1899. Gudeman, Dr. E., 903, Postal Telegraph Building, Chicago, Ill., U.S.A., Chemist.

1906. Guess, Prof. Geo. A., University of Toronto, Canada, Professor of Metallurgy.

1911. Guild, Edward J., 5, Grove Terrace, Leek, Staffs., Analytical Chemist.

1899. Guild, Frank N., University of Arizona, Tucson, Arizona, U.S.A., Professor of Chemistry.

1909. Gullick, Wm. A., Government Printing Office, Sydney, N.S.W., Government Printer.

1906. Gulline, Percy, Merrimack Manufacturing Co., Lowell, Mass., U.S.A., Printworks Superintendent.

1904. Gundlach, Walter, 249, West 104th Street, New York City, U.S.A., Superintendent of Colour Works.

1905. Gundlich, Dr. Charles, Park Street and Central Avenue, Hackensack, N.J., U.S.A., Technical Chemist.

1903. Gunn, Gilbert, 181, Bury New Road, Heywood, Lancs., Paper Mill Chemist.

1900. Günther, Chas. E., Liebig's Extract of Meat Co., Ltd., Thames House, Queen Street Place, London, E.C., Merchant.

1910. Gunther, C. M., Pyrmont Sugar Refinery, Sydney, N.S.W., Sugar Chemist.

1899. Gutcher, Wm., Singapore Oil Mills, Singapore, S.S., Superintendent Engineer.

1903. Guthrie, Alan, Dept. of Industries, Post Box 112, Madras, India, Leather Chemist.

1901. Guthrie, John M., 199, Ferry Road, Leith, N.B., Analytical Chemist.

1909. Guttmann, Camillo J., 60, Mark Lane, London, E.C., Chemical Engineer.

1903. Guttmann, Dr. Leo F., School of Mining, Queen's University, Kingston, Ont., Canada, Research Chemist.

1912. Guy, Wm. W., 6, Cecil Road, Upton Manor, E., Analytical Chemist.

H

1904. Hacking, D. H., Enfield Soap Works, Clayton-le-Moors, near Accrington, Soap Manufacturer.

1900. Haddock, Arthur G. *See* Haydock.

1887. Hadfield, Sir Robert A., Hecla Works, Sheffield; 28, Hertford Street, Mayfair, London, W., and (Journals) c/o J. E. Mortimer, 220, Newhall Road, Attercliffe, Sheffield, Steel Founder.

1884. Hadkinson, F., Pamphila Oil and Soap Works, Mitylene, Mediterranean, Oil Refiner and Soap Manufacturer.

O.M. Hadkinson, R., Smyrna, Asia Minor, Oil Refiner.

1904. Hadley, Geo., Waterfall Lane, Blackheath, Birmingham, Spelter Works Manager.

1906. Hagen, Dr. Carl, c/o E. I. du Pont de Nemours Powder Co., 20, Bishopsgate, London, E.C., Representative.

1887. Haig, Robert, Dollarfield, Dollar, N.B., Chemical Engineer.

1904. Haigh, B. Wilson, By-Product Coke Oven Dept., Barnsley Main Colliery, Barnsley, Yorks., Chemical Engineer.

1896. Haigh, De Lagnel, 39, Hill Crest, Summit, N.J., U.S.A., Chemist.

1888 Hailes, A. J. de, 15, Red Lion Square, London, W.C., Analytical Chemist.

1910. Hailstone, Harold J., 44, Cordley Street, West Bromwich, Works Chemist.

1889. Haines, Reuben, Haines Street, near Chew Street, Germantown, Philadelphia, Pa., U.S.A., Analytical Chemist.

O.M. Hake, C. Napier, Oriental Club, Hanover Square, London, W., Chemical Adviser.

1903. Halbert, Thos., c/o British South African Explosives Co., Modderfontein, Transvaal, Chemist.

1888. Hale, Edw. P., Endmoor, near Kendal, Analytical Chemist.

1887. Hall, Allan T., c/o Sissons Bros. and Co., Ltd., Hull, Oil Refiner and Varnish Manufacturer.

1905. Hall, Archibald A., Armstrong College, Newcastle-on-Tyne, Demonstrator in Chemistry.

1898. Hall, Clarence A., 18, McPherson Street, Mount Airy, Philadelphia, Pa., U.S.A., Chemist.

O.M. Hall, Edgar, Silver Spur, Queensland, Australia, Technical Chemist.

1909. Hall, Harold, 98, Birkin Avenue, Hyson Green, Nottingham, Analyst.

1902. Hall, Henry, c/o Booth and Co., Irk Vale Works, Middleton, Lancashire, Dyer and Finisher.

1893. Hall, Jas. W., 3, Dixon Terrace, Darlington, Linseed Oil Mills Manager.

1885. Hall, Lt.-Col. Jno. A., Langston, Esquimault Old Road, Victoria, B.C., Canada, Analytical Chemist.

1908. Hall, John S., Manor House, Overseal, Ashby-de-la-Zouch, Chemist.

1896. Hall, S. Godfrey, East London Soap Works, Bow, E., Soap Maker.

1886. Haller, Geo., Sussex House, 52, Leadenhall Street, London, E.C., Chemical Merchant.

1893. Haller, H. Loft, 26, Scale Lane, Hull, Analytical Chemist.

1912. Halliday, McDonald, Oficina, North Lagunas, Iquique, Chile, Analytical Chemist.

1895. Halliwell, Edw., c/o Ribble Joint Committee, 2, Stanley Place, Preston, Chief Inspector.

1900. Hallock, Dr. Albert P., 463, West 159th Street, New York City, U.S.A., Chemist.

1892. Hamaguchi, Gihei, IV., Toyoharacho, Komatsubaratori, Wakayamashi, Japan, Soy Manufacturer.

1897. Hambly, Fred J., Buckingham, Quebec, Canada, Chemist.

1901. Hambuechen, Carl, 217, South Mills Street, Madison, Wis., U.S.A., Consulting Chemical Engineer.

1910. Hamburg, Dr. Max, c/o The British Diamalt Co., Sawbridgeworth, Herts, Chemist and Manager.

1911. Hamilton, David J., 9, Montgomerie Quadrant, Glasgow, W., Oil Refiner and Paint Manufacturer.

1904. Hamilton, Edward H., Virginia Smelting Works, West Norfolk, Va., U.S.A., Manager.

1892. Hamilton Robt., 40, Sefton Terrace, Beeston Hill, Leeds, Analytical Chemist.

1884. Hamilton, Robert, Glengarnock Chemical Co., Ltd., Glengarnock, Ayrshire, Works Manager.

1911. Hammersley, Wm., 70, Winsor Terrace, Beckton, E., Manufacturing Chemist.

1898. Hammersley, W. Stanley, Rue Champbertrand, Sens (Yonne), France, Tanner.

O.M. Hammill, M. J., The Gables, St. Helens, Alkali Manufacturer.

O.M. Hammond, J., Gas Works, Eastbourne, Sussex, Gas Manager.

1906. Hancock, H. Irving, Blue Point, N.Y., U.S.A., Chemist.

1905. Hancock, Thos. J., 4029, North Springfield Avenue, Chicago, Ill., U.S.A., Chemist.

1900. Hancock, Walter C., 10, Upper Chadwell Street, Myddleton Square, London, E.C., Chemist.
1896. Hand, Daniel, 30, Mount Pleasant Avenue, Newark, N.J., U.S.A., Chemist.
1889. Handy, Jas. O., 109, South Graham Street, Pittsburg, Pa., U.S.A., Chemist.
1888. Hanks, Abbot A., 630, Sacramento Street. San Francisco, Cal., U.S.A., Assayer.
1901. Hanna, Charles E., P.O. Box 600, Montreal, Canada, Secretary.
1905. Hanna, W. W., Hotel Majestic, Philadelphia, Pa., U.S.A., Aniline Colour Manufacturer.
1905. Hanson, H. Norman, Field Head, Brighouse, Yorks., Research Assistant.
1908. Hanson, W. G., c/o United States Glue Co., Milwaukee, Wis., U.S.A.
1909. Harbord, F. W., 16, Victoria Street, Westminster, S.W., Metallurgist.
1905. Harcourt, Prof. R., Ontario Agricultural College, Guelph, Ont., Canada, Professor of Chemistry.
1904. Hard, Dr. James M. B., 2A, del Canadá, Colonia de Sta. Julia, Mexico, D.F., Chemist and Pathologist.
1901. Hardcastle, G. Fred., 29. Normanton Road, Leicester, Teacher of Science and Technology.
1894. Harden, Dr. Arthur, F.R.S., 2. Marlborough Road, Richmond, Surrey, Lecturer in Chemistry.
1910. Hardie, Thos., Newcastle and Gateshead Gas Co., Tyneside Road, Newcastle-on-Tyne, Gas Engineer.
1909. Harding, Herbert, 47, Streathbourne Road, Upper Tooting, S.W., Assistant Examiner (H.M. Patent Office).
1908. Hardman, Benj., c/o Kodak, Ltd., Wealdstone, Middlesex, Analytical Chemist.
1900. Hardwick, W. Roscoe, 13, Batavia Buildings, Hackins Hey, Liverpool, Chemist.
1905. Hardy, Chas. H., c/o Reckitt & Sons, Ltd., Hull, Chemist.
1907. Harfeld, Louis E., 7, Belsize Square, London. N.W., Merchant.
1906. Hargreaves, Frank, Hough Green, Widnes, Chemist.
1896. Hargreaves, Jas., May Villa, Peel House Lane, Widnes, Lancashire, Chemical Engineer.
O.M. Hargreaves, Jno., Widnes, Alkali Manufacturer.
1904. Harker, Dr. George, 35, Boulevarde, Petersham, Sydney, N.S.W., Australia, Chemist.
1909. Harland, Robert M., 37, Lombard Street, London, E.C., Analytical Chemist and Assayer.
1893. Harlock, E. B., Newton House, Middlewich, Chemical Manufacturer.
1898. Harman, Edw. A., Gas Works, Huddersfield, Gas Engineer, M.Inst. C.E.
1905. Harper, Dr. Henry W., University of Texas, 2216, Rio Grande Street, Austin, Texas, U.S.A., Professor of Chemistry.
1893. Harris, Arthur, 22, Marsh Gate Lane, Stratford, E., Soap Maker.
1885. Harris, Booth, jun., Beeleigh, Victoria Road, Buckhurst Hill, Essex, Soap Maker.
O.M. Harris, David, F.R.S.E., Lyncombe Mount, Oldfield Road, Bath, Chemical Manufacturer.
1897. Harris, Fred. W., 38, Cochrane Street, Glasgow, Public Analyst.
1907 Harris, John B., Danforth Avenue, Toronto, Canada, Manufacturer of Glues and Fertilisers.
1906. Harris, Jonathan W., c/o Western Electric Co., 463, West Street, New York City, U.S.A., Chemist.
1907. Harris, Thos. E., c/o The Union Acid Co., 17, Cooper Street, Manchester, Chemical Merchant.
1906. Harris, Wm. G., jun., 25 and 31, William Street, Toronto, Canada, Metallurgist.
1905. Harrison, E. F., Langholm, Edgar Road, South Croydon, Analytical Chemist.
1909. Harrison, Edwin D., 86, Harrison Place, Irvington, N.J., U.S.A., Celluloid Manufacturer.
1883. Harrison, G. Herbert, Hagley, Stourbridge, Firebrick Maker.
1892. Harrison, Prof. John B., C.M.G., Government Laboratory, Georgetown, British Guiana, Government Analyst.
1907. Harrison, W., 14, Devonshire Place, Ardwick, Manchester, Chemist.
1898. Harrison, Wm. H., Coimbatore, India, Agricultural Chemist (Government of Madras).
1896. Hart, Bertram, c/o Tennants and Co., Clayton, Manchester, Analyst.
1886. Hart, Bertram H., Rosslyn, High Street. Sidcup, Kent, Analytical Chemist.
O.M. Hart, Dr E., Gayley Hall, Lafayette College, Easton Pa., U.S.A., Professor of Chemistry.
1905. Hart, George Adam, Sewage Engineers' Office, Municipal Buildings, Leeds, Civil Engineer.
1890. Hart, H. W., 5, Cambridge Road. Ansdell, Lytham, Lancashire, Analytical Chemist.
1897. Hart, Wm. Beamont, Manchester Laboratory, 8, Exchange Street, Manchester, Consulting Chemist.
1908. Hartley, Bernard C., 56, Wood View, Manningham, Bradford Analytical Chemist.
1883. Hartley, Joseph, 73, East Street, Stockport Road, Longsight, Manchester, Technical Chemist.
1905. Hartshorne, Wm. D., 40, Pleasant Street, and (Journals), Arlington Mills, Methuen, Mass., U.S.A., Agent.
1901. Hartwell, S. Warren, 120, North Fourth Street, Easton, Pa., U.S.A., Chemist.
1908. Harvey, Arthur J., 88A, East India Dock Road, Poplar, E., Chemist.
1885. Harvey, Ernest W., 36, Arthur Road, Wimbledon Park, London, S.W., A.R.S.M., Engineer.
1891. Harvey, Sidney, South-Eastern Laboratory, Canterbury, Analytical Chemist.
1899. Harvey, Thos. F., 69, North Road, West Bridgford, Nottingham, Analyst (Drug Co.).
1883. Harvey, T. H., Cattedown, Plymouth, Chemical Manufacturer.
1908. Harvey, Wm. Ross, c/o R. Lehmann and Co., Ltd., Peninsular House, Monument Street, London, E.C., Starch Manufacturer.
1903. Hasenclever, Max, Chemische Fabrik Rhenania, Aachen, Prussia, Chemical Manufacturer.
1906. Haskell, Walter F., 234, Bridge Street, Westbrook, Maine, U.S.A., Textile Chemist and Colourist.
1900. Haslwanter, Chas., 447, Spruce Street, Richmond Hill, Long Is., N.Y., U.S.A., Analytical Chemist.
1897. Hasslacher, Jacob, P.O. Box 1999, New York City, U.S.A., President, Roessler-Hasslacher Chemical Co.
1903. Hatschek, Emil, c/o S. Bornett and Co., Ltd., 19, St. Dunstan's Hill, London, E.C., Engineer.
1887. Hatton, Wm. P., c/o W. R. Hatton and Sons, Wormwood Scrubbs, W., Starch Works Manager.
1906. Havercroft, Arthur E., Glenholme, Burton Road, Hornsea, Yorks, Chemist.
1899. Hawdon, H. S., Cleadon, near Sunderland, Manager.
1909. Hawes, Edward, 45, Howard Park Avenue, Toronto, Canada, Manufacturing Chemist.
1895. Hawker, E. W., Gladstone Chambers, Adelaide, South Australia, Metallurgist.
1910. Hawkes, Cornelius A., Dovercourt, Painswick Road, Gloucester, Analytical Chemist.
1902. Hawkins, Clement C., c/o The Texas Co., Port Neches, Texas, U.S.A., Chemist.
1897. Hawkins, Ernest M., Watling Chambers, Canterbury, Analytical Chemist.
1905. Hawkins, Henry, Moyola Villa, Lansdown, Limerick, Ireland, Gas Engineer.
1893. Hawkins, J. Dawson, c/o U. S. Reduction and Refining Co., Colorado Springs, Colo., U.S.A., President and General Manager.
1887. Hawliczek, Josef, c/o United Alkali Co., Sullivan Works, Widnes, Consulting Chemical Expert.
1899. Haworth, Dr. Edw., Ivy Bank, Moughland Lane, Runcorn, Cheshire, Chemist.
1903. Haworth, Herbert, Crown Works, Appley Bridge, near Wigan, Director (Grove Chemical Co.).
1910. Haworth, John, 117, Millhouses Lane, Sheffield, Chemist and Sewage Works Superintendent.
1904. Hawthorn, J. H., Municipal Technical School, Leicester, Head Master.

1895. Hay, Alex. B., Kelvindock Chemical Works, Maryhill, Glasgow, Manufacturing Chemist.

1910. Hay, J. Gordon, 37, Worcester Road, Bootle, Liverpool, Analytical Chemist.

O.M. Haydn-Morris, J., 22 Largo das Fontanhas, Lisbon, Portugal, Technical Chemist.

1900. Haydock, A. G., c/o The Castner-Kellner Alkali Co., Wallsend-on-Tyne, Technical Chemist.

1909. Haydon, James R., 91, Ampthill Road, Aigburth, Liverpool, Works Manager and Chemist.

1894. Haynes, David O., 82, Fulton Street, New York City, U.S.A., Proprietor, "Pharmaceutical Era."

1902. Hays, B. F., c/o E. R. Squibb and Sons, 80, Beekman Street, New York City, U.S.A., Pharmaceutical Chemist.

1906. Hayworth, W. P., Kimberley Lodge, Tufnail Road, East Hill, Dartford, Kent, Chemist.

1905. Hazard, Fred R., P.O. Box 2, Syracuse, N.Y., U.S.A., President (Solvay Process Co.).

1903. Hazen, Chas. R., 258, Prince Albert Avenue, Westmount, Quebec, Canada, Chemist.

1894. Heal, Carlton, Dalston House, Dumfries, N.B., Tanner.

O.M. Heath, R. C., Myton Grange, near Warwick, Chemical Manufacturer.

1905. Heathcote, Henry L., c/o Rudge-Whitworth, Ltd., Coventry, Research Chemist.

1904. Heaton, Noel, 72, Abbey Road, London, N.W., Colour Manufacturer.

1905. Heberlein, Dr. Edw., c/o H. T. Enthoven & Sons, Ltd., 247, Rotherhithe Street, London, S.E., Works Manager.

1889. Hecht, Jos. L., c/o French and Hecht, Davenport, Iowa, U.S.A., Analytical Chemist.

1900. Heckman, J. Conrad, Larkin Soap Manufacturing Co., Seneca Street, Buffalo, N.Y., U.S.A., Chemist.

1885. Hedley, Armorer, Durrant House, Bournemouth, Hants.

1912. Hedley, Dr. Edgar P., c/o Kynoch, Ltd., Umbogintwini, Durban, South Africa, Chemist.

1903. Hegeman, John W., 102, Barbey Street, Brooklyn, N.Y., U.S.A., Chemist.

O.M. Hehner, Otto, 11, Billiter Square, London, E.C., Analytical and Consulting Chemist.

1908. Heilmann, Dr. Ernst, Güstrow, Mecklenburg, Germany, Chemical Manufacturer.

1887. Hellier, E. A., Avonside Varnish Works, St. Philip's Marsh, Bristol, Varnish Manufacturer.

1885. Hellon, Dr. R., 40, New Lowther Street, Whitehaven, Analytical and Consulting Chemist.

1903. Helps, D. H., c/o Reading Gas Co., King's Road, Works, Reading, Engineer and Manager.

1908. Helps, James W., Gas Works, Waddon, Croydon, General Manager, Gas Co.

1898. Hemingway, Frank C. R., 64, Water Street, New York City, U.S.A.

1883. Hemingway, H., 9, Albemarle Mansions, Hampstead, N.W., Chemical Manufacturer.

1903. Hemstreet, George P., Hastings-on-Hudson, N.Y., U.S.A., Mechanical Engineer.

1910. Henderson, Ernest G., c/o Canadian Salt Co., Ltd., Windsor, Ont., Canada, Vice-President and Manager.

1883. Henderson, Prof. G. G., Royal Technical College, George Street, Glasgow, Professor of Chemistry.

1902. Henderson, Prof. Jas. A. Russell, Stranord, West Kilbride, Ayrshire, Professor of Chemistry and Physics.

1900. Henderson, J. Brownlie, Government Analyst's Office, Brisbane, Queensland, Government Analyst.

1894. Henderson, Jos., Eskbank Ironworks, Lithgow, N.S.W., Australia, Blast Furnace Manager.

1894. Henderson, Norman M., Broxburn Lodge, Broxburn, N.B., Oil Works Manager.

O.M. Henderson, W. F., Moorfield, Claremont Gardens, Newcastle-on-Tyne.

1910. Hendey, Alfred E., c/o Powers-Weightman-Rosengarten Co., 145, Front Street, New York City, U.S.A., Chemical Agent.

1893. Hendrick, Jas., Marischal College, Aberdeen, Lecturer on Agricultural Chemistry.

1906. Henius, Dr. Max, 1135—1147, Fullerton Avenue, Chicago, Ill., U.S.A., Secretary, Brewers' School.

1904. Henley, Hon. F. R., 9, Beaufort Gardens, London, S.W., Brewers' Chemist.

1905. Henning, Albert, c/o Hedley and Co., 92, Harrow Road, Leytonstone, N.E., Ester Manufacturer.

1906. Henning, C. I. B., c/o E. I. du Pont de Nemours Powder Co., Haskell, N.J., U.S.A., Chemist.

1894. Henshaw, Sam., Glenthorne, Wolstanton, Stoke-on-Trent Chemical Works Manager.

1911. Henzell, Prof. A. Willoughby, Imperial Provincial College, Chinanfu, Shantung, China, Professor of Science.

1910. Hepburn, Edward, Priory Works, Dartford, Kent, Tanner.

1888. Hepworth-Collins, W., Junior Constitutional Club, Piccadilly, London, W., Civil Engineer.

1906. Herig, Harry W., c/o General Chemical Co., Hudson River Works, Edgewater, N.J., U.S.A., Chemist.

1897. Heriot, T. H. P., Royal Technical College, Glasgow, Lecturer in Sugar Manufacture.

O.M. Herman, W. D., Holm Lea, Rainhill, Lancashire, Glass Works Chemist.

O.M. Heron, John, 110, Fenchurch Street, London, E.C., Brewing Chemist.

1903. Herreshoff, J. B. F., 620, West End Avenue, New York City, U.S.A., Chemical Engineer.

1887. Herriot, Wm. Scott, Clarewood, Thorntonhall, Lanarkshire, Mechanical Engineer.

O.M. Herrmann, R. W., 59, Mark Lane, London, E.C., Chemical Merchant.

1891. Hersam, Ernest A., University of California, Berkeley, Cal., U.S.A., Associate Professor of Metallurgy.

1898. Hersey, Dr. Milton L., P.O. Box 1086, Montreal, Canada, Consulting Chemist.

1903. Herstein, Dr. Bernard, c/o Tariff Board, Treasury Building, Washington, D.C., U.S.A., Technical Chemist.

1906. Herty, Prof. Chas. H., University of N. Carolina, Chapel Hill, N.C., U.S.A., Professor of Chemistry.

1906. Herz, Dr. Albert, Holme Dene, Stafford Avenue, Halifax, Yorks, Chemist.

1885. Hess, Dr. Adolph, Kirkstall Road, Leeds, Chemical Manufacturer.

1907. Hess, Arthur F., c/o A. Hess & Bro., Ltd., Kirkstall Road, Leeds, Oil Distiller.

1904. Hess, H. W., c/o Libbey Glass Co., Toledo, Ohio, U.S.A., Chemist.

1905. Hesse, Dr. Bernhard C., 90, William Street, New York City, U.S.A., Chemist.

1891. Hetherington, Dr. Albert E., Ammonia Soda Works, Fleetwood, Lancashire, Analytical Chemist.

1904. Heurich, Christian, 1307, New Hampshire Avenue N.W., Washington, D.C., U.S.A., Brewer.

1894. Hewitt, A. H., The Green Island Cement Co., Ltd., Hong Kong, China, Engineer.

1910. Hewitt, Arthur, c/o Consumers' Gas Co., 19, Toronto Street, Toronto, Canada, General Manager.

O.M. Hewitt, Dr. D. B., Grove Mount, Davenham, Cheshire, Alkali Manufacturer.

1896. Hewitt, Dr. J. Theo., F.R.S., Clifford House, Bedfont, Middlesex, Lecturer.

1890. Hewlett, John C., 40—42, Charlotte Street, Great Eastern Street, London, E.C., Manufacturing Chemist.

1907. Hewson, Geo. W., Grasmere, Field Terrace, Jarrow-on-Tyne, Analytical Chemist.

1893. Hey, Harry, 2, Ash Terrace, Savile Town, Dewsbury, Dyer.

1894. Heyl, G. Edward, 85, Gracechurch Street, London, E.C., Chemical and Electrical Engineer.

1906. Heys, Charles H., Toronto Arcade, Toronto, Canada, Consulting Chemist.

1901. Hiby, Dr. Walter, c/o The Otto Hilgenstock Coke Oven Co., Ltd., Crigglestone, near Wakefield, Yorks, Chemical Engineer.

1906. Hicking, W. Norton, Queen's Road Works, Nottingham, Lace Dresser.
1906. Hickman, T. Moore, Holmdale, Penn Road, Wolverhampton, Analyst.
1897. Hicks, Edwin F., 4837, Fairmount Avenue, Philadelphia, Pa., U.S.A., Analytical Chemist.
O.M. Higgin, W. H., Hollywood, Lostock, near Bolton-le-Moors, Chemical Manufacturer.
1886. Higgins, C. L., 41, Knowsley Road, Cressington Park, Liverpool, Manufacturing Chemist.
1905. Higgins, Dr. Eric, 12, Elleray Park Road, Wallasey, Cheshire, Chemist.
1905. Higgins, John M., 39, Queen Street, Melbourne, Vic., Australia, Consulting Metallurgist.
1908. Higgins, S. H., Luncarty Bleachfield, Perth, N.B., Chemist and Asst. Manager.
1909. Higson, Frank, 52, Chapel Street, Salford, Manchester, Analytical Chemist.
1909. Higuchi, Ken-ichi, 118, Honmurachō, Azubuku, Tokyo, Japan, Chemical Engineer, Japanese Department of Agriculture and Commerce.
1911. Hilditch, T. P., Sunnyside Villa, Knutsford Road, Grappenhall, Warrington, Research Chemist.
1909. Hill, Arthur E., British P.O., Salonica, Turkey, Technical Chemist.
1903. Hill, Chas. Alex., c/o British Drug Houses, Ltd., 22—30, Graham Street, City Road, N., Chemist.
1897. Hill, Dr. Herbert M., 21, Niagara Street, Buffalo, N.Y., U.S.A., City Chemist.
1907. Hill, James A., 122, Greenway Road, Runcorn, Cheshire, Technical Chemist.
1908. Hill, J. H. F., c/o Broken Hill Proprietary Co., Broken Hill, N.S.W., Australia, Mining Engineer.
O.M. Hill, J. K., 13, Osborne Place, Ibrox, Glasgow, Manufacturing Chemist.
1892. Hill, Sydney, c/o Blundell, Spence, & Co., Ltd., Hull, Analytical Chemist.
1903. Hill, W. Basil, Foss Islands Tannery, York, Tanner.
1902. Hill, Wm. G., jun., c/o Apsley Rubber Co., Hudson, Mass., U.S.A., Chemist.
1898. Hill-Jones, Thos., Invicta Mills, Bow Common Lane, London, E., Manufacturing Chemist.
1894. Hills, Harold F., Commercial Gas Works, Stepney, London, E., Analytical Chemist.
O.M. Hills, W., Oxford Works, Tower Bridge Road, London, S.E., Pharmaceutical Chemist.
1899. Hinchley, J. W., 55, Redcliffe Road, London, S.W., Chemical Engineer.
1904. Hinckley, J. F., 550, East 7th Street, Brooklyn, N.Y., U.S.A., Chemical Engineer.
O.M. Hindle, J. H., 8, Cobham Street, Accrington, Dyeworks Manager.
1909. Hinks, Edward, 16, Southwark Street, London, S.E., Analyst.
1899. Hinks, Percy J., Danger Building Dept., Royal Laboratory, Woolwich Arsenal, S.E., Chemist.
1891. Hinman, Bertrand C., Coventry House, South Place, Finsbury, London, E.C., Metallurgical Chemist.
1909. Hirsch, Fritz, 51, Ferndale Avenue, Wallsend-on-Tyne, Analytical Chemist.
1895. Hirst, H. Reginald, Bank House, Staincliffe, Batley, Yorks, Works Chemist.
1907. Hirt, Wilhelm B., c/o Cuming, Smith, & Co., Ltd., Yarra Junction, Vic., Australia, Analytical Chemist.
1907. Hirtz, Dr. Heinrich, Kühlingsgasse 32, Duisburg, Germany, Chemist.
1896. Hislop, Geo. R., (Journals) Gas Works, (communications) Greenhill House, Underwood Road, Paisley, N.B., Gas Engineer and Manager.
1900. Hobbs, Alex. F., c/o The United States Finishing Co., Box A., North Station, Providence, R.I., U.S.A., Printworks Superintendent.
1900. Hobbs, Dr. Perry L., Western Reserve Medical College, and (Journals) 2047, East 9th Street, Cleveland, Ohio, U.S.A., Professor of Chemistry.
1906. Hobsbaum, Isaac B., Analytical Chemist.
1905. Hobson, Alfred, Dantzic Brewery, Imperial Street, Regent Street, Leeds, Brewer and Wine Manufacturer.
1907. Hochstetter, Robt. W., Oak and Bellevue Avenues, Mount Auburn, Cincinnati, Ohio, U.S.A., Superintendent.
1909. Hodgart, Matthew, Vulcan Works, Paisley, N.B., Engineer.
1894. Hodge, Andrew, Brookfield House, Whaley Bridge, near Stockport, Printworks Chemist.
1890. Hodges, Harry B., Pennsylvania Railroad Station, Seventh Avenue, New York City, U.S.A., Chemical Engineer.
O.M. Hodgkinson, Dr. W. R., 89, Shooters Hill Road, Blackheath, S.E., Professor of Chemistry.
O.M. Hodgson, Chris., 33, Oakdale Road, Nether Edge, Sheffield, Metallurgical Chemist.
1897. Hodgson, Matthew, Ardmore, Church Hill, Wicklow, Ireland, Technical Chemist.
1890. Hodgson, Wm., 66, Deansgate, Manchester, Oil and Colour Broker.
1910. Hodsman, Henry J., 2, Richmond Hill, Langley, nr. Birmingham, Chemist (British Cyanides Co.).
1906. Hogarth, Julius W., The University, Sydney, N.S.W., Australia, Demonstrator of Chemistry.
1886. Hogben, W., Post Office, Port Talbot, South Wales, Chemical Expert (Celluloid, etc.).
O.M. Hogg, T. W., c/o John Spencer and Sons, Newburn Steelworks, Newcastle-on-Tyne, Metallurgical Chemist.
1905. Holcroft, Harold, Parkdale, Wolverhampton, Ironfounder.
1899. Holden, Archie Neill, c/o Hardman and Holden, Ltd., Miles Platting, Manchester, Chemist.
1887. Holden, G. H., Manchester Oxide Co., Ltd., Canal Street, Miles Platting, Manchester, Chemist.
1904. Holden, Norman N., c/o Hardman and Holden, Ltd., Colliery Lane, Clayton, Manchester, Manufacturing Chemist.
1902. Holdsworth, Ernest T., 10, Merton Road, Bradford, Dyer.
1885. Holgate, T. E., 173, Hollins Grove, Darwen, Lancashire, Metallurgist.
1884. Holgate, Thos., 61, Calton Road, Dulwich, S.E., Gas Engineer.
O.M. Holland, Philip, 22, Taviton Street, Gordon Square, London, W.C., Analytical Chemist.
1892. Holland, Philip H., 546, Sherbrooke Street West, Montreal, Canada, Merchant.
1901. Hollick, Herbert, 304, The Robeson, Camden, N.J., U.S.A., Chemical Engineer.
1909. Holliday, F. E., 81, Fulton Street, New York City, U.S.A.
1902. Holliday, Lionel B., Lunnclough Hall, Huddersfield, Chemical Manufacturer.
1896. Hollings, J. Spencer, Vrondeg, near Wrexham, North Wales, Works Manager.
1909. Hollingworth, David V., Gas Offices, Bloom Street, Salford, Gas Works Analyst.
1903. Hollinshead, Peter, The Beeches, Weston Road Runcorn, Cheshire, Chemist.
1904. Holloway, E. G., c/o Jas. S. Kirk and Co., 360, North Water Street, Chicago, Ill., U.S.A., Chemist.
1890. Holloway, G. T., 9—13, Emmett Street, Limehouse, London, E., Analytical and Consulting Chemist.
1883. Holmes, Ellwood, Wyncote, Jesmond Park East, Newcastle-on-Tyne, Colour Manufacturer.
O.M., Holmes, F. G., Thames Tar Works, Lower Road, Northfleet, Kent, Tar and Ammonia Distiller.
1900. Holthouse, Harold B., 12, Melton Grove, West Bridgford, Notts, Chemist.
1902. Holton, Alf. L., Chemical Dept., Gas Works, Bradford Road, Manchester, Chemist.
1892. Holton, E. C., 601, Canal Road, N. W., Cleveland, Ohio, U.S.A., Chemist.
1910. Holzapfel, Dr. J. G., c/o Holzapfels, Ltd., Felling-on-Tyne, Chemist.
1893. Holzapfel, Max, Kenton Lodge, Newcastle-on-Tyne, Manufacturer.
1893. Homfray, D., Midland Agricultural and Dairy College, Kingston, Derby, Analytical Chemist.
1909. Hook, Russell W., 8, Holton Street, West Medford, Mass., U.S.A.

1904. Hooker, A. H., c/o Hooker Electrochemical Co., Niagara Falls, N.Y., U.S.A., Manufacturing Chemist.

O.M. Hooper, E. Grant, 16, Royal Avenue, Sloane Square, S.W., Chemist.

1889. Hooper, Ernest F., c/o Brotherton and Co., Ltd., Wear Tar Works, South Dock, Sunderland, Technical Chemist.

1888. Hope, Jas., The Nickel Co., Kirkintilloch, N.B., Nickel Works Manager.

1904. Hopewell, Fredk., 59, William Street, Montreal, Canada, Manager.

1892. Hopkins, Erastus, Geneva, N.Y., U.S.A., Consulting Chemist.

1905. Hoppenstedt, A. W., c/o Schoellkopf and Co., Perry and Mississippi Streets, Buffalo, N.Y., U.S.A., Chemist.

1911. Hord, Arthur R., 49, Northcote Street, Westgate Road, Newcastle-on-Tyne, Analytical Chemist.

1895. Horne, Dr. W. D., 175, Park Avenue, Yonkers, N.Y., U.S.A., Consulting Chemist.

1904. Hornsey, J. W., 27, William Street, New York City, U.S.A., Chemical Engineer.

1900. Horsfall, Jno., 4, Grange Avenue, Rawtenstall, Manchester, Analytical and Consulting Chemist.

1901. Horton, Edw., jun., 10, Smith Street, Chelsea, S.W., Student.

1906. Hoseason, Jas. H., Sun Buildings, 2, Bridge Street, Manchester, Chemical Manufacturer.

1890. Hoskins, A. Percy, Clonlee, Rosetta Park, Belfast, Ireland, Analytical Chemist.

1899. Hoskins, Wm., 2009, Harris Trust Building, 111, West Monroe Street, Chicago, Ill., U.S.A., Chemist.

1911. Hough, Samuel, c/o Lever Bros., Ltd., Balmain, Sydney, N.S.W., Australia, Chemist.

1899. Houlder, Bertram E., 50, Lady Margaret Road, Southall, Middlesex, Chemist.

1892. Houston, John, 30, Princess Street, Manchester, Drysalter.

O.M. Howard, A. G., Burnt House, Chigwell, Essex, Chemical Manufacturer.

1901. Howard, Bernard F., Firbank, Loughton, Essex, Chemist.

O.M. Howard, D., Devon House, Buckhurst Hill, Essex, Chemical Manufacturer.

1887. Howard, D. Lloyd, City Mills, Stratford, E., Chemical Manufacturer.

1898. Howard, Henry, 36, Amory Street, Brookline, Mass., U.S.A., Chemical Engineer.

1902. Howard, Nelson A., c/o General Chemical Co. of California, 705, Royal Insurance Building, San Francisco, Cal., U.S.A., General Manager.

1904. Howard, T., Elleker House, Onslow Road, Richmond-on-Thames, Chemist.

O.M. Howard, W. D., 11, Cornwall Terrace, Regent's Park, London, N.W., Chemical Manufacturer.

1906. Howe, Chester A., 124, Purchase Street, Boston, Mass., U.S.A., Dyestuff Merchant.

1903. Howe, Jas. Lewis, Washington and Lee University, Lexington, Va., U.S.A., Professor of Chemistry.

1909. Howell, Harry, c/o W. C. Holmes & Co., Whitestone Ironworks, Huddersfield, Chemical Engineer.

1904. Howell, Walter L., Room 314, Custom House, New Orleans, La., U.S.A., Chemist.

1899. Howles, Fred., c/o McDougall Bros., 66—68, Port Street, Manchester, Chemist.

1889. Howorth, F. Wise, 46, Lincoln's Inn Fields, W.C., Technical Chemist and Chartered Patent Agent.

1907. Howroyd, Richard R., c/o Calder Mersey Extract Co., Ltd., Ditton, near Widnes, Chemist.

1909. Howse, Geo. H., 67, Union Street, Smethwick, Birmingham, Paint Manufacturer.

1906. Hoyler, Fritz, 49, Market Street, Perth Amboy, N.J., U.S.A., Chemist.

1896. Hoyte, Percy S., Gas Works, Coxside, Plymouth, Gas Engineer.

1900. Hübner, Julius, Ash Villa, Cheadle Hulme, Cheshire, Director of Dyeing and Papermaking Departments (Municipal School of Technology).

1909. Hudson, Baker, Public Library, Middlesbrough, Librarian.

1899. Hudson, Dr. Edw. J., c/o Pioneer Iron Co., Marquette, Mich., U.S.A., Chemist.

1905. Hudson, O. F., The University, Edgbaston, Birmingham, Lecturer on Metallurgy.

O.M. Hughes, J., 79, Mark Lane, London, E.C., Agricultural Chemist.

1898. Hughes, Raymond M., Miami University, Oxford, Butler Co., Ohio, U.S.A., Professor of Chemistry and Physics.

1908. Hughes, Wm. E., Chemical Laboratory, Messrs. W. Canning and Co., Great Hampton Street, Birmingham, Electro Chemist.

1906. Hulme, Robert B., c/o Phoenix Cotton Oil Co., Memphis, Tenn., U.S.A., Chemical Engineer and Manager.

1909. Hultman, G. H., St. Paulsgatan 31, Stockholm, Sweden, Gas Engineer.

1905. Hulton, H. F. E., 11, Colinette Road, Putney, S.W., Chemist.

1905. Humel, Edward J., Lake Avenue, cor. Edward Street, Lakewood, Cleveland, Ohio, U.S.A., Chemist.

1893. Humfrey, Chas., Hilderstone, Hartford, Cheshire, Alkali Works Manager.

1902. Humphrey, Rich. L., 1001, Harrison Building, Philadelphia, Pa., U.S.A., Civil Engineer.

1903. Humphreys, A. C., 165, Broadway, New York City, and (Jnls.) Stevens Inst. of Technology, Hoboken, N.J., U.S.A., Engineer.

1908. Humphries, Albert E., Coxes Lock Mill, Weybridge, Surrey, Flour Miller.

1912. Humphries, Herbert B. P., 117, Avenell Road, Highbury, N., Consulting Chemist.

O.M. Humphrys, N. H., Gasworks, Salisbury, Wilts., Gas Engineer.

1900. Hunt, Arthur V., 284, New Chester Road, Port Sunlight, Cheshire, Analytical Chemist.

O.M. Hunt, Chas., 17, Victoria Street, Westminster, London, S.W., Civil Engineer.

1909. Hunt, Edwin J., The Grange, Walsall, Staffs., Managing Director, Chance and Hunt, Ltd.

1883. Hunt, J. S., Appleton, Widnes.

1903. Hunt, P. C. Holmes, Metropolitan Gas Co., Flinders Street, Melbourne, Vic., Australia, Gas Engineer.

O.M. Hunt, W., Hampton House, Wood Green, Wednesbury, Staffordshire, Chemical Manufacturer.

1903. Hunter, H. B., Dennery Factory, St. Lucia, West Indies, Sugar Works Manager.

1893. Hunter, Prof. Matthew, Rangoon College, Rangoon, Burmah, Professor of Chemistry.

O.M. Huntington, Prof. A. K., King's College, Strand, London, W.C., Professor of Metallurgy.

1902. Huntly, Geo. N., 14A, Finsbury Square, London, E.C., Analytical and Consulting Chemist.

1904. Huntzinger, Alfred, 119, Avenue Van Becelaere, Boitsfort, Belgium, Chemist and Colourist.

1904. Hurren, F. H., c/o The Rover Co., Ltd., Coventry, Analytical Chemist.

1894. Hurry, E. H., Llanover, Churt, Farnham, Surrey, Mechanical Engineer.

O.M. Huson, C. W., 18, Batavia Buildings, Hackins Hey, Liverpool, Analytical Chemist.

1894. Hutcheson, Jno. F., 39, St. Enoch's Square, Glasgow, Chemical Manufacturer.

1906. Hutchings, W. Maynard, Easedale, Elmfield Road Gosforth, Newcastle-on-Tyne, Metallurgist.

O.M. Hutchinson, C. C., K.C., 3, Harcourt Buildings, Temple, E.C., Barrister-at-Law and Chemical Engineer.

1900. Hutchinson, E. George, Gas Dept., Engineer's Office, Workington, Manager.

O.M. Hutchinson, T. J., Aden House, Manchester Road, Bury, Analytical and Consulting Chemist.

1909. Hutchison, Chas. F., Eastman Kodak Co., Kodak Park, Rochester, N.Y., U.S.A., Photographic Emulsion Maker.

1909. Hütz, Dr. R., 32, India Street, Boston, Mass., U.S.A., Colour Chemist.

O.M. Huxley, Jas. H., c/o Vickers, Son, and Maxim, Ltd., River Don Works, Sheffield, Metallurgical Chemist.

1906. Huyett, Miles C., 1005, Morgan Building, Buffalo, N.Y., U.S.A., Mechanical Engineer.

1897. Hyams, Godfrey M., 312, Sears Building, Boston, Mass., U.S.A., Mines Manager.

1902. Hyde, Austin T., Box 98, Rumford Falls, Maine, U.S.A., Chemical Engineer.

1897. Hyde, B. T. Babbitt, 11, Broadway, New York City, U.S.A., Soap Manufacturer.

1899. Hyde, Fred. S., 215, Schermerhorn Street, Brooklyn, N.Y., U.S.A., Research Chemist.

1899. Hyde, Wm. Grantley, Garden Wharf, Church Road, Battersea, S.W., Assayer.

1901. Hyman, Leonard W., 342, South Pearl Street, Albany, N.Y., U.S.A., Analytical Chemist.

I

1900. Ichioka, Dr. Tajiro, 19, Maruyama, Shinmachi, Hongo, Tokio, Japan, Chemist (Imperial Japanese Navy).

1906. Iddings, Richard P., Arlington Mills, Lawrence, Mass., U.S.A., Chemist.

1885. Idris, T. H. W., M.P., 120, Pratt Street, Camden Town, N.W., Mineral Water Manufacturer.

1909. Imison, C. S., The Cottage, Runcorn, Cheshire, Chemist, United Alkali Co.

1900. Imrie, John, 83, Horndean Road, Firth Park, Sheffield, Producer Gas and By-Products Plant Manager.

1900. Ingalls, Walter R., (Communications) 505, Pearl Street, New York City; and (Journals) Bement Avenue, West New Brighton, Staten Is., N.Y., U.S.A., Mining Engineer and Metallurgist.

1889. Ingle, Dr. Harry, 6, Highfield Terrace, Kingston Road, Leeds, Organic Chemist.

1909. Ingleby, G. W., c/o John L. Seaton & Co., Ltd., Sculcoates, Hull, Director.

1906. Inglis, Dr. Jno. K. H., University of Otago, Dunedin, New Zealand, Professor of Chemistry.

1912. Inglis, Robert J. C., Greenmount, Gravesend, Kent, Analytical Chemist.

1911. Innes, Dr. Alfred G., Fabrique de Soie Artificielle, Tubize, Belgium, Technical Chemist.

1909. Innes, R. Faraday, c/o The British Chrome Tanning Co., St. Andrew's Tannery, Northampton, Chemist.

1910. Irvine, Prof. J. C., Chemical Research Laboratory, The University, St. Andrews, Scotland, Professor of Chemistry.

1884. Irving, J. M., 17A, Dickinson Street, Cooper Street, Manchester, Chemical Merchant.

1911. Irwin, George C., c/o S. H. Johnson and Co., Ltd., Carpenter's Road, Stratford, E., Manager (Engineering Works).

1906. Irwin, John T., Cledford, Middlewich, Cheshire, Manufacturing Chemist.

O.M. Irwin, W., Sunnyside, Papcastle, Cockermouth, Analytical Chemist.

1901. Isakovics, Alois von, Synfleur Scientific Laboratories, Monticello, N.Y., U.S.A., Manufacturing Chemist.

1900. Ittner, Dr. Martin H., c/o Colgate and Co., Jersey City, N.J., U.S.A., Soap and Essential Oil Chemist.

1912. Ivatt, Albert, The Engadine, Histon, Cambridge, Chemist (Foods).

1908. Ives, Herbert, 125, Pearl Street, Boston, Mass., U.S.A., Manager (Dyestuffs, etc.).

J

1890. Jackman, E. J., 60, Belgrave Road, Ilford, Essex, Technical Chemist.

O.M. Jackson, Edward, Raven's Cliff, Oxford Road, Moseley, Birmingham, Alkali Works Inspector.

1904. Jackson, Ernest W., Godrevy, Saltburn, Yorks, Analytical Chemist.

1891. Jackson, F., Smedley Bridge Works, Cheetham, near Manchester, Bleacher and Dyer.

1883. Jackson, Frederick, 14, Cross Street, Manchester, Laboratory Furnisher.

1886. Jackson, John, 98, Dobbie's Loan, Glasgow, Lubricant Manufacturer

1901. Jackson, Percy G., c/o National Boiler Insurance Co., St. Mary's Parsonage, Manchester, Chemist.

1890. Jackson, Saml., 3, Buckingham Gardens, Perambore Barracks, Madras, India, Analytical Chemist.

1902. Jackson, Samuel, c/o Wm. Metcalf, Ltd., Church, near Accrington, Director (Tar Distillery).

1898. Jackson, Thos., Thornton View, Clayton, Manchester, Chemical Manufacturer.

1900. Jackson, Victor G., 21, Frankfort Road, Herne Hill, S.E., Chemist.

1900. Jackson, Dr. W. Hatchett, Radcliffe Library, Oxford, Librarian and Science Tutor (Keble College).

1893. Jackson, Rt. Hon. W. L., F.R.S. *See* Allerton, Rt. Hon. Lord.

1899. Jackson, W. Morton, c/o British Oxygen Co., Ltd., Great Marlborough Street, Manchester, Manager.

O.M. Jackson, W. P., Saxilby, near Lincoln, Chemical Works Manager.

1900. Jacoby, Areli H., c/o American Dyewood Co., 84, William Street, New York City, U.S.A., Chemist.

1897. Jacqué, Maurice, "La Cantabrica," Galdacano, cerca Bilbao, Spain, Chemical Engineer.

1901. Jadhava, Khasherao B., Mehsana, Baroda, India, Collector and District Magistrate.

1900. Jäger, B. M., c/o Geo. Jäger and Sons, 77, Burlington Street, Liverpool, Sugar Chemist.

1886. Jago, Wm., 1, Garden Court, Temple, London, E.C., Barrister-at-Law,

1883. James, E. T., British Alizarin Co., Ltd., Silvertown, Victoria Docks, E., Secretary.

1893. James, Lawrence, S. 32, Hawley Street, Boston, Mass., U.S.A., Gas Inspector.

1905. James, Oscar S., 227, George Street, Toronto, Canada, Analytical Chemist.

1911. Jamieson, R. H., 264, St. Patrick Street, Montreal, Canada, Varnish and Paint Manufacturer.

O.M. Japp, Dr. F. R., F.R.S., The University, Aberdeen, Professor of Chemistry.

1890. Jarmain, Geo. S., Dalton Lodge, Huddersfield, Wool Extractor.

O.M. Jarmay, G., Hartford Lodge, Hartford, Cheshire, Alkali Manufacturer.

1911. Jarrom, Harry G., 41, Wilberforce Road, Hendon, N.W., Managing Director.

1900. Jarvie, Jas., Ferndale, Kenmure Avenue, Bishopbriggs, N.B., Chemist.

1907. Jatar, S. B., 219, Upper Brook Street, C. on M., Manchester, Student.

1910. Jayne, David W., c/o Barrett Manufacturing Co., Frankford, Philadelphia, Pa., U.S.A., Manager.

1908. Jeffery, John H., 10, Daysbrook Road, Streatham Hill, London, S.W., Chemist and Metallurgist.

1892. Jenkin, W. A., 5, Bella Vista, Minas de Rio Tinto, Provincia de Huelva, Spain, Metallurgical Chemist.

1905. Jenkins, Chas. D., 408, Burton Halls, Cambridge, Mass., U.S.A., Chemist.

1894. Jenkins, John H. B., Laboratory, G.E.R. Works, Stratford, E., Analytical Chemist.

1912. Jenkins, Leslie C. W., 31, Eastcombe Avenue, Charlton, Kent, Chemist (Wood Dyeing).

1894. Jenks, Robt. L., Kasauli, Punjab, India, Chemist.

1911. Jennens, John H., 4, Highbridge Road, Wylde Green, nr. Birmingham, Analytical Chemist.

1908. Jennison, George, Derby House, Heaton Chapel, Stockport, Chemist.

1905. Jennison, Jas., Mountfield, London Road, Greenhithe, Kent, Chemist.

1907. Jensen, Chas. W. L., Collins Green Brewery, Newton-le-Willows, Lancashire, Brewer and Maltster.

1904. Jepson, John Elliott, c/o Star Paper Mill Co., Ltd., Feniscowles, near Blackburn, Chemist.

1899. Jerdan, Dr. David S., Temora, Colinton, Midlothian, Chemist (Gelatin Works).

1899. Jessop, Louis V., Holmlea, 23, Woodville Road, Leytonstone, Essex, Chemist.

1904. Jewson, F. T., Earith, near St. Ives, Hunts, Chemist.
1896. Job, Robt., 649, Roslyn Avenue, Westmount, Quebec, Canada, Analytical Chemist.
1906. John, David, Haileybury, Ontario, Canada, Chemist.
1908. Johnson, Arthur, 25, Nursery Street, Pendleton, Manchester, Chemist.
1886. Johnson, A. E., 24, Parkdale, Wolverhampton, Analytical Chemist.
1904. Johnson, Cedric, West House, Hartford, Cheshire, Chemical Engineer.
1891. Johnson, Edmond E., c/o J. and R. Niven, P.O. Box 4022, Johannesburg, Transvaal, Chemical Engineer.
1910. Johnson, E. J., 43—44, National Bank and Loan Building, Watertown, N.Y., U.S.A., Chemist.
1908. Johnson, Dr. Edw. S., c/o Solvay Process Co., and (Journals) 672, Park Avenue, Syracuse, N.Y., U.S.A., Chemist.
1904. Johnson, Dr. F. M. G., 286, Peel Street, Montreal, Canada, Chemist.
1904. Johnson, G. B., 7, Church Street, Liverpool, Wholesale Chemist.
1907. Johnson, H. Finnis, c/o Borax Consolidated, Ltd., 16, Eastcheap, London, E.C., Sales Manager.
1908. Johnson, Horton, 511, West Water Street, Elmira, N.Y., U.S.A., Tanner.
O.M. Johnson, J. E. J., 133, Earlham Grove, Forest Gate, E., Manufacturing Chemist.
1895. Johnson, Jesse F., P.O. Box 94, St. Anne de Bellevue, Quebec, Canada, Chemical Engineer.
1900. Johnson, John, c/o John Johnson and Co., 37th Street, and Second Avenue Brooklyn, N.Y., U.S.A., Chemical Engineer.
1900. Johnson, Jno. W. H., York House, Thornhill, Dewsbury, and (Journals) West Riding Rivers Board, Wakefield, Yorks, Chemist.
1906. Johnson, Oliver L., c/o The Aspinook Co., Jewett City, Conn., U.S.A., Dye Works Manager.
1904. Johnson, S. Hearon, 7, Church Street, Liverpool, Wholesale Chemist.
1895. Johnston, Alex. R., 18, Percy Street, Ibrox, Glasgow, Analytical Chemist.
1906. Johnston, A. McA., Box 108, Germiston, Transvaal, Metallurgical Chemist.
1894. Johnston, G. Lawson. *See* Lawson-Johnston, G.
1904. Johnston, J. H., 8, Leopold Road, Wimbledon, S.W., Chemist and Bacteriologist.
1904. Johnston, Thos. J., 4, Garrioch Drive, Maryhill, Glasgow, Chemist.
1890. Johnston, Wm. A., The S.S. White Dental Manufacturing Co., Princess Bay, Staten Island, N.Y., U.S.A., Dental Enamel Manufacturer.
1894. Johnston, W. E. Lawson. *See* Lawson-Johnston, W.E.
O.M. Johnston, Wm. G., Anchor Chemical Works, 1005, Garngad Road, Glasgow, Technical Chemist.
O.M. Johnstone, Jas., Shawfield Works, Rutherglen, Glasgow, Technical Chemist.
1905. Johnstone, J. Swanston, Natal Distilleries Co., Bond Street, Durban, Natal, Distiller.
1903. Johnstone, S. J., 15, Springfield Road, New Southgate, N., Research Chemist.
1907. Jolliffe, Ernest H., Technical High School, 149, College Street, Toronto, Canada, Works Chemist.
1905. Jolliffe, Frank, 27, Riseldine Road, Honor Oak Park, S.E., Chemist.
1912. Jone, Hugo, 752, Broadway, Brooklyn, N.J., U.S.A., Chemist.
1908. Jones, Andrew C., c/o The Parker Foundry Co., Ltd., Montreal, Canada, Mechanical Contractor.
1909. Jones, Arthur, c/o Grout & Co., Ltd., Silk Crape Works, Great Yarmouth, Technical Chemist.
1904. Jones, Arthur B., 981, Central Avenue, Plainfield, N.J., U.S.A., Superintendent.
1912. Jones, B. Vaughan, P.O. Box 27, Petersburg, Va., U.S.A., Chemist and Manufacturer.
1902. Jones, David R., Triton Chemical Works, Upper Clapton, London, N.E., Chemical Engineer.
1908. Jones, D. Trevor, 7, Drury Lane, Normanton, Yorks., Works Chemist.
1911. Jones, Edgar D., 3, Neville Road, Waterloo, near Liverpool, Analytical Chemist.
1912. Jones, E. Gabriel, Public Analyst's Laboratories, 36, Dansie Street, Liverpool, Assistant Public Analyst for Liverpool.
1910. Jones, E. Protheroe, The Golden Horseshoe Estates Co., Salisbury House, London Wall, London, E.C., Secretary.
1902. Jones, E. Strangways, Sulphide Corporation, Ltd., Cockle Creek, N.S.W., Australia, Metallurgical Chemist.
1909. Jones, E. Willis, 22, Coleshill Terrace, Llanelly, South Wales, Chemical Manufacturer.
O.M. Jones, E. W. T., 10, Victoria Street, Wolverhampton, Analytical Chemist.
1897. Jones, Fred. W., 39, Pembury Road, Clapton, N.E., Technical Chemist.
1896. Jones, G. Cecil, 41, London Road, Forest Hill, S.E., Consulting Chemist.
1905. Jones, Harold, Morro Velho, Villa Nova de Lima, Minas Geraes, Brazil, Analyst and Assayer.
O.M. Jones, H. Chapman, Imperial College of Science and Technology, South Kensington, S.W., Lecturer in Photography.
1907. Jones, Henry Williams, Westbourne, Gravelly Hill, Birmingham, Analytical Chemist.
1893. Jones, Herbert. *See* Sefton-Jones, H.
1901. Jones, Herbert J., 40, Reginald Road, Forest Gate, E., Chemist.
1910. Jones, Ivor R., 54, Atlantic Chambers, Manchester, Chemical Merchant.
1905. Jones, J. E. Stacey, 92, Little Park Street, Coventry, Consulting Chemist and Technical Metallurgist.
1911. Jones, J. Herbert, 7, Kitchener Drive, Orrell Park, Liverpool, Mechanical and Electrical Engineer.
1904. Jones, J. Shirley, Moscow, Idaho, U.S.A., Chemist.
1894. Jones, M. W., Stonebeck Brislington, Bristol, Manager (Oil and Colour Works).
1887. Jones, T. Tolley, Australian Explosives and Chemical Co., Ltd., 135, William Street, Melbourne, Victoria, Australia, Explosives Manufacturer.
O.M. Jones, Walter Norris, Lancashire Metal Works, Widnes, Technical Chemist.
1903. Jones, Wm. App, c/o Boston Artificial Leather Co., Metropolitan Building, New York City, U.S.A., Chemist.
1905. Jones, W. Ellis, 80, Arundel Avenue, Liverpool, Sugar Refiner.
1908. Joselin, Percy H., 81, Bennerley Road, New Wandsworth, S.W., Chemist.
1905. Joseph, A. F., Ceylon Technical College, Colombo, Ceylon, and (Journals) 209, Harlesden Road, London, N.W., Lecturer on Chemistry.
1900. Josephson, Edgar, c/o Pantazote Leather Co., Passaic, N.J., U.S.A.
1906. Joshua, Dr. Walter P., c/o Cordoba Copper Co., Ltd., Cerro Muriano, nr. Cordoba, Spain, Chemist.
1891. Joslin, Omar T., 3223, Spring Grove Avenue, Cincinnati, Ohio, U.S.A., Chemical Engineer.
1887. Jouët, Dr. C. H., 238, East 2nd Avenue, Roselle Union Co., N.J., U.S.A., Technical Chemist.
1889. Journaud, Louis, Pont Evêque (Isère), France, Technical Chemist.
1910. Jouve, Adolphe, 1, Boulevard St. Germain, Paris, France, Technical Chemist.
1904. Jowett, Dr. H. A. D., Phœnix Mills, Dartford, Kent, Research Chemist.
1903. Joyce, Clarence M., P.O. Box 23, Arlington, N.J., U.S.A., Chemist.
1887. Jürgensen, Dr. Rolof, Nerndagasse 14, Prag-Weinberge, Austria, Chemist.
O.M. Justice, Philip M., 55–56, Chancery Lane, London, W.C., Patent Agent.

K

1896. Kalbfleisch, Franklin H., 31, Union Square West, New York City, U.S.A., Chemical Manufacturer.
1908. Kalenski, Edmund, The Argyll Club, 52, Russell Square, London, W.C., Chemist.

1908. Kaliski, Dr. Maximilian S., 118, West 119th Street, New York City, U.S.A., Technical Chemist.

1881. Kalle, Dr. Wm., Biebrich-am-Rhein, Germany, Colour Manufacturer.

1901. Kauder, Dr. E., c/o Merck and Co., Rahway, N.J., U.S.A., Chemist.

1903. Kauffman, Milton H., American Smelting and Refining Co., Denver, Colo., U.S.A., Chemist.

1910. Kaufmann, George von, Solotwina, Ost-Galizien, Austria, and (Journals) Collinson House, Mill Hill School, N.W., Director (Austrian Petroleum Co.).

1892. Kaufmann, Dr. Herbert M., c/o Mutual Chemical Co., Jersey City, N.J., U.S.A., Chemist.

1910. Kaufmann, Dr. W. P., c/o J. J. McLaughlin, Ltd., 145—155, Sherbourne Street, Toronto, Canada, Manufacturing Chemist.

1904. Kaus, Dr. Emil, c/o Roessler and Hasslacher Chemical Co., Perth Amboy, N.J., U.S.A., Chemist.

1904. Kawai, I., 54, Shirokano, Shidamachi, Shiba, Tokyo, Japan, Chemist (Camphor Monopoly).

1885. Kawakita, Prof. Michitada, Imperial Engineering College, Tokio, Japan, Professor of Applied Chemistry.

O.M. Kay, Wm. E., 319, The Cliff, Broughton Park, Manchester, Printworks Chemist.

1910. Kaye, Henry R., c/o Cuming, Smith, & Co., Port Melbourne, Vic., Australia, Analytical Chemist.

1904. Kaye, Thos., 26, Rose Crescent, Perth, Scotland, Analytical Chemist.

1884. Keane, Dr. Chas. A., Sir John Cass Technical Institute, Jewry Street, Aldgate, E.C., Principal.

O.M. Kearns, H. W., Baxenden, near Accrington, Dyer.

1897. Kearns, Jno. S., Cowpe Mills, Waterfoot, near Manchester, Chemist and Dyer.

1894. Kebler, Lyman F., 1322, Park Road, Washington, D.C., U.S.A., Chief of Drug Laboratory, Department of Agriculture.

1908. Keeble, A. J., Wereham Hall, Stoke Ferry, Norfolk, Land Owner.

1910. Keeler, Warren J., 214, Main Street, New Britain, Conn., U.S.A., Analytical Chemist.

1911. Keenan, Thomas J., 117, East 24th Street, New York City, U.S.A., Paper Chemist.

1908. Keiller, P. A., c/o Colombo Commercial Co., Ltd., Colombo, Ceylon, Agricultural Analyst.

1910. Keillor, John, Hamilton Gas Light Co., Hamilton, Canada, Gas Engineer.

1886. Keiser, Prof. E. H., Washington University, St. Louis, Mo., U.S.A., Professor of Chemistry.

1908. Keith, Jas. W., c/o C. Tennant and Co., Ltd., Carnoustie, Forfarshire, Analytical Chemist.

1907. Keller, Dr. Edward, P.O. Box 363, Perth Amboy, N.J., U.S.A., Chemist and Metallurgist.

1905. Keller, Robt. J., 88, Broad Street, Boston, Mass., U.S.A., Dyestuff and Chemical Merchant.

1885. Kellner, Dr. Wm., 135, Victoria Road, Old Charlton, S.E., Chemist to War Department.

1908. Kellogg, H. W., c/o National Electrolytic Co., Niagara Falls, N.Y., U.S.A., General Manager.

1909. Kelso, Jas. A., c/o Canada Cement Co., Exshaw Alta, Canada, Chemist.

1910. Kemmerich, Dr. Wm. E., 47, Zasius-strasse, Freiburg i/B., Germany, Chemist.

1907. Kendall, G. F., Chemical Works, Stratford-on-Avon, Chemical Manufacturer.

1911. Kendall, George R., McGill University College, Vancouver, B.C., Canada, Lecturer in Chemistry.

1901. Kennedy, Alex., Kenmill House, Bothwell, N.B., Rosin Distiller.

1903. Kenyon, Percy S., Park House, Cheadle Hulme, Cheshire, Drysalter.

1889. Kenyon, Thos., The Shrubbery, Hilton Park, Prestwich, near Manchester, Manufacturing Chemist.

1906. Kepner, S. H., 22, Tenth Street, Long Island City, N.Y., U.S.A., Superintendent.

1888. Ker, Alan D., 14, Wilton Mansions, Glasgow; and (Journals) c/o J. C. Barr, 180, West Regent Street, Glasgow, Chemical Manufacturer.

1899. Kern, Walter P., 275, Lafayette Avenue; and (Journals) c/o General Chemical Co., Dundee Works, Passaic, N.J., U.S.A., Chemist.

1906. Kerr, Charles, H., c/o Pittsburg Plate Glass Co. Creighton, Pa., U.S.A., Research Ceramic Chemist.

1890. Kerr, Saml. T., 516, North Delaware Avenue, Philadelphia, Pa., U.S.A., Salt Manufacturer.

1897. Kerr, Wm. M., 712, La Fayette Building, Philadelphia, Pa., U.S.A., Manufacturing Chemist.

1896. Kershaw, Jno. B. C., West Lancashire Laboratory, Waterloo, Liverpool, Analytical Chemist.

1909. Kesava Menon, A., 86, Messina Avenue, West Hampstead, N.W., Chemist.

1902. Kessler, Henry W., 317, Electric Building, Cleveland, Ohio, U.S.A., Manufacturing Chemist.

1893. Kestner, Paul, 7, Rue de Toul, Lille, France, Chemist.

1900. Kewley, Jas., Arbory Road, Castletown, Isle of Man; and (Journals) Balik Papan, Dutch Borneo, Technical Chemist.

1890. Keys, W. H., Hall End Works, West Bromwich, Oil and Chemical Manufacturer.

1892. Kibble, W. Oakes, Charlotte, N.C., U.S.A., Chemical Engineer and City Biologist.

1900. Kilgore, Benj. W., Raleigh, N.C., U.S.A., Chemist.

1901. Kilmer, Fred. B., c/o Messrs. Johnson and Johnson, New Brunswick, N.J., U.S.A., Chemical Manufacturer.

1905. Kimball, Herbert S., 46, Cornhill, Boston, Mass., U.S.A., Mill Engineer.

O.M. Kinch, E., Royal Agricultural College, Cirencester, Professor of Chemistry.

O.M. King, A. J., Elleray, Windermere, Bleacher and Finisher.

1907. King, C. A., c/o The Farnley Iron Co., Farnley, near Leeds, Technical Chemist.

1905. King, Frank E., 75, Gracechurch Street, London, E.C., Analytical Chemist.

1911. King, Harold, 161, Altmore Avenue, East Ham, E., Chemist (Gas Light and Coke Co.).

O.M. King, J. Falconer, 30, Chambers Street, Edinburgh, Consulting Chemist.

1910. King, John, Summerville Gardens, Latchford, Warrington, Lancashire, Works Manager.

1895. King, Sidney J., Hazeldene, Avenue Road, Bexley Heath, Kent, Colour and Dyestuff Traveller.

1910. King, Dr. Victor L., Wood Ridge, Bergen Co., N.J., U.S.A., Chemical Engineer.

O.M. King, Walter R., 16, Mincing Lane, London, E.C.; and (Journals) Torville, The Cliffs, Southend-on-Sea, Chemical Manufacturer.

1905. King, Warren C., 72, Front Street, New York City, U.S.A., Salesman.

1896. Kingdon, Holman, c/o Joseph Crosfield and Sons, Warrington, Technical Chemist.

1908. Kingsbury, Percy C., c/o Didier-March Co., 30, Church Street, New York City, U.S.A., Civil Engineer.

1883. Kingsford, T. P., Oswego, N.Y., U.S.A., Starch Manufacturer.

O.M. Kingzett, C. T., Newlands, St. George's Avenue, Weybridge, Surrey, and (Journals) Sanitas Co., Ltd., Locksley Street, Limehouse, E., Technical Chemist.

1906. Kinnersley, H. W., Branscombe, Merry Hill Road, Bushey, Herts, Chemist and Manufacturer.

1897. Kipping, Dr. F. Stanley, F.R.S., University College, Nottingham, Prof. of Chemistry.

1908. Kirkhope, T. Bertram, "Hylberton," Connor-downs, Hayle, Cornwall, Explosives Works Chemist.

1898. Kirkland, Archd., 78, High Street, Irvine, N.B., Baker.

1905. Kirkland, John, 105, Holmdene Avenue, Herne Hill, S.E., Technical Instructor.

1900. Kirkpatrick, Prof. Stafford F., 84, Gore Street, Kingston, Ont., Canada, Professor of Metallurgy.

1911. Kirstein, H. C., 3, Lombard Street, London, E.C., Consulting Engineer.

1910. Kirwan, P. T., junr., 105, St. Vincent Street, Toronto, Canada, Chemist.

1902. Kitchen, Wm. J., Port Melbourne North, Vic., Australia. Soap and Candle Manufacturer.

1883. Kitto, B., 26, Lancaster Road, Finsbury Park, London, N., Analytical Chemist.

1900. Kittredge, H. G., c/o The Kay and Ess Co., Dayton, Ohio, U.S.A., Chemist.

1908. Klaber, Wm., c/o Castle Kid Co., Camden, N.J., U.S.A., Chemist.

1900. Kleber, Dr. Clemens, Union Avenue, Clifton, N.J., U.S.A., Director (Fritzche Bros.' Laboratory).

1888. Kleemann, Dr. S., Farben Fabrik, Forchheim, Bavaria, Analytical Chemist.

1911. Klein, C. A., 4, Brimsdown Avenue, Enfield Highway, Middlesex, Works Chemist.

1908. Klein, Dr. Friedrich, 762, Melrose Avenue, New York City, U.S.A., Chemist.

1909. Klemm, Wilfred E., c/o Messrs. Charles Greaves, 217, Chester Road, Manchester, Chemist.

1908. Klien, Dr. J. L., c/o Aboshi Celluloid Co., Abòshi, Kobé, Japan, Works Manager.

1903. Kline, Clarence M., 429, Arch Street, Philadelphia, Pa., U.S.A., Wholesale Druggist.

1889. Klipstein, A., 122, Pearl Street, New York City, U.S.A., Chemical Manufacturer.

1902. Klipstein, Ernest C., 93, Prospect Street, East Orange, N.J., U.S.A., Chemical Merchant.

1891. Knaggs, Alfred B., 37, Mannville Terrace, Bradford, Technical Chemist in Dyeworks.

1911. Knapp, Arthur W., c/o Cadbury Bros., Ltd., Bourneville, nr. Birmingham, Analytical Chemist.

1911. Knapp, Harry P., 38–44, Middle Street, Lowell, Mass., U.S.A., Chemical Manufacturer.

1892. Knecht, Dr. E., Beech Mount, Marple, Cheshire. Professor of Tinctorial Chemistry.

1904. Kniffen, Frederick, 823, North Franklin Street, Wilmington, Del., U.S.A., Chemist.

1887. Knight, A. H., 51, Highfield Street, Liverpool, Assayer.

1903. Knight, Harley F., 14, Old Queen Street, Westminster, S.W., Analyst.

1884. Knight, Henry, Stanley House, 73, Anfield Road, Liverpool, Colour and Varnish Manufacturer.

O.M. Knight, J. Baillie, Royal Primrose Soapworks, Silvertown, London, E., Soap Manufacturer.

1887. Knights, J. West, 67, Tenison Road, Cambridge, Analytical Chemist.

1885. Knipler, F., c/o R. Harper and Co., Port Melbourne, Victoria, Australia, Starch Manufacturer.

1907. Knoedler, E. L., c/o Welsbach Co., Gloucester City, N.J., U.S.A., Factory Foreman.

1910. Knott, E. Anthony F., The Priestman Collieries, Ltd., Ottovale Coke Works, Blaydon-on-Tyne, Works Chemist.

1911. Knowland, Daniel P., c/o Geigy-ter-Meer, 69, Barclay Street, New York City, U.S.A., Chemist.

1883. Knowles, Joshua, Tottington Mills, near Bury, Calico Printer.

1904. Knowles, W. R., The Hollies, Wood Green, Wednesbury, Chemical Works Manager.

1886. Knox, E. W., Colonial Sugar Refining Co., Sydney, N.S.W.; and (subs.) c/o Parbury, Henty, and Co., 20, Eastcheap, London, E.C., Sugar Manufacturer and Refiner.

1906. Knudsen, Kristian Hv., Morgantown, West Va., U.S.A., Chemist.

1905. Koch, Dr. Geo. W., 905, Willoughby Avenue, Brooklyn, N.Y., U.S.A., Chemist.

1904. Koch, J. A., Bluff and Pride Streets, Pittsburg, Pa., U.S.A., Chemist.

1911. Kochs, A. Victor, 301, Glossop Road, Sheffield, Gas Engineer.

1904. Koebig, Dr. J., 414, I. W. Hellman Building, Los Angeles, Cal., U.S.A., Consulting Chemical Engineer.

1909. Koekkoek, Patrick R., c/o Messrs. Colthurst and Harding, Phoenix Works, Templegate, Bristol, Works Chemist.

1911. Koelle, Dr. G., Metallbank und Metallurgische Gesellschaft, Bockenheimer Anlage 45, Frankfurt a/M., Germany. Chemist.

1884. Kohn, Dr. Charles A. *See* Keane, Dr. Chas. A.

1902. Kohnstamm, Lothair S., 87, Park Place, New York City, U.S.A., Chemist.

1910. Komuro, S., c/o Mrs. Ohtani, Karasumaru, Sawaragi, Nishie, Iru, Kyoto, Japan, Technical Chemist.

O.M. Kraftmeier, E., 54, Parliament Street, Westminster, S.W., Explosives Manufacturer.

1906. Krais, Dr. Paul, Tuebingen, Germany, Chemist.

1894. Krause, Dr. Albert H., 1444, West 98th Street, Cleveland, Ohio, U.S.A., Chemist (Grasselli Chemical Co.).

O.M. Krause, Prof. Dr. G., Cöthen (Anhalt), Germany, Chemist.

1898. Krebs, H. J., 806, Franklin Street, Wilmington, Del., U.S.A., Manufacturing Chemist.

1908. Kress, Otto, 438, West 116th Street, New York City, U.S.A., Teacher of Science.

1910. Krone, L. J., c/o "The Metal Industry," 99, John Street, New York City, U.S.A., Consulting Metallurgist and Editor.

O.M. Kühl, W. H., 82, Königgrätzerstrasse, Berlin, S.W., XI., Germany, Bookseller.

1900. Kunheim, Dr. Erich, Niederschöneweide, near Berlin, Germany, Chemist.

1904. Kunz, Dr. George F., c/o Tiffany and Co., 401, 5th Avenue, New York City, U.S.A., Gem Expert.

1905. Kurt, Franklin T., 553, Boylston Street, Boston, Mass., U.S.A., Professor of Chemistry, B.Y.M.C.A.

1907. Kutsch, Dr. Wm. A., c/o Corn Products Manufacturing Co., Pekin, Ill., U.S.A., Chemist.

1910. Kuttroff, Arthur, 17, East 69th Street, New York City, U.S.A., Colour and Chemical Merchant.

1900. Kuttroff, Fred., 128, Duane Street, New York City, U.S.A., Merchant.

1909. Kwoh, See Kwain, c/o Ta-Chou Electrical Lighting Co., Lily Pond, Chinkiang, China, Chemical Engineer.

O.M. Kynaston, J. W., 3, Oak Terrace, Beech Street, Liverpool, Chemical Engineer.

1907. Kynaston, Wm. C. R., 9, Harland Road, Higher Tranmere, Birkenhead, Analyst.

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1897. Labonde, Dr. Leon 3418, South Flower Street, Los Angeles, Cal., U.S.A., Consulting Chemical Engineer.

1906. Lacell, Harold G., Ardoch, Nether Street, Finchley, N., Chemist.

1890. Lacey, E. C., St. Julian's Lodge, St. Julian's Farm Road, West Norwood, Manufacturing Chemist.

1903. Lachman, Dr. Arthur, 3037, Wheeler Street, Berkeley, Cal., U.S.A., Chemical Engineer.

O.M. Laidler, C. P., 20, Noble Terrace, Gateshead-on Tyne, Analytical Chemist.

O.M. Lake, G., jun., Lee Mount, Glossop, Derbyshire, Analytical Chemist.

1907. Lake, Henry B., Canadian Pacific Railway Co., Winnipeg, Canada, Chemical Engineer.

1900. Lamar, Wm. R., Lamar Chemical Works, 8—14, Johnson Street, Newark, N.J., U.S.A., President.

1898. Lamb, Morris Chas., Leathersellers' Technical College, 176, Tower Bridge Road, London, S.E., Chemist.

1907. Lancaster, Harry M., Laboratory, Provincial Board of Health, Toronto, Canada, Chemist.

1910. Landrum, R. D., c/o Lisk Manufacturing Co., Canandaigua, N.Y., U.S.A., Chemical Engineer.

1904. Lane, C. Cyril P., c/o The Avon India-Rubber Co., Melksham, Wilts., Chemist.

1910. Lane, J. Henry, 3, Arbour Square, Stepney, London, E., Chemist.

1903. Lane, Nathaniel J., U.S. Laboratory, 641, Washington Street, New York City, U.S.A., Chemist.

1893. Lang, Dr. Wm. R., University of Toronto, Canada, Professor of Chemistry.

O.M. Langdon, Dr. M. J., 18, Arnold Avenue, Amsterdam, N.Y., U.S.A., Analytical Chemist.

1892. Langer, Dr. Carl, Ynyspenllweh, Clydach, R.S.O., Glamorganshire, Analytical Chemist.

1897. Langmuir, Arthur C., c/o Marx and Rawolle, 9, Van Brunt Street, Brooklyn, N.Y., U.S.A., Factory Manager.

1902. Langmuir, F. Leighton, 350, Bloor Street West, Toronto, Canada, Chemist.

1898. Langstaff, Wm., 39, Orchard Street, Elizabeth, N.J., U.S.A., Chemist.

1900. Lant, Herbert, "Ivy Bank," Wath-on-Dearne, near Rotherham, Yorks, Chemist and Manager.

1909. Lantsberry, Fred. C. A. H., Birmingham Small Arms Co., and (Journal) 63, Walford Road, Sparkbrook, Birmingham, Metallurgical Chemist.

1906. Lantz, Alfred, 139, Rue La Fayette, Paris, France, Colour Works Manager.

1903. Larter, Alfred T., 86, Inderwick Road, Stroud Green, N., Chemist.

1907. Lasché, Prof. Alfred, The Lasché Institute, 2809, Vine Street, Milwaukee, Wis., U.S.A., Chemist and Bacteriologist.

1904. Lasher, F. G., 251, Bush Street, Brooklyn, N.Y., U.S.A., Chemist.

1884. Latham, Baldwin, Parliament Mansions, Victoria Street, Westminster, S.W., Civil Engineer.

1889. Latham, J. J., Mill House, Bold, Widnes, Chemical Works Manager.

1907. Lathwood, Arthur, c/o Borax Consolidated, Ltd., 16, Eastcheap, London, E.C., Chemist.

1908. Lauder, A. Gilbert, c/o Nelson and Lauder, O'Neil Building, Binghampton, N.Y., U.S.A., Consulting Chemist.

1909. Law, Douglas J., Trent Bridge Leather Works, Nottingham, Chemist.

1907. La Wall, Chas. H., 39, South 10th Street, Philadelphia, Pa., U.S.A., Analytical Chemist.

O.M. Lawrence, Jas., Box 737, Joplin, Mo., U.S.A., Explosives Manufacturer.

1911. Lawrence, Wm. A., Laboratory, 11, Vandewater Street, New York City, U.S.A., Director.

1904. Lawson, Jos. H. S., Britannia Mills, Hulme, Manchester, Salesman.

1900. Lawson, Wm. L., c/o Great Western Sugar Co., Sterling, Colo., U.S.A., Chemist.

1894. Lawson-Johnston, G., (Journals) 29, Portmau Square, W., and 1, King's Arms Yard, London, E.C., Chairman of Bovril, Ltd.

1894. Lawson-Johnston, W. E., c/o Bovril, Ltd., 152, Old Street, London, E.C., Director.

1890. Laycock, Dr. W. F., 46, Boar Lane, Leeds, Analytical Chemist.

1907. Leach, Dr. F. P., Briarswood, Chester Road, Erdington, Birmingham, Research Chemist.

1908. Leake, Percy C., Deanbank Terrace, Ferryhill Village, Co. Durham, Tar Works Manager.

1898. Lean, Geo., 15, Park Terrace, Glasgow, Chemist.

1897. Leathart, Thos. H., Lead Works, Newcastle-on-Tyne, Lead Manufacturer.

O.M. Leather, Dr. J. Walter, Agricultural Research Institute, Pusa, Bengal, India, Government Chemist.

1893. Le Boutillier, Clement, c/o Taylor Iron and Steel Co., High Bridge, N.J., U.S.A., Chemist.

1907. Lecco, Prof. Marco T., Belgrade, Servia, Professor of Chemistry.

1904. Le Chatelier, Prof. H., 75, Rue Notre Dame des Champs, Paris, France, Professor (l'Ecole des Mines).

1896. Lecomber, W. G., Cambridge Works, Knott Mill, Manchester, Engineer.

1896. Lederle, Dr. E. J., Dept. of Health, 55th Street and Sixth Avenue, New York City, U.S.A., Chief Chemist.

1892. Ledoff, Prof. A., Technological Institute, Kharkoff, Russia, Professor of Chemistry.

1895. Ledoux, Dr. Albert R., 99, John Street, New York City, U.S.A., Chemist.

1903. Ledoux, Aug. D., 15, William Street, New York City, U.S.A., Importer of Pyrites.

1905. Lee, Ashton, Lawrence, Mass., U.S.A., Manufacturing Chemist.

1905. Lee, Frank W., Lawrence, Mass., U.S.A., Manufacturing Chemist.

1905. Lee, John C., Mountford Street, Brookline, Mass., U.S.A., Assistant Engineer (American Telegraph and Telephone Co.).

1898. Lee, Jno. L., Woodfield, Lytham, Lancashire, Dyer and Bleacher.

1911. Lee, Joseph, 14, Moorside Street, Droylsden Manchester, Works Chemist.

1885. Lee, S. Wright, 6-10, Whitechapel, Liverpool, Wholesale Druggist.

1906. Lee, William, 28, Sherard Gardens, Eltham, Kent, Works Chemist.

1901. Leffler, Rudolf L., c/o Thos. Firth and Sons, Ltd., Norfolk Works, Sheffield, Metallurgical Chemist.

1907. Lehmann, Dr. Adolf, University of Alberta, Strathcona, Alberta, Canada, Professor of Chemistry.

1888. Leigh, Cecil, Birmingham Metal and Munition Co., Adderley Park Rolling Mills, Birmingham, Technical Chemist.

1906. Leigh, Edw. Collier, c/o Companhia do Gaz, Pará, North Brazil, Gas Works Manager.

1902. Leighton, A. E., Commonwealth Cordite Factory, Maribyrnong, Victoria, Analytical Chemist.

1894. Leitch, Jno. W., Milnsbridge Chemical Works, near Huddersfield, Aniline Dye Manufacturer.

1904. Le Maistre, Fred J., Room 727, Du Pont Building, Wilmington, Del., U.S.A., Research Chemist.

1910. Leman, Sheldon D., c/o Cowell Portland Cement Co., Cowell, Cal., U.S.A., Chemist.

1898. Leman, Wm. T., P.O. Box 747, Chicago, Ill., U.S.A., Oil and Asphalt Agent.

1908. Lemeland, Dr. P., 8, Rue Alfred de Vigny, Paris, France, Chemist.

1883. Lennard, F., Iford Manor House, near Lewes, Sussex, Chemical Manufacturer.

1884. Leonard, Wm. J., 1, Lindfield Gardens, Hampstead, N.W., Naphtha Distiller.

1888. Lequin, E., Directeur Général des Usines de Produits Chimiques de la Société de St. Gobain, 1, Place des Saussaies, Paris (VIII^e.), France.

1904. Lesley, R. W., 604, Pennsylvania Building, Philadelphia, Pa., U.S.A., Cement Manufacturer.

1910. Leslie, A. W., 73, Manor Road, Stamford Hill, N., Rubber Merchant.

1907. Leslie, Dr. Fred. A., College of Pharmacy, 115, West 68th Street, New York City, U.S.A., Chemist.

1894. Leslie, Hugh M., Marikuppam, Mysore State, South India, and (Jnls.) c/o G. Dickson, 7, Caledonian Mansions, Glasgow, W., Chemical Engineer.

1904. Lessing, Dr. Rudolf, Southampton House, 317, High Holborn, London, W.C., Consulting Chemist.

1892. Lester, J. H., Grange Drive, Morton Green, Eccles, Lancs., Analytical Chemist.

1899. Le Sueur, Dr. Henry R., Chemical Laboratory, St. Thomas' Hospital, London, S.E., Demonstrator.

1909. Lever, J. D'Arcy, jun., Thornton House, Thornton Hough, Cheshire, Soap Manufacturer.

1891. Lever, Sir Wm. H., Bart., Thornton House, Thornton Hough, Cheshire, Soap Manufacturer.

1909. Lever, W. Hulme, Thornton Manor, Thornton Hough, Cheshire, Soap Manufacturer.

1901. Levett, Walter, Holmlands, Stanford-le-Hope; and (Journals) Mines Safety Explosives Co., Stanford-le-Hope, Essex, Factory Manager.

1903. Levi, Dr. Louis E., c/o Pfister and Vogel Leather Co., Milwaukee, Wis., U.S.A., Chemist.

1906. Levinstein, Edgar, 74, India Street, Boston, Mass., U.S.A., Chemical Manufacturer.

1901. Levinstein, Dr. Herbert, c/o Levinstein, Ltd., Blackley, near Manchester, Chemist.

O.M. Levinstein, Ivan, Hawkesmoor, Fallowfield, Manchester, Colour Manufacturer.

1903. Levy, Arthur G., 1927, Madison Avenue, New York City, U.S.A., Chemist.

1909. Levy, Louis S., 100, William Street, New York City, U.S.A., Editor, "American Perfumer."

1905. Lévy, René J., 4, St. Joseph Boulevard East, Montreal, Canada, Chemical Engineer.
1901. Levy-Mond, Dr. Albert. *See* Mond, Dr. Albert L.
1887. Lewes, Prof. Vivian B., Royal Naval College, Greenwich, S.E., Professor of Chemistry.
1898. Lewin, H. James, Royal Clarence Yard, Gosport, Hants, Analytical Chemist.
1896. Lewis, Daniel C., c/o Millville Manufacturing Co., Millville, N.J., U.S.A., Dye Works Chemist.
1904. Lewis, Edw. W., c/o J. G. Ingram and Sons, London India Rubber Works, Hackney Wick, N.E., Chemist.
1900. Lewis, Ernest A., 310, Dudley Road, Birmingham, Chemist and Metallurgist.
1905. Lewis, F. W Aetna Powder Co., 143, Dearborn Street, Chicago, Ill., U.S.A., Secretary.
1900. Lewis, John, 35, Mundania Road, Honor Oak, S.E., Cashier (Paint Works).
1909. Lewis, Reginald J., Govt. Explosives Office, 423, Flinders Lane, Melbourne, Australia, Chemist.
1900. Lewis, Dr. S. Judd, 122, Newington Causeway, London, S.E., Analytical Chemist.
1889. Lewkowitsch, Dr. Julius, 71, Priory Road, West Hampstead, N.W., Consulting Chemist.
1907. Leyson, Lewis T., c/o Standard Bank of South Africa, Johannesburg, Transvaal, Analytical Chemist.
1901. Lichtenstein, Alf. F., c/o Geisenheimer and Co., P.O. Box 994, New York City, U.S.A., Chemist.
O.M. Lichtenstein, Theodore, Chemical Works, Silvertown, E., Manufacturing Chemist.
1904. Lichtenthaeler, Robt. A., Rhode Island Agricultural Experiment Station, P.O. Box 112, Kingston, R.I., U.S.A., Chemist.
1892. Liddle, G. A., George Hotel, Castletown, Isle of Man, Chemist, Dyewood Extract Works.
1904. Lieber, Hugo, 381, Fourth Avenue, New York City, U.S.A., Chemist.
O.M. Liebmann, Dr. A., The Whim, Weybridge, Surrey, Consulting Chemist.
O.M. Lightfoot, T. E., Fernleigh, Accrington, Calico Printer's Chemist.
1905. Liley, Thos. A., 37, Aston Road, Bramley, Leeds, Chemist.
1911. Lilja, Sten Gustaf, Misterton, Gainsborough, Chemical Engineer.
1909. Lillie, W. H., Merton, Marple, Cheshire, Cloth Finisher.
1898. Lilly, Josiah K., c/o Eli Lilly and Co., Indianapolis, Ind., U.S.A., Manufacturing Pharmacist.
1904. Lindemann, Ottocar, 53, Victoria Street, Westminster, S.W., Managing Director (Korting Bros., Ltd.).
1908. Lindfield, James H., 135, Putney Bridge Road, Putney, S.W., Technical Chemist.
1897. Lindsay, Robt., P.O. Box 54, Cleveland, Transvaal, Chemist.
1911. Line, Chas. A., 39, Beaufort Road, Edgbaston, Birmingham, Technologist.
1890. Ling, Arthur R., Laboratory, 74, Great Tower Street, London, E.C., Consulting Chemist.
1908. Linthicum, J. Francis, c/o The Spanish-American Iron Co., Felton, Oriente, Cuba, Chemist.
1905. Lips, Dr. Carl H., 99, Hart Street, Brooklyn, N.Y., U.S.A., Chemist.
1896. Lishman, Geo. P., Lambton Coke Works, Fence Houses, Co. Durham, Colliery Chemist.
1905. Little, Arthur D., 93, Broad Street, Boston, Mass., U.S.A., Consulting Chemist.
1889. Little, Wm. G., Buckingham House, Shoreham, Sussex, Chemical Manufacturer.
O.M. Littlejohn, Jas., c/o Littlejohn and Whitby, P.O. Box 849, Johannesburg, Transvaal, Analytical Chemist.
1911. Liu, Hamilton C., Back Niwar Street, Pekin, China, viâ Siberia, Chemist.
1904. Livermore, W. D., Washington Mill, Lawrence, Mass., U.S.A., Chemist.
1886. Liversedge, A. J., 5, Brunel Terrace, Nottingham, Mechanical Engineer.
1906. Liversedge, S. G., City Laboratory, Castle Street, Dublin, Ireland, Analytical Chemist.
1904. Liverseege, J. F., Council House, Birmingham, Public Analyst.
O.M. Liversidge, Prof. A., F.R.S., Hornton Cottage, Hornton Street, Kensington, W., Professor of Chemistry.
1907. Liversidge, Bernard, Rossholme, Clifton Lane, Rotherham, Yorks., Analytical Chemist.
1883. Livingston, W. J., 26, Osbaldeston Road, Stoke Newington Common, London, N., Analytical Chemist.
1903. Llewellyn, Ivor P., Goole Alum Works, Goole, Chemist.
1907. Llewellyn, W. B., Rock Villa, New Hey, near Rochdale, Chemist.
1909. Lloyd, Edward, 27, Broomgrove Road, Sheffield, Chemical Engineer.
1904. Lloyd, Leonard B., Broadford Tannery, Broadford, Victoria, Australia, Tanner.
1907. Lloyd, Dr. Lorenzo L., Technical College, Bradford, Yorks., Lecturer in Chemistry.
1908. Lloyd, Capt. M. B., 3, Neville Terrace, Onslow Gardens, London, S.W., Director of Curtis's and Harvey, Ltd.
1900. Lloyd, Thos. H., c/o Quibell Bros., Newark, Analyst.
1909. Lobley, Alfred G., c/o British Aluminium Co., Ltd., Kinlochleven, Argyll, N.B., Works Chemist.
1888. Lodge, Edw., 33, Scale Hill, Cowcliffe, Huddersfield, Teacher of Wool Dyeing.
1900. Loeb, Dr. Morris, 50, East 41st Street, New York City, U.S.A., Professor of Chemistry.
1891. Loewenthal, Dr. R., Uhlandstrasse 39, Frankfurt a/M., Germany, Lecturer on Dyeing.
1907. Lomax, Ernest L., c/o Mower and Co., 8–12, Sparkes Street, Rangoon, Burmah, Chemist.
1901. Long, Eugene J., c/o E. O'Callaghan and Son, City Tannery, Limerick, Ireland, Tanner.
1909. Long, George, Cudahy, Wis., U.S.A., Glue Maker.
1898. Longstaff, Dr. Jas. P., Chemical Department, The University, Edinburgh, Assistant.
1908. Longwell, Alex., 404, Lumsden Building, Toronto, Canada, Mining Engineer.
1902. Loomis, Henry M., U.S. Food Laboratory, 445, Arcade Annex Building, Seattle, Wash., U.S.A., Chemist.
1890. Lord, F. J., Winmarleigh, Southbourne, Christchurch, Hants., Analytical Chemist.
1896. Lord, Jno. Lloyd, 23, Park View, Elton, Bury, Lancs., Chemist and Manager.
O.M. Lorenz, H., 7 and 8, Idol Lane, London, E.C., Chemical Merchant.
1904. Lorimer, John H., 280, West Walnut Lane, Germantown, Philadelphia, Pa., U.S.A., Textile Machinist and Merceriser.
1905. Loring, Lindsley, Box 160, Boston, Mass., U.S.A., Vice-President (Cochrane Chemical Co.).
1909. Lorleberg, C., c/o R. W. Greeff and Co., 20, Eastcheap, London, E.C., Chemical Merchant.
O.M. Lorrain, Jas. G., Staple Inn Buildings, Holborn, London, E.C., Chartered Patent Agent.
1904. Lossen, Dr. Clemens F., Boulevardul Independentei 8, Ploesti, Roumania, Chemist.
O.M. Lott, F. E., The Laboratory, Bridge Chambers, Burton-on-Trent, Consulting Brewing Chemist.
O.M. Louis, D. A., 123, Pall Mall, London, S.W., Metallurgist and Mining Engineer.
1894. Louis, Prof. Henry, Armstrong College, and (Jnls.) Northern Scientific Club, Bolbec Hall, Westgate Road, Newcastle-on-Tyne, Professor of Mining.
O.M. Love, Dr. E. G., 80, East 55th Street, New York City, U.S.A., Analytical Chemist.
1899. Love, Wm., 28, Royal Exchange Square, Glasgow, Managing Director (Broxburn Oil Co., Ltd.).
1895. Lovejoy, Frank W., 22, Seneca Parkway, Rochester, N.Y., U.S.A., Chemical Engineer.
1911. Lovelace, B. F., Johns Hopkins University, Baltimore, Md., U.S.A., Teacher of Chemistry.
1904. Loveland, Jas. W., 409, Prospect Avenue, Hackensack, N.J., U.S.A., Superintendent of Soap Works.

O.M. Lovibond, J. W., The Pleasaunce, Lake, near Salisbury, Tintometer Manufacturer.
O.M. Lovibond, T. W., West Jesmond House, Newcastle-on-Tyne, Brewer.
1900. Low, Prof. Wilson H., Cudahy Packing Co., South Omaha, Neb., U.S.A., Chemist.
1911. Lowcock, J. Harold, Garstang, Kemerton Road, Beckenham, Kent, Chemist.
1887. Lowe, Clement W., Thorneyholme, Knutsford, Cheshire, Manufacturing Chemist.
1905. Lowe, Houston, The Lowe Bros. Co., 452, East Third Street, Dayton, Ohio, U.S.A., Paint and Varnish Maker.
O.M. Lowe, W. F., 18, Hough Green, Chester, Analytical Chemist.
1885. Lowson, Dr. J. G. F., Snitterfield House, Stratford-on-Avon, Paper Maker.
1906. Lowson, Wm., The University, Leeds, Chemical Lecturer.
1895. Lucas, Alf., Laboratories, Public Works Ministry Gardens, Cairo, Egypt, Analyst.
1892. Lucas, Bernard R., Winnington Park, Northwich, Alkali Works Manager.
1900. Lummus, Walter E., 39, Bassett Street, Lynn, Mass., U.S.A., Manager.
1903. Lumsden, Alex. A., Forth Chemical Works, Bo'ness, N.B., Technical Chemist.
1910. Lumsden, William W., 39, Caledonia Road, Saltcoats, Scotland.
1888. Lund, Jas., 142, Hawthorne Street, Malden, Mass., U.S.A., Ammonia Works Manager.
1888. Lundholm, Carl O., 220, Winchester House, Old Broad Street, London, E.C., Explosives Works Manager.
1898. Lundteigen, Andreas, Union City, Mich., U.S.A., Chemist.
O.M. Lunge, Dr. G., Carmenstrasse 37, Zurich, Switzerland, Professor of Chemistry.
1894. Lungwitz, Theo., c/o Chas. Pfizer and Co., 81, Maiden Lane, New York City, U.S.A., Chemist.
1885. Lupton, Sydney, 102, Park Street, Grosvenor Square, London, W.
1884. Lüthy, Otto, P.O. Box 63, Maywood, N.J., U.S.A., Analytical Chemist.
1895. Luxmoore, Dr. Chas. M., 19, Disraeli Gardens, Putney, S.W., Lecturer on Chemistry.
1903. Lye, Ernest B., Leagrave Hall, near Luton, Beds., Straw Plait Dyer and Bleacher.
1885. Lye, W. T., Leagrave Hall, near Luton, Beds., Straw Dyer.
1884. Lyle, James, Ardesco, West Silvertown, E., Sugar Refiner.
1885. Lyle, Jno., 21, Mincing Lane, London, E.C., Sugar Refiner.
1896. Lymn, Arthur H., Queen Anne's Chambers, Westminster, S.W., and (Jnls.) 53, Hampstead Way, London, N.W., Consulting Chemical and Gas Engineer.
1899. Lynn, R. Rankine, 7, Highburgh Terrace, Dowanhill, Glasgow, Chemical Engineer.
1902. Lyon, Edwd. H., 520, West 27th Street, New York City, U.S.A., Manufacturing Chemist.
O.M. Lyon, J. G., The Aire Tar Works, Knottingley, Yorks., Tar Distiller.
1906. Lyons, Robert H., Emporium, Pa., U.S.A., Chemist.
O.M. Lytle, A. M., North of Ireland Chemical Co., Ltd., 34, Victoria Street, Belfast, Ireland, Chemical Manufacturer.

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1908. Maas, Milton A., 100, William Street, New York City, U.S.A., Manufacturing Chemist.
1911. Mabbitt, Alan T., 3, Wallwood Road, Leytonstone, N.E., Analytical Chemist.
1887. Mabery, Prof. Chas. F., Case School of Applied Science, Cleveland, Ohio, U.S.A., Professor of Chemistry.
1891. Macadam, Herbert E., Dalkeith, Glengall Road, Woodford Green, Essex, Manure Works Manager.
1894. Macadam, Stevenson, 55, York Place, Edinburgh, Analytical Chemist.
1912. McAfee, A. McD., The Texas Co., Bayonne, N.J., U.S.A., Chemist.
1891. Macallan, J., 3, Rutland Terrace, Clontarf, Dublin, Analytical Chemist.
1894. McAlley, Robt., Bankside, Falkirk, N.B., Paint Works Manager.
1892. Macara, Thos., jun., 13, Ridge Road, Stroud Green, N., Chemist.
1887. McArthur, James B., Price's Patent Candle Co., Limited, Belmont Works, Battersea, S.W., Chemist.
1889. McArthur, Jno., Woodfield, Maplehurst, Horsham, Sussex, Chemist.
O.M. McArthur, J. S., 74, York Street, Glasgow, Consulting Chemist and Metallurgist.
1901. Macarthur, Jno. S., 15, St. John's Road, Pollokshields, Glasgow, Paint and Varnish Manufacturer.
1892. McArthur, Thos., 711, Tower Building, Water Street, Liverpool, Drysalter and Dyewood Extractor.
1911. McBride, K. R., Glens Falls, N.Y., U.S.A., Colour Chemist.
1898. MacCallum, D. A., 359, Central Chambers, 93, Hope Street, Glasgow, Chemist.
O.M. McCallum, J. M., Southdene, Paisley, N.B., Soap Manufacturer.
1894. McCann, Owen, 23, Oriel Street, Vauxhall Road, Liverpool, Printing Ink Manufacturer.
1909. McCarthy, Harold H., 323, West Green Road, London, N., Chemist and Druggist.
1905. McCaw, Lt.-Col. W. D., Library, Surgeon General's Office, Washington, D.C., U.S.A., Officer, Medical Department, U.S. Army.
1905. McCleary, Wm., 61, Station Road, Pendlebury, near Manchester, Finisher.
1910. McColl, A. L., Santa Barbara, Cerro Azul, Peru, Chemist.
1907. McConnan, Dr. Jas., Chemical Laboratory, Frigorifico, Campana F.C.R., Argentina, Chemist (River Plate Fresh Meat Co.).
1903. McCourt, Cyril D., c/o Radiant Heating, Ltd., Carlton Works, Armley, Leeds, Chemist.
1897. McCrae, Dr. John, Government Laboratories, P.O. Box 1080, Johannesburg, Transvaal, Government Analyst.
1898. McCreath, Wm. D., c/o Quantock Vale Cider Works, North Petherton, Bridgwater, Cider Manufacturer.
1911. McCulloch, Norman G., Rhodes Works, Rhodes, Manchester, Chemist and Calico Printer.
1903. McCully, R. E. J., 7, London Road, Northfleet, Kent, Analytical Chemist.
1909. McCune, W. H., American Sheet and Tin Plate Co., Vandergrift, Pa., U.S.A., Chief Chemist.
O.M. McDaniel, J. J., Kinsale, Ireland, Distiller.
O.M. Macdonald, A., 72, Great Clyde Street, Glasgow.
1910. Macdonald, Alexander, Brampton House, Camphill Avenue, Langside, Glasgow, Clerk.
1912. McDonald, Allan D., "Belgrano," Milngavie, near Glasgow, Manufacturing Chemist.
1897. MacDonald, G. W., Whitefriars, Rochester, Kent, Chief Explosives Research Chemist (Curtis's and Harvey, Ltd.).
1910. Macdonald, J. L. A., 13, Howard Place, St. Andrew's, Fife, N.B., Assistant Manager, Oak Extract Works.
O.M. Macdonald, J. W., 8, Prince of Wales Terrace, Kensington, W., Analytical Chemist.
1899. MacDonald, S. Fremont, c/o Ashtabula Hide and Leather Co., Ashtabula, Ohio, U.S.A., Tanner.
O.M. McDonald, T. McG., Walilabo Estate, St. Vincent, West Indies, Sugar Chemist.
1906. Macdougald, Geo. D., City Laboratory, 13, Shore Terrace, Dundee, City Analyst.
1895. McDougall, Isaac, jun., 68, Port Street, Manchester, Chemical Manufacturer.
1890. McDougall, J. T., Dunolly, Morden Road, Blackheath, S.E., Manufacturing Chemist.
1906. McDowall, Wm., 42, Herriet Street, Pollokshields, Glasgow, Analytical Chemist.
1889. MacEwan, Peter, 64, Southwood Lane, Highgate, N., Editor of "Chemist and Druggist."

1901. McEwen, Duncan C., c/o Jardine, Matheson, and Co., No. 1, Bund, Yokohama, Japan, Metallurgical Chemist.
1908. McEwen, Stewart R., c/o Chemical Laboratories, Ltd., 148, Van Horne Street, Toronto, Canada, Chemist.
1902. McFarland, Alan R., c/o Solvay Process Co., Syracuse, N.Y., U.S.A., Alkali Works Manager.
1910. McFarlane, John, 6, Gordon Terrace, Shettleston, Glasgow, Metallurgist.
O.M. Macfarlane, R. F., Tharsis Copper Works, East Moors, Cardiff, Works Manager.
1901. McFarlane, Walter, The Lodge, Brinscall, near Chorley, Printworks Manager.
1890. McFarlane, W. W., East 20th Street, Chester, Pa., U.S.A., Dyeworks Manager.
1893. McGhie, T. Burns, c/o Bwana M'Kubwa Copper Mining Co., Salisbury House, London Wall, E.C., Metallurgist.
1904. McGill, Dr. A., 317, Queen Street, Ottawa, Canada, Analytical Chemist.
1899. MacGillivray, Wm. A., c/o Swansea Safety Fuse Co., Pipe House Wharf, Swansea, Analytical Chemist.
1887. McGlashan, John, Cawnpore Sugar Works, Cawnpore, India, Technical Chemist.
1906. McGregor, Russell, 194, High Street, Scunthorpe, near Doncaster, Analytical Chemist.
1896. McIlhiney, Dr. Parker C., 7, East 42nd Street, New York City, U.S.A., Chemist.
O.M. McIlwaine, Alf. W., Stoneferry, Hull, Oil Manufacturer.
O.M. MacIndoe, G. D., Ness Street, Invercargill, New Zealand, Public Analyst and Consulting Chemist.
1903. Macintire, Benj. Gould, c/o E. I. du Pont Powder Co., Henry Clay P.O., Del., U.S.A., Chemist.
1909. McIntyre, George D., c/o Canadian Explosives Co., Ltd., Montreal, Canada, Analytical Chemist.
1910. Mackay, Angus, Laboratory, Wellpark Brewery, Glasgow, Brewer's Chemist.
1911. Mackay, F., c/o Lautaro Nitrate Co., Ltd., Taltal, Chili, Analytical Chemist.
1912. McKechnie, Alex., Chad Hill Cottage, Edgbaston, Birmingham, Copper Smelter.
O.M. McKechnie, D., Heath House, Runcorn, Copper Extractor.
O.M. McKechnie, D. M., The Grange, Halewood, near Liverpool, Copper Extractor.
1904. McKechnie, R. D., Minas de Rio Tinto, Provincia de Huelva, Spain, Chemical Engineer.
1887. McKellar, W. G., c/o United Alkali Co., Ltd., St. Rollox Works, Glasgow, Technical Chemist.
1895. McKenna, Dr. Chas. F., 50, Church Street, New York City, U.S.A., Chemist.
1899. McKenzie, Alex. H., 17, North Street, North Adams, Mass., U.S.A., Colour Mixer.
1909. Mackenzie, Kenneth G., c/o The Texas Co., Bayonne, N.J., U.S.A., Chemist.
1893. McKerrow, C. A., 56, Ramillies Road, Bedford Park, W.; and (Journals) c/o Mitchells, Ashworth, and Co., 23–24, Old Bailey, London, E.C., Consulting Chemist.
1905. McKerrow, W. J., Analytical Chemist.
1893. McKesson, John, 91, Fulton Street, New York City, U.S.A., Manufacturing Chemist.
1911. McKey, Arthur W., 216, Milk Street, Boston, Mass., U.S.A., Sales Agent.
1891. Mackey, W. McD., Victoria Chambers, Leeds, Analytical Chemist.
1890. McKillop, Jno., 32, Aynho Road, Hammersmith, W., and (Jnls.), c/o W. Müller, 16, Grape Street, Oxford Street, W., Metallurgist.
1902. McKim, Wm., 37, Fairview Street, Yonkers, N.Y., U.S.A., Colour Maker.
1908. McLaren, Alex., 22, Moss Lane, Walton, Liverpool, Analytical Chemist.
1908. McLaren, Alex. W., 3, Hayfield Terrace, Langside, Glasgow, Analytical Chemist.
1898. McLaurin, Robt., Homesteads, Cambusbarron, Stirling, Chemist.
1909. MacLaurin, Dr. Robert D., University of Saskatchewan, Saskatoon, Saskatchewan, Canada, Chemist.
1905. McLellan, Basil G., c/o Rowntree & Co., Ltd. The Cocoa Works, York, Analytical Chemist.
1910. MacLellan, George A., 1, Montague Terrace, Glasgow, W., Rubber Manufacturer.
1910. MacLennan, Alex., Tannery, Ross, Herefordshire, Rubber Chemist.
1908. Macleod, Alex., Mount Pleasant, Old Kilpatrick, N.B., Analytical Chemist.
1892. McLeod, Jas., Gas Works, Greenock, N.B., Manager.
1903. MacMahon, F. W., Netherhay, The Common, Warlingham, Surrey, Chemist (Oxychlorides, Ltd.).
1896. McMaster, Daniel, 108, Somerset Road, Rumford, Maine, U.S.A., Paper Mill Manager.
1904. McMullen, Alan, 108, James Street, Dublin, Ireland, Brewer.
1889. McMurtrie, J. M., 212, West Regent Street, Glasgow, Brass Founder.
1900. McMurtrie, Dr. Wm., 480, Park Avenue, New York City, U.S.A., Chemist.
1895. McMurtry, G. C., Templemore, Richmond, Nelson, New Zealand, Manager.
O.M. Macnab, W., 10, Cromwell Crescent, London, S.W., Analytical Chemist.
1907. McNaughton, Wm. G., Port Edwards, Wis., U.S.A. Chemist.
1908. McQueen, James, jun., Clyde House, Uddingston, N.B., Analytical Chemist.
1909. McWhirter, James, c/o Wm. Beardmore and Co., Laboratory, Parkhead Forge, Glasgow, Metallurgical Chemist.
1910. Madge, Norman, c/o Continental Rubber Co. of New York, 11, Vandewater Street, New York City, U.S.A., Chemist.
1895. Magnus, Isidor, 52, Leadenhall Street, London, E.C., Chemical Merchant.
1901. Magruder, Egbert W., Department of Agriculture, Richmond, Va., U.S.A., Chemist.
1885. Mahon, R. W., N.Y. Central and Hudson River Railroad, West Albany, N.Y., U.S.A., Chemist.
1912. Main, Hugh, Almondale, Buckingham Road, South Woodford, N.E., Analytical Chemist.
1898. Main, Wm., Piermont, N.Y., U.S.A., Chemist.
1904. Mair, William, 37, Morningside Drive, Edinburgh, Chemist.
1905. Major, Ernest, "Seafield," Day Street, Drummoyne, Sydney, N.S.W., Paint Works Manager.
O.M. Major, J. Lewis, Welton Garth, Brough, East Yorks., Tar Distiller and Chemical Manufacturer.
1910. Male, C. E., Brookland House, Cottenham, Cambs., Chemist.
1886. Mallinckrodt, Edw., Mallinckrodt Chemical Works, St. Louis, Mo., U.S.A., Manufacturing Chemist.
1908. Mander, C. Arthur, Varnish and Colour Works, Wolverhampton, Varnish Manufacturer.
1896. Mann, E. A., Government Laboratory, Perth, Western Australia, Government Analyst.
1893. Mann, Harold H., Agricultural College, Poona, Bombay, India, Research Chemist.
1899. Mann, Jas. S., 19, Stopford Road, Upton Manor, Essex, Analyst.
1891. Mann, John C., 23, Nicholls Street, West Bromwich, Staffs., Chemist.
1903. Mannhardt, Hans, 1104, Oakdale Avenue, Chicago, Ill., U.S.A., Chemical Engineer.
O.M. Mannington, H. T., Marshlea, Beaconsfield Road, Farnworth, Widnes.
1909. Manns, Dr. J., c/o C. W. Schmidt, Varnish Works, Stratford, E., Chemist.
1892. Mansbridge, Wm., 4, Norwich Road, Wavertree, Liverpool, Chemist.
1904. Marckworth, O. S., Ohio Testing Laboratory, 426, Chamber of Commerce, Columbus, Ohio, U.S.A., Director.
1883. Markel, Dr. K. E., 20, Queen's Gate Terrace, South Kensington, S.W., Technical Chemist.
1905. Marland, Percy, c/o Brotherton and Co., Ltd., Ammonia Works, Wakefield, Works Chemist.
1905. Marlatt, Wilbur T., Oakville, Ont., Canada, Leather Manufacturer.

1912. Marly, Dr. Simon M., 58, Oak Street, Southport, Analytical Chemist.

1904. Marris, H. C., 68, Schlusselberg Prospect, St. Petersburg, Russia, Analytical Chemist

1901. Marsden, Dr. Fred., Office of Industries, Poonmallee Road, Madras, India, Chemist.

1906. Marsden, Oliver, Manor Road Mill, Victoria Road, Leeds, Cashier.

O.M. Marsh, J. T., Ammonia Soda Works, Fleetwood, Lancashire, Chemist.

1883. Marsh, W., Union Alkali Co., Soho Works, Ancoats, Manchester, Chemical Manufacturer.

1895. Marshall, Arthur, Waverley Cottage, Naini Tal, India, Chief Chemical Examiner.

1895. Marshall, Francis G., 56, Bewick Road, Gateshead Technical Chemist.

1891. Marshall, Dr. Hugh, Chemical Dept., University College, Dundee, Professor of Chemistry.

1908. Marshall, John, Cudbear Street, Hunslet, Leeds, Dyeware Manufacturer.

1883. Marshall, Wm., Laboratory, Ladybrook Road, Cheadle Hulme, Cheshire, Dyer.

1884. Marshall, Wm., Barkley, Teddington, Middlesex Analytical Chemist.

1904. Marston, John P., 247, Atlantic Avenue, Boston, Mass., U.S.A., Merchant.

1894. Martin, Alex. M., Hillview, Twechar by Glasgow, Analytical Chemist.

1895. Martin, Chas. H., 40, Bolton Road, Pendleton, Salford, Oil and Soap Works Manager.

1911. Martin, Dr. G., 4, Bertram Road, Hendon, N.W., Science Teacher and Industrial Chemist.

1911. Martin, G. F. Wesley, Castle Park, Lancaster, Chemist.

O.M. Martin, N. H., Ravenswood, Low Fell, Gateshead on-Tyne, Manufacturing Chemist.

1899. Martin, Wm. E., 111, Belle Vue Road, Durban, Natal, South Africa, Chemist.

1911. Martin, Wilmot S., 2, Coronation Terrace, Truro, Cornwall, Analyst and Assayer.

1887. Martineau, Sydney, Streatham Grove, Norwood, S.E., Sugar Chemist.

1907. Martius, Dr. C. A. von, Voss Strasse 12, Berlin, Germany, Dyestuff Manufacturer.

1894. Martyn, T. Graham, Box 5, Maraisburg, Transvaal, South Africa, Metallurgist.

1909. Marx, Robert J., 133–139, Finsbury Pavement, London, E.C., Engineer.

1908. Mason, Douglas H. C., 448, Confederation Life Building, Toronto, Canada, Manufacturer.

1904. Mason, Dr. Edward D., 32, Vernon Road, Edgbaston, Birmingham, Scientific Apparatus Dealer.

1911. Mason, Francis A., c/o Murphy and Lonsdale, 26a, Great George Street, Leeds, Analytical Chemist.

1906. Mason, Dr. Frederic S., 90, Beekman Street, New York City, U.S.A., Manufacturing Chemist.

1901. Mason, Glen F., c/o H. J. Heinz Co., Pittsburg, Pa., U.S.A., Chemist.

1887. Mason, J. Francis, Eynsham Hall, Witney, Oxon.

1910. Mason, James H., 180, Richmond Street West, Toronto, Canada, Metallurgist.

1906. Mason, M. Edgar, 1030, North Branch Street, Chicago, Ill., U.S.A., Consulting Chemist.

1906. Massa, Corradino, Castelguelfo Parmense, Parma, Italy, Sulphuric Acid and Fertiliser Manufacturer

O.M. Masson, Prof. D. Orme, University of Melbourne Victoria, Australia, Professor of Chemistry.

1908. Masson, R. Duncan, c/o Messrs. R. Silcock and Sons, Stanley Hall, Union Street, Liverpool, Analytical Chemist.

1902. Masujima, Prof. Bunjiro, c/o K. Takebe, 25, Gazenbocho, Azabuku, Tokyo, Japan, Prof. of Applied Chemistry.

1902. Masury, Fred L. M., L.D. 545, Sharon, Pa., U.S.A., Explosives Manufacturer.

1910. Matchet, Andrew S., 13, Bute Gardens, Muirend Cathcart, N.B., Analytical Chemist.

1911. Mather, Hubert, Lonsdale Terrace, Whitefield, Lancashire, Chemist.

O.M. Mather, J., Blaydon Chemical Works, Blaydon on Tyne, Manager.

1904. Mather, J. Cecil, 46, Franklin Place, Washington Avenue, Montclair, N.J., U.S.A., Works Chemist

1900. Mather, Wm., c/o The Standard Chemical Co., St. Henri, Montreal, Canada, Chemist

1907. Matheson, A. Greville E., 38-40, Lloyd Street Manchester, Engineer.

1890. Matheson, W. J., c/o Cassella Color Co., 182, Front Street, New York City, U.S.A., Chemical Merchant

1901. Mathew, W. E. B. de Vere, Dunham, Hillside Gardens, Wallington, Surrey, Analytical Chemist.

1900. Mathews, Dr. Jno. A., c/o Halcombe Steel Co., Syracuse, N.Y., U.S.A., Managing Director.

1898. Mathewson, E. P., Anaconda, Mont., U.S.A., Metallurgist.

1888. Matos, Dr. Louis J., (Comms.) 103, North 19th Street, East Orange, N.J., and (Jnls.) c/o Cassella Color Co., 182-4, Front Street, New York City, U.S.A., Chemist.

1896. Matsui, G., c/o Japan Sugar Refinery Co., Onagigawa, Tokio, Japan, Chemical Engineer.

1912. Matthewman, Fred. P., Analyst's Office, L.B. & S.C. Railway Co., Brighton, Chief Chemist.

O.M. Matthews, Chas. G., 31, Stapenhill Road, Burton-on-Trent, Brewing Chemist.

1907. Matthews, Dr. F. E., Ashlawn, The Glebe, Blackheath, S.E., Technical Research Chemist.

1899. Matthews, Dr. J. Merritt, 19, Wilcox Place, East Orange, N.J., U.S.A., Professor of Chemistry and Dyeing.

1889. Mawdsley, W. H., c/o Gold Mining Co., Ltd., Mount Morgan, Queensland, Chemist.

1903. Maxim, Hudson, Landing, N.J., U.S.A., Chemist and Mechanical Engineer.

1891. Maxwell, Jno., Solway Chemical Works, Silloth, Cumberland, and (communications) English Street, Carlisle, Chemical Manure Manufacturer.

1903. Maxwell, Orin P., c/o West Virginia Pulp and Paper Co., Luke, Md., U.S.A., Chemist.

1911. May, Clarence E., 320, South Walnut Street, Bloomington, Ind., U.S.A.

1897. May, George H., 35, Graycliff Road, Newton Centre, Mass., U.S.A., Assistant Chemist.

1884. Mayenfeld, Dr. E. von Salis. *See* Salis-Mayenfeld, Dr. E. von.

1903. Mayer, Andrew, jun., 129, York Street, Brooklyn, N.Y., U.S.A., Chemist.

1908. Mayer, Frederick J., Hudson Terminal Building, 30, Church Street, New York City, U.S.A., General Manager.

1896. Mayfield, A. S., Thirlmere, Newland, Hull, Analyst.

1892. Mayfield, H. B., Normanhurst, Mundy Street, Heanor, near Nottingham, Dyer.

1885. Mayhew, E. W. A., High Street, Freemantle, Western Australia, Manufacturing Chemist.

1900. Maywald, F. J., 89, Pine Street, New York City, U.S.A., Technical Chemist

1909. Meanwell, Chas. W., 15, Woodlands Crescent, Muswell Hill Road, London, N., Analytical Chemist.

1898. Meeds, Alonzo D., 2124, Harriet Avenue, Minneapolis, Minn., U.S.A., Analytical Chemist.

1896. Meggitt, Loxley, Wheatsheaf Works, Alexandria, Sydney, N.S.W., Australia, Analytical Chemist.

1901. Meier, Dr. Franz, c/o Society of Chemical Industry in Basle, Basle, Switzerland, Chemist.

1888. Meikle, Jno., 8, Melrose Street, Great Western Road, Glasgow, Journalist.

1902. Melcher, Arthur C., 58, Bowen Street, Newton Centre, Mass., U.S.A., Research Chemist.

O.M. Meldola, Prof. R., F.R.S., 6, Brunswick Square, London, W.C., Professor of Chemistry.

1911. Mellerio, Lucien P., 46, Bonneville Gardens, Clapham Park, S.W., Technical Assistant.

1912. Melling, S. E., Lynton, Prestwich Park, Manchester, Analytical Chemist.

O.M. Mellon, W. W., Woodlands, Blackrock, Co. Dublin, Ireland, Manufacturing Chemist.

1910. Mellor, Dr. Jos. W., 19, Villas, Stoke on Trent, Ceramic Chemist.

1884. Melville, D., 2, Melville Avenue, Delray, Detroit, Mich., U.S.A., Chemical Works Manager.
1909. Melville, Robt. L., Westfield Chem. Works, Box 655, G.P.O., Auckland, N.Z., Chemist.
1893. Mensching, Dr. C., Mersey Chemical Works, Bromborough, Cheshire, Chemist.
O.M. Menzies, R. C., Inveresk Mills, Musselburgh, N.B., Paper Maker.
1892. Mercer, C. A., 34, Camomile Street, London, E.C., Chemical Apparatus Maker.
1890. Merck, Dr. E., Darmstadt, Germany, Manufacturing Chemist.
1905. Merck, George, Merck and Co., 45, Park Place, New York City, U.S.A., Manufacturing Chemist.
1899. Merrill, Frank H., 2420, Ocean View Avenue, Los Angeles, Cal., U.S.A., Factory Superintendent.
1906. Merrils, Fred. J., 25, Figtree Lane, Sheffield, Analytical Chemist.
1909. Merriman, C. E. B., 129, Trent Boulevard, West Bridgford, Nottingham, Technical Chemist.
1909. Merriman, H. J., 244, Victoria Park Road, South Hackney, N.E., Research Chemist.
1905. Merrin, A. C., 194–200, Bishopsgate, London, E.C., Assistant Editor and Analyst.
1904. Merry, Jno. B., 74, Park Hill Road, Harborne, Birmingham, Metallurgical Chemist.
1903. Mersan, Ferdinand de, Fairfield, Chestnut Avenue, Boston Spa, Yorks., Chemist.
1905. Merz, Eugene, P.O. Box 216, Newark, N.J., U.S.A., Superintendent, Heller and Merz Co.
1897. Meslans, Prof. M., 6, Rue de Navarin, Paris, France, Professor of Chemistry.
O.M. Messel, Dr. R., F.R.S., 147, Victoria Street, London, S.W., Chemical Manufacturer.
1899. Metcalf, Howard F., Farr Alpaca Co., Holyoke, Mass., U.S.A.
1886. Metcalf, Jno., Moorfield Chemical Works, Altham, near Accrington, Tar Distiller.
1908. Metcalfe, Ernest D., 3, Gracechurch Street, London, E.C., Secretary.
1906. Methley, Bernard, Ferndale, Moorgate, Rotherham, Yorks., Engineering Chemist.
1898. Metz, Herman A., P.O. Box 753, New York City, U.S.A., Chemical Merchant.
1905. Metzis, Josef, Anglicia Petroleum Co., Drohobycz Galicia, Austria, Manager of Refinery.
1900. Mewborne, Robt. G., c/o Kentucky Tobacco Products Co., Louisville, Ky., U.S.A., Chemist.
1907. Meyer, Dr. Erwin, c/o Morgan and Wright, Detroit, Mich., U.S.A., Chemist.
1898. Meyer, Dr. Franz, c/o R. Wedekind und Co., Uerdingen a/Rhein, Germany, Metallurgical and Chemical Engineer.
1904. Meyer, Prof. Dr. Richard, Technische Hochschule, Braunschweig, Germany, Professor of Chemistry.
1902. Meyrick, L. J., 137, City Road, Birmingham, Assistant Analyst.
1912. Michie, Arthur C., The Wallsend Laboratories, Wallsend-on-Tyne, Technical Chemist.
1909. Michie, John L., 3, Townhead Terrace, Paisley, N.B.
1907. Micklethwait, Miss Frances M. G., Royal College of Science, London, S.W., Chemist.
1911. Middlemass, Alphonso, 59, Promenade, Portobello, Midlothian, Works Chemist.
1904. Mighill, Dr. Thos. A., 15, Exchange Street, Boston, Mass., U.S.A., Chemist.
1896. Miles, G. Wellington, Room 214, 88, Broad Street, Boston, Mass., U.S.A., Analytical Chemist.
1889. Milestone, W. C., 7, Heathfield Road, Wandsworth Common, S.W., Chemical Works Manager.
1899. Millar, Jas. H., Box 4975, Johannesburg, Transvaal, Manufacturing and Analytical Chemist.
1909. Millar, Jas. Hill, Chief Chemist's Laboratory, St. James' Gate Brewery, Dublin, Chemist.
1883. Miller, Dr. A. K., Kilvert's Buildings, Withy Grove, Manchester, Analytical Chemist.
O.M. Miller, E. V., Sugar Works, Chelsea, Auckland, New Zealand, Sugar Works Chemist.
1889. Miller, Geo., Thornlea, Beaconsfield Road, Farnworth, Widnes, Technical Chemist.
1893. Miller, Dr. Harry E., 305, Palm Avenue, Oakland, Cal., U.S.A., Chemist.
1883. Miller, Dr. H. von. *See* Miller-Aichholz, Dr. H. von.
1894. Miller, Dr. John A., 44–45, Lewis Block, Buffalo, N.Y., U.S.A., Consulting Chemist, State Analyst.
1908. Miller, Lt.-Col. John B., 98, Wellesley Street, Toronto, Canada, Lumber and Iron Manufacturer.
1894. Miller, J. Carlile, 188, St. Vincent Street, Glasgow Manufacturing Chemist.
1888. Miller, J. Hopkins, 86, North Frederick Street, Glasgow, Dyeworks Chemist.
1889. Miller, Jno. Poynter, Sandilands Chemical Works, Aberdeen, Technical Chemist.
1907. Miller, R. H., c/o The Flavell Co., Box 924, Asbury Park, N.J., U.S.A., Chemical Manufacturer.
1901. Miller, Stuart B., c/o E. I. du Pont de Nemours Powder Co., Wilmington, Del., U.S.A., Chemical Engineer.
1901. Miller, Dr. W. Lash, 50, St. Alban Street, Toronto, Canada, Associate Professor of Physical Chemistry.
1884. Miller, W. M., Caledonia Estate, Prov. Wellesley, Penang, S.S., Sugar Chemist.
1883. Miller-Aichholz, Dr. H. von, Beatrixgasse 32, Wien, Austria, Chemical Manufacturer.
1902. Milligan, R. E., New York Continental Jewell Filtration Co., 15, Broad Street, New York City, U.S.A., Chemical Engineer.
O.M. Mills, Prof. E. J., F.R.S., 64, Twyford Avenue, West Acton, W., Emeritus Professor of Technical Chemistry and Consulting Chemist.
1909. Mills, Harry P., 19, Winchester Street, Toronto, Canada, Chemist.
1904. Mills, Dr. J. E., cor. Servais and Pulaske Streets, Columbia, S.C., U.S.A., Analytical and Consulting Chemist.
1905. Mills, Wm. Henry, 45, Wall Street, New York City, U.S.A., Merchant.
1906. Mills, Wm. Hobson, Northern Polytechnic Institute, Holloway, London, N., Lecturer in Chemistry.
1905. Milne, Thomas, c/o The Gas Light and Coke Co., Ltd., 4, Fenchurch Avenue, London, E.C., Chemical Products Salesman.
1903. Milnes, Cresswell, Arlesey, near Hitchin, Herts., Cement Works Manager.
1887. Milnes, Edmund, Seedfield, Bury, Lancashire, Dyeing Extract Maker.
1902. Milnes, Ernest E., Park Print Works, Halifax, Yorks., Chemist.
1909. Mindeleff, Chas., c/o American Smelting and Refining Co., Maurer, N.J., U.S.A., Chemist.
1895. Miner, Harlan S., c/o Welsbach Light Co., Gloucester City, N.J., U.S.A., Technical Chemist.
1889 Miniati, T. K., Penketh, near Warrington, Chemist.
1895. Mitchell, Chas. A., c/o Beaufoy and Co., South Lambeth Road, S.W., Analyst.
1898. Mitchell, G. D. H., c/o Ed. S. Brownson, junr., 50, Pine Street, New York City, U.S.A., Chemist.
1906. Mitchell, Oswald H., c/o Basil Turner, Woolwich, Sydney, N.S.W., Australia, Assayer.
1904. Mitsugi, R., Chiyoda Gasworks, Shiba, Tokio, Japan, Chemist.
O.M. Mitting, E. Kennard, 38, Harold Road, Norwood, S.E., Technical Chemist.
1908. Miyake, Hanzaburo, Ensulko Sugar Factory, Taiwan (Formosa), Japan, Chemist.
1910. Miyama, Kisaburo, 37, Ushigome Kitacho, Tokyo, Japan, Technical Chemist.
1909. Miyoshi, K., Imperial Steel Works, Yawatamachi, Chikuzen, Japan, Engineer
1909. Moek, Hugo, 220, Broadway, New York City, U.S.A., Lawyer.
1905. Modi, Dr. E. M., Meher Buildings, Tardeo, Bombay, India, Manufacturing and Analytical Chemist.
1910. Moe, Carl, 4, Rue Royale, Three Rivers, P.Q., Canada, Chemist.
1906. Moe, Eldor H., Box 266, Salt Lake City, Utah, U.S.A., Chemist.
1911. Mohan, Richard T., 93, MacNab Street North, Hamilton, Ont., Canada, Chemist.

O.M. Mohr, Dr. B., 69A, Parliament Hill, Hampstead, N.W., Consulting Chemist and Metallurgist.
1891. Mole, Herbert B., Royal Albert Brewery, Queen's Road, Reading, Brewer
1902. Molesworth, F. H., Jersey Road, Artarmon, N.S.W., Australia, Analytical Chemist.
1910. Möller, Dr. Wilhelm, Lawes Chemical Manure Works, Ltd., Barking Creek, Essex, Managing Chemist.
1901. Mond, Dr. Albert L., c/o Huber and Mond, 19, Southampton Buildings, Chancery Lane, London, W.C., Chemical Engineer.
1899. Mond, Emile S., 22, Hyde Park Square, London, W., Technical Chemist.
1891. Mond, Dr. Robt. L., Winnington Hall, Northwich, Chemist.
1906. Monier-Williams, G. W., Chessington, Surrey.
1908. Monk, Chas. W., 102, Bloomfield Road, Plumstead, Kent, Chemist.
1909. Monk, Reginald H., 388, Grosvenor Avenue, Westmount, P.Q., Canada, Chemical Engineer.
1909. Monro, Irwin W., Bangalore, South India, Manufacturing Chemist.
1890. Moodie, Wm. E., Alexandria Works, Alexandria, N.B., Analytical Chemist.
1905. Moody, Dr. Gerald T., Lorne House, North Dulwich, S.E., Barrister-at-Law.
1898. Moody, Dr. Herbert R., College of the City of New York, and (Journals) 320, Convent Avenue, New York City, U.S.A., Professor of Chemistry.
1903. Mooney, F. M., 118, Pembroke Road, Dublin, Chemical Manure Manufacturer.
1903. Mooney, Geo. A., 310, St. Paul Street, Montreal, Canada, Chemical Merchant.
1902. Mooney, Luke, 36, West 52nd Street, Bayonne, N.J., U.S.A.
1887. Moore, Chas. C., 33, Clarendon Road, Garston, Liverpool, Chemist.
1901. Moore, Dr. Chas. W., c/o Crosfield and Sons, Ltd., Laboratory, Warrington, Chemist.
1907. Moore, Ernest P., c/o The Steel Co. of Canada, Hamilton, Ont., Canada, Chemist.
1911. Moore, Ernest W., c/o T. G. Tickler, Pasture Street Works, Grimsby, Lincolnshire, Analytical Chemist.
1902 Moore, Fred., Victoria Chemical Co., Ltd., Victoria, B.C., Canada, Manufacturing Chemist.
1906. Moore, F. H., Messrs. G. H. Ogston and Moore, 87–89, Aldgate, London, E., Analytical Chemist.
1892. Moore, Dr. Geo. D., 201, Salisbury Street, Worcester, Mass., U.S.A., Professor of Chemistry.
1905. Moore, Leslie R., 173, Oakleigh Road, Newton, Mass., U.S.A., Chemist.
1899. Moore, Quintin, jun., c/o Wm. Beardmore and Co., Ltd., Parkhead Forge, Glasgow, Works Manager.
1885. Moore, R. T., 142, St. Vincent Street, Glasgow, Mining Engineer.
1899. Moore, Dr. Russell W., 340/344, Hudson Street, New York City, U.S.A., Chemist.
1890. Moore, Thos., Compton Park Villas, Plymouth, Analytical Chemist.
1910. Moorhouse, Samuel, 138, New Road, Blackley, Manchester, Secretary and Oil Specialist.
1905. Moorwood, F. Colin, c/o W. H. Dyson, The Amalgams Co., Ltd., Attercliffe Road, Sheffield, Steel Manufacturer.
1903. Moran, Geo. A., 611½, Central Avenue, Dover, N.H., U.S.A., Chemist.
1890. Mordle, F. Dare, Guilderoy, Matlock Bath, Derbyshire, Starch Manufacturer.
1902. More, Andrew, Ellesmere, King's Road, Walton-on-Thames, Analytical Chemist.
1906. Morewood, C. Darcy, Frodingham Ironstone Mines, Scunthorpe, near Doncaster, Analytical Chemist.
1908. Morfey, Harold, 133, Hough Lane, Wombwell, near Barnsley, Yorks., Manager of By-Products Works.
1901. Morgan, Dr. Gilbert T., Royal College of Science, South Kensington, S.W., Demonstrator of Chemistry.
1905. Morgan, Prof. Jerome J., Stevens Institute of Technology, Hoboken, N.J., U.S.A., Instructor in Engineering Chemistry.
1907. Morgan, Leonard P., Assay Dept., Royal Mint, Ottawa, Canada, Electro Chemist.
1906. Morgan, Thos., "Meirion," Dovedale Road, Mossley Hill, Liverpool, Manufacturing Chemist.
1898. Morgan, T. M., 370, Wood Avenue, Westmount, Quebec, Canada, Cement Works Manager.
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1885. Morley, Dr. H. Forster, 5, Lyndhurst Road, Hampstead, N.W., Professor of Chemistry.
1902. Morrell, Dr. R. S., Messrs. Mander Bros., Colour and Varnish Works, Wolverhampton, Chemist.
1881. Morrice, Jas. A., 1, Prince's Terrace, Dowanhill, Glasgow, Starch and Gum Manufacturer.
1906. Morris, A. H., 13, Park Street, Bolton, Lancs., Brewer.
1898. Morris, Edgar F., 60, Millgate, Stockport, Research Chemist.
1897. Morris, Harry, The Hall, Hexthorpe, Doncaster, Chemical Merchant.
1890. Morris, Herbert N., Gorton Brook Chemical Works, Manchester, Technical Chemist.
O.M. Morris, J. Haydn. *See* Haydn-Morris, J.
1908. Morris, Wm. J., 31, Prince Alfred Road, Wavertree, Liverpool, Chemist.
1911. Morrison, G. R., Oficina Reducto, Santa Catalina, Iquique, Chile, Chemist.
1910. Morrison, J. A. S., 20, Cavendish Road, Leeds, Leather Chemist.
1910. Morrison, John W., Gas Offices, Sheffield, Gas Engineer.
1902. Morrison, Jos., Wellfield, Farnworth, Widnes, Manager.
1906. Morrow, Jas. M., 665, Beverley Street, Winnipeg, Man., Canada, Analytical Chemist.
1901. Morse, Willard S., Seaford, Del., U.S.A., Manager.
1909. Morson, Leslie J., Summerfield Works, Ponders End, Middlesex, Manufacturing Chemist.
1904. Morson, Thos. D., 14, Elm Street, Gray's Inn Road, London, W.C., Chemist.
1906. Morson, T. Pierre, 14, Elm Street, Gray's Inn Road, London, W.C., Chemical Manufacturer.
1907. Morton, George A., c/o United Malaysian Rubber Co., Goebilt, Sarawak, Borneo, Chemist.
1889. Morton, Jas., Dalquhurn Works, Renton, N.B., Dyeworks Manager.
1897. Morton, Jno., North Road, St. Helens, Lancashire, Analytical Chemist.
1902. Mosbaugh, F. R., c/o Anglo-Canadian Leather Co., Huntsville, Ont., Canada, Chemist.
1905. Moseley, F. A. D. H., Box 1657, Johannesburg, Transvaal, Analytical Chemist.
1911. Mosenthal, E. Macqueron de, 40, Hansaring, Cologne, Germany, Chemist.
1888. Mosenthal, Henry de, 220, Winchester House, Old Broad Street, E.C., Explosives Company Manager.
1906. Moss, Wm., Moss Chem. Manuf. Co., Foot of Carlaw Avenue, Toronto, Canada, Chem. Manufacturer.
1894. Moszczenski, J. B., 216, Ovington Avenue, Brooklyn, N.Y., U.S.A., Consulting Chemist.
1897. Motion, Jno., c/o The Joseph Dixon Crucible Co., Jersey City, N.J., U.S.A., Assistant Superintendent.
1887. Moul, Frank, Aldersgate Chemical Works, Southall, Technical Chemist.
1901. Moule, Jno. W., Great Fitzroy Mine, Mount Chalmers, Queensland, Metallurgist.
1884. Moult, J., 3, Gladstone Terrace, Gateshead-on-Tyne, Secretary.
1898. Moulton, Prof. Chas. W., Vassar College, Poughkeepsie, N.Y., U.S.A., Professor of Chemistry.
1905. Moulton, Rt. Hon. Sir J. Fletcher, F.R.S., 57, Onslow Square, London, S.W., Lord Justice of Appeal.
1892. Mount, Edw., Oaklands, Aughton, near Ormskirk, Assistant Secretary (United Alkali Company).
1905. Mrazek, F. M., 23, West Cromwell Road, London, S.W., Consulting Chemist.

1904. Muckenfuss, A. M., c/o University of Mississippi. University, Miss., U.S.A., State Chemist.
1907. Mueller, Dr. Carl, The Heyden Chemical Works, Garfield, N.J., U.S.A., Chemist.
1890. Muir, Jas. Stanley, 23, Lilybank Gardens, Glasgow, Chemist.
O.M. Muller, Dr. H., F.R.S., 13, Park Square East, Regent's Park, London, N.W., Research Chemist.
1896. Mundy, Lionel, 27, Merton Road, Kensington, W., Importer of Unfermented Wines.
1887. Munroe, Prof. Chas. E., George Washington University, Washington, D.C., U.S.A., Professor of Chemistry and Dean.
1900. Munsell, Dr. Chas. E., c/o Devoe and Raynolds Co., 110, Horatio Street, New York City, U.S.A., Colour Chemist.
1900. Munton, Fred. T., Rosslyn, Swanlow, Winsford, Cheshire, A.R.S.M., Analytical Chemist.
1897. Murch, D. Wilshin, 123, Derby Street, Burton-on-Trent, Chemist.
1904. Murdoch, Alexander, 507, Alexandra Parade, Dennistoun, Glasgow, Analytical Chemist.
1886. Murdoch, R. H. M., Norwood, Saltcoats, Ayrshire, Explosives Chemist.
1899. Murphy, Albert J., 26A, Great George Street, Leeds, Brewer's Chemist.
1906. Murphy, Frederic W., Standard Sugar Refinery, Granite Street, South Boston, Mass., U.S.A., Chemist.
1901. Murray, Benjamin L., c/o Merck and Co., Rahway, N.J., U.S.A., Chemist.
1903. Murray, Chas. B., 407, Perry Payne Building, Cleveland, Ohio, U.S.A., Chemist.
1901. Murray, Jas. P., Toronto Carpet Manufacturing Co., Ltd., King Street, and Fraser Avenue, Toronto, Canada, Carpet Manufacturer.
1898. Murray, Rd., c/o Brotherton and Co., Ltd., Ammonia Works, Holmes Street, Leeds, Analyst.
1908. Murray, Dr. Thos. J., Municipal Technical School, Wolverhampton, Lecturer on Chemistry.
1905. Murray, Wm. Wallace, c/o Union Abattoir Co., Baltimore, Md., U.S.A., Chemist.
1905. Murrill, Dr. Paul I., c/o Du Pont Powder Co., Wilmington, Del., U.S.A., Representative.
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1894. Muspratt, Max, The Grange, Fulwood Park, Liverpool, Technical Chemist.
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1907. Musso, Louis A., Box 956, G.P.O., Sydney, N.S.W., Australia, Technical Chemist.
1895. Muurling, I. J. R., 117, Hudson Street, New York City, U.S.A., Dyestuff Importer.
1911. Myers, Ernest M., c/o The Shelton Iron, Steel, and Coal Co., Ltd., Stoke on Trent, Coke Oven Manager and Chemist.
1891. Myers, Dr. Wm. S., 71, Nassau Street, New York City, U.S.A., Director.

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1902. Naef, Dr. Ernest E., Clydach, Swansea, South Wales, Chemist.
1903. Nagel, Dr. Oskar, P.O. Box 385, New York City, U.S.A., Chemist.
1908. Nagle, J. C., Fern Bank, Edge Lane, Stretford, Manchester, Glucose and Starch Manufacturer.
1897. Nairn, Michael, Dysart House, Fife, N.B., Linoleum Manufacturer.
1909. Nakai, S., Miike Colliery Office, Omuta-machi, Chikugo, Japan, Engineer.
1903. Nakayama, T., c/o Fuji Paper Co., Mill No. 7, Shimonocho, Nishino, Nishiku, Osaka, Japan, Chemist.
1901. Nanabhai, Krishnalal, Chopaty, Grant Road P.O., Bombay, India, Technological Chemist.
1893. Napier, Jno. W., Gas Works, Alloa, N.B., Manager and Chemist.
1904. Napper, Sidney S., c/o S. Courtauld and Co., Ltd., Foleshill Road, Coventry, Chemist.
1903. Nash, A. Douglas, Beech Street, Waldheim, Flushing, N.Y., U.S.A., Glass Manufacturer.
1897. Nash, Leonard M., Westlands, Princess Road, Finsbury Park, N., Works Chemist.
1910. Nash, N. C., Trelcaven, Darling Street, Balmain East, Sydney, N.S.W., Works Chemist.
1905. Nash, W. A., Corn Exchange Bank, New York City, U.S.A., President, Corn Exchange Bank.
1908. Nasmith, M. E., 131, Balsam Avenue, Balmy Beach, Toronto, Canada, Baker.
1900. Nathan, Lt.-Col. Sir Frederic L., R.A., Ardeer, Stevenston, Ayrshire, Superintendent, Nobel's Explosives Works.
1907. Nauckhoff, Sigurd, c/o Nitroglycerin Aktiebolaget, Vinterviken, Stockholm, Sweden, Chemical Engineer.
O.M. Naylor, W. A. H., The British Drug Houses, Ltd., 22–30, Graham Street, City Road, London, N., Manufacturing Chemist.
1909. Neal, C. S., Acme White Lead and Colour Works, Detroit, Mich., U.S.A., Manager.
1899. Neate, Percy J., 49, Frognal, Hampstead, N.W., Director of Cement Co.
1902. Neave, Dr. Geo. B., Royal Technical College, Montrose Street, Glasgow, Assistant to Professor of Chemistry.
1905. Neech, Herbert R., 12, Colegrave Street, Lincoln, Chemical Engineer.
1905. Needham, Edward R., 48, Paton Street, Glasgow, Manufacturing Chemist.
1905. Neff, Robert W., 22, India Square, Boston, Mass., U.S.A., Chemical Manufacturer.
1906. Neil, Dr. Archibald A., c/o Thos. Riley, 39, Victoria Crescent, Eccles, Manchester, Chemical Engineer.
1890. Neill, Geo. D., Drumslea, Greenock, N.B., Sugar Refiner.
1898. Neilson, Alex. McG., Umbilo, Durban, Natal, Analytical Chemist.
1911. Neilson, R. G., c/o Burmah Oil Co., Ltd., P. Box 67, Rangoon, Burmah, and (Jnls.), Craven Hotel, Craven Street, Strand, W.C., Assistant.
1910. Neiman, Howard S., Hudson Terminal Building, 30, Church Street, New York City, U.S.A., Patent Attorney.
1902. Neish, Dr. Arthur C., Columbia University, New York City, U.S.A., Chemist.
1911. Nello, Vincent, Baldwin's Hill, Loughton, Artists' Colour Manufacturer.
1897. Nelson, Walter, Emscote Mills, Warwick, Gelatin Manufacturer.
1906. Nestell, Raymond J., 1919, Cordova Street, Los Angeles, Cal., U.S.A., Analytical Chemist.
1902. Neumann, Dr. Edgar, 7 and 8, Idol Lane, London, E.C.
1903. Neumann, Dr. Max, Dambachthal 9, Wiesbaden Germany.
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1905. Newall, Jos., Morley Road, Runcorn, Cheshire, Chemist.
1889. Newberry, Spencer B., Sandusky Portland Cement Co., Sandusky, Ohio, U.S.A., Manager.
O.M. Newlands, B. E. R., 2, St. Dunstan's Hill, London, E.C., Analytical and Consulting Chemist.
O.M. Newlands, W. P. R., 10, Cricklade Avenue, Streatham Hill, S.W., Sugar Chemist.
O.M. Newton, Jno., Manor Works, Rotherhithe New Road, London, S.E., Manure Manufacturer.
1912. Newton, Leonard O., St. Elba, Napoleon Road, St. Margarets on Thames, Analytical Chemist.
1901. Nibelius, Axel W. T., c/o Emporium Powder Co., Emporium, Pa., U.S.A., Chemist.
1904. Nichols, C. W., 25, Broad Street, New York City, U.S.A., Manufacturing Chemist.
1905. Nichols, E. Remington, 25, Broad Street, New York City, U.S.A., Treasurer (Nichols Chemical Co.).
1884. Nichols, J. A., Stanley Mount, New Mills, near Stockport, Teacher of Science.
1911. Nichols, M. F., 697, Cherry Street, Grand Rapids Mich., U.S.A., Chemist.

1888. Nichols, Dr. Wm. H., 25, Broad Street New York City, U.S.A., Chemical Manufacturer.
1905. Nichols, W. H., jun., 25, Broad Street, New York City, U.S.A., Chemical Manufacturer.
1904. Nicholson, Wilfred E., Hunslet Chemical Works, Leeds, Chemical Manufacturer.
1897. Nicholson, Wm. J., Ardeer, Stevenston, Ayrshire, Chemist.
1903. Nicoll, Frank, Clevedon, Bankfield Lane, Southport, Chemist.
1905. Nieghorn, Albert, c/o Nichols Chemical Co. Toronto, Canada, Agent.
1900. Nield, J. H., c/o General Chemical Co., Edgewater, N.J., U.S.A., Superintendent.
1906. Nielson, Dr. Carl, 704, Harrison Ave. Harrison, N.J., U.S.A., Chemist.
1898. Nightscales, Geo., 642, Holderness Road, Hull, Oil Merchant.
1899. Nihoul, Dr. Edw., 204, Rue St. Laurent, Liége, Belgium, Director of the Liége Tannery School.
O.M. Nimmo, Jas., 35, Whitworth Road, South Norwood, S.E., Analytical Chemist.
1907. Nims, H. E., c/o The Fiberloid Co., Indian Orchard, Mass., U.S.A., Chemist.
1885. Nishigawa, T., 20, Hirakawa Cho, Go Chome, Tokyo, Japan, Works Director and Chemical Engineer.
1898. Nishikawa, Prof. Dr. T., Dept. of Applied Chemistry Kyushu Imp. University, Fukuoka, Japan, Prof. of Applied Chemistry.
1908. Noble, Sir Andrew, Bart., K.C.B., F.R.S., Jesmond Dene House, Newcastle-on-Tyne.
O.M. Nölting, Dr. E., Ecole de Chimie, Mulhouse, Alsace, Germany, Professor of Chemistry.
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1892. Norman, J. T., 23, Leadenhall Street, London, E.C., Consulting Chemist.
1890. Norman-Bott, Dr. Wm., 16, St. Helen's Place, London, E.C., Consulting Chemist.
1908. Norris, Wm. H. H., 18, Allfarthing Lane, Wandsworth, S.W., Chemist.
1902. North, Barker, 22, Horton Park Avenue, Bradford, Assistant Professor of Chemistry.
1903. North, Henry A., 2338, Marshall Boulevard, Chicago, Ill., U.S.A., Chemist.
1909. Northcote, Reginald S., c/o Continental Mexican Rubber Co., Torreon, Coahuila, Mexico, Chemist.
O.M. Northing, J., The Murrough, Wicklow, Ireland, Technical Chemist.
1905. Norton, Arthur L., 36, Purchase Street, Boston, Mass., U.S.A., Dyestuff Merchant.
O.M. Norton, Dr. S. A., 363, East Town Street, Columbus, Ohio, U.S.A., Professor of Chemistry (Ohio State University).
1911. Norton, Samuel J., 22, Bushnell Road, Balham, S.W., Engineer and Manager.
1887. Norton, Dr. T. H., c/o Wm. Bryce, 54, Lothian Street, Edinburgh, U.S. Consul.
1899. Noyes, Henry c/o Noyes Bros., 153 7, William Street, Melbourne, Victoria, Engineer.
1901. Noyes, Prof. Wm. A., University of Illinois, Urbana, Ill., U.S.A., Editor (J. Amer. Chem. Society).

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1910. Oakden, W. E., c/o American Optical Co., Southbridge, Mass., U.S.A., Director of Research Laboratory.
1905. Oakes, F. J., jun., 141, Milk Street, Boston, Mass., U.S.A., Secretary, Oakes Manufacturing Co.
1904. Oberländer, Dr. Otto, 29, Queen Street, London, E.C., Research and Consulting Chemist.
1904. O'Brien, Claude H., Malgrave, Cairns, North Queensland, Supervising Chemist.
1900. O'Brien, Frederick, Lynwood, Grange Road, Bishopsworth, near Bristol, Analytical Chemist.
1905. Oburg, W. F., 33, Broad Street, Boston, Mass., U.S.A., Assistant Treasurer (Merrimac Chem. Co.).
1902. Oekel, Reinhold, Technical Chemist
1901. O'Connor, Chas. P., 7, Fairfield Street, Montclair, N.J., U.S.A., Analytical Chemist.
1908. O'Day, John, 32, India Street, Boston, Mass., U.S.A., Dyestuff and Chemical Merchant.
1888. Oddy, Robert W., Abbey Street, Toad Lane, Rochdale, Chemist.
1911. Oehler, Prof. John, Carlstadt, N.J., U.S.A., Assoc. Prof. of Chemistry (Columbia University).
1906. Ogilvie, Alex. M., 9, Belmont Drive, Giffnock, Renfrewshire.
1908. Ogilvie, Jas. P., Homedale, Hendon Lane, Church End, Finchley, N., Chemist.
1901. Ogston, Alex. G., Heath Park, near Aberdeen, N.B., Soap Manufacturer.
1903. Ohlenschlager, J. G., jun., Shanghai House, Botolph Lane, London, E.C., Chemical Merchant.
1905. Ohliger, Willard, c/o F. Stearns & Co., Detroit, Mich., U.S.A., Chemist.
1907. Oke, Alfred W., 32, Denmark Villas, Hove, Sussex, Solicitor.
1884. Oliver, F., 31, Horsley Hill Road, Westoe, South Shields, Analytical Chemist.
1912. Oliver, Ralph R., c/o Southern Fibre Co., Portsmouth, Va., U.S.A., Paper Chemist
1888. Oliver, Wm. Letts, 101, Vernon Street, Oakland, Cal., U.S.A., Mining Engineer.
1910. Oliver, Willie, 270, Spotland Bridge, Rochdale, Works Chemist.
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1906. Olmsted, Fred. A., c/o Willamette Pulp and Paper Co., Oregon City, Oregon, U.S.A., Chemical Engineer.
1904. Olney, L. A., 118, Riverside Street, Lowell, Mass., U.S.A., Professor of Chemistry and Dyeing.
1904. Olshausen, B. A., 143, South Broadway, Los Angeles, Cal., U.S.A., Chemist.
1902. O'Neill, Chas., c/o Bleachers' Association, Ltd., 4, Norfolk Street, Manchester, Chemist and Colourist.
1907. Oppen, Wm. A., Vera Chemical Co., Stoneham, Mass., U.S.A., Chemist and Superintendent.
1905. Ormandy, Dr. W. R., 53a, Barton Arcade, Manchester, Consulting Chemist.
1898. Ormerod, Dr. Ernest, Oak Lodge, St. Anne's-on-Sea, Lancashire, Consulting Chemist.
1894. Ormerod, John, Globe Leather Works, Castleton, Manchester, Tanner and Currier.
O.M. Orr, A., 35A, Bligh Street, Sydney, New South Wales, Analytical Chemist.
O.M. Orr, J. B., Crossacres, Woolton, Liverpool, Chemical Manufacturer.
1899. Orr, Thos. W., c/o W. Orr, 20, Renfield Street, Glasgow; and (Journals) Lethnot, Burnside, Rutherglen, Glasgow, Chemist.
1907. Ortved, Niels C., c/o Hiram Walker & Sons, Ltd., Walkerville, Ont., Canada, Chemist and Fermentologist.
1900. Osbourne, Jno. P., 6, Garrioch Drive, Maryhill, Glasgow, Analytical Chemist.
1900. O'Shaughnessy, Francis R., Home Farm, Tyburn, Birmingham, Chemist.
1885. O'Shea, Prof. L. T., Dept. of Applied Science, St. George's Square, Sheffield, Professor of Applied Chemistry (University of Sheffield).
1908. Osland, Clarence R., 725, Monroe Avenue, Scranton, Pa., U.S.A., Chemist.
1883. O'Sullivan, J., High Bank, Burton-on-Trent, Brewing Chemist.
1905. Otsuki, Prof. Chiri, Chemical Laboratory, Kyoto Imperial University, Kyoto, Japan, Professor of Applied Chemistry.
1912. Otto, Chas. W., 154, East 175th Street, New York City, U.S.A., Chemist.
1898. Oushkoff, John P., Warwarka, 5, Moscow, Russia, Chemical Manufacturer.
1904. Owen, Halsall, Burfield, Appleton, near Warrington, Engineer.
1906. Oxley, Horace F., Church Green, Lymm, Cheshire, Chemist.

1908. Oxley, John C., Claycroft, Guiseley, near Leeds, Aniline Colour Merchant.
1903. Ozias, Ramon E., 732, Clinton Avenue, Newark, N.J., U.S.A., Assayer.

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1904. Page, Edwin P., Glenroy, Highland Grove, Worksop, Notts., Chemist.
1886. Pagès, Albert, 34, Boulevard Henri IV., Paris, Technical Chemist.
1892. Paine, Augustus G., 200, Fifth Avenue, New York City, U.S.A., President of Paper Making Co.
1912. Painter, G. Macaulay, 1, Hillside, Highgate Road, London, N.W., Demonstrator in Chemistry.
1906. Palm, Otto G., 41, Colborne Street, Toronto, Canada, President (Atteaux Dye and Chemical Co.).
1903. Palmenberg, O. W., 50, East 41st Street, New York City, U.S.A., Consulting Chemist and Fuel Engineer.
1902. Palmer, Fred. G., c/o Japanese Explosives Co., Hiratsuka, Sagami, Japan, Chemist and Acid Superintendent.
1887. Palmer, T. Chalkley, c/o American Dyewood Co., Chester, Pa., U.S.A., Manufacturing Chemist.
1887. Palmer, Thos. C., c/o W. J. Fraser and Co., Ltd., Dagenham, Essex.
1907. Palmer, Wm. J., c/o W. H. Holmes and Sons, Portland Road, Newcastle-on-Tyne, Analytical Chemist.
1911. Paniker, Ramni, c/o Messrs. Röhm and Haas, 4, Quai St. Clair, Lyons, France, Leather Trades Chemist.
1888. Parker, Chas. E., Penketh, Warrington, Tanner.
1898. Parker, Charles H., Chemist.
1891. Parker, Edw., Laburnum House, Rushford Avenue, Levenshulme, Manchester, Analytical Chemist.
1894. Parker, Dr. J. Gordon, Leathersellers' Technical College, 176, Tower Bridge Road, London, S.E., Principal.
1897. Parker, Prof. Matthew A., University of Manitoba, Winnipeg, Canada, Professor of Chemistry.
1901. Parker, Richard H., 147, Seymour Avenue, Newark, N.J., U.S.A., Analytical Chemist.
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1894. Parker, Thos. J., 25, Broad Street, New York City; and (Journals) Bayonne, N.J., U.S.A., Chemical Works Manager.
1903. Parker, Wm. B., 96, Murray Road, Rugby, Chief Chemist (British Thomson-Houston Co., Ltd.).
1901. Parker, Dr. Wm. Huntington, 177, State Street, Boston, Mass., U.S.A., Chemist (U.S. Appraisers).
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1905. Parr, Prof. S. W., University of Illinois, Urbana, Ill., U.S.A., Professor of Applied Chemistry.
1898. Parrish, Saml., 80, Grange Avenue, Chapeltown Road, Leeds, Teacher of Chemistry.
1901. Pass, James, Onondaga Pottery Co., Syracuse, N.Y., U.S.A., Pottery Manufacturer.
1909. Passmore, Dr. Francis W., 63, Queen Victoria Street, London, E.C., Consulting Chemist.
1902. Patch, Prof. Jas. A., Syrian Protestant College, Beirût, Syria, Professor of Chemistry.
1910. Patch, N. K. B., c/o Lumen Bearing Co., Weston Road and C.P.R. Tracks, West Toronto, Canada, Manager.
1897. Patchett, Col. Jas., Oakworth, Hadley, Wellington, Salop, Ironmaster.
1884. Paterson, John, Belle Isle Place, Workington, Cumberland, Mechanical Engineer.
1887. Paton, J. M. C., Messrs. Manlove, Alliott, and Co., Ltd., Nottingham, Mechanical Engineer.
1886. Paton, W. Grant, Airlie, Huyton, near Liverpool, Alkali Works Manager.
1901. Patterson, Chas. A., c/o E. I. du Pont de Nemours Powder Co., Pinole, Cal., U.S.A., Analytical Chemist.
O.M. Patterson, Geo., c/o The Maubré Saccharine Co., Ltd., Fulham Palace Road, Hammersmith, W., Technical Chemist.
1909. Patterson, G. H., Ivanhoe, Linden Grove, West Hartlepool, Works Manager.
1893. Patterson, Harry J., College Park, Prince George's Co., Md., U.S.A., Agricultural Chemist.
O.M. Patterson, T. L., Maybank, Finnart Street, Greenock, N.B., Sugar Works Manager.
1902. Patterson, Wm. Hamilton, Monksferry Chemical Laboratory, Birkenhead, Technical Chemist.
O.M. Pattinson, John, 10, Dean Street, Newcastle-on-Tyne, Consulting Chemist.
O.M. Pattison, Jas., Drimnamona, Kilmalcolm, N.B., Chemical Merchant.
1889. Pattison, Percy J., St. Budeaux, Devonshire Road, Hornchurch, Essex, Technical Chemist.
1909. Patton, H. G., c/o Fred Rueping Leather Co., Fond du Lac, Wis., U.S.A., Chemist.
1904. Patz, E. O., 215, Water Street, New York City, U.S.A., Manager, Berlin Aniline Works.
1908. Paul, David M., c/o Chance and Hunt, Ltd., Oldbury, Birmingham, Chemist.
1891. Paul, Jas. H., 11, Glenluce Road, Blackheath, S.E., Analytical Chemist.
1900. Paul, Dr. L. Gordon, Market Hall Chambers, King Street, Huddersfield, Consulting Chemist.
1902. Pay, Walter H., Explosives Office, New Law Courts, Johannesburg, Transvaal, Government Inspector of Explosives.
1904. Payne, A. G. C., 6, Bradford Place, Penarth, near Cardiff, Chemist.
O.M. Payne, J. B., 13, Mosley Street, Newcastle-on-Tyne, Manufacturing Chemist.
1910. Peacock, Samuel, 725, Market Street, Philadelphia, Pa., U.S.A., Chemist and Metallurgist.
1912. Pearce, Geoffrey V., 14, Park Crescent, Portland Place, London, W., Chemical Manufacturer.
1891. Pearce, Jas. Stanley, Clements, Snaresbrook, Essex, Chemical Manufacturer.
1897. Pearce, Richard, 6, Beach Lawn, Waterloo, Liverpool, Metallurgist.
1883. Pearce, W., M.P., Chemical Works, Bow Common, London, E., Chemical Manufacturer.
1903. Pearcy, A. C., 43, Marlborough Mansions, Cannon Hill, London, N.W., Director, Explosives Co.
1903. Pears, Thos., The Laboratory, Soap Works, Isleworth, Soap Manufacturer.
1904. Pease, Fred N., P.O. Box 503, Altoona, Pa., U.S.A., Chemist.
O.M. Péchiney, A. R., Villa Les Rochers, Hyères (Var), France, Chemical Engineer.
1898. Peck, Dr. Ernest L., High Lawn, Bromboro', Cheshire, Chemist.
1909. Peck, Lieut. Sydney C., 7, Nightingale Place, Woolwich, S.E., Lieut., R.A.
1898. Peckham, Stephen F., 150, Halsey Street, Brooklyn, N.Y., U.S.A., Chemist.
1891. Peden, Jno., 30, Ardgowan Street West, Greenock, N.B., Analytical Chemist.
1909. Pederneiras, Lieut.-Col. A., Fabrica de Polvora, Piquete, Lorenci, Sao Paulo, Brazil, Director Smokeless Powder Factory.
O.M. Pedler, Sir Alexander, C.I.E., F.R.S., 28, Stanhope Gardens, Queen's Gate, London, S.W., Director of Public Instruction (retired).
1886. Pedler, J. R., 47, Tregunter Road, South Kensington, S.W., Clerk.
1906. Peile, Henry, Millburn House, Newcastle-on-Tyne, and (Journals) c/o F. J. Willott, Victoria Garesfield Colliery, Rowlands Gill, Co. Durham, Colliery Owner.
1899. Pell, A., 7, Elphinstone Circle, Bombay, India, Chemist.
1897. Pellew, Chas. E., 111, East 78th Street, New York City, U.S.A., Adjunct Professor of Chemistry.
1904. Pelly, Russell George, 3, Wingate Road, Hammersmith, W., Analytical Chemist.

1896. Penney, Mulgrave D., 11, High Street, Hull, Analytical Chemist.
1890. Pennock, J. D., c/o Solvay Process Co., Syracuse, N.Y., U.S.A., Technical Chemist.
1885. Pentecost, S. J., Alexandra Mount, Mapperly Hill, and (Journals), Lenton Works, Nottingham, Lace Dresser.
1887. Pentermann, H. T., 37, Chilton Crescent, Peckham, S.E., Brewing Chemist.
1892. Peploe, D. H. T., Underriver House, Sevenoaks, Kent.
1910. Percival, G. Arnelitle, 45, Hungerford Road, London, N., Metallurgical Chemist.
1885. Perkin, A. G., F.R.S., Grosvenor Lodge, Grosvenor Road, Leeds, Technical Chemist.
1898. Perkin, Dr. F. Mollwo, 199, Piccadilly, London, W., Head of Chemical Department, Borough Polytechnic.
1887. Perkin, Dr. W. H., F.R.S., Fairview, Wilbraham Road, Fallowfield, Manchester, Professor of Chemistry.
1893. Perkins, T. S., 30, Tiffany Place, Brooklyn, N.Y., U.S.A., Chemist.
1899. Perks, Walter G., Lisnaice, Woodcote Grove Road, Coulsdon, Surrey, Manufacturer.
1906. Perrow, Mosley G., Lynchburg, Va., U.S.A.
1901. Perry, Chas. M., Greene, Kent County, R.I., U.S.A., Bleach and Dyeworks Chemist.
1887. Perry, David, Norwood, Lenzie, N.B., and (Journals) Forth and Clyde Chemical Works, Nitshill, near Glasgow, Manufacturing Chemist.
1895. Perry, Jos. H., 276, Highland Street, Worcester, Mass., U.S.A., Teacher of Chemistry.
1903. Perry, M. J. T., Australian Drug Co., O'Connell Street, Sydney, N.S.W., Australia, Manufacturing Chemist.
1903. Perry, Robt. Swain, 3500, Grays Ferry Road, and (Journals) Station D., Philadelphia, Pa., U.S.A., President (Harrison Bros. and Co.).
1901. Persons, Ashton C., 5, Lincoln Avenue, Willimantic, Conn., U.S.A., Chemist.
1897. Peter, Dr. A. H., 26, West 30th Street, New York City, U.S.A., Chemist.
1908. Peters, John M., c/o National Lead Co., 111, Broadway, New York City, U.S.A., White Lead Manufacturer.
1893. Pethybridge, Walter, 3, Rhodesia Road, Stockwell, S.W., Chemist and Assayer.
1909. Petrie, A. Swanston, c/o Gibbs and Co., Iquique, Chile, S. America, Analytical Chemist.
1903. Petrie, Dr. Jas. M., The University, Sydney, N.S.W., Australia, Chemist.
1902. Petsche, B. W., 60, Glenwood Avenue, Yonkers, N.Y., U.S.A., Chemist.
1906. Pettee, Chas. L. W., c/o Hartford Laboratory Co., Hartford, Conn., U.S.A., Chemist.
1892. Pettigrew, Robert, c/o Mersey and Irwell Joint Committee, 44, Mosley Street, Manchester, Electro-Chemist.
1902. Pettitt, Alf., 457, State Street, Brooklyn, N.Y., U.S.A., Chemist.
1906. Peuchen, Arthur G., Standard Chemical Co., Ltd., 509, Manning Chambers, Toronto, Canada, Chemical Manufacturer.
O.M. Peyton, E. P., Chemical Works, Lister Street, Birmingham, Chemical Manufacturer.
1900. Peyton, Wm. C., c/o Peyton Chemical Co., Room 657, Mills Building, San Francisco, Cal., U.S.A., Chemist.
1888. Philip, Arnold, Chemical Laboratory, H.M. Dockyard, Portsmouth, Electro-Metallurgist and Electrical Engineer.
1908. Philip, Dr. James C., Imperial College of Science and Technology, South Kensington, S.W., Chemist.
1903. Philipp, Herbert, 84, High Street, Perth Amboy, N.J., U.S.A., Chemist and Electrochemical Engineer.
1910. Phillips, A. W., 6, Hall Place, Albany, N.Y., U.S.A., Chemist.
1912. Phillips, G. A., Laboratory, The Powell Duffryn Co., Aberdare, Mon., Chemist.
O.M. Phillips, Harcourt, Lynwood, Turton, Lancs., Analytical Chemist
1911. Phillips, Henry A., Royal Gunpowder Factory, Waltham Abbey, Essex, Chemist.
1910. Phillips, Prof. Percy P., Thomason College, Rurki, United Provinces, India, Professor of Chemistry
1895. Phillips, S. Chas., 47, Cannon Street, London, E.C., Chemical Engineer.
1904. Phillips, V. C., 7, Testard Road, Guildford, Chemist.
1912. Phillips, William E., 45, Ben Lamond Avenue, Toronto, Canada.
1898. Phillips, Wm. H., 100, Milton Avenue, East Ham, E., Soap Works Chemist.
1911. Philpotts, Wilfred C., 539, Sherbourne Street, Toronto, Canada, Chemist (Consumers' Gas Co.).
1894. Picard, Hugh F. K., 44, London Wall, London, E.C., Metallurgist.
1904. Pickard, Glenn H., c/o Geo. D. Wetherill and Co., 114, North Front Street, Philadelphia, Pa., U.S.A., Chemist.
1905. Pickard, Greenleaf W., Amesbury, Mass., U.S.A., Electrical Engineer.
1902. Pickard, Dr. R. H., Billinge, Blackburn, Teacher and Analyst.
1904. Pickett, Chas. E., 120, Clerk Street, Jersey City, N.J., U.S.A., Superintendent, Borax Refinery.
1904. Pickup, Edgar H., 348, Great Clowes Street, Higher Broughton, Manchester, Calico Printer.
1888. Pilkington, G., 9, Knowsley Street, Bury, Lancashire, Analytical Chemist.
1893. Pilley, Thos. W., 33, Grove Hill Road, Denmark Hill, S.E., Analytical Chemist.
1894. Pilling, John E., 229, Hornby Road, Blackpool, Chemist.
1906. Pincott, Emile S., 222, St. James Street, Montreal, Canada, Manager (Nichols Chemical Co. of Canada, Ltd.).
1910. Pinnock, Douglas R., 99, Old Bergen Road, Greenville, N.J., U.S.A., Chemist.
1905. Pinnock, H. T., 11, Arthur Road, Edgbaston, Birmingham, Chemist.
1883. Pipe, Jas., Woodburn, Irvine, N.B., Chemical Manufacturer.
1896. Piper, Walter E., Boston Rubber Shoe Co., Malden, Mass., U.S.A., Chemist.
1910. Pisart, F., 71, Avenue Blonden, Liége, Belgium, Chemical Engineer.
1907. Pitman, Brig.-Gen. John, 167, Berkeley Avenue Orange, N.J., U.S.A., U.S. Army (retired).
1902. Pittard, Jno. 30, Mansfield Road, Ilford, Essex, Chemical Manufacturer.
1884. Pittuck, F. W., 19, Stratford Grove, Heaton, Newcastle-on-Tyne, Technical Chemist.
1909. Piutti, Prof. Dr. Arnaldo, Instituto Chimico-farmaceutico, R. Universita, Napoli, Italy, Director.
1899. Pizey, Jas. H., 45, South Road, Smethwick, Birmingham, Chemist.
1896. Platten, Frank, 12, Montague Road, Edgbaston, Birmingham, Metallurgical Chemist.
1890. Platts, Jno. C. "Sandygate," Chapel Lane, Wilmslow, Cheshire, Metallurgical Chemist.
1896. Plaut, Albert, P.O. Box 350, New York City, U.S.A., Wholesale Druggist.
1888. Playfair, David J., 7, Victoria Crescent, Dowanhill, Glasgow, Manufacturing Chemist.
1891. Pocklington, Hy., 11, Regent Park Terrace, Leeds.
1907. Poetschke, Paul, 26, West Spruce Street, Corona, N.Y., U.S.A., Chemist.
1901. Pollard, Wm., Museum, Jermyn Street, London, S.W., Chemist (H.M. Geological Survey).
1904. Pollitt, Dr. Geo. P., Winnington, Northwich, Cheshire, Chemist.
1902. Pollitt, Jas. C. T., 7, Grosvenor Road, Handsworth Birmingham, Managing Chemist.
1893. Pollitt, R. B., c/o Gudgeons, Peecock, and Prentice, Stowmarket, Suffolk, Civil Engineer.
1883. Pollock, A., Kirkland, Bonhill, Dumbartonshire, Dyeworks Manager.
1912. Polson, Neil C., 317, University Avenue, Kingston, Ont., Canada, Wholesale Druggist.

1890. Pomeroy, Dr. Chas. T., Bramhall Road, Rahway, N.J., U.S.A., Ink Manufacturer.

1909. Pond, Dr. Francis J., Stevens Institute of Technology, Hoboken, N.J., U.S.A., Professor of Chemistry.

1896. Pond, Prof. G. G., State College, Centre Co., Pa., U.S.A., Professor of Chemistry.

O.M. Pond, J. A., 99, Queen Street, Auckland, New Zealand, Analytical Chemist.

1906. Pont, A. Felix du, Box 31, Wilmington, Del., U.S.A., Explosives Manufacturer.

1895. Pont, Pierre S. du, Wilmington, Del., U.S.A., Explosives Manufacturer.

O.M. Pope, S., 34, Clarendon Road West, Chorlton-cum-Hardy, Manchester, Chemical Works Manager.

1899. Pope, Thos. H., The University, Edmund Street, Birmingham, Chemist and Lecturer on Brewing.

1900. Pope, Prof. W. J., F.R.S., University Chemical Laboratory and (Journals) Holmesdale, Brooklands Avenue, Cambridge, Professor of Chemistry.

1911. Porteous, Jas. W., c/o Bolckow, Vaughan, and Co., Ltd., Grange Hill, Bishop Auckland, Co. Durham, Chemist and Coke Oven Manager.

1902. Porter, J. Edw., P.O. Box 785, Syracuse, N.Y., U.S.A., Chemist.

1901. Porter, Jno. L., Water Purification Station, P.O. Box 791, Station B, New Orleans, La., U.S.A., Chemist.

1884. Potter, Chas. E., Love Lane Sugar Refinery, Liverpool, Sugar Works Chemist.

1888. Potter, Chas. J., Heaton Hall, Newcastle-on-Tyne, Cement Manufacturer.

O.M. Potter, E. P., Salwick Hall, near Preston, and (Journals) c/o E. P. Potter and Co., Ltd., Little Lever, near Bolton, Alkali Manufacturer.

1900. Potts, Geo. E., 200, Fifth Avenue, New York City, U.S.A., Explosives Manufacturer.

1910. Potts, Harold E., c/o Hubers and Mond, 19, Southampton Buildings, London, W.C., Research Chemist.

1900. Pough, Frank H., (subs.) 82, Beaver Street, New York City, and (Journals) 149, Columbia Heights, Brooklyn, N.Y., U.S.A., Assistant Secretary.

1900. Powell, Harry J., 125, Thurlow Park Road, Dulwich, S.E., Glass Manufacturer.

1897. Power, Dr. Fred. B., Wellcome Research Laboratories, 6, King Street, Snow Hill, London, E.C., Director.

1907. Powers, Wm. A., c/o A. T. and S. F. R. R. Co., Topeka, Kans., U.S.A., Chief Chemist.

1902. Powney, Wm. E. F., 17, Nightingale Lane, Hornsey, N., Analytical Chemist.

1897. Prentice, Dr. Bertram, Royal Technical Institute, Salford, Lecturer on Chemistry.

1902. Prentice, Dr. David, The Nook, Whitefield Road, Stockton Heath, Warrington, Chemist.

1903. Prentice, Jas., Cossipore Sugar Works, Cossipore, Calcutta, India, Chemist.

1911. Prescott, Alfred, 63, Corporation Street, Manchester, Chemical Agent.

1900. Prescott, Saml. C., 739, Boylston Street, Boston, Mass., U.S.A., Assoc. Prof. of Ind. Biology.

1905 Preston, Jas. F., 403, Andover Street, Lowell, Mass., U.S.A., Manufacturing Chemist.

O.M. Price, Arthur F., 2503, Broadway, San Francisco, Cal., U.S.A., Analytical Chemist.

1905. Price, Dr. T. Slater, The Technical School, Birmingham, Lecturer on Chemistry.

1904. Prichard, Norman B., 40, Quebec Street, Sherbrooke, Quebec, Canada, Superintendent.

1904. Prideaux, Dr. E. B. R., Muspratt Laboratory, The University, Liverpool, Research Chemist.

1905. Priest, Geo. Wesley, c/o Lloyd and Richards, Inc., Point and Erie Streets, Camden, N.J., U.S.A., Manufacturer.

1899. Prinsen-Geerligs, H. C., Wanningstraat 17, Amsterdam, Holland, Director of Sugar Cane Experimental Station.

1893. Pritchard, Edgar J., 87, Gordon Road, Ealing, W., Oxalic Acid Manufacturer.

1903. Pritchard, Philip M., Chief Engineer's Office, United Alkali Co., Ltd., Widnes, Engineer.

1896. Prochazka, Dr. Geo. A., 138, West 13th Street, New York City, U.S.A., Colour Manufacturer.

O.M. Procter, Prof. H. R., The University, Leeds; and (Journals) Rowangarth, Ben Rhydding, near Leeds, Lecturer on Tanning.

1884. Procter, J. W., Skeldergate Bridge, York, Manure Manufacturer.

1890. Proctor, Miss Anne J., Free Library, Widnes, Librarian.

O.M. Proctor, C., 118, Grosvenor Road, London, S.W., Analytical Chemist.

1901. Propach, C., 146, West Kinzie Street, Chicago, Ill., U.S.A., Colour Merchant.

1912. Propach, Dr. Wilhelm, Dynamit Act.-Ges. vorm. A. Nobel und Co., Alsterdamer 39r, Hamburg, Germany, Chemist.

1905. Pugh, John V., Guiting House, Allesley, near Coventry, Works Director (Rudge-Whitworth, Ltd.).

1899. Pullar, Edmund, Keirfield, Bridge of Allan, N.B., Manufacturer.

1894. Pullar, Herbert S., Pullar's Dyeworks, Perth, N.B., Dyer.

O.M. Pullar, Sir Robert, M.P.: Journals to Jas. Craigie Sandeman Public Library, Perth, N.B., Dyer.

O.M. Pullar, R. D., Pullar's Dyeworks, Perth, N.B., Dyer

1903. Pullin, Sydney R., c/o Palmarejo and Mexican Goldfields, Ltd., Chinipas, Chihuahua, Mexico Chemist.

1902. Puntan, H. H. C., 10, London Chambers, Durban, Natal, Public Analyst.

1894. Purdie, Dr. Thos., F.R.S., 14, South Street, St. Andrews, N.B., Professor of Chemistry.

1905. Pyman, Dr. Frank Lee, Carlee, Selborne Road, Sidcup, Kent, Chemist.

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1903. Queeny, Jno. F., Monsanto Chemical Works, 1800, South 2nd Street, St. Louis, Mo., U.S.A., Chemical Manufacturer.

1903. Queneau, Augustin L. J., 929, Chestnut Street, Philadelphia, Pa., U.S.A., Metallurgical Engineer.

1887. Quibell, Oliver, Shalem Lodge, Newark-on-Trent, Manure Manufacturer.

1902. Quinan, Kenneth B., Cape Explosives Works Somerset West, C.C., South Africa, and (subscriptions) c/o Cape Explosives Works, Ltd., 15, St. Swithin's Lane, E.C., Superintendent.

R

1911. Race, Joseph, Water Filtration Dept., City Hall Toronto, Canada, Analyst and Bacteriologist.

1901. Rademacher, Dr. Ferdinand, Prag-Carolinenthal Austria, Chemical Manufacturer.

1900. Radley, Ernest G., 49, Ernest Street, West Norwood S.E.

1911. Rae, J. S., 17, Park Place East, Sunderland, Manufacturing Chemist.

1901. Ralston, Wm., 149, Onslow Drive, Dennistoun, Glasgow, Government Chemist.

1902. Ramsay, A. Alexander, Laboratory, Department of Agriculture, 136, George Street, Sydney, N.S.W., Australia, Assistant Chemist.

1910. Ramsay, Norman, 17, Brownlie Gardens, Toll Cross Glasgow, Works Manager.

O.M. Ramsay, Sir William, K.C.B., F.R.S., University College, London, W.C.; Journals to 19, Chester Terrace, N.W., Professor of Chemistry.

1885. Ramsay, W., c/o Cammell, Laird, and Co., Ltd., Birkenhead Ironworks, Birkenhead, Chemist and Assayer.

1911. Ramsay, Wm. G., Hilton, Hillside Road, Bushey, Herts., Research Chemist.

1906. Ranck, Samuel H., Ryerson Public Library Building, Grand Rapids, Mich., U.S.A., Librarian.

1909. Randall, George, The Limes, Kenilworth, Warwickshire, Tanner

1911. Randolph, Charles E., 7, Middleton Road, Ilkley, and (subscriptions) 26A, Great George Street, Leeds, Analytical Chemist.
1910. Ranken, Charles, 19, Stockton Road, Sunderland, Analytical and Consulting Chemist.
1901. Ransom, Francis, The Chilterns, Hitchin, Herts., Manufacturing Pharmaceutical Chemist.
1905. Ransom, H. B., St. Stephen's House, Victoria Embankment, Westminster, S.W., Consulting Engineer.
1910. Ransome, A. Oswald, Beechwood, Greenock Road, Paisley, N.B., Works Chemist.
1904. Rapelje, Walter S., 568, Jamaica Avenue, Brooklyn, N.Y., U.S.A., Chemist.
1898. Raschen, Dr. Julius, The Highlands, Runcorn, Cheshire, Consulting Chemist (United Alkali Co.).
1905 Raschig, Dr. F., Ludwigshafen a/Rhein, Germany, Manufacturing Chemist.
1908. Rassow, Prof. Dr. Berthold, Stephanstrasse 8, Leipzig, Germany, General Secretary, Vereins Deutscher Chemiker.
1893. Ratcliff, Frank D., Stourbank House, Stourport, Vinegar Brewer.
1904. Ratcliffe, C. F., Haigh Park Chemical Works, Stourton, near Leeds, Tar Distiller.
1898. Ratcliffe, Walter, 21, Mawdsley Street, Bolton, Analytical Chemist.
1901. Rawlins, Herbert J. L., The Cottage, Rainhill, Lancashire, Managing Director.
1903. Rawolle, Frederick C., c/o Marx and Rawolle, 100, William Street, New York City, U.S.A., Chemist.
O.M. Rawson, Chris., 2, Melbourne Place, Bradford, Yorks, Consulting Chemist.
1909. Rawson, H. Wyatt, c/o Woodhead and Co., 41, Charing Cross, London, S.W.
1909 Rayner, Arthur B., Normanhurst, Alexandra Park Road, Muswell Hill, N., Chemical Broker.
1895. Read, E. J. Dart Villa, Victoria Avenue, Westgate-on-Sea; and (Journals) c/o D. G. Robertson, Ltd., Kuala Lumpur, Fed. Malay States, Analyst.
1890. Reade, Thos., Sebright House, Tettenhall Wood, Wolverhampton, Manufacturing Chemist.
O.M. Readman, Dr. J. B., Belmont, Hereford, Analytical and Consulting Chemist.
1908. Reavell, J. Arthur, 181, Queen Victoria Street, London, E.C., Engineer.
1907. Rebhun, Frank E., c/o Pennsylvania Salt Manufacturing Co., Natrona, Pa. U.S.A., Chemist.
1902. Redfern, C. G., 15, South Street, Finsbury, London, E.C., Patent Agent.
O.M. Redwood, Sir Boverton, Bart., 4, Bishopsgate, London, E.C., Petroleum Expert.
1887. Redwood, Robt., 4, Bishopsgate, London, E.C., Secretary.
1886. Rée, Dr. A., 15, Mauldeth Road, Withington, Manchester, Aniline Dye Manufacturer.
1884. Reed, Albert E., 11, Portland Place, London, W., Paper Works Chemist.
1902 Reed, Herbert C., 227-229, Fulton Street, New York City, U.S.A., Cons. Tanning Chemist.
1906. Reed, William, Victoria Leadworks, 306, Burdett Road, Limehouse, E., Foreman.
1893. Reekie, J. A., Buckton Grange, Stalybridge, Calico Printer's Colour Mixer.
1883. Reeks, T. H., 106, Queen Victoria Street, London, E.C., Analytical and Consulting Chemist.
1897. Rees, W. H., c/o Alameda Sugar Co., Alvarado, Cal., U.S.A., Chemist.
1906. Rees, Walter J., c/o Chance Bros. and Co., Ltd., Smethwick, near Birmingham, Glass Works Chemist.
1900. Reese, Dr. Chas. L., Eastern Laboratory, P.O. Box 424, Chester, Pa., U.S.A., Chemist.
1897. Reid, Andrew, c/o L. and J. McLellan, 65, Port Dundas Road, Glasgow, Chemist.
1909. Reid, David E., Kodak Park, Rochester, N.Y., U.S.A., Chemist.
1909. Reid, Howard E., c/o Lawrence Portland Cement Co., Siegfried, Pa., U.S.A., Chemist.
1906. Reid, James, Caldercruix Mills, by Airdrie, N.B., Chemist.
1905. Reid, Dr. John H., Cranford, Barton Heys Road, Formby, Lancs., Chemist.
1907. Reid, Robert, Agencia de Tharsis, Huelva, Spain, Analytical Chemist.
1896. Reid, Robt., Oil Mills, Horbury Bridge, near Wakefield, Chemist.
O.M. Reid, Walter F., Fieldside, Addlestone, Surrey, Technical Chemist
1893. Reid, Wm., jun., Bombay Dyeworks, Dadur, Bombay, India, Dyer.
1907. Reimarus, Dr. C., Chemische Fabrik auf Actien (vorm. E. Schering), Mullerstrasse 170-171, Berlin, N. 39, Germany, Manager.
1904. Reinherz, Otto, 9, Heaton Grove, Bradford, Yorks., Chemist.
1906. Reinhold, Gustave, 26, Kidbrook Park Road, Blackheath, S.E., Works Manager.
1910. Reiter, Dr. Kaspar, 17, Osborne Road, Brimsdown, Middlesex, Chemist.
1898. Reitmeyer, Robt. E. D., 63, Crutched Friars, London, E.C., Chemical Merchant.
1904. Remington, Prof. Joseph P., 1832, Pine Street, Philadelphia, Pa., U.S.A., Author, U.S. Pharmacopœia.
1900. Remington, J. Stewart, Aynsome, Grange-over-Sands, R.S.O., Lancs., Consulting Chemist.
1903. Remsen, President Ira, Johns Hopkins University, Baltimore, Md., U.S.A., President.
1911. Renaud, Paul, 8, Rue Nouvelle, Paris (9^{e}), France, Consulting Engineer.
O.M. Rennie, Dr. E. H., University of Adelaide, South Australia, Professor of Chemistry.
1911. Rentschler, Mahlon J., c/o Oakland Chemical Co., Rossville, Staten Is., N.Y., U.S.A., Bacteriologist.
1901. Renwick, Frank F., Norland House, Avenue Road, Brentwood, Essex, Chemist (Photographic Works).
1907. Reoch, Robert A. S., c/o Pacific Mills Co., Dover, N.H., U.S.A., Printworks Superintendent.
1894. Rettie, Theodore, 17, Manor Place, Edinburgh, Metallurgical Chemist.
1895. Reubens, Chas. M., 68, Cliff Street, New York City, U.S.A., Chemist.
1912. Reuter, Dr. L., c/o La Union S.A., Apartado 6, Torreon, Coahuila, Mexico, Glycerin Manufacturer.
1905. Revis, Cecil, 5, Carlton Villas, Station Road, Barnes, S.W., Analyst.
O.M. Reynolds, Dr. J. Emerson, F.R.S., 3, Inverness Gardens, Kensington, W., Professor of Chemistry.
1908. Rhoads, J. Edgar, Box 961, Wilmington, Del., U.S.A., Leather Chemist.
O.M. Rhodes, E., c/o Thos. Vickers and Sons, Widnes, Technical Chemist.
1892. Rhodes, P. J., Bridge House, Church, Accrington, Dye and Print Works Manager.
1889. Richards, Edgar, 60, Ayrault Street, Newport, R.I., U.S.A., Analytical Chemist.
1910. Richardson, C. Gordon, 137, Jarvis Street, Toronto, Canada, Chemist.
1888. Richardson, Dr. Clifford, 30, Church Street, New York City, U.S.A., Chemical Engineer.
1903 Richardson, F. J., Chemical Works, Ringsend Docks, Dublin, Ireland, Chemical Manure Manufacturer.
1884 Richardson, F. W., County Analyst's Office, Bradford, Yorkshire, Analytical Chemist.
1900. Richardson, Jno. H., 57, Cavendish Road, Rock Ferry, Cheshire, Manager, H. D. Pochin and Co.
1905. Richardson, L. G., Newtown View, Glenpatrick Road, Elderslie, Johnston, N.B., Chemist.
1889. Richardson, S. M., 115, Main Street, Bonhill, N.B., Analytical Chemist.
1891. Richardson, Walter W., Aldingham, Park View Crescent, Roundhay, Leeds, Manufacturing Chemist.
1903. Richardson, Wm., Linfield, Wood Lane, Headingley, Leeds, Drysalter.

1894. Richardson, Wm. H., Newsky Thread Mills, Malaja, Bolotnaja, St. Petersburg, Russia, Textile Chemist.
1886. Richmond, H. D., Mex, Avondale Avenue, Woodside Park, N., Chief Chemist (Aylesbury Dairy Co.).
1898. Richmond, Jno. R., The Hollies, Blurton, Longton, Staffs., Alkali Works Manager.
1901. Richmond, Sylvester O., Royal William Yard, Plymouth, Analytical Chemist.
1907. Ricketts, Guy D. *See* Bengough, Guy D.
1886. Riddell, R., 130, Station Street, Burton-on-Trent, Brewer.
1884. Rideal, Dr. Samuel, Laboratory, 28, Victoria Street, Westminster, S.W., Consulting Chemist.
1905. Ridge, H. M., 62, London Wall, London, E.C., Mining Engineer.
O.M. Ridsdale, C. H., Ravenscroft, Roman Road, Linthorpe, Middlesbrough, Analytical Chemist.
1899. Riederer, Emil J., Forcite Works, Landing, N.J., U.S.A., Works Chemist.
1902. Riederer, Dr. Herman S., 251, West 95th Street, New York City, U.S.A., Chemist.
1908. Rigby, Wm. T., County Analyst's Laboratory, Temple Street, Birmingham, Public Analyst.
1907. Rigg, Gilbert, c/o New Jersey Zinc Co., Palmerton, Carbon Co., Pa., U.S.A., Chemist.
1892. Riker, Jno. J., 46, Cedar Street, New York City, U.S.A., Merchant.
O.M. Riley, E., 2, City Road, Finsbury Square, London, E.C., Metallurgical Chemist.
1905. Riley, Louis J., 8, Newton Road, London, W., Chemist.
1912. Riley, Walter A., 100, King Street, Norwich, Brewer.
1899. Rink, Arnold, 11, Bridgewater Street, Barbican, London, E.C., Tannin Extract Manufacturer.
1889. Rintoul, Wm., "Lauriston," Ardrossan, Ayrshire, Explosives Chemist.
1901. Ripley, Philip F., 7, Abbott Street, Andover, Mass., U.S.A., Chemist.
1909. Roberts, Alfred R., c/o Canada Cement Co., Plant No. 9, Shallow Lake, Ontario, Canada, Chemist.
1907. Roberts, Chester, Swarthmore College, Swarthmore, Pa., U.S.A., Superintendent.
O.M. Roberts, F. G. Adair, Oak Hill Lodge, Frognal, N.W., and Jnls. to E. T. Millar, "Crail," Blake Hall Road, Wanstead, N.E., Chemical Manufacturer.
1901. Roberts, H. E. U., c/o British Explosives Synd., Pitsea, Essex, Chemist.
1911. Roberts, H. W., Dynamite Factory, Somerset West, Cape Colony, South Africa, Chemist.
1907. Roberts, Percy R., P.O. Box 62, Wilmington, Del., U.S.A., Leather Chemist.
1902. Roberts, Wm. H., 4, Sugnall Street, Liverpool, Analytical Chemist.
1891. Robertson, Alex. A., Riversdale, Cressington Park, Liverpool, Technical Chemist.
1897. Robertson, Andrew J., 2, North Ninth Street, Richmond, Va., U.S.A., Analytical Chemist.
1910. Robertson, Arthur F., National Chemical Works, 27, St. Jean Baptiste Street, Montreal, Canada, Chemist.
1910. Robertson, Charles, c/o Messrs. S. Allsopp and Sons, Ltd., Burton-on-Trent, Brewer.
1909. Robertson, F. A., 492, Euclid Avenue, Toronto, Canada, Chemist.
1900. Robertson, Jas., Barncraig, South Medrox, by Glenboig, N.B., Analytical Chemist.
1910. Robertson, Dr. Joseph G., Braidwood, Tollcross, Glasgow, Manufacturer.
1891. Robertson, Dr. Robt., Research Dept., Royal Arsenal, Woolwich; and (Journals) 29, Charlton Road, Blackheath, S.E., Research Chemist.
1910. Robertson, William, Chemical Dept., City and Guilds College, Exhibition Road, London, S.W., Lecturer and Research Chemist.
1910. Robin, Alex. G., Castlehill, Hamilton, N.B., Chemical Merchant.
1897. Robinson, Clarence J., 708, Jewett Avenue, West New Brighton, N.Y., U.S.A., Chemist.
1902. Robinson, Hy. Fishwick, Culcheth Chemical Works, Newton Heath, Manchester, Manufacturing Chemist.
O.M. Robinson, H. H., 42, Penywern Road, Earl's Court, S.W., Analytical Chemist.
1907. Robinson, Herbert W., Robinson Bros., Ltd., Ryders Green, West Bromwich, Staffordshire, Tar Distiller.
1911. Robinson, Jas. H., 11, East Street, Rugby, Analytical Chemist.
O.M. Robinson, Jos., Farnworth, Widnes, Chemical Manufacturer.
1887. Robinson, Thomas, (Journals) 401, West Street, Glasgow; and (communications), The Villa, Nitshill, N.B., Chemical Works Manager.
1902. Robitschek, Carl, 200, Worth Street, New York City, U.S.A., Scientific Brewer.
1884. Rodger, Edw., 1, Clairmont Gardens, Glasgow, W.
1904. Rodger, Robert, Government Laboratory, Clement's Inn Passage, Strand, London, W.C., Chemist.
1905. Rodger, R. L., Manager (Peña Copper Mines).
1909. Rody, Franz A., c/o Mammoth Copper Mining Co., Kennett, Cal., U.S.A., Chemist.
1903. Roelofsen, Dr. J. A., c/o Coal Distillation Co., Middlesbrough, Yorks., Works Manager.
1910. Roessler, Dr. F., 89, High Street, Perth Amboy, N.J., U.S.A., Chemist.
1905. Rogers, Dr. Allen, Pratt Institute, Brooklyn,, N.Y., U.S.A., Research Chemist.
1900. Rogers, Geo. J., 32, Chudleigh Road, Brockley, S.E., Chemist.
1890. Rogers, Harry, 5, Stoke Newington Common, London, N.
1908. Rogers, Harry V., Ash Street, Ilkeston, Derbyshire, Engineer.
1907. Rogers, Henry L., Casilla 1118, Buenos Aires, Argentina, Analytical Chemist.
1909. Rogers, Herbert, 52, Cannon Street, London, E.C., Rubber Works Chemist.
1899. Rogers, John, c/o Nobel's Explosives Co., Ltd., Nobel House, Glasgow, Chemist.
1910. Rogers, L. Joslyn, Chemical and Mining Building, The University, College Street, Toronto, Canada.
1911. Röhm, Dr. Otto, Weiterstädterstrasse 4/6, Darmstadt, Germany, Chemist.
1907. Roller, Frank R., 525, 31st Street, Oakland, Cal., U.S.A., Powder Works Superintendent.
1898. Roller, H. C., 493, Central Avenue, Newark, N.J., U.S.A., Superintendent.
1899. Rollin, Chas., Bylton, East Jarrow-on-Tyne, Chemical Manufacturer.
1909. Rollin, Hugh, Overdene, Riding Mill-on-Tyne, Chemical Manufacturer.
O.M. Rollin, J. C., 1, St. Nicholas Buildings, Newcastle-on-Tyne, Chemical Manufacturer.
1907. Rolph, George M., c/o California and Hawaiian Sugar Refining Co., Crockett, Cal., U.S.A., Sugar Refiner.
1905. Romanes, J. W., Casa Colon, Huelva, Spain, and (Jnls.) Craigknowe, Slateford, N.B., Chemical Engineer.
O.M. Roscoe, Rt. Hon. Sir Henry, F.R.S., 10, Bramham Gardens, South Kensington, S.W., Consulting Chemist.
1904. Rose, Jno., Wicken House, Stretton, near Warrington, Technical Chemist.
1901. Rose, Jno. Leonard, 3, Florence Road, Ealing, W., Chemist.
1902. Rosebrugh, Prof. T. R., 150, West Newell Street, Syracuse, N.Y., U.S.A., Professor of Electrical Engineering.
1897. Rosengarten, Dr. Geo. D., P.O. Box 1625, Philadelphia, Pa., U.S.A., Manufacturing Chemist.
1887. Ross, Alex. J. J., Tay-a-Valla, Camelon, Falkirk, N.B., Chemical Manufacturer.
1893. Ross, Arthur, 1, Glengall Road, Old Kent Road, London, S.E., Analytical Chemist.

1900. Ross, Raymond, Public Analyst's Office, Burnley, Lancashire, Analytical Chemist.

1910. Ross, Thos. M., c/o Burmah Oil Co., Ltd., P.O. Box 67, Rangoon, Burmah, Analytical Chemist.

1911. Ross, Prof. W. J. Clunies, 12, Church Street, Ashfield, Sydney, N.S.W., Australia, Prof. of Chemistry (Sydney Technical College).

1910. Rossati, Guido, 226, Lafayette Street, New York City, U.S.A., Agricultural Chemist.

1911. Rossi, Dr. Carlo, 29, Via Leopardi, Milano, Italy, Electro-chemist.

1906. Rossi, Louis M., c/o General Bakelite Co., Perth Amboy, N.J., U.S.A., Works Manager.

1906. Rossiter, E. C., 4, Park Road, West Smethwick, Birmingham, Chemical Engineer.

1888. Rothwell, C. F. Seymour, Photographic Works, Mobberley, Cheshire, Chemist.

1905. Rothwell, Robert R., 88, George Street, Moss Side, Manchester, Chemistry and Physics Teacher.

O.M. Rottenburg, Dr. Paul, 55, West Regent Street, Glasgow, Chemical Merchant.

1899. Rouse, H. W., Anglo-Continental Guano Co., Victoria Docks, E., Foreman.

1903. Rouse, Wm., Millburn Terrace, Alexandria, Dumbartonshire, Chemist.

1906. Rowell, Herbert W., 36, Thornbury Road, Osterley Park, W., Analytical Chemist.

O.M. Rowland, W. L., 4800, Chester Avenue, Philadelphia, Pa., U.S.A., Chemist.

1904. Rowley, Ernest W., Chemical Laboratory, Locomotive Department, North Eastern Railway, Gateshead-on-Tyne, Analytical Chemist.

1908. Rowley, Frank, 4, Doughty Street, London, W.C., Metallurgist.

1901. Rowley, Walter Eugene, c/o National Aniline and Chemical Co., 100, William Street, New York City, U.S.A., Chemist.

1904. Rowling, S. R., 1, Beechwood, Kendal, Westmoreland, Chemist.

1896. Royal-Dawson, H., Chemist.

1898. Royle, Chas. L., c/o Cartavio Sugar Co., Trujillo, Peru, Sugar Chemist.

O.M. Royse, S. W., St. Andrew's Chambers, 20, Albert Square, Manchester, Chemical Engineer.

1902. Rücker, Dr. Hermann von, 91, Lancaster Avenue, Buffalo, N.Y., U.S.A., Chemist.

1896. Ruddock, Fred. G., Corporation Street, Warrington, Analytical Chemist.

1895. Rudge, Alfred, Sutton Alkali Works, St. Helens, Lancs., Analytical Chemist.

1911. Rudnick, Paul, c/o Armour and Co., Union Stock Yards, Chicago, Ill., U.S.A., Chemist.

1908. Rudolf, Prof. Norman S., Dept. of Applied Chemistry, Indian Institute of Science, Bangalore, India, Professor.

1909. Rudorf, Dr. G., c/o Messrs. T. Morson and Son, Ponders End, N., Manufacturing Chemist.

1884. Ruffle, Jno., Musley, Ware, Herts, Consulting Chemist and Electrician.

1905. Rüger, Richard, 389, New Chester Road, Rock Ferry, Cheshire, Chemist.

1898. Ruhl, Louis, c/o Roessler and Hasslacher Chemical Co., P.O. Box 1999, 100, William Street, New York City, U.S.A., Chemical Merchant.

1909. Ruiloba, J. A., c/o U.S. Steel Corporation, 71, Broadway, New York City, U.S.A., Engineer.

1910. Rule, Dr. Alexander, The University, Liverpool, Lecturer in Chemistry.

O.M. Rumble, C., Belmont Works, Battersea; and (Journals) 154, Valley Road, Streatham, S.W., Candle Works Chemist.

1899. Rumbold, Wm. R., Calverley Lodge, Tunbridge Wells, Kent, Electro-Metallurgist.

1895. Rump, Ernest, The Leeds Phosphate Works, Hunslet, Leeds, Manager.

1911. Runcekles, A. R., c/o Brotherton and Co., Ltd., Litherland Tar Works, Liverpool, Technical Chemist.

1903. Runyan, Elmer G., Hutchins Building, Washington, D.C., U.S.A., Chemist and Gas Inspector.

1899. Rushby, Wm., Oak View, Batley, Yorks, Analyst.

1906. Russell, David, Cadham, Markinch, Fife, Scotland, Paper Maker.

1910. Russell, William, 116, Peel House Lane, Widnes, Lancashire, Chemist.

1905. Ruttan, Prof. R. F., Medical Faculty, McGill University, Montreal, Canada, Professor of Chemistry.

1909. Ryall, W. E., 27, Darfield Crescent, Harehills, Leeds, Soapworks Chemist.

1905. Ryan, Prof. F. G., c/o Parke, Davis, and Co., Detroit, Mich., U.S.A., Manufacturing Chemist.

1910. Ryan, Leo G., 10, Travancore Apartments, Montreal, Canada, Druggist.

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1895. Saalfeld, Adolphe, 2, South King Street, Manchester, Chemical Merchant.

1895. Saarbach, Dr. L., 114, Pearl Street, New York City, U.S.A., Consulting Chemist.

1905. Sabin, Alvah H., 432, Sandford Avenue, Flushing, N.Y., U.S.A., Chemist, Varnish Works.

1883. Sadler, A. E., Sand Hall, Ulverston, Lancashire, Manufacturing Chemist.

1908. Sadtler, Philip B., 945, Monadnock Building, Chicago, Ill., U.S.A., Consulting Chemist and Engineer.

1881. Sadtler, Dr. S. P., 145, North 10th Street, Philadelphia, Pa., U.S.A., Consulting Chemist.

1896. Sadtler, Dr. S. S., c/o Samuel P. Sadtler and Son, 39, South 10th Street, Philadelphia, Pa., U.S.A., Analytical and Consulting Chemist.

1897. Sage, C. Edward, 10, London Street, London, E.C., Consulting Chemist.

1902. Sahm, Louis N., c/o The Heller and Merz Co., 505, Hudson Street, New York City, U.S.A., Chemist.

1907. Saiki, Kenkichi, c/o Kikuchi Law Office, Uchisaiwaicho, Kojimachi, Tokyo, Japan, Chemist.

1881. Salamon, A. Gordon, 1, Fenchurch Avenue, London, E.C., Consulting Chemist.

1885. Salamon, Jno., Ferry Road, Rainham, S.O., Essex, Manufacturing Chemist.

1911. Salamon, Maurice S., 79, Mark Lane, London, E.C., Consulting Analyst.

1884. Salis-Mayenfeld, Dr. E. von, 21, South Allen Street, Albany, N.Y., U.S.A., Technical Chemist.

1907. Samuel, Marcus R. A., c/o Compania General de Tabacos Filipinas, 37, Fenchurch Street, London, E.C., Merchant.

O.M. Samuel, W. Cobden, 66, Croxted Road, West Dulwich, S.E., Analytical Chemist.

1896. Samuelson, Francis A. E., Sir B. Samuelson and Co., Ltd., Middlesbrough, Ironmaster.

1904. Sand, Dr. Henry J. S., University College, Nottingham, Lecturer and Demonstrator.

1909. Sandberg, Sixten, Skutskärs Sulphite and Sodapulp Mills, Skutskär, Sweden, Chemist and Mill Manager.

1910. Sandeman, Archibald, Ruchill Oil Works, Glasgow, Chemist.

1906. Sanders, J. McConnell, P.O. Box 3033, Mexico, D. F., Analytical and Consulting Chemist.

1902. Sanders, Warren W., 127, Vernon Street, Gardner, Mass., U.S.A., Chemist.

1895. Sanderson, John, c/o B. S. Cohen, Ltd., Neasden Lane, London, N.W., Chemist.

1898. Sanderson, T. Crisp, Dubois Avenue, West New Brighton, N.Y., U.S.A., Chemical Engineer.

1907. Sandiz, A., P.O. Box 702, Chicago, Ill., U.S.A., Sales Manager.

1890. Saniter, E. H., Strafford Villa, Moorgate, Rotherham, Analytical Chemist.

1901. Sargent, Dr. Geo. W., c/o Crucible Steel Co. of America, Oliver Building, Pittsburgh, Pa., U.S.A., Chemist and Metallurgist.

1910. Sargent, R. N., c/o Roessler and Hasslacher Chem. Co., Perth Amboy, N.J., U.S.A., Chemical Engineer.

1911. Sauer, J., 30, Valerinsstraat, Amsterdam, Holland, Sugar Chemist.

1910. Sauerschnig, José, P.O. Box 313, Mexico City, Mexico, Acid Manufacturer.

1911. Saunders, A. G., 73, Alexandra Road, Hampstead, N.W.

1903. Saunders, Lewis E., 123, Buffalo Avenue, Niagara Falls, N.Y., U.S.A., Electro-Chemical Engineer.

1896. Saunders, Walter M., 20, Dewey Street, Olneyville, R.I., U.S.A., Analytical Chemist.

1911. Saville, W. B. 117, Vassall Road, Brixton, S.W., Analytical Chemist.

1895. Sawers, Wm. D., 7, Minard Road, Partick Hill, Glasgow, Chemist.

1907. Saxe, Joel B., P.O. Box 1086, Montreal, Canada, Chemist.

1898. Saxe, Sigmond, 107, Manhattan Avenue, New York City, U.S.A., Manufacturing Chemist.

1895. Sayer, Harry, Woodleigh, Redbourne Avenue, Finchley, N., Metallurgical Chemist.

1890. Sayers, Jos. J., Nobel Villa, Stevenston, Ayrshire, Explosives Chemist.

1899. Schaak, Dr. Milton J., 108, Penn Street, Brooklyn, N.Y., U.S.A., Chemist.

O.M. Schack-Sommer, Dr. G., 87, Victoria Street, London, S.W., Sugar Refiner.

1908. Schad, Dr. Philip, Winnington Park, Northwich, Cheshire, Manufacturing Chemist.

1910. Schaefer, Dr. George L., New York Quinine and Chemical Works, 105, North 11th Street, Brooklyn, N.Y., U.S.A., Chemist and Technical Manager.

1899. Schaefer, Dr. L., Maywood, N.J., U.S.A., Manufacturing Chemist.

1903. Schanche, H. G., 3401, Gray's Ferry Road, Philadelphia, Pa., U.S.A., Chemist.

1908. Schatzmann, Dr. Paul, Isleben bei Fluelen, Switzerland, Chemist.

1908. Scheele, Edward H., 3, Lloyds Avenue, London, E.C., Chemical Merchant.

1903. Scheidel, Dr. Aug., c/o Commonwealth Portland Cement Co., 4, O'Connell Street, Sydney, N.S.W., Australia, Managing Director.

1886. Schellhaas, Henry Alf., Thornhill, Beech Road, Hartford, Northwich, Mechanical Engineer.

1904. Schenck, Henry, c/o Merck and Co., Box 1443, New York City, U.S.A.

1894. Schidrowitz, Dr. P., 57, Chancery Lane, London, W.C., Research Chemist.

1905. Schill, Dr. Emil, c/o Opal Leather Co., Manchester, N.H., U.S.A., Chemist.

1909. Schlagintweit, Theo., 94, Market Street, Manchester, Imperial German Consul.

1902. Schlegel, Jno. Wm., New York Sugar Refinery, Long Island City, N.Y., U.S.A., Chemist.

1893. Schleicher, Francis J., 38, West Tenth Street, Long Island City, N.Y., U.S.A., Technical Chemist.

1902. Schlesinger, Barthold E., 68, Northampton Street, Boston, Mass., U.S.A., Chemist.

1901. Schlichting, Emil, 28, Cranberry Street, Brooklyn, N.Y., U.S.A., Chemist.

1906. Schmidt, J., 52, Camberwell Green, London, S.E., Works Manager.

1907. Schmitt, Charles A., The Carter's Ink Co., Cambridge "C," Boston, Mass., U.S.A., Chemist.

1906. Schneible, Joseph, 934-6, People's Gas Building, Chicago, Ill., U.S.A., Chemical Engineer.

1899. Schniewind, Dr. F., c/o German American Coke and Gas Co., 17, Battery Place, New York City, U.S.A., President.

1904. Schniewind, Heinrich, Jun., Susquehanna Silk Mills, 18, West 18th Street, New York City, U.S.A., Vice-President and Treasurer.

1907. Schober, Prof. W. B., Lehigh University, South Bethlehem, Pa., U.S.A., Professor of Chemistry.

1904. Schoeller, Dr. Walter R., c/o Simeons and Co., 17, Wilson Street, Finsbury, E.C., Analytical Chemist.

1902. Schofield, Prof. Jas. A., The University, Sydney, N.S.W., Australia, Lecturer in Chemistry.

1908. Scholefield, Fred., c/o R. P. Lawson and Sons, Britannia Mills, Hulme, Manchester, Works Chemist.

O.M. Scholefield, H. E., Edge Hill Chemical Works, Liverpool, Chemical Manufacturer.

1906. Schroeder, C. M. E., Rutherford, N.J., U.S.A., Analytical Chemist.

1895. Schroeder, E. August, c/o Church and Dwight Co., 36, Ash Street, Brooklyn, N.Y., U.S.A., Chemist.

1908. Schüll, Gustav, Messrs. Carl Schleicher & Schüll, Düren, Rheinland, Germany, Filter Paper Manufacturer.

1906. Schulten, Dr. C., P.O. Box 279, Calcutta, India, Analytical Chemist.

1904. Schultz, Carl R., 440, First Avenue, New York City, U.S.A., Mineral Water Manufacturer.

1901. Schultze, Wm., c/o General Chemical Co., Laurel Hill, Long Island, N.Y., U.S.A., Chemist.

1893. Schüpphaus, Dr. R. C., 1466, Dean Street, Brooklyn, N.Y., U.S.A., Consulting Chemist.

1893. Schwab, Dr. L. C., Sedanstrasse 53 Bernburg, Anhalt, Germany, Technical Chemist.

1912. Schwabacher, Dr. Hermann, 6, Broad Street Place, London, E.C., Consulting Engineer.

1908. Schwalbe, Dr. Carl G., Rossdorferstrasse 86, III., Darmstadt, Germany, Professor (Technische Hochschule).

1907. Schwamm, Chas. A., c/o Antoine Chiris, 20, Platt Street, New York City, U.S.A., Chemist.

1889. Schweich, Emile. *See* Mond, Emile S.

1894. Schweitzer, Dr. H., 427, West 117th Street, New York City, U.S.A., Chemical Expert.

1906. Schwerin, Lorenz R., c/o Casein Co. of America, Bainbridge, N.Y., U.S.A., Vice-President, Casein Co.

1906. Scott, Alex. C., 102, St. Mary Street, Cardiff, Explosives Manufacturer.

1891. Scott, Andrew, Royal Gunpowder Factory, Waltham Abbey, Essex, Analytical Chemist.

1889. Scott, Ernest G., c/o Ernest Scott & Co., Ltd., Kingsway House, Kingsway, London, W.C., Chemical Engineer.

1912. Scott, Harold M., The Sycamores, Massie Street, Cheadle, Cheshire, Works Chemist.

1898. Scott, Jas., Cawnpore Woollen Mills, Cawnpore, India, Chemist.

1894. Scott, Jno. Gillespie, Annislea, Clermiston Road, Corstorphine, Edinburgh, Analytical Chemist.

1912. Scott, Jno. William, 576, Church Street, Toronto, Canada.

1902. Scott, Walter, 119-122, Merchants' Exchange, Cardiff, Chemist.

1907. Scott, Wm. F., c/o Madison Woollen Co., Madison, Maine, U.S.A., Manager.

1894. Scott-Smith, G. E., 67, Surrey Street, Sheffield, Analytical and Consulting Chemist.

1889. Scovell, M. A., Agricultural Experiment Station, Lexington, Ky., U.S.A., Agricultural Chemist.

1904. Scoville, Wilbur L., c/o Parke, Davis, & Co., Detroit, Mich., U.S.A., Analytical Chemist.

O.M. Scudder, F., Mersey and Irwell Joint Committee, 44, Mosley Street, Manchester, Chemist.

1909. Seager, Dan G., Fayville, Ill., U.S.A., Chemist.

1889. Searl, Albert, Montreux, Victoria Road, Sidcup, Kent, Technical Chemist.

1898. Searle, Alfred B., Cliftonville, Claremont, Sheffield, Analytical Chemist.

1901. Sederholm, Erik, K. Flottans Varf, Stockholm, Sweden, Chemist (Royal Navy Board).

1905. Seebohm, H. C. A., 117, Hudson Street, New York City, U.S.A., Importer of Dyestuffs and Chemicals.

1905. Seeker, A. F., 160, Midwood Street, Brooklyn, N.Y., U.S.A., Food Analyst.

1907. Seelemann, Dr. A., Isestrasse 125, Hamburg, Germany, Managing Director of Explosives Works.

1893. Sefton-Jones, Herbert, 285, High Holborn, London, W.C., Chemist and Patent Agent.

1907. Seidensticker, Lewis J., c/o Warner Sugar Refining Co., Edgewater, N.J., U.S.A., Chief Chemist.

1896. Seldner, Rudolph, 1395, Dean Street, Brooklyn, N.Y., U.S.A., Manufacturing Chemist.

1904. Seligman, Dr. Richard, Point Pleasant, Putney Bridge Road, Wandsworth, S.W., Chemist.

1908. Sellen, Elijah, Gasworks Laboratory, M.L.H. & P Co., Elm Station, Montreal, Canada, Chemist.

1905. Sellers, Geo. E., Rock View, Milnsbridge, near Huddersfield, Aniline Colour Maker.

1911. Sellers, N. Burdett, 11, Hugh Oldham Drive, The Cliff, Higher Broughton, Manchester, Analytical Chemist.

1898. Sen (Gupta), Nagendra Nath, 19, Lower Chitpur Road, Calcutta, India, Physician and Chemist.

1910. Sen, Prof. Rajendara Nath, Engineering College, Sibpur, Bengal, India, Professor of Tinctorial Chemistry.

1899. Senior, Francis L., Box 31, Sanford, Maine, U.S.A., Mill Chemist.

1911. Serra y Carbo, Jos., Cassa de la Selva, Prov. de Gerona, Spain, Chemist.

1906. Setz, C. F., Herculaneum, Mo., U.S.A., Chemist and Metallurgist.

1905. Sewell, B. F. Brooke, P.O. Box 70, Washington, D.C., U.S.A., Chemical Engineer.

1896. Seyler, Clarence A., Public Analysts' Office, Nelson Terrace, Swansea, Chemist and Assayer.

1907. Seymour, Tom G., Kilton, Northway, Wavertree, Liverpool, Analytical Chemist.

1911. Seymour-Jones, R. A., Leather Industries Dept., The University, Leeds, Research Chemist.

1903. Shacklady, T. G., Hope Point, Cliffe at Hoo, Kent, Technical Chemist.

1911. Shah, Prof. P. G., 759, Sankdi Sheri, Ahmedabad, India, Professor of Chemistry, Forman Christian College.

1906. Shah, Prof. S. J., c/o C. M. Shroff, 124, Girgaum Back Road, Bombay, India, Chemist.

1905. Shainwald, R. L., jun., Papenhuderstrasse 3, Hamburg, Germany, Chemist.

1906. Shankland, George A., Edge Hill, Mansfield Woodhouse, Notts., Manager.

1892. Shanks, Arch., Mount Pleasant, Dalry, Ayrshire, N.B., Chemist.

1908. Shanks, John, Dalmeny Park, Barrhead, near Glasgow, Sanitary Engineer.

1904. Sharples, G. H., Ivy Cottage, Middlewich, Cheshire, Works Chemist.

1905. Sharples, Philip P., 332, Waverley Street, Belmont, Mass., U.S.A., President (Natl. Coal Tar Co.).

1884. Sharples, Stephen P., 26, Broad Street, Boston, Mass., U.S.A., Analytical Chemist.

1911. Sharrock, Charles W., Lion Works, West Thurrock, Grays, Essex, Cement Manufacturer.

1900. Sharwood, Wm. J., c/o Homestake Mining Co., Lead, South Dakota, U.S.A., Metallurgical Chemist.

1900. Shattuck, A. F., c/o Solvay Process Co., Detroit Mich., U.S.A., Chemist.

1908. Shaw, Dr. T. P., 1022, Dorchester Street West, Montreal, Canada, Doctor of Medicine.

1904. Shedden, Frank, 659, Foleshill Road, Coventry Science Master.

1903. Sheldon, Dr. N. L., Cordite Factory, Aruvankad, Nilgiri Hills, India, Works Manager.

1911. Shelton, James, 26, Studdridge Street, Fulham, S.W., Chemist.

1911. Shen, Bucchok, Sien Teh Lane, Burkill Road, Shanghai, China, Chemist.

1892. Shenton, Jas. P., 37, Torbay Road, Chorlton-cum-Hardy, near Manchester, Analytical Chemist.

1889. Shepard, Dr. Chas. U., (communications) P.O. Box 42, Summerville, S.C.: and (Journals) P.O. Box 284, Charleston, S.C., U.S.A.

1906. Shepard, Jas. H., Experiment Station, Brookings, S. Dak., U.S.A., Agricultural Chemist.

1907. Shepheard, Fred. G., 5, University Road, Galway, Ireland, Chemist.

1904 Shepherd, A. B., Copenhagen Oil Mills, Limehouse, London, E., Analytical Chemist.

1893. Shepherd, H. H. B., Crayside, Bexley, Kent, Chemist.

1898. Shepherd, Reginald des F., Central Laboratory, Rhodes, Manchester, Printworks Chemist.

1909. Shepherd, Stephen W., c/o Brotherton and Co., Ltd., Nichells Chemical Works, Birmingham, Works Manager.

1899. Shero, John E., c/o Aluminium Co. of America, Niagara Falls, N.Y., U.S.A., Chemist.

1906. Sherwin, R. S., Chemist.

1893. Shields, Dr. John, Minas de Rio Tinto, Prov. de Huelva, Spain, Chemist.

1896. Shimomura, Prof. K., Shinkarasumaru Kojinguchi Sagaru, Kyoto, Japan, Professor of Chemistry.

1888. Shishkoff, Sergius A., Mojga, Government of Viatka, Russia, Glass Manufacturer.

1905. Shoffstall, Arthur S., 1, Park Street, Tarentum, Pa., U.S.A., Chemist.

1899. Sholes, Chas. E., 60, Wall Street, New York City, U.S.A., Chemical Agent.

1900. Shonk, Albert, 10, Dartmouth Road, Hendon, N., Analytical Chemist.

1897. Shores, Dr. Jeff. H., King's Road, Wallsend-on-Tyne, Chemist.

1901. Short, Andrew, 18, Percy Park Road, Tynemouth, Northumberland, Works Chemist.

1902. Shoubridge, Sydney Y., M.I.C.E., Gasworks, Lower Sydenham, S.E., Gas Engineer.

1910. Shrimpton, Jno. K., Redshaw House, Ripon, Yorks, Works Manager.

1901. Shukoff, Dr. Alexis A., Borowaja No. 86, St. Petersburg, Russia, Technical Chemist.

1899. Shuler, Darius P., Sudbury, Ont., Canada, Chemist.

1890. Shutt, Frank T., Central Experimental Farm, Ottawa, Canada, Agricultural Chemist.

1906. Shuttleworth, E. B., 220, Sherbourne Street, Toronto, Canada, Chemist.

1901. Siau, Raymond L., Springfield Brewery, Wolverhampton, Research Chemist.

1902. Sibley, Samuel E., Hawthorne, King Street, Randwick, Sydney, N.S.W., Australia, Technical Chemist.

1907. Siebel, Fred. P., 960–962, Montana Street, Chicago, Ill., U.S.A., Analytical Chemist.

1902. Siebold, Alfred, 5, Elgin Road, Sutton, Surrey, Technical Chemist.

1901. Silberrad, Dr. Oswald, Sunny Croft, Buckhurst Hill, Essex, Research Chemist.

1912. Sillars, Daniel, The Laboratory, Bolckow, Vaughan and Co., Ltd., South Bank, S.O., Yorks, Metallurgical Chemist.

1892. Silvester, Harry, 78, Holyhead Road, Handsworth, Birmingham, Analytical and Consulting Chemist.

1901. Sim, Wilfrid A., c/o Wm. Sim and Sons, 40, Jane Street, Leith, N.B., Colour Manufacturer.

1911. Simmons, Thos. A., 67, Hollingbury Road, Brighton, Analytical Chemist.

1903. Simmons, Wm. H., Oakleigh, Stoke Newington Common, N., Analytical Chemist.

1898. Simon, Dr. A., 80, Bishopsgate, London, E.C., Chemical Engineer.

1905. Simons, Albert J., Pontianak, Dutch West Borneo, via Singapore, S.S., Engineer.

1902. Simonson, Wm., 126, West 9th Street, Cincinnati, Ohio, U.S.A., Chemist.

1905. Simpson, Henry, 34, Kimbolton Avenue, Lenton Sands, Nottingham, Works Chemical Assistant.

O.M. Simpson, W. S., The Gables, Cannon Hill, Southgate, N., Analytical Chemist.

1900. Sims, W. Edgar, c/o British Aluminium Co., Ltd., Larne Harbour, Co. Antrim, Ireland, Assistant Manager.

1894. Sinclair, Dr. W., 250, Ferry Road, Leith, N.B., Chemist.

1890. Sindall, R. W., 291, Wellmeadow Road, Catford, S.E., and (Journals) Oxford Court, Cannon Street, E.C., Paper Chemist.

1911. Singh, Shersingh W., c/o Thomas Cook and Son, Ludgate Circus, London, E.C., Engineer.

1899. Singmaster, J. Arthur, c/o New Jersey Zinc Co. of Penna., Palmerton, Pa., U.S.A., Chemist.

1901. Sinnatt, Frank S., 321, Great Clowes Street, Higher Broughton, Manchester, Demonstrator of Chemistry.

1905. Sjöström, Waldemar L., 37, Farnham Street, Laurence, Mass., U.S.A., Dyeworks Superintendent.
1885. Skaife, Wilfred T., 3, Trafalgar Avenue, Montreal, Canada, Sugar Chemist.
1912. Skellon, Herbert, Helsby Cable Works, Helsby, near Warrington, Chemist.
1894. Skelton, John R., c/o Norwich Crape Co., Ltd.. St. Augustine's, Norwich, Managing Director.
1897. Skertchly, W. P., Laboratory, 11, Billiter Square, London, E.C., Analytical Chemist.
1891. Skilton, C. F. E.. c/o Beamish and Crawford, Ltd., Cork, Ireland, Brewer.
1901. Skinner, Hervey J., c/o A. D. Little, 93, Broad Street, Boston, Mass., U.S.A., Chemist.
1908. Skinner. Wm., 38, Sauchiehall Street, Glasgow, Analytical Chemist.
1904. Skirrow, Dr. F. W., 8, Morecambe Terrace, Morecambe, Lancashire, Research Chemist.
1912 Skita. Prof. Dr. A., 18, Wendtstrasse, Karlsruhe, Baden. Germany. Professor, Techn. Hochschule.
1911. Skjold. E., Elm View, The Avenue, Erith, Kent, Technical Manager and Chemist.
1904. Skowronski, S., c/o C. L. Constant Co.. 42, New Street, New York City, U.S.A., Chemist.
1891. Skurray. Thos., The Brewery, 40, Ock Street. Abingdon. Berks, Brewer.
1904. Slator, Dr. Arthur, The Priory, Burton-on-Trent. Lecturer and Demonstrator.
1906. Sleeper, Robt. R., 112, Charles Street, Lowell. Mass., U.S.A., Instructor in Dyeing.
1895. Slocum, Dr. Frank L., 401, South Linden Avenue, E.E., Pittsburg. Pa., U.S.A., Chemist.
1883. Smail, J. J., Warren Wood, Hayes Common, Beckenham, Kent, Chemical Manufacturer.
1908. Small, Bertram G.. Beechlands, Timperley, Cheshire, Engineer.
1898. Small, Fritz H., 28, Berwick Street, Worcester, Mass., U.S.A., Chemist.
1904. Smart, Bertram J., Government Testing Laboratory, Lithgow, N.S.W., Australia, Chemist.
O.M. Smetham, A., 16, Brunswick Street, Liverpool, Analytical Chemist.
1905. Smith, Prof. Albert W., Case Library, Cleveland, Ohio, U.S.A., Professor of Chemistry.
1898. Smith, Alf. B., Ryecroft, Glossop, Derbyshire. Bleacher and Dyers' Manager.
1897. Smith, Allan, c/o Kellner-Partington Paper Pulp Co., Hallein, bei Salzburg, Austria, Chemist.
1896. Smith, Andrew T., c/o Castner-Kellner Alkali Co., Ltd., 43. Castle Street, Liverpool, General Manager.
1905. Smith, Arthur, Town End Chemical Works, Bramley, Leeds, Chemical Manufacturer.
1893. Smith, Edgar B., c/o Dominion Tar and Chemical Co., Box 445, Sault-Ste.-Marie, Ont., Canada, Manager.
1906. Smith, E. A. Cappelen, c/o American Smelting and Refining Co., 165, Broadway, New York City, U.S.A., Metallurgical Engineer.
1895. Smith, Dr. E. Ellsworth, Suite 80, Chemists' Building, 50, East 41st Street, New York City, U.S.A., Consulting Physiological Chemist.
1892. Smith, Ernest A., The Assay Office, Leopold Street, Sheffield, Assayer.
1903. Smith, Ewing, 233, Dunn Avenue, Toronto, Canada, Analytical Chemist.
1911. Smith, E. Woodhouse, 43, Cornwall Buildings, Newhall Street, Birmingham, Research Chemist.
1903. Smith, F. M., 100, William Street, New York City, U.S.A., President (Pacific Coast Borax Co.).
1891. Smith, Francis P., 24–26, East 21st Street, New York City, U.S.A., Chemist.
1907. Smith, Frank Morse, 100, William Street, New York City, U.S.A.. Chemical Merchant.
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1908. Smith, George A., 1433, President Street, Brooklyn, N.Y., U.S.A., Chemist (Printing Ink Manufacturing).
1907. Smith, George D., 216, Milk Street, Boston, Mass., U.S.A., Salesman.
1890. Smith, Harry, Tower House, Freshfield, near Liverpool Cons. Chemist (Paints and Pigments).
1890. Smith, Harry E., 36, Beersford Place, East Cleveland, Ohio, U.S.A., Analytical Chemist.
1904. Smith, Henry, 83, Brownlow Road, Horwich, Bolton-le-Moors, Lancs., Analytical Chemist.
1902. Smith, Hy. Geo., Technological Museum, Harris Street, Ultimo, Sydney, N.S.W., Australia, Assistant Curator and Chemist.
1905. Smith, H. Melville, Ammunition Works, Abbey Wood, Kent, Engineer and Superintendent.
1901. Smith, H. Procter, Shotton Lane, Shotton, Flintshire. Metallurgical Chemist.
O.M. Smith, H. R., 1, Aubert Park, Highbury, London, N., Analytical Chemist.
1905. Smith, Hugh Dunford, 7 and 9, The Side, Newcastle-on-Tyne, Analytical Chemist.
1906. Smith, Irwin J., P.O. Box 506, Troy, N.Y., U.S.A., Salesman.
O.M. Smith, Jas., Ash Grove House, Radcliffe, Manchester.
1897. Smith, James, Sunnyside, Groes Road, Cressington, near Liverpool, Analytical Chemist.
1903. Smith, James, "Lyndhurst," Frodsham, and (Jnls.) Ditton Copper Works, Widnes, Metallurgist.
1907. Smith, Jas. C., c/o Edward Ripley and Son, Ltd., Bowling Dyeworks, Bradford, Dyer.
1893. Smith, Jas. F., 41, Grange Avenue, Scarborough, Yorks., Analytical Chemist.
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O.M. Smith, Jno. W., 7, Brookfield Street, Roslindale, Boston, Mass., U.S.A., Analytical Chemist.
1896. Smith, Jos. Kent., 8, Hillfoot Road, Woolton, near Liverpool, Metallurgical Chemist.
1890. Smith, J. Wm., 1615, West Genesee Street, Syracuse, N.Y., U.S.A., Alkali Works Manager.
1910. Smith, L. Hewgill, c/o The New Transvaal Chemical Co., Delmore, Transvaal, Technical Chemist.
1911. Smith, N. Garrett, Balliol House, Toynbee Hall, Commercial Street, London, E., Anal. Chemist.
1898. Smith, R. F. Wood, 90, Lower Thames Street, London, E.C., Consulting Chemist.
1890. Smith, Dr. R. Greig, Linnean Society's House, Elizabeth Bay, Sydney, N.S.W., Bacteriologist and Chemist.
1890. Smith, Robt. W., c/o Alex. Smith, 55, Bath Street, Glasgow, Chemical Works Manager.
1911. Smith, Stuart, c/o Superior Portland Cement Co., Orangeville, Ont., Canada, Chief Chemist.
1897. Smith, Theophilus R., c/o Brotherton and Co., Ltd., The Wear Tar Works, South Dock, Sunderland, Chemist.
1907. Smith, Thorn, 49, West Larned Street, Detroit, Mich., U.S.A., Chemist.
1910. Smith, Vincent, 9, Wheathouse Terrace, Birkby, Huddersfield, Technical Chemist.
1896. Smith, Walter E., 141, Cypress Street, Providence, R.I., U.S.A., Instructor in Chemistry.
1903. Smith, Dr. Warren R., Lewis Institute, Chicago, Ill., U.S.A., Teacher.
O.M. Smith, Watson, 34, Upper Park Road, Haverstock Hill, N.W., Editor of Society's Journal.
1908. Smith, Dr. Watson, jun., Cape Explosives Works, Somerset West, C.C., South Africa, Chemist.
O.M. Smith, Wilfred, 182, West Street, Glasgow, Chemical Manufacturer.
1910. Smith, W. C., c/o The Anchor Cable Co., Leigh, Lancashire. Analytical Chemist.
1909. Smith, Wm. G., c/o R. W. Greeff and Co., 20, Eastcheap, London, E.C., Chemical Merchant.
1896. Smith, Dr. W. Stanley, Dunston House, Nailsea, Somerset, Brewer.
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O.M. Smithers, F. O., 171, Adelaide Road, London, N.W., and (Jnls.) c/o W. E. Harrison, Technical School, Goldshill Road, Handsworth, near Birmingham, Chemical Agent.
1902. Smoot, Albert M., 99, John Street, New York City, U.S.A., Analytical Chemist.
1909. Smoot, Chas. C., III., c/o C. C. Smoot and Sons Co., North Wilkesboro', N.C., U.S.A., Tanning Chemist.
1902. Smythe, Dr. Jno. A., Armstrong College, Newcastle-on-Tyne, Demonstrator in Chemistry.
1902. Smythe, Dr. J. S., Rocklands, Sandown Park, Wavertree, Liverpool, Analytical Chemist.
1888. Snape, Dr. H. Lloyd, Balholm, Lathom Road, Southport, Director of Education for Lancashire.
1908. Snell, Professor John F., Macdonald College P.O., Prov. Quebec, Canada, Professor of Chemistry.
1896. Snowdon, J., jun., Messrs. Snowdon, Sons and Co., Millwall, E., Chemical and Oil Manufacturer.
1900. Sodeau, Dr. Wm. H., Torpedofabrik, Fiume, Hungary, Chemist.
1903. Sohlman, Ragnar, Bofors, Sweden, Manager (A. B. Bofors Nobelkrut).
1894. Sohn, Chas. E., 52, Fore Street, London, E.C., and (Journals) 82, Wightman Road, Harringay, N., Analyst.
1912. Solomon, J. Bernard, 56, Priory Road, London, N.W., Tannery Chemist.
1906. Solomon, M., Birmingham Carbon Works, Witton, Birmingham, Manager.
1895. Solvay, Armand, 25, Rue Prince Albert, Brussels, Gérant de la Société Solvay et Cie.
1884. Solvay, Ernest, 43, Rue des Champs Elysées, Brussels, Alkali Manufacturer.
1897. Somerset, H. St. John, jun., Mount Morgan Gold Mining Co., Mount Morgan, Queensland, Australia, Assayer.
1884. Sommer, Adolf, Corner 1st and Binney Streets, East Cambridge, Boston, Mass., U.S.A., Pharmaceutical Chemist.
1909. Sommer, Dr. Albert, c/o The Barber Asphalt Paving Co., Land Title Building, Philadelphia, Pa., U.S.A., Engineer Chemist.
1904. Southall, A. W., Lower Priory, Birmingham, Manufacturing Chemist.
1904. Southerden, F., 11, Gordon Road, Exeter, Teacher of Chemistry.
1883. Soward, A. W., 28, Therapia Road, Honor Oak, S.E., Principal Clerk (Legacy Duty Office).
1890. Sowerby, Thos. H., Canal Soap Works, Verney Road, Rotherhithe, S.E., Soap Manufacturer.
O.M. Sowerby, W. M., c/o United Alkali Co., Ltd., Allhusen Works, Gateshead-on-Tyne, Manager.
1887. Spackman, Chas., Rosehaugh, Clitheroe, Lancashire, Portland Cement Manufacturer.
1910. Spackman, Henry S., 2211, Chestnut Street, Philadelphia, Pa., U.S.A., President of Engineering Co.
1904. Sparre, Fin, 606, West 20th Street, Wilmington, Del., U.S.A., Chemist.
1904. Speiden, C. C., 46, Cliff Street, New York City, U.S.A., Chemical Merchant.
1905. Speight, W E. Hacken Sewage Works, Great Lever, Bolton, Chemist.
1909. Speirs, Wm., c/o W. N. Gemmill and Co., 142, Queen Street, Glasgow, Chemical Broker.
1883. Spence, D., Manchester Alum Works, Manchester, Alum Manufacturer.
1911. Spence, Dr. David, c/o The Diamond Rubber Co., Akron, Ohio, U.S.A., Director of Research Laboratory.
1900. Spence, Howard, (Journals) Audley, Broad Road, Sale, Cheshire; and Alum Works, Manchester, Chemical Manufacturer.
1909. Spence, Jno., 113, West Regent Street, Glasgow, Analyst.
1883. Spence, Jno. W., Tiviot Colour Works, Manchester Road, Stockport, Drysalter.
1903. Spencer, A. Gordon, 601—603, Canadian Express Building, Montreal, Canada, Chemist.
1902. Sperry, Elmer A., 100, Marlborough Road, Prospect Park South, Brooklyn, N.Y., U.S.A., Electrical Engineer.
1897. Sperry, Erwin S., "The Brass World," 260, John Street, Bridgeport, Conn., U.S.A., Metallurgist and Editor.
1884. Spiegel, Dr. Adolf, Messel bei Darmstadt, Germany, Analytical Chemist.
1903. Spielmann, Dr. P.E., 21, Cadogan Gardens, London, S.W., Chemist.
1906. Spiera, Dr. V. G. Hotel des Boulevards, 9, Place de la Commune, Antwerp, Belgium, Chemist.
1889. Spies, Adolph, 102, Fenchurch Street, London, E.C., Chemical Merchant.
1885. Spiller, A., Edison-Swan Electric Co., South Benwell Works, Newcastle-on-Tyne, Electrician.
O.M. Spiller, J., 2, St. Mary's Road, Canonbury, London, N., Consulting Chemist.
1896. Spoor, J. L., Rede Court, Rochester, Kent, Portland Cement Manufacturer.
1909. Sprague, F. O., c/o Cattaraugus Tanning Co., Olean, N.Y., U.S.A., Chemist.
1900. Spurge, Edw. C., University Club, Niagara Falls, N.Y., U.S.A., Chemist.
O.M. Squire, P. W., 413, Oxford Street, London, W., Pharmaceutical Chemist.
1910. Stadler, Hans, c/o Herr Kommerzienrat J. Stadler, Prague, Austria, Technical Chemist.
1896. Stafford, Chas. H., c/o The Birkacre Printing Co., Chorley, Lancs, Colourist.
O.M. Stahl, Dr. K. F., 57th Street and A. V. Ry., Pittsburg, Pa., U.S.A., Chemical Works Manager.
1905. Stahl, Dr. Paul G., 13, Square de Jussieu, Lille (Nord), France, Chemical Manufacturer.
1905. Stalmann, Otto, 317, McCornick Building, Salt Lake City, Utah, U.S.A., and (Jnls.) 1, Wetherby Mansions, Earl's Court Square, London, S.W., Metallurgical Engineer.
1904. Standfast, Jno., T. Prince Regent's Wharf, Silvertown, E., Chemist.
1910. Stanford, Dr. R. V., Chemical Laboratory, City of Cardiff Mental Hospital, Whitchurch, near Cardiff, Research Chemist.
1906. Stanley, Wm., Great Barrington, Mass. U.S.A., Engineer.
1888. Stantial, Frank G., c/o Cochrane Chemical Co., Everett, Mass., U.S.A., Technical Chemist.
1885. Staples, H. J., The Old Hall, Spondon, Derby, Colour Manufacturer.
O.M. Stark, J. F., Rosedale, Bromborough, Cheshire Works Manager.
1896. Statham, Noel, 46, Landscape Avenue, Yonkers, N.Y., U.S.A., Engineer.
1907. Staud, Joseph E., c/o W. W. Lawrence and Co., Pittsburg, Pa., U.S.A., Chemist.
1904. Stauffacher, W., 64, Oberwilerstrasse, Basle, Switzerland, Chemical Works Manager.
1895. Stead, J. Christopher, 55, Chancery Lane, London, W.C., Technical Chemist.
O.M. Stead, J. E., F.R.S., 11, Queen's Terrace, Middlesbrough-on-Tees, Analytical Chemist.
O.M. Stebbins, Dr. J. H., 50, East 41st Street, New York City, U.S.A., Analytical Chemist
1896. Steel, Fred. W., c/o General Chemical Co., Ltd., Auburn, Sydney, Australia, Works Manager.
1900. Steel, Jno. S., Achernar, Blackburn, Melbourne, Vic., Australia, Chemist.
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1909. Stehle, Chas., 5010, Penn Street, Frankford, Philadelphia, Pa., U.S.A., Proprietor of Dye Works.
1905. Steiger, George, c/o U.S. Geological Survey, Washington, D.C., U.S.A., Chemist.
1897. Stein, Sigmund, 214, Upper Parliament Street, Liverpool, Sugar Refinery Manager.
1912. Steiner, Bernard C., Enoch Pratt Free Library, Baltimore, Md., U.S.A., Librarian.
1897. Steinhart, Dr. Oscar J., c/o Twite and Steinhart, 65, London Wall, London, E.C., Consulting Metallurgist.

1903. Stell, S. F., 25, Henry Street, Keighley, Yorks, Teacher of Chemistry.
1887. Stenhouse, T., 166, Drake Street, Rochdale, Analytical Chemist.
1908. Stenhouse, Thos., jun., Chemical Laboratory, H.M. Dockyard, Portsmouth, Analytical Chemist.
1904. Stephen, A. E., Rydal Mount, Webb's Avenue, Ashfield, Sydney, N.S.W., Australia, Analytical Chemist.
1911. Stephens, C. E., c/o Spies Bros. and Co., 102, Fenchurch Street, London, E.C., Chemical Merchant.
1884. Stephens, H. Chas., Avenue House, Finchley, N., Ink Manufacturer.
1892. Stephens, M. E., 57—60, Aldersgate Street, London, E.C., Ink Manufacturer.
1909. Stephenson, Henry H., Royal Doulton Potteries, Lambeth, S.E., Technical Chemist.
1909. Stephenson, Herbert F., 8, Mitcham Park, Surrey, Analytical Chemist.
1889. Stern, Arthur L., 148, High Street, Burton-on-Trent, Brewing Chemist.
O.M. Steuart, D. R., Osborne Cottage, Broxburn, West Lothian, N.B., Oilworks Chemist.
1903. Steven, A. B., Royal Technical College, Glasgow, Lecturer on Dyeing.
1907. Steven, Michael M., Laboratory, Glenochil Distillery, Menstrie, N.B., Analytical Chemist.
1899. Stevenot, G. A., c/o H. A. Metz Co., 122, Hudson Street, New York City, U.S.A., Chemist.
1898. Stevens, Arthur F., Paper Examiner.
1902. Stevens, Dr. Hy. P., Laboratory, 15, Borough, London Bridge, S.E., Consulting Chemist.
1894. Stevens, Jno. H., 295, Ferry Street, Newark, N.J., U.S.A., Manufacturing Chemist.
1908. Stevens, J. Venn, c/o Central Chile Copper Co., Panulcillo, Coquimbo, Chile, Analytical Chemist.
1902. Stevens, M. White, H.M. Patent Office, Chancery Lane, London, W.C., Chemist.
1903. Stevens, T. R. B., P.O. Box 57, Kalgoorlie, West Australia, Metallurgical Chemist.
O.M. Stevenson, W., Standard Works, 95A, Southwark Street, London, S.E., Chemical Manufacturer.
1912. Stewart, Allan E., 136, Bedford Road, Toronto, Canada, Chemist.
1901. Stewart, David B. D., Aberdeen Comb Works, Hutcheon Street, Aberdeen, Managing Director.
1903. Stewart, Jas., "The Gas World," 8, Bouverie Street, Fleet Street, London, E.C., Editor.
1909. Stewart, Jeffrey, India Refining Co., McKean and Swanston Streets, Philadelphia, Pa., U.S.A., Works Manager.
1890. Stewart, Robt., 46, Westbourne Road, Luton, Chemical Works Manager.
O.M. Stewart, S., c/o Michael Nairn and Co., Ltd., Kirkcaldy, Fife, Technical Chemist.
1906. Stickland, Oliver W., c/o The New Explosives Co., Ltd., Stowmarket, Suffolk, Works Chemist.
1904. Stieglitz, Dr. Julius, University of Chicago, Chicago, Ill., U.S.A., Associate Professor of Chemistry.
1904. Stiff, John T., 60, Parrock Street, Gravesend, Kent, Works Chemist.
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1903. Stingelin, Dr. Fritz, 7, Ruetschistrasse, Zürich, Switzerland, Chemist.
1886. Stirk, Jos., The Sunnyside Hydro, Southport, Brewer's Engineer.
1893. Stock, F. W. Keating, County Analyst's Office, Darlington, Analytical and Consulting Chemist.
1900. Stockdale, Edgar, c/o R. Dewhurst and Co., Ltd., Printworks, Batley, Yorks, Colour Mixer.
1888. Stockdale, Wm., Rosebank Printworks, Ramsbottom, near Manchester, Calico Printer.
1887. Stocks, H. B., 12, Victoria Road, West Kirby, Cheshire, Analytical Chemist.
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1899. Stokes, Alf. W., Laboratory, Town Hall, Paddington Green, W., Public Analyst.
1910. Stokes, Edward S., c/o Metropolitan Board of Water Supply and Sewerage, Pitt Street, Sydney, N.S.W., Australia, Medical Officer.
1906. Stokes, Francis J., 17th and Cambria Streets, Philadelphia, Pa., U.S.A., Manufacturing Chemist.
1900. Stone, Geo. C., c/o New Jersey Zinc Co., 55, Wall Street, New York City, U.S.A., Engineer.
1899. Stone, I. F., 100, William Street, New York City, U.S.A., Chemical Merchant.
1888. Stone, Thos. W., Chemical Works, St. George, Bristol, Chemical Manufacturer.
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1902. Storr, Bertram V., 147, Coventry Road, Ilford, Essex, Chemist.
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1909. Strachan, Jas. T., c/o Hendon Paper Works Co., Ltd., Sunderland, Works Chemist.
1883. Strangman, J. Pim, 9 Clydesdale Road, Notting Hill, W., Bleacher.
1908. Stratford, Alfred W., Alexandra Road, King's Langley, Herts, Chemist.
1903. Strayer, D. W., 428, West King Street, York, Pa., U.S.A., Chemist.
1903. Strickler, Emerson H., c/o General Chemical Co., 25, Broad Street, New York City, U.S.A., Chemist.
1909. Strivens, Percy R., Oil Mills, Horbury Bridge, near Wakefield, Analytical Chemist.
O.M. Stuart, C. E., 29, Moseley Street, Newcastle-on-Tyne, Chemical Apparatus Dealer.
1911. Stuart, F. A., 534, Waterloo Street, London, Ont., Canada, Teacher.
1896. Stuart, Harry T. R., Know Mill House, Entwistle, near Bolton, Printworks Manager.
O.M. Stuart, T. W., 7, Livingston Drive, Sefton Park, Liverpool, Alkali Works Manager.
1896. Stubbs, Augustus J., Claris 111, Barcelona, Spain.
1903. Sturrock, Capt. G. C., R.A., Indian Cordite Factory, Aruvankad, Nilgiris, India, Assistant Superintendent.
1911. Stut, John C. H., 417, Montgomery Street, San Francisco, Cal., U.S.A., Consulting Engineer.
1908. Suart, Arthur B., c/o Johnson and Sons' Smelting Works, Paul Street, Finsbury, London, E.C., Bullion Refiner.
1895. Sudborough, Dr. J. J., Indian Institute of Science, Bangalore, India, Lecturer in Chemistry.
1889. Sulman, H. L., 44, London Wall, London, E.C., Chemist and Metallurgist.
1910. Sulzer, Albert F., 41, Gorsline Street, Rochester, N.Y., U.S.A., Chemical Engineer.
1895. Summers, Bertrand S., c/o The Summers Fiber Co., Port Huron, Mich., U.S.A., Electro-Chemist.
1907. Sundarram, Minakshi, c/o Parry & Co., Ranipettai, N. Arcot, Madras, India, Agricultural Chemist.
1899. Sundström, Carl, c/o Solvay Process Co., Detroit, Mich., U.S.A., Chemist.
1906. Sutermeister, Edwin, c/o S. D. Warren and Co., Cumberland Mills, Westbrook, Maine, U.S.A., Chemist.
1884. Sutherland, D. A., 26, Victoria Street, Westminster, S.W., Consulting Technical Chemist.
1909. Sutherland, Daniel M., Ashgrove, Sunbury Common, Middlesex, Works Manager.
1894. Sutherland, Geo., Croft Cottage, Bonhill, N.B., Chemist.
1887. Sutherland, Jas., c/o British Aluminium Co., Ltd., Larne Harbour, Co. Antrim, Ireland, Chemist.
1906. Sutherland, John, Larkhill, Larne Harbour, Co. Antrim, Ireland, Manager of Carbon Factory.
O.M. Sutherland, R. M., Lime Wharf Chemical Works, Falkirk; and Solsgirth, Dollar, N.B., Chemical Manufacturer.

O.M. Sutton, Dr. Francis, Norfolk County Laboratory, Redwell Street, Norwich, Analytical Chemist.

1886. Sutton, F. Napier, 6, Grosvenor Gardens, Cricklewood, N.W., Alkali Works Inspector.

1900. Sutton, W. Lincolne, Hillcroft, Eaton, Norwich, Public Analyst.

O.M. Swan, Sir Jos. W., F.R.S., Overhill, Warlingham, Surrey, Chemist and Electrician.

1906. Sweet, Everell F., 52, Union Street, Boston, Mass., U.S.A., Importer.

1905. Swenarton, W. Hastings, Broadway Chambers, 277, Broadway, New York City, U.S.A., Patent Lawyer.

1904. Swindells, Seth, Liverpool Road, Kidsgrove, Stoke-on-Trent, Chemist.

1912. Swinden, Thos., 28, Holland Road, Highfield, Sheffield, Metallurgist.

1901. Swinton, Ralph S., c/o W. J. Bush, Incorporated, Linden, N.J., U.S.A., Analytical Chemist.

1912. Sykes, Charles D., 95, Vicarage Road, Langley, near Birmingham, Chemical Works Manager.

1902. Sylow, Paul L. P. G., New Farm Sugar Refinery, Brisbane, Queensland, Analytical Chemist.

O.M. Syme, W. B., Elm Cottage, Addiewell, West Calder N.B., Oil Works Chemist.

1906. Symes, Langford P., Belfast Freezing Works, Christchurch, New Zealand, Chemist.

1906. Symonds, Abram E., Wick Lane Colour Works, Old Ford Road, Bow, E., Colour Manufacturer.

1910. Szilagyi, L. F., 13, St. Helen's Place, London, E.C., Consulting Engineer.

T

1895. Taber, G. H., 814, Frick Building, Pittsburg, Pa., U.S.A., General Manager (Gulf Refining Co.).

1910. Tainsh, Peter, Belmont, Sorbie Road, Ardrossan, Ayrshire, Technical Chemist.

1909. Tait, Walter Scott, 1000, Massachusetts Avenue, Cambridge, Mass., U.S.A., Works Manager.

1896. Takagi, T., 10, Nishikatamachi, Hongo, Tokyo, Japan, Chemical Engineer.

1910. Takahashi, Kakuichiro, Su-i-ta, near Osaka Japan, Chemist.

O.M. Takamatsu, T., 13, Nishikatamachi, Hongo, Tokyo, Japan, Analytical Chemist.

O.M. Takamine, Dr. Jokichi, 550, West 173rd Street, New York City, U.S.A., Engineer.

1890. Takayama, Jintaro, Nando Machi 26, Ushigome, Tokyo, Japan, Director (Imperial Industrial Experiment Station).

1905. Talbot, Prof. Henry P., Mass. Institute of Technology, Boston, Mass., U.S.A., Professor of Inorganic Chemistry.

1910. Tanahashi, Dr. T., 486, Sendamachi, Fukagawa, Tokio, Japan, Manufacturing Chemist.

1898. Tanaka, Keishin, Matsuba Hotel, Kudansaka, Uye, Tokyo, Japan, Chemist.

1900. Tankard, Arnold R., City Analyst's Office, 40, Lowgate, Hull, and (Journals) 12, Feren's Avenue, Cottingham Road, Hull, Analytical Chemist.

1907. Tartar, Herman V., Corvallis, Oregon, U.S.A., Analytical Chemist.

1911. Tarver, Percy, 2095, East 36th Street, Cleveland, Ohio, U.S.A., Chemist (Sherwin-Williams Co.).

O.M. Tate, F. H., 9, Hackins Hey, Liverpool, Analytical and Technical Chemist.

1910. Tatlock, Chas. S. A., 156, Bath Street, Glasgow, Analytical Chemist.

O.M. Tatlock, R. R., 156, Bath Street, Glasgow, Consulting Chemist.

1902. Tatters, Hugh Lee, 10, Birchfield Road, Widnes, Analytical Chemist.

1906. Tattersfield, Frederick, 96, Bewick Road, Gateshead-on-Tyne, Analyst.

1907. Taussig, Dr. Rudolf, Würthgasse 8, Vienna XIX., Austria, Chemist.

1905. Taveau, René de Mortemer, 2100, Chestnut Street, Philadelphia, Pa., U.S.A., Chemist.

1901. Tayler, Jno. Bernard, Anglo-Chinese College, Tientsin, North China, Chemist.

1903. Taylor, Alvin M., c/o General Chemical Co., Hegewisch, Ill., U.S.A., Chemist.

1902. Taylor, Arthur P., c/o John Taylor and Co., 531 Front Street East, Toronto, Ont., Canada, Soap Manufacturer.

1907. Taylor, C. Marshall, Sewaren, N.J., U.S.A., Chemist.

1902. Taylor, Edward R., Penn Yan, N.Y., U.S.A., Manufacturing Chemist.

1886. Taylor, G. Crosland, Ravenscar, Helsby, near Warrington, Electrical Engineer.

1894. Taylor, G. Midgley, Caxton House, Westminster, S.W., Analytical Chemist.

1893. Taylor G. W., Dinting Vale Printworks, Dinting, near Manchester, Printworks Chemist.

O.M. Taylor, H. E., 1, Alexandra Park Gardens, Glasgow, Lead Works Manager.

1883. Taylor, Jas., "Adderton," Dundas, N.S.W., Australia, Government Metallurgist.

1898. Taylor, Jas. M., Tynevale, Groes Road, Cressington, Liverpool, Analytical Chemist.

1888. Taylor, J. Scott, North London Colour Works, Spring Place, Kentish Town, N.W., Technical Chemist.

1896. Taylor, Martin, "The Clough," Buckhurst Hill, Essex, Chemical Works Manager.

1901. Taylor, Sidney H., 258, Ecclesall Road, Sheffield, Works Chemist.

1898. Taylor, Walter, 475, Grosvenor Place, Limefield, Bury, Lancs., Technical Chemist.

1905. Taylor, Wm. H., 36, Glenhouse Road, Eltham Park, Kent, Chemist.

1887. Teanby, G. W. A., Elvin Lodge, East Dereham, Norfolk, Analytical Chemist.

1899. Teas, Wm. Holmes, Ridgeway, Pa., U.S.A., Chemist.

O.M. Teed, Dr. F. L., Chem. Laby., 9, Mincing Lane, London, E.C., Analytical Chemist.

1905. Teeple, Dr. J. E., 50, East 41st Street, New York City, U.S.A., Director.

1908. Teichfeld, Arnold, Pruszkow, near Warsaw, Russian Poland, Chemist in Ceramic Industry.

1904. Teller, George L., 31, North State Street, Chicago, Ill., U.S.A., Chemist.

1906. Tempany, Harold A., Government Laboratory, St. John's, Antigua, West Indies, Analyst.

1884. Tennant, Jas., Fairlie, Ayrshire, Lead and Colour Manufacturer.

1896. Tennille, Geo. F., c/o Southern Cotton Oil Co., 206, Bay Street East, Savannah, Ga., U.S.A., Chemist.

1908. Terleski, Fred. H., 11, Oaklands Road, Kersal, Manchester, Technical Chemist.

1911. Terrey, Augustus G., c/o Dussek Bros. and Co., Ltd., Verney Road, London, S.E., Chemist (Tar Distillery).

1884. Terry, Hubert L., (Journals) 3, Herbert Street, Moss Side, Manchester; and (Laboratory) 23, Hopwood Avenue, Manchester, Technical Chemist.

O.M. Tervet, R., 68, Windsor Road, Leyton, Essex, Oil Works Manager.

1893. Tetley, C. F., Messrs. Jos. Tetley and Son, The Brewery, Leeds, Brewer.

1897. Tetlow, Dr. Wm. E., Ash Cottage, Ashfield, Dunblane, N.B., Chemist.

1908. Thatcher, Dr. C. J., 1352, Hudson Terminal Building, New York City, U.S.A., Consulting Chemist and Patent Expert.

1903. Thatcher, Ed. J., The Manor House, Chew Magna, near Bristol, Merchant and Manufacturer.

1909. Thaxter, Gerald N., c/o Brewer and Co., Worcester, Mass., U.S.A., Chemist.

1908. Theis, Dr. Friedrich C., Konigsteinerstrasse 60, Höchst a/Main, Germany, Chemist.

1908. Thiele, Dr. Ludwig, Holland, Mich., U.S.A., Manager Holland Gelatine Works.

1910. Thom, T. Mathieson, Woodlands, Cheshunt, Herts, Chemical Engineer.

1908. Thom, Wm. H., 1024, Dovercourt Road, Toronto, Canada, Chemist.

1911. Thomas, Benjamin F., 650, McCallie Avenue, Chattanooga, Tenn., U.S.A., President, Cocalola Bottling Co.
1911. Thomas, D. Hibbert, 56, Waun Road, Morriston, Glamorganshire, Chemical Works Manager.
1912. Thomas, Frederick, c/o Williams Bros. and Co., Colour Manufacturers, Hounslow, Middlesex, Chemist and Works Manager.
1894. Thomas, H. Russell, Broad Plain Soap Works, Bristol, Soap Manufacturer.
1909. Thomas, John, Highfield, Brettell Lane, near Stourbridge, Analytical Chemist.
1911. Thomas, J. Herbert, 1, Campfield Villas, Truro, Cornwall, Analytical Chemist.
O.M. Thomas, J. W., Overdale, Shortlands, Kent, Analytical Chemist.
1902. Thomas, Nehemiah M., Roseville Avenue, Pymble, N.S.W., Australia, Inspector.
1901. Thomas, Octavius, Gas and Water Offices, Pentre, Glamorganshire, Gas and Water Engineer.
1908. Thomas, Oswald J. D., c/o Canada Cement Co., Ltd., Plant No. 2, Long Point, Montreal, Canada, Analytical Chemist.
1888. Thomas, S. Percy, Technical Chemist.
1898. Thomas, Wm. Harrison, jun., South Norwalk, Conn., U.S.A., Printworks Chemist.
1905. Thomlinson, Wm., Seaton Carew Ironworks, West Hartlepool, Ironmaster.
1905. Thompson, Alf. J., c/o R. W. Greeff and Co., 20, Eastcheap, London, E.C., Chemical Merchant.
1885. Thompson, Prof. Claude M., 38, Park Place, Cardiff, Professor of Chemistry.
1898. Thompson, Edw. C., Froyle House, 42, Westcombe Park Road, Blackheath, S.E., Manufacturing Chemist.
1909. Thompson, Edwin, 25, Sefton Drive, Liverpool, Manufacturing Chemist.
1893. Thompson, G. Rudd, 69, Dock Street, Newport, Mon., Analytical and Consulting Chemist.
1895. Thompson, Gustave W., 129, York Street, Brooklyn, N.Y., U.S.A., Chemist.
1907. Thompson, Jas. G., Donegall Quay Mills, Belfast, Ireland, Corn Miller.
1903. Thompson, Jno. T., Corporation Sewage Works, Knostrop, Leeds, Analyst.
1907. Thompson, Milton S., 72, Broad Street, Boston, Mass., U.S.A., Manufacturer.
1885. Thompson, W., Sankey Hill, Earlestown, Lancashire, Sugar Refiner.
O.M. Thompson, W. P., Patent Office, 6, Lord Street, Liverpool, Patent Agent.
1896. Thomsen, Alonzo L., Maryland Club, 1, East Eager Street, Baltimore, Md., U.S.A., Manufacturing Chemist.
1884. Thomson, G. Carruthers, 53, Bedford Road, Rock Ferry, Birkenhead, Engineer.
1907. Thomson, H. N., P.O. Box 337, Tooele, Utah, U.S.A., Metallurgist.
1891. Thomson, Jas. M., Royal Gunpowder Factory, Waltham Abbey, Essex, Manager (Cordite Branch).
1884. Thomson, Robt. T., 156, Bath Street, Glasgow, Analytical Chemist.
1899. Thomson, Thos., c/o Waterproofing Co., Barrhead, near Glasgow, Manufacturer.
O.M. Thomson, W., Royal Institution Laboratory, 79A, Princess Street, Manchester, Analytical and Consulting Chemist.
1890. Thomson, Wm. Thos., Royal Gunpowder Factory, and (Journals) Forest View, Honey Lane, Waltham Abbey, Essex, Explosives Chemist.
1902. Thorburn, Jas., 30, Cromartie Avenue, Newlands, Glasgow, Analytical Chemist.
1910. Thorne, Carl B., c/o Riordan Paper Co., Hawkesbury, Ontario, Canada, Manager.
O.M. Thorne, Dr. L. T., Highlands, The Crescent, Belmont, Surrey, and (Journals) Southampton Wharf, Battersea, S.W., Technical Chemist.
1907. Thornewell, A. R., 66, Marshall Street, West Smethwick, Birmingham, Works Chemist.
O.M. Thorneycroft, Wallace, Plean House, Plean, Stirling, Technical Chemist.
1904. Thornley, Thomas, 19, Hope Street, Glasgow, Chemical Manufacturer.
1887. Thornton, H., Redbourn, Ashford, Middlesex, Analytical Chemist.
1910. Thornton, Horace M., 24, Coventry Road, Ilford, Essex, Gas Engineer.
1899. Thornton, Wm., c/o J. S. MacArthur and Co., Porcupine, North Ontario, Canada, Chemist.
1895. Thorp, Dr. Frank H., Mass. Inst. of Technology, Boston, Mass., U.S.A., Assistant Professor of Industrial Chemistry.
1911. Thorp, John W., 74, Ripon Street, Blackburn, Works Chemist.
1907. Thorp, Thos., Moss Bank, Whitefield, near Manchester, Engineer.
1906. Thorp, Walter, Sorrentoville, Dalkey, Co. Dublin, Ireland, Analytical Chemist.
O.M. Thorpe, Sir Edward, C.B., F.R.S., 61, Ladbroke Grove, Notting Hill, W., Professor of Chemistry.
1905. Thorpe, Dr. J. F., F.R.S., 5, Endcliffe Hall Avenue, Sheffield, Lecturer.
1905. Thresh, Dr. John C., Chelmsford, Essex, Medical Officer of Health and Sanitary Expert.
1902. Thurlow, Nathaniel, c/o General Bakelite Co., Perth Amboy, N.J., U.S.A., Chemist.
1898. Thurnauer, Dr. Gustav, c/o Aurora Metal Co., Aurora, Ill., U.S.A., Chemist.
1904. Thurston, Azor, Grand Rapids, Ohio, U.S.A., Chemist.
1909. Thwaites, John, c/o Mount Hope Finishing Co., North Dighton, Mass., U.S.A., Textile Finisher.
1908. Thwaites, John H., Market Chambers, Peterborough, Chemical Engineer.
1904. Tickle, Thos., Laboratory, 83, Queen Street, Exeter, Analyst.
O.M. Tilden, Sir William A., F.R.S., The Oaks, Murray Road, Northwood, Middlesex, Professor of Chemistry.
1908. Tillberg, Erik W., Westervik, Sweden, Extract Manufacturer.
1911. Tilley, Hugh B., County Agricultural Laboratories, 1, Richmond Road, Exeter, Chemist.
1900. Tilley, Jas. W., 95A, Southwark Street, London, S.E., Research Chemist.
1906. Tillson, Henry E., 223, South 61st Street, Philadelphia, Pa., U.S.A., Dyer.
1901. Timmans, W. G., The Basford Chemical Co., Ltd., Basford, Nottingham, Chemical Manufacturer.
1905. Tindall, W. B., 39, St. Mary Street, Toronto, Canada, Secretary and Treasurer.
1908. Tingle, J. Grantley, c/o Pacific Phosphate Co., Ltd., A.M.P. Building, Collins Street, Melbourne, Victoria, Assayer.
1894. Tipler, Fred. C., 48, Brooklyn Street, Crewe, Analytical Chemist.
1907. Tischbein, Dr. Robert, The Heyden Chemical Works, Garfield, N.J., U.S.A., Chemist.
1890. Tobey, C. H., Burks Falls, Ontario, Canada, Tannery Chemist.
1911. Tobitt, Miss Edith, Omaha Public Library, Omaha, Neb., U.S.A., Librarian.
1894. Toch, Maximilian, 52, 9th Street, Long Island City, N.Y.; and (Journals) 320, Fifth Avenue, New York City, U.S.A., Chemist.
1886. Todd, A. M., c/o The A. M. Todd Co., Kalamazoo, Mich., U.S.A., Manufacturing Chemist and Distiller of Essential Oils.
1911. Todd, Fred. W., Gunpowder Works, Tonbridge, Kent, Chemist.
1905. Tolson, Stanley, c/o The Northern Rubber Co., Retford, Notts, Chemist.
O.M. Toms, F. Woodland, States Analyst's Office, St. Heliers, Jersey, Analytical Chemist.
1902. Tone, Frank Jerome, c/o The Carborundum Co., Niagara Falls, N.Y., U.S.A., Manager.
1909. Tonry, Wm. S., 58, Euclid Avenue, Hackensack, N.J., U.S.A., Chemical Engineer.
1907. Torrey, Dr. Joseph, Craigie Lea, Blundellsands, Liverpool, Engineer.

1911. Tower, Clement B., jun., 28, Albion Street, Hyde Park, Mass., U.S.A., Gelatine Manufacturer.
O.M. Towers, J. W., Widnes, Lancashire, Analytical Chemist.
1907. Towler, A. E., c/o Sulphide Corporation, Cockle Creek, near Newcastle, N.S.W., Australia, Chemist.
1909. Townend, Harry, Public Library, Bury, Lancashire Librarian.
1897 Towse Walter, Elswick Leather Works, Newcastle-on-Tyne, Technical Chemist.
1904. Toyne, Francis D., c/o Kelsall and Kemp, Ltd., Woodhouse Mills, Norden, near Rochdale, Chemist.
1899. Trantom, Dr. Wm., York Road, Grappenhall, Warrington, Chemist.
1894. Traphagen, Dr. Frank W., Colorado School of Mines, Golden, Colo., U.S.A., Professor of Metallurgy and Assaying.
1900. Traquair, Jno., Glenfield Starch Works, Paisley, N.B., Analytical Chemist.
1901. Trautwein, A. P., Carbondale, Pa., U.S.A., President (Carbondale Instrument Co.).
1906. Travell, Norman E., 1, Grosvenor Avenue, Ebers Road, Nottingham, Lace Dresser.
1893. Travers, Prof. Morris W., F.R.S., Indian Institute of Science, Bangalore, India, Professor of Chemistry.
1889. Trechmann, A. O., Halling Lime and Cement Works, near Rochester, Kent, Cement Manufacturer.
1911. Trechmann, C. T., Warren Cement Works, Hartlepool, Cement Manufacturer.
1895. Treharne, F. Gwilym, Wrangbrook, Llanishen, near Cardiff, Analytical Chemist.
1885. Trewby, Herbert, Lampetts, Fyfield, Essex, Analytical Chemist.
1909. Trier, Thorvald G., 237, West 22nd Street, New York City, U.S.A., Technical Chemist.
1901. Trigger, Oliver, Chem. Dept., Royal Arsenal, Woolwich, S.E., Analytical Chemist.
1898. Tripp, Dr. E. Howard, 26, Chaucer Road, Bedford, Science Master.
O.M. Trobridge, A., c/o Trobridge and Co., Ltd., Heworth Shore, Felling-on-Tyne, Technical Chemist.
1897. Trotman, Saml. R., The City Laboratory, 1, Regent Street, Nottingham, City Analyst.
1900. True, Percival E., 279, Douglas Avenue, Elgin, Ill., U.S.A., Chemical Engineer.
1887. Tsukiyama, S., 2nd of No. 2116, Fukiai-chō, Kobe, Japan, Paper Mills Chemist.
1894. Tucker, Alex. E., 55, Station Street, Birmingham, Metallurgist and Chemist.
1897. Tucker, Samuel A., Columbia University, New York City, U.S.A., Tutor in Industrial Chemistry.
1886. Tuer, Arthur H., Douglas House, Worthington, near Wigan, Analytical Chemist.
1903. Tufts, C. G., c/o Semet-Solvay Co., Syracuse, N.Y., U.S.A., Chemical Engineer.
1909. Tulloch, Capt. T. G., 54, Parliament Street, London, S.W., Director of Public Companies.
1901. Tulloch, Wm. F., 30, George Square, Glasgow, Merchant.
1909. Tunks, Dr. F. R., Borthwen, Minffordd, N. Wales, Manager, Steelite Explosives, Ltd.
1904. Tunnell, Raymond W., 251, West Walnut Lane, Germantown, Philadelphia, Pa., U.S.A., Manufacturer.
1899. Turnbull, Dr. Andrew, 18, Hackins Hey, Liverpool, Consulting Chemist.
1888. Turnbull, G. W., Ash Cottage, North Road, Carnforth, Lancashire, Metallurgical Chemist.
1904. Turnbull, R. H., c/o MacAndrews and Forbes Co., Camden, N.J., U.S.A., Analytical Chemist.
1884. Turnbull, W. S., 38, Bath Street, Glasgow, Chemical Manufacturer.
1911. Turner, Prof. A. J., Technical Institute, Byculla, Bombay, India, Professor of Chemistry.
1902. Turner, Basil, 83, Pitt Street, Sydney, N.S.W., Australia, Metallurgist.
1902. Turner, Jos., c/o Read Holliday and Sons, Ltd., and (Jnls.) Azo House, Birkby, Huddersfield, Chemist.
1905. Turner, Prof. Thomas, Springfields, Selly Hill, Birmingham, Professor of Metallurgy.
1897. Turney, Fred. N., 12, Dieghem Straat, Saventham, near Brussels, Belgium, Leather Dresser.
1887. Turney, Sir J., Trent Bridge Leather Works, Nottingham, Tanner.
1908. Turnill, Thos. W., 8, Leonard Street, Beverley Road, Hull, Works Chemist.
1905. Tutwiler, Carrington C., 1706, North Broad Street, Philadelphia, Pa., U.S.A., Chemist.
1890. Tweedy, Jas., 245, Burdett Road, Limehouse, E., Metallurgical Chemist.
1905. Twigg, Geo. F., 77, Arthur Street, Derby, Gas Works Chemist.
1891. Twitchell, E., Wyoming, Ohio, U.S.A., Candle Works Manager.
O.M. Twynam, T., Wynyard House, Coatham Road, Redcar, Yorks, Metallurgist.
1901. Tyler, Chas. R., c/o Dr. Francis Wyatt, 402, West 23rd Street, New York City, U.S.A., Analytical Chemist.
O.M. Typke, P. G. W., Lawn House, New Malden, Surrey, Chemical Manufacturer.
O.M. Tyrer, Thos., Stirling Chemical Works, Stratford, E.; and (Journals) 14, Sandwell Mansions, West End Lane, N.W., Chemical Manufacturer.

U

1907. Udal, John P., Ridge Road, Berea, Durban, Natal, Engineer.
1894. Uhlig, E. C., Citizens' Gas Works, Fifth and Hoyt Streets, Brooklyn, N.Y., U.S.A., Chemist.
1900. Uhlig, W. C., c/o Hygeia Distilled Water Co., 349, West 12th Street, New York City, U.S.A., Chemist.
O.M. Umney, C., (communications) Fernbrake, Branksome Wood Road, Bournemouth; and (Journals) 48, Southwark Street, London, S.E., Manufacturing Chemist.
1905. Umney, John C., 48, Southwark Street, London, S.E., Wholesale Druggist.
1889. Underhill, Thos. J., "Stanley," Quernmore Road, Bromley, Kent, Inspector of Stores.
1885. Underwood, G. R., 10, Emerson Street, Peabody, Mass., U.S.A., Glue Works Chemist.
1908. Underwood, Norman, Bureau of Engraving and Printing, Treasury Dept., Washington, D.C., U.S.A., Chemist.
1908. Upton, Wm. C., Sara Cook Street, Rawdwick, N.S.W., Australia, Soap and Candle Manufacturer.
1904. Uyeda, Toyokitsu, Takasago, Harima, Japan, Chemist.

V

1907. Vail, Jas. G., c/o Philadelphia Quartz Co., Delaware Avenue and Howell Street, Chester, Pa., U.S.A., Chemist.
1911. Vakil, Kapilram H., No. 5, Santa Cruz, Bombay, India, Chemist.
1896. Van der Linde, Harold, c/o Continental Rubber Co., Whitehall Building, 17, Battery Place, New York City, U.S.A., Vice-President.
1895. Vanderpoel, Dr. Frank, 175, Park Avenue, Orange, N.J., U.S.A., Chemist.
1903. Van Dyck, Edwin M., c/o Ault and Wiborg Co., 534, Pearl Street, New York City, U.S.A., Chemist and Ink Maker.
1907. Van Essen, E. C., 54, Cannon Street, London, E.C., Analytical and Consulting Chemist.
1897. Van Gelder, Arthur P., c/o E. I. du Pont de Nemours Powder Co., Kenvil, N.J., U.S.A., Superintendent.
1891. Van Gundy, Chas. P., Laboratory, B. and O. R. R., Baltimore, Md., U.S.A., Metallurgical Chemist.
1896. Van Laer, Norbert, Truman's Brewery, Burton-on-Trent, Brewer and Chemist.

1897. Van Marken, J. C., Box 204, Aix la Chapelle, Germany, Chemical Engineer.
1910. Van Ryn, Dr. J. J. L., 50, Mount Park Road, Ealing, W., Netherlands Agricultural Commissioner.
1888. Vargas-Vergara, J.M., Apartado No. 120, Bogota, Colombia, S. America, Metallurgical Chemist.
1910. Vass, David, Gas Works, Perth, N.B., Manager.
1912. Ventress, Ernest W. S., c/o Messrs. Lever Bros., Kabushiki Kaisha, P.O. Box Sannomiya 174, Kobe, Japan, Oil Mill Manager.
1898. Verity, Ben, 550, Hood Street, Fall River, Mass., U.S.A., Print Works Chemist.
1897. Verity, Victo., 10, Minot Street, North Woburn, Mass., U.S.A., Chemical Works Foreman.
1910. Verner, E. P., Parker Laboratory, 40, Broad Street, Charleston, S.C., U.S.A., Chemist.
1904. Vernon, R. H., Chemie Gebäude, Polytechnikum, Zürich, Switzerland, Chemical Engineer.
1908. Vickers, Benj. Threlfall, Gascoigne Street, Boar Lane, Leeds, Oil Merchant.
O.M. Vickers, Wm., c/o Thos. Vickers and Sons, Miles Platting, Manchester, Chemical Manufacturer.
1907. Vietinghoff-Scheel, Dr. Karl Freiherr von, "Chemiker-Zeitung," Cöthen (Anhalt), Germany, Editor in Chief.
1908. Vieweg, Dr. Walter, Gross-Auheim, bei Hanau a/M., Germany, Chemist.
1909. Virolleaud, Leopold, 16, Quai de Suresnes, Suresnes, Seine, France, Chemical Engineer.
1897. Vlies, Leonard E., Belmont, Gowan Road, Alexandra Park, Manchester.
O.M. Voelcker, E. W., 22, Tudor Street, London, E.C., Analytical and Consulting Chemist.
1887. Voelcker, Dr. J. A., 20, Upper Phillimore Gardens, Kensington, W., Agricultural Chemist.
1901. Vogel, G. C., 409, Terrace Avenue, Milwaukee, Wis., U.S.A., Tanner.
1897. Vogel, Julius L. F., 27, Old Jewry, London, E.C., Engineer.
1899. Vogeler, Gustav, 17, Philpot Lane, London, E.C., Merchant.
1897. Voorhees, Louis A., 111, Carroll Place, New Brunswick, N.J., U.S.A., Agricultural Chemist.
1899. Voorhees, Samuel S., Bureau of Standards, Washington, D.C., U.S.A., Chemist.
1902. Vorisek, Dr. Anton, College of Pharmacy, 115—119, West 68th Street, New York City, U.S.A., Instructor.
1888. Vörster, Fritz, Cöln-Marienburg, Germany, Manufacturing Chemist.
1885. Voss, Hermann, 19, Beckenham Road, Beckenham, Kent, Manure Works Manager.
1899. Voss, Walter A., Carlton Chemical Works, Glengall Road, Millwall, E., Manufacturing Chemist.

W

1896. Wachtel, Gregory, Alexandrowski Prospect 21, St. Petersburg, Russia, Chemical Engineer.
1905. Waddell, Montgomery, 1, West 101st Street, New York City, U.S.A., Consulting Engineer.
1911. Waddock, Wm. P., 666, Harris Street, Ultimo, Sydney, N.S.W., Milk Analyst.
1902. Wade, Frank, 26, St. Ronan's Avenue, Southsea, Analytical Chemist.
1890. Wade, Jas. L., 28, West Kensington Gardens, London, W., Chemical Manufacturer.
1889. Wadman, W. E., 102, Lord Avenue, Bayonne, N.J., U.S.A., Manufacturing Chemist.
1911. Waele, Armand de, c/o Barry, Ostlere, and Shepherd, Ltd., Forth Works, Kirkcaldy, Fife, N.B., Technical Chemist.
1897. Wagner, Dr. Theodore B., Room 2229, 17, Battery Place, New York City, U.S.A., Chemist.
1893. Wagner, W. G., 12, North Common Road, Ealing, W., Manufacturing Chemist.
1906. Wagstaffe, Dr. E. A., 22, Blackfriars Street, Manchester, Analytical Chemist.
1906. Wahl, Dr. Robert, 1135—1147, Fullerton Avenue, Chicago, Ill., U.S.A., President, Brewers' School.
1903. Wainwright, J., Ellerslie, The Wiend, Lower Bebington, Cheshire, Soap Works Manager.
1906. Wainwright, R. E., Woodside Dyeworks, Horsforth, near Leeds, Dyer.
1895. Wainwright, Wm., c/o Spooner and Bailey, Manure Works, Eling, near Southampton, Chemist.
1908. Wait, Douglas, c/o R. Gay and Co., Ltd., Langthorne Works, Stratford Market, London, E., Analytical Chemist.
1901. Waite, C. Nelson, c/o The Jessup & Moore Paper Co., Delaware Mills, Wilmington, Del., U.S.A., Chemist.
1899. Wakefield, Wm. C., Mill Street East, Savile Town, Dewsbury, Chemical Manufacturer.
1905. Waldenberger, Dr. C. A., 62, Mercer Street, Jersey City, N.J., U.S.A., Chemist.
1894. Waldman, Louis J., 78, Willett Street, Albany, N.Y., U.S.A., Aniline Dye Manufacturer.
1895. Waldstein, Dr. Martin E., 23, Broadwater Down, Tunbridge Wells, Kent, Manufacturing Chemist.
1887. Walker, Archibald, Newark Castle, Ayr, N.B., Distiller.
1908. Walker, George, c/o Anglo-Persian Oil Co., Mohammera, Persia, viâ Bombay, Analytical Chemist.
1897. Walker, H. V., 193, Lincoln Avenue, Newark, N.J., U.S.A., Chemist.
1894. Walker, Dr. Jas., 5, Wester Coates Road, Edinburgh, Professor of Chemistry.
1897. Walker, Jas. W., Marine Lodge, Irvine, N.B., Chemical Manufacturer.
1906. Walker, Jas. W., Stonydale, Oakamoor, Stoke-on-Trent, Assayer.
1902. Walker, Jno. H., Gourepore Works, Naihati, E.B.S.R., Bengal, India, Chemist.
1910. Walker, John S., Hiratsuka, Sagami, Japan, Chemist.
1884. Walker, S. R., Fern Bank, Starling Road, Radcliffe, Manchester, Foreman Dyer.
1900. Walker, Dr. Wm. H., Mass. Institute of Technology, Boston, Mass., U.S.A., Chemical Expert.
1895. Walker, W. Sloane, c/o Walker, Ltd., Litherland, near Liverpool, Tanner.
1897. Wallace, Edwin C., 306, South Street, Jamaica Plain, Boston, Mass., U.S.A., Chemist.
1883. Wallace, Robert, 20, Murrayfield Avenue, Edinburgh, Distiller.
1897. Wallace, Robt. A., Chemical Manufacturer.
O.M. Waller, Dr. Elwyn, 7, Franklin Place, Morristown, N.J., U.S.A., Professor of Chemistry.
1906. Wallerstein, Leo, 1, West 64th Street, New York City, U.S.A., Chemist.
1899. Wallerstein, Dr. Max, 24—26, West 30th Street, New York City, U.S.A., Chemist.
1886. Walsh, F. T., 12, Valentine Street, West Newton, Mass., U.S.A., Colour Printer.
1901. Walsh, Lionel O. P., c/o Dominion Tar and Chemical Co., Ltd., Sydney, Cape Breton, Canada, Chemist.
1903. Walsh, Peter H., P.O. Box 569, Magog, Quebec, Canada, Analytical Chemist.
1904. Walther, Wm., Holzapfel's Compositions Co., Ltd., Heworth Shore, Felling-on-Tyne, Chemist and Works Manager.
1908. Walton, Robert H., Railway Stores, Eveleigh, Sydney, N.S.W., Analyst.
1902. Walton, Thos. U., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Analytical Chemist.
1911. Walton, Wm. Keighley, c/o Thos. Illingworth and Co., Ltd., Willesden Junction, London, N.W., Analyst.
1895. Want, W. Philip, 194—200, Bishopsgate, London, E.C., Pharmacist and Editor.
1901. Warburton, Frank, 50, Rosebery Road, Muswell Hill, N., Manager.
1904. Warburton, George H., 77, Kingsgate Road, West Hampstead, N.W., Analytical Chemist.
1896. Warburton, Thos., 14, Sunny Bank Road, Longsight, Manchester, Chemist.
1912. Ward, Dudley R., 251, Peckham Rye, London, S.E., Analytical Chemist.

O.M. Ward, Geo., Messrs. Hirst, Brooke, and Hirst, Ltd., Millgarth Mills, Leeds, Chemical Manufacturer.

1891. Ward, G. J., Hallam Fields, Ilkeston, Notts., Civil Engineer.

1898. Ward, John, Barnstone Blue Lias Lime Co., Ltd., Barnstone, Notts., Manager.

1899. Ward, Wm. J., 11, Manor Road, Sale, Manchester, Chemist.

1908. Wardleworth, Theo. H., 168, Côte Saint Antoine Road, Westmount, Montreal, Canada, Manufacturing Chemist.

1902. Waring, W. Geo., Webb City, Mo., U.S.A., Metallurgical Chemist.

1899. Warnes, Arthur R., 97, Broughton Road, Thornton Heath, Surrey, Chemist.

1890. Warren, Fiske, c/o S. D. Warren and Co., Cumberland Mills, Westbrook, Maine, U.S.A., Paper Manufacturer.

1901. Warren, Jno. E., Eagle Chemical Works, Barchester Street, Poplar, E., Tar Distiller.

1907. Warren, W. H., Gas Works, Beckton, E., Gas Engineer.

1911. Washburn, Frank S., Stahlman Building, Nashville, Tenn., U.S.A., President, American Cyanamid Co.

1885. Waterfall, W. B., c/o Avon Manure Co., Bristol; and (Journals) Thirlmere, Clavering Road, Redland, Bristol, Manure Manufacturer.

1902. Watkins, E. J., 1, St. Mary's Road, Peckham, S.E., Works Chemist.

1898. Watkins, Willard H., c/o Schoellkopf, Hartford, and Hanna Co., P.O. Drawer 57, Buffalo, N.Y., U.S.A., Chemist.

1894. Watmough, Benj., 1, Ryeburn, Stanley Road; and (Journals) c/o Brotherton and Co., Ltd., Ammonia Works, Wakefield, Chemist.

1884. Watson, Chas., Rose Bank, School Road, Moseley, Birmingham, Manufacturing Chemist.

1894. Watson, Chas. Ernest, 28, Highfield Road, Stretford, Manchester, Chemical Assistant.

1908. Watson, C. I. Wilkinson, 9, Albany Gardens, Shettleston, Glasgow, Chemist.

1890. Watson, Eric E., c/o Straits Trading Co., Butterworth, Penang, S.S., Chemist.

1901. Watson, Herbert J., 68, Peel House Lane, Widnes, Chemist.

1903. Watson, H. W., Rose Villa, Roper Avenue, Gledhow, Leeds, Analytical Chemist.

1903. Watson, Hugh M., 22, Coleraine Road, Blackheath, S.E., Paint Manufacturer.

1894. Watson, Jas., Tyne View, Hebburn-on-Tyne, Alkali Works Manager.

1905. Watson, James, 62, Goddington Road, Strood, Kent, Cement Works Manager.

1891. Watson, Jno., Langdon, Beaconsfield Road, Blackheath, S.E., Analytical Chemist.

O.M. Watson, Jno. C., P.O. Box 523, North Adams, Mass., U.S.A., Printworks Chemist.

O.M. Watt, A., c/o Macfie and Sons, 34, Moorfields, Liverpool, Sugar Works Chemist.

1901. Watt, Francis L., 10, Northcote Chambers, Reiby Lane, Circular Quay, Sydney, N.S.W., Australia, Analytical Chemist.

1906. Watt, Dr. H. E., Blandfield Chemical Works, Wheatfield Road, Edinburgh, Chemist.

1893. Watts, Jno. Isaac, Fairleigh, Hartford, Cheshire, Alkali Works Manager.

1908. Watts, Jno. Wm., Newcastle Tar Works, Blaydon-on-Tyne, Manager.

1910. Watts, Reginald H. Pole, Rosebery House, Cardiff Road, Luton; and (Journal) Laboratory Department, Diamond Foundries, Luton, Beds., Research Chemist.

1907. Waumsley, Harry, Hanley Lodge, Springfield Road, Chelmsford, Chemical Engineer.

1903. Wayland, Wm. A., 12, Albert Road, Brockley, S.E., Manufacturing Chemist.

1906. Webb, Frank H., 7, Dustin Street, Haverhill, Mass., U.S.A., Chemist.

1905. Webber, W. J., 40, Central Street, Boston, Mass., U.S.A., Manufacturing Chemist.

1912. Weber, Dr. Max G., 17, Water Street, Perth Amboy, N.Y., U.S.A., Works Manager.

1901. Webster, Geo. J., 115, Delaware Avenue, Toronto, Canada, Secretary.

1902. Webster, Jno., Laboratory of Pathological Chemistry, St. Mary's Hospital, London, W., Analyst.

1906. Weddell, George, 20, Grainger Street West, Newcastle-on-Tyne, Manufacturing Chemist.

1904. Wedekind, Rud., Uerdingen, Niederrhein, Germany, Manufacturer of Alizarin and Bichromates.

1897. Wedge, Utley, Pennsylvania Salt Manufacturing Co., Philadelphia, Pa., U.S.A., Chemist.

1902. Weed, Hy. T., 181, Prospect Park West, Brooklyn, N.Y., U.S.A., Teacher of Chemistry.

1893. Weeks, H. B., 2, Infield Park Road, Barrow-in-Furness, Analytical Chemist.

1904. Weil, Jacob A., c/o The Power Gas Corporation, Ltd., Stockton-on-Tees, Chemist.

1910. Weinberg, Dr. Arthur von, "Buchenrode," Forsthaus-strasse, Frankfurt a/M, Germany, Dyestuff and Chemical Manufacturer.

1906. Weir, James, c/o Imperial Varnish and Color Co., 6—24, Morse Street, Toronto, Canada, Chemist.

1902. Weiskopf, Dr. Erich, c/o Japanese Explosives Co., Ltd., Hiratsuka, Japan, Works Manager.

1910. Weiss, John M., c/o Barrett Manufacturing Co., Research Dept., Hudson Heights, N.J., U.S.A., U.S.A., Chemist.

1908. Weissmuller, Edward F., Hill Crest, Runcorn, Cheshire, Chemist.

1905. Weissmüller, Ernest C., Hill Crest, The Heath, Runcorn, Cheshire, Research Chemist.

1910. Welch, Bertie M., 35a, Bligh Street, Sydney, N.S.W., Australia, Assayer.

1899. Weldon, Leonard E., 151, Egypt Road, New Basford, Nottingham, Dyer.

1907. Welham, Samuel D., 28, Cowlersley Lane, Milnsbridge, Huddersfield, Technical Chemist.

1903. Wellcome, Henry S., Snow Hill Buildings, London, E.C., Manufacturing Chemist.

1912. Wells, Jas. H., 18, Alwyne Place, Canonbury, London, N., Metallurgist.

1894. Wells, Pierson L., 86, Joralemon Street, Brooklyn, N.Y., U.S.A., Patent Lawyer and Engineer.

1885. Welsh, Jas., Standard Mills, Ferguson Road, Bombay, India, Printworks Manager.

1890. Welsh, Thos. L., 3, Prince's Gardens, Dowanhill, Glasgow, Analytical Chemist.

O.M. Welsh, W., Holt Town Oil Works, Manchester.

1905. Welt, Dr. Ida, 35, West 96th Street, New York City, U.S.A., Chemist.

1906. Wenger, Francis E., Clivedon, Wolstanton, Stoke-on-Trent, Ceramic Colour Manufacturer.

1909. Wentworth, Henry A., c/o Huff Electostatic Separator Co., 60, India Street, Boston, Mass., U.S.A., Mining Engineer.

1909. Westcott, J. P., Jr., 55, Washington Park, Newtonville, Mass., U.S.A. Manager, Atlas Chemical Co..

1903. Wesener, Dr. John A., 103, State Street, Chicago, Ill., U.S.A., Consulting Chemist.

1889. Wesson, D., 111, South Mountain Avenue, Montclair, N.J., U.S.A., and (Jnls.) Hotel Continental, Hamburg, E., Germany, Technical Chemist and Cotton-oil Expert.

1908. West, Chas. A., c/o American Camphor Refining Co., 14, Fulton Street, Boston, Mass., U.S.A., President.

1903. West, Leonard, "Ashfield," Duffield, near Derby, Manufacturing Chemist.

1909. West, Percy C. H., 153, Barnsbury Road, London, N., Analytical Chemist.

1900. Westenfelder, B. D., 1414, Race Street, Cincinnati, Ohio, U.S.A. Chemist.

1885. Westmoreland, J. W., 12, Arthington Terrace, Hunslet, Leeds, Metallurgical Chemist.

1898. Weston, David B., Sharon, Mass., U.S.A., Chemist.

1894. Weston, Robt. S., 14, Beacon Street, Boston, Mass., U.S.A., Chemist and Bacteriologist.

1885. Weston, Wm., 2, Ulundi Road, Blackheath, S.E., Analytical Chemist.

1890. Wetter, Jasper. 37—39. Essex Street. Strand, London, W.C., Patent Agent.
O.M Whalley, L. J. de, 18, Brandram Road, Lee, S.E., Sugar Chemist.
1909. Wharton, Fredk. M., 14, Council Road, Tientsin, North China, via Siberia, Chemist (Imperial Mint).
1908. Wheaton, H. J., 21, Chesterton Road, Cambridge, Chemical Engineer.
1909 Wheeler, Edward, 144, Earlsdon Lane, Coventry. Demonstrator of Chemistry.
1898. Wheeler, Dr. Edwd. J., 79, Chapel Street, Albany, N.Y., U.S.A., Analytical Chemist.
1903. Wheeler, Ernest, 4, Fairfield Terrrace, Higher Openshaw, Manchester, Metallurgical Chemist.
1906. Wheeler, Frank G., Trenton, Mich., U.S.A., Chemist.
1907. Wheeler, R. Vernon, Home Office Experimental Station, Eskmeals, Cumberland, Chemist.
1895. Wheelwright, Dr. E. W., 24, Stanmore Road. Edgbaston. Birmingham.
1905. Whetton, John, 77, Front Street East, Toronto. Canada, Manager of Canadian Branch of Read, Holliday & Sons. Ltd.
1909. Whiffen, G. Goodman, Lombard Road. Battersea. London, S.W., Chemical Engineer.
O.M. Whiffen, Thos. J., Cerris House, West Hill. Putney. S.W., Manufacturing Chemist.
O.M. Whiffen, W. G., Lombard Road, Battersea, London. S.W., Manufacturing Chemist.
1899. Whitaker. Milton C., Columbia University, New York City, U.S.A., Chemist.
1895. Whitaker, Thos., Aire Vale Dye Works. Newlay. near Leeds, Dyer.
O.M. Whitaker, Thorpe, (Journals) Bradford Dyers' Association, Ltd., and 35. Pemberton Drive. Bradford, Yorks, Dyer's Chemist.
1893. White, Arthur F., 2, Melbourne Grove, Thornbury, Bradford, Yorks. Manufacturing Druggist.
1901. White, H. Graham, 28, Brancote Road, Oxton. Birkenhead, Works Chemist.
1889. White, Henry, "Eastville," Norwood Road, Sheffield. Manufacturing Chemist.
1898. White, Jno., County Offices, St. Mary's Gate, Derby, Public Analyst to County of Derby.
1911. White, John W., c/o E.C. Powder Co., Green Street Green. Dartford. Kent, Works Chemist.
O.M. White, Paul T., Hortonfield House, West Drayton. Chemical Manufacturer.
1910. White, P. Winzar, Hortonfield House, West Drayton, Middlesex, Manufacturing Chemist.
1911. White, Walter W., c/o Citro Chemical Co., Maywood. N.J., U.S.A., Secretary and Manager.
1905. White, William, Beloeil Station. Province Quebec, Canada, Chemist.
1903. Whitehouse, P. L., c/o W. H. Keys, Ltd., West Bromwich, Staffordshire, Oil Chemist.
1906. Whiteley, C. E., 21, Brudenell View, Leeds, Demonstrator of Chemistry.
1885. Whiteley, R. Lloyd, The Institute, West Bromwich. Staffordshire, Principal.
1892. Whiteside, Jno. L., 376. St. Helen's Road, Bolton-le-Moors, Chemical Lecturer.
1911. Whitley, George, jr., c/o Ridley, Whitley, and Co., Ltd., Angel Road Works, Edmonton, N., Linoleum Manufacturer.
1885. Whittaker, C. J., Winthrop, Ansdell Road, Lytham. Lancashire, Chemical Engineer.
1904. Whittier, Charles T., 78, Brinkerhoff Street, Jersey City. N.J., U.S.A., Manager.
1901. Whitton, Jas. T., c/o Nobel's Explosives Co., Ltd., Ardeer. Stevenston, N.B., Chemist.
1884. Whowell, F., Croich Hey, Tottington, Bury, Lancs., Bleacher.
1910. Whymper, R., St. Clare's, St. Mary's Road, Ditton Hill, Surbiton, Chemist.
1899. Wiarda, Jno. C., 259-273, Green Street, Brooklyn. N.Y., U.S.A., Manufacturing Chemist.
1908. Wickes, Clarence S., 28, Franklin Avenue, Merchantville. N.J., U.S.A., Factory Superintendent.
1905. Widmann, Eugene A., 495, Eighth Avenue, Brooklyn, N.Y., U.S.A., Dyestuff Merchant.
1904. Wieler, Eric E., Northern Assurance Buildings, Albert Square, Manchester, Chemical Merchant.
1906. Wiffen, Henry J., 17, Albany Road, Manor Park, Essex, Manufacturing Chemist.
1883. Wiggin, W. W., Wiggin Street Works, Birmingham. Nickel Refiner.
1897. Wigglesworth, H., 25, Broad Street, New York City, U.S.A., Manufacturing Chemist.
O.M. Wightman, C., Springfield, Stevenage, Herts, Chemical Merchant.
1906. Wikner, Sigurd A., 103, Moston Street, Birches Head, Hanley, Tar Works Chemist.
1899. Wild, Roland C., The Grange, New Eltham, Kent. Analytical Chemist.
1893. Wilder, F. L., Morro Velho, Villa Novo de Lima, Estado de Minas Geraes, Brazil, Assayer.
1902. Wilder, Salmon W., jun., 33, Broad Street, Boston, Mass., U.S.A., Treasurer.
1911. Wildt, Dr. Edwin, c/o Badische Anilin und Soda Fabrik. Ludwigshafen a Rhein, Germany. Technical Chemist.
1902. Wiley, Dr. Harvey W., Bureau of Chemistry. Department of Agriculture, Washington, D.C., U.S.A., Chief.
1912. Wiley, Samuel W., 15, South Gay Street, Baltimore, Md., U.S.A., Analytical Chemist.
1906. Wilke, Wm., 86, Norwood Avenue, Buffalo, N.Y., U.S.A., Chemical Engineer.
1899. Wilkens, H. A. J., 30, Church Street. New York City, U.S.A., Mining Engineer.
1903. Wilkie, Jno. M., 38, South Road, West Bridgford. Nottingham. Analytical Chemist.
1885. Wilkin, Sir Walter, K.C.M.G., Appold Street, Finsbury, E.C., Yeast Manufacturer.
1895. Wilkins, Charles, 40, Church Lane, Hornsey, N., Manufacturing Perfumer.
1911. Wilkinson, Frank, West Lodge, Handsworth, near Sheffield, Chemical Manufacturer.
1904. Wilkinson, Prof. J. A., South African School of Mines and Technology, P.O. Box 1176. Johannesburg, Transvaal, Professor of Chemistry.
1886. Wilkinson, J. B., Tong Street, Dudley Hill, Bradford. Yorks., Chemical Manufacturer.
1903. Willard, C. T., c/o The Singer Manufacturing Co., Elizabethport, N.J., U.S.A., Chemist.
1893. Willcox, Benjamin, 47, Lincoln's Inn Fields, London, W.C., Patent Agent.
1911. Willcox, Stuart J., 46, Mulgrave Street, Liverpool, Chemist.
1903. Williams, Chas. E., Thornhayes, Sleaford. Seed Crusher.
1895. Williams, David T., 42. Finsbury Square, London, E.C., Chemist and Assayer.
1912. Williams, Egbert R., 43, Kendall Avenue, Toronto, Canada. Chemist.
1891. Williams, Henry J., 161, Tremont Street, Boston, Mass., U.S.A., Chemical Engineer.
1908. Williams, Herbert E., 12. Clevedon Road, Beckenham Road, Penge, Chemist.
1904. Williams, Jno. T., 55, Liberty Street, New York City, U.S.A.
1904. Williams, Naboth, 28, Rolleston Street, Warrington, Technical Chemist.
1902. Williams, Percy, 4, Ferron Road, Clapton, N.E., Chemist.
1885. Williams, Rowland, Hale Cote, Haverbreaks, Lancaster, Analytical Chemist.
1900. Williams, Saml. H., Glastonbury, Conn., U.S.A., Soap Manufacturer.
1903. Williams, S. M., 269, Springdale Avenue, East Orange, N.J., U.S.A., Chemist.
1885. Williams, T. Howell. *See* Idris, T. H. W.
1884. Williams, Prof. W. Carleton, Broomgrove. Goring-on-Thames, Professor of Chemistry.
1902. Williams, Walter Scott, 150, Mystic Street, West Medford, Mass., U.S.A., Textile Engineer.
1887. Williams, W. Collingwood, 36, Dansie Street, Liverpool, Analytical Chemist.
O.M. Williams, W. J., 5004, Franklin Street, Frankford, Philadelphia, Pa., U.S.A., Analytical Chemist.

1894. Williamson, J. Alex., The Croft, Chase Court Gardens, Enfield, N., Analytical Chemist
1911. Williamson, John, junr., Mine Hill, Camp Road, Maryport, Cumberland, Tanner.
O.M. Williamson, Robt., Low Walker, Newcastle-on-Tyne, Technical Chemist.
1903. Wills, J. Lamson, 133, Melwood Street, Brooklyn, N.Y., U.S.A., Technical and Brewing Chemist.
1905. Wills, Wm. H., 23, Willow Street, Waltham, Mass., U.S.A., Dyer.
1895. Willson, Thos. L., St. Catherine's, Ont., Canada, Electrical Engineer.
1888. Wilson, Cecil H., c/o Sheffield Smelting Co., Ltd., Royds Mills Street, Sheffield, Chemist.
1888. Wilson, Dr. David, Carbeth, Killearn, by Glasgow.
1910. Wilson, Dr. Forsyth J., Royal Technical College, Glasgow, Lecturer.
1885. Wilson, Frank, 7, Bedford Square, London, W.C., Brewer.
1903. Wilson, Geo. C., 298, Byars Road, Hillhead, Glasgow, Chemist.
O.M. Wilson, G. E., The Chemical Works, Oldbury, near Birmingham, Chemical Manufacturer.
1902. Wilson, Geo. W., Simmondley, Glossop, Derbyshire, Works Chemist.
1899. Wilson, Gordon, Benallan, Kirkintilloch, N.B., and (Journals) Apartado 188, Durango, Mexico, Chemist and Assayer.
1886. Wilson, Jno., Fyneside, Hagley Road, Birmingham, Technical Chemist.
1896. Wilson, Jno., The Vines, Oxford Road, Runcorn, Chemical Engineer.
1909. Wilson, Jno., Battersea Polytechnic, London, S.W., Head of Chem. Dept.
1905. Wilson, J. E., c/o General Chemical Co., 25, Broad Street, New York City, U.S.A., Chemical Salesman.
1906. Wilson, J. Murray, c/o Canadian Explosives Ltd., Montreal, Canada, Technical Chemist.
1902. Wilson, Leonard P., 8, Chester Street, Coventry, Technical Chemist.
1910. Wilson, Leslie, West Bank, Doxey, near Stafford.
O.M. Wilson, R. H., Egglescliffe P.O., Co. Durham, Chemical Manufacturer.
1900. Wilson, Walter A., P.O. Drawer 50 Nanaimo, B.C., Canada, Chemist.
1909. Wilson, Wm. J., 12, Vicarage Park, Plumstead, Kent, Chemist.
1908. Wilson, William James, c/o Wilson's Portland Cement Co., Ltd., Warkworth, Auckland, New Zealand, Cement Works Manager.
1890. Wilson, W. W., Dalmonach House, Alexandria, Dumbartonshire, Analytical Chemist.
1911. Wilton, Norman, c/o The Chemical Engineering Co., Hendon N.W., Chemical Engineer.
1884. Wilton, Thos., Winsor House, Beckton, E., Tar Works Manager.
1912. Windsor, P. L., University of Illinois Library, Urbana, Ill., U.S.A., Librarian.
1892. Wingfield, T. R., 5, Bromwich Street, Bolton, Brewer.
O.M. Wingham, A., 57, Victoria Road South, Southsea, Hants, Metallurgical Chemist.
1908. Winkler, Hermann, Bockenheimer Anlage 43, Frankfurt a/Main, Germany, Merchant.
O.M. Winser, P. J., Heath House, Knutsford, Cheshire, Consulting Chemist.
1907. Winsloe, Louis S., 1, Booth Street, Manchester, Manufacturing Chemist.
1892. Winstanley, W. Hy., Bridge House, Cheadle Hulme, Cheshire, Technical Chemist.
1886. Winstone, E. H., Members' Mansions, 36, Victoria Street, London, S.W., Ink Manufacturer.
1907. Winther, Dr. A., Chemische Fabrik Griesheim-Elektron, Werk Oehler, Offenbach a/Main, Germany, Chemist.
1892. Wirtz, Dr. Quirin, 28, Great Ormond Street, London, W.C., Consulting Chemist.
1889. Wishart, Jno., 39, St. Vincent Place, Glasgow, General Manager (Oakbank Oil Co., Ltd.).
1902. Withers, Prof. W. A., State A. and M. College, West Raleigh, N.C., U.S.A., Professor of Chemistry.
1906. Withey, Wm. S., Eldorado Mine, Lomagundi, South Rhodesia, Chemist.
O.M. Witt, Dr. Otto N., Ebereschenallee 10 Westend, bei Berlin, Professor of Chemistry.
1904. Wolf, August S., 206, West 95th Street, New York City, U.S.A., Chemist.
1903. Wolf, Jacques, c/o Jacques Wolf and Co., Passaic N.J., U.S.A., Manufacturing Chemist.
1911. Wollaston, T. Roland, Dirleton House, Priory Road, Sale, Cheshire, Consulting Engineer.
1903. Wolton, Wm. R., c/o Joseph Fison and Co., Ltd., Ipswich, Manager.
1906. Wood, E. Escott, Hurricane House, Brymbo, near Wrexham, North Wales, Chemist and Metallurgist.
1900. Wood, Frank, Osborne House, Barnsley, Yorks., Assistant Manager (Glass Works).
1901. Wood, Frank S., Chin Chu, Heathcote Street, Newland, Hull Cement Works Chemist.
1909. Wood, Hubert R., c/o Fenner and Alder and Co., Fenner's Wharf Millwall, E., Works Chemist.
1887. Wood, Jos. T., 62, Park Road, Nottingham, Tanner
1886. Wood, Wm., 20, Rue Général van Merlen, Antwerp, Belgium, Bleacher and Dyer.
1906. Woodall, Corbett, Palace Chambers, Westminster, London, S.W., Civil Engineer.
1908 Woodbridge, Walter B., c/o Macleod and Co., 213, East Pearl Street, Cincinnati, Ohio, U.S.A., Chemist.
O.M. Woodcock, R. C., c/o Sanitas Co., Ltd., Locksley Street, Limehouse, London, E. Technical Chemist.
1910. Woodhead, Arthur E., Dyeing Dept., The University, Leeds, Research Student.
1902. Woodhead, Chas. E., 458, Edge Lane, Droylsden, Manchester, Chemist.
1884. Woodhead, Jas., Inglewood, Slaithwaite, near Huddersfield, Tar Distiller.
1900. Woodrow, John, 84, Harpenden Road, Manor Park, E., Chemist.
1906. Woodward, Horace A., Cowell Avenue, West Orange, N.J., U.S.A., Chemist.
1904. Woolcott, Geo. H., Lady's Well Brewery, Cork, Ireland, Brewer's Chemist.
O.M. Woolley, G. S., Victoria Bridge, Manchester, Pharmaceutical Chemist.
1905. Woore, N. L., P.O. Box 12, Mount Morgan, Queensland, Australia, Assayer.
1901. Worden, Edw. C., c/o Clark Thread Co., Newark, N.J., U.S.A., Analytical Chemist.
1909. Work, Charles O., 22, Cambridge Road, Great Crosby, Liverpool, Analytical Chemist.
O.M. Worrall, H., Crimsworth, Upper Chorlton Road, Manchester, Dyer.
1903. Worstall, Robt. A., 21, North La Salle Street, Chicago, Ill., U.S.A., Paint and Varnish Specialist.
1900. Worthington, Arthur, Lynwood, Green Lane, Bolton, Chemist and Sub-Manager.
1896. Wrampelmeier, T. J., 2324, Piedmont Avenue, Berkeley, Cal., U.S.A., Chemist.
O.M. Wray, O. J. P., Hazlemere, Coleraine Road, Blackheath, S.E., Technical Chemist.
1904. Wright, Allister M., Box 617, G.P.O., Christchurch, N.Z., Chemist (Christchurch Meat Co.).
1895. Wright, Arthur C., c/o Turner, Morrison, and Co., 6, Lyons Range, Calcutta, India, Chemist.
1908. Wright, C. Harold, Government Laboratory, Port of Spain, Trinidad, B.W.I., Analytical Chemist.
1904. Wright, Chas. L., c/o U.S. Geological Survey, 40th and Butler Streets, Pittsburg, Pa., U.S.A., Chemical Engineer.
1901. Wright, Harold E., c/o Sir B. Samuelson and Co., Ltd., Middlesbrough, Chemist.
1907. Wright, John Henry, 16, Norwood Avenue, Shipley, Yorks, Technical Chemist.
1885. Wright, Jos., 19, Arboretum Street, Nottingham, Lace Dresser.
O.M. Wright, L. T., Junior Constitutional Club, Piccadilly, London, W., Chemical Engineer.

1910. Wright, Robert, 122, York Street, Jarrow-on-Tyne, Blast Furnace Manager.
1911. Wright, Robt., c/o Thos. Adams, Ltd., Sherwood Hill Works, Nottingham, Bleacher and Dyer.
1900. Wright, Walter J., 3, Newington Villas, Briton Road, Faversham, Kent, Chief Chemist (Cotton Powder Co.).
1890. Wülfing, Dr. Charles, Hönningen a/Rhein, Germany, Technical Chemist.
1907. Wurster, Oscar H., c/o Lever Bros., Ltd., Toronto, Canada, Soap Works Chemist.
1890. Wyatt, Dr. Francis, 402, West 23rd Street, New York City, U.S.A., Consulting Chemist.
1905. Wyer, Malcolm G., The Library, State University, Iowa City, Iowa, U.S.A., Librarian.
O.M. Wyld, Jno., The Avenue, Lidgett Park, Roundhay, Leeds, Chemical Works Manager.
1908. Wyler, Dr. Max, 165, High Street, C. on M., Manchester, Manufacturing Chemist.
1906. Wynne, Prof. W. Palmer, F.R.S., The University Sheffield, and (Journals) 17, Taptonville Road, Sheffield, Professor of Chemistry.

Y

1901. Yardley, Frank, c/o Henry Jutson and Sons, Liverpool Street, Birmingham, Chemical Manufacturer.
1897. Yates, W. H., 10, Curzon Road, Southport, Technical Chemist.
1906. Yerkes, Leonard A., c/o Jos. Bancroft and Sons Co., Wilmington, Del., U.S.A., Bleacher and Finisher.
1898. Yetton, Thos., 86, Bow Road, London, E., Consulting Distiller's Chemist.
1894. Yocum, Dr. Jno., H., 359, Halsey Street, Newark, N.J., U.S.A., Chemist.
1886. Yoshida, Prof. H., Imperial University of Kyoto, Kyoto, Japan, Professor of Chemistry.
1900. Yoshitake, E., 18, Tatsuokacho, Hongo, Tokyo, Japan, Chemist.
1885. Young, Alfred C., 17, Vicar's Hill, Lewisham, S.E.
1885. Young, Brougham, 2A, Sigdon Road, Dalston, N.E., Analytical Chemist.
1902. Young, Chas. C., c/o Farbenfabriken of Elberfeld Co., 117, Hudson Street, New York City, U.S.A., Colourist.
1890. Young, Dr. Geo., Bradda, Church Crescent, Church End, Finchley, N., Chemist.
1904. Young, James, 2, Montague Terrace, Kelvinside, Glasgow, Chemist.
O.M. Young, Jno., 2, Montague Terrace, Kelvinside Glasgow, Technical Chemist.
1886. Young, Jno., Claremont House, Beverley Road, Hull, Gas Engineer.
1909. Young, John, Research Laboratories, The Diamond Rubber Co., Akron, Ohio, U.S.A., Analytical Chemist.
1904. Young, Jno H., c/o The Cassel Cyanide Co., Ltd., Shuna Street, Maryhill, Glasgow, Technical Chemist.
1898. Young, J. W., 22, Maxwell Drive, Glasgow, S., Inspector under Alkali Acts.
1909. Young, R. F., c/o Tarkwa Banket West, Ltd., Tarkwa, Gold Coast, West Africa, Chemist and Metallurgist.
1912. Young, Robert, 16, Rowallan Gardens, Glasgow, W., Technical Chemist.
1883. Young, Prof. Sydney, F.R.S., University Chemical Laboratory, Trinity College, Dublin, Professor of Chemistry.
O.M. Young, W. C., Laboratory, 24, Aldgate, London, E.C., Gas Examiner and Consulting Chemist.
1898. Young, W. Gathorne, Analyst's Dept., G.N.R., Doncaster, Yorks, Chief Chemist.

Z

1899. Zabriskie, C. B., c/o Pacific Coast Borax Co., 100, William Street, New York City, U.S.A., Manager.
1897. Zacharias, Dr. P. D., Philhellinon Street 22, Athens, Greece, Industrial Chemist.
1906. Zaremba, Edw., 707, D. S. Morgan Building, Buffalo, N.Y., U.S.A., President (Zaremba Co.).
1906. Zdanowicz, Joseph, 9, Knaresborough Place, Earl's Court, S.W., Chemical Engineer (Artificial Silk).
1899. Zilz, Henry, 20—26, Brunswick Place, City Road, London, N., Agent (Badische Anilin und Soda Fabrik).
O.M. Zimmermann, A., 3, Lloyd's Avenue, London, E.C., Chemical Agent.
1905. Zimmermann, Chas., 9 & 10, St. Mary-at Hill, London, E.C., Chemical Merchant.
1897. Zinsser, Dr. Fred. G., Hastings-upon-Hudson, N.Y., U.S.A., Manufacturing Chemist.

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